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Snap beans: present status in the developing world and bibliography of research (1919-1987)

CIAT
Centro Internacional de Agricultura Tropical

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Willem Janssen
Jorge López S.
Francy González V.

CIAT
Centro Internacional de Agricultura Tropical

Centro Internacional de Agricultura Tropical
CIAT
Apartado Aéreo 6713
Cali, Colombia

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FOREWORD

Production of snap beans (edible green pods) reached some 2.5 million tons in 1984-1986 for a total value of production of about US$900 million. Good nutrition requires adequate levels of vitamins and minerals in addition to calories and proteins, and snap beans are an excellent source of those nutrients.

Demand for snap beans is growing rapidly along with that for other vegetables in the tropics, propelled by improvements in income that enable consumers to diversify and enrich their diets. This buoyant market provides an excellent income-earning opportunity for producers, and small farmers are well positioned to take advantage of this potential due to the high labor and management intensity of snap bean production.

Phaseolus species, with origin in tropical America, comprise the bulk of snap bean production. Research on snap beans, however, has been concentrated in temperate countries, and much less has been done to improve snap bean production in the tropics, where disease and pest pressures are distinct and especially intense.

This bibliography provides a valuable baseline on what is currently known about snap beans. The accompanying introductory essay appraises the socioeconomic potential of snap beans in the tropics, and poses the challenge of whether sufficient attention has been devoted to this crop, an issue which clearly merits thoughtful consideration.

Douglas Pachico
Bean Program Leader

INTRODUCTION

In developing countries, there is a growing interest in improving the quality of food, firstly to provide secondary sources of nutrients, such as minerals and vitamins, and secondly to raise the income levels of small farmers. Snap beans outstand among potential crops; its similarity to common beans suggests that it can be grown in many tropical regions, traditionally devoted to the cultivation of staple food crops.

CIAT's Bean Program and Bean Information Center have attempted to put together the literature on snap beans, mainly through the consultation of the Bean Information Center database and documents remitted by bean researchers worldwide.

The first part of the publication consists of a review of the present status of snap beans in the developing world, dealing mainly with socioeconomic aspects. Production, marketing and consumption features are described and the future potential for the crop is outlined. Constraints to production increases are discussed and the opportunities for research and development of the crop are defined.

The socioeconomic orientation of the opening paper and the technical emphasis of the bibliography are highly complementary. Whereas the paper outlines the major issues in snap bean production and utilization, the bibliography indicates what has been accomplished in them.

The bibliography contains 922 references to research on snap beans. Most of the documents are available at CIAT. Consultation to other sources yielded 161 references (marked with an asterisk), which will soon be incorporated into the bean database. References are organized by disciplines and are complemented with author and subject indexes. Within each discipline, the

citations are arranged alphabetically by authors, and within the papers of each author, by year in descending chronological order.

Users may obtain the full text of the documents by citing the complete number appearing in the upper left hand corner of each reference. (Please cite this bibliography as the source.) Requests should be directed to:

CIAT
Communication and Information Support Unit
Library Services - Photocopies
Apartado Aéreo 6713
Cali, Colombia

The Bean Information Center also contacted institutions to identify those that carry out research on snap beans and to establish mechanisms for a permanent exchange of information. The institutions that responded affirmatively are listed in the enclosed preliminary directory, which also includes the names of the snap bean researchers recorded in our database and the participants in the Workshop on Snap Bean Breeding held at CIAT in 1987.

We hope that this publication will be a useful reference tool to snap bean researchers worldwide. Contributions are solicited, and those persons who send articles to be added to the collection directly to the Bean Information Center, may request copies of a corresponding number of articles currently in the collection, free of charge. An updated and final version of the directory will be published. Since this preliminary version is not complete, we encourage other snap bean researchers to send in their data.

SNAP BEANS IN THE DEVELOPING WORLD

by

Willem Janssen

CIAT

Bean Program

INTRODUCTION

Observers of the Latin American and Asian food situation are paying increasing attention to food quality issues. Twenty years ago most development specialists were concerned with producing enough food to feed the world's rapidly increasing population. Questions on the quality of the produced food were secondary. The events during the 80's have shown that the world's capacity to produce food is in no way exhausted. Through the combination of sensible agricultural policy, investments in agricultural infrastructure, improved agricultural technology and better training and extension, food availability in these continents, especially rice and wheat, has improved greatly. Today highly populated countries like India and Bangladesh are capable of being net food exporters.

The world's food problem, however, is not solved. The situation in sub-Saharan Africa, where neither rice nor wheat production had great impact, remains critical. The purchasing power of the many poor in Asia and Latin America is insufficient to provide adequate nutrition, and the ongoing vagaries of agricultural production still deeply affect the world's small farmers and low-income consumers in years of bad harvest.

In many countries further improvements of the food situation will depend on producing not only more but also better products. Two main arguments support this thinking. The first one is that better quality products will satisfy more easily the needs for secondary nutrients, such as vitamins and minerals. The other argument is that the extra value added of improved products will allow income increases for the agricultural population, allowing their incomes to keep up with those in other sectors.

Vegetables are a suitable food crop that would comply with both arguments. Most of them do not provide major amounts of calories and proteins per kilogram, but are rich in a variety of vitamins and minerals. While they are mostly grown on very small farms, they still tend to provide more than average incomes to their producers. The increased attention for vegetables is evident in FAO's networking activities (e.g., FAO, 1987), in the discussions within the Consultative Group on International Agricultural Research and in the increased attention for production systems that combine staple food and vegetable production (e.g., Zandstra et al., 1981).

Snap beans hold a special place among vegetables grown and consumed in developing countries. They are eaten in many parts of Asia and Latin America and are of increasing importance in Africa. Because snap beans belong to the same species as common dry beans, Phaseolus vulgaris L., they can be grown in similar conditions and with comparable cultural practices. Snap beans do not provide the proteins and calories dry beans do, but they do provide the vitamins and minerals that most staple foods lack. The similarity in production methods, but the difference in the final product, allows producers to supplement (quantity-oriented) staple food production with (quality-oriented) vegetable production. Snap beans thus provide the ideal crop with which to initiate vegetable production in areas traditionally relegated to staple food production.

This paper aims to introduce the role of snap beans in the food sector of the developing world. A brief description of snap beans and other bean vegetable products will be followed by the major features involved in the production, processing, marketing and consumption of snap beans in the developing world. Chemical control in snap bean farming is particularly high and will be discussed in detail. Observations on seed distribution and on the effect of agricultural development on snap bean production will be made. Finally some suggestions for possible snap bean research will be outlined.

VEGETABLE BEAN PRODUCTS

In both the developed and the developing world *P. vulgaris* is primarily consumed as dry beans; however, *P. vulgaris* is also harvested and consumed in its fresh, green state (common in Latin America and Africa), and bean leaves are consumed as a sort of vitamin A-rich spinach in Africa (Bittenbender et al., 1984). Alternatively, in the case of snap beans, the green pods are commonly consumed in their immature, preferably fiberless state, in Europe, the Americas and Asia. As shown in Table 1, production, marketing and consumption characteristics of green shelled beans, snap beans and bean leaves are very different from those of dry beans.

Dry beans mainly supply proteins and calories. The consumption of fresh bean products provides high vitamin and mineral levels, in exchange for decreased protein and carbohydrate contents. In many parts of the world, vitamin availability is deficient, causing serious problems, even blindness (Davidson et al., 1975). Increased consumption of vegetable bean products could contribute to improved health conditions.

The production cycle of dry beans is shorter than that of most cereals but still longer than that of the vegetable bean products. For this reason green shelled beans will be eaten in parts of Africa until dry beans become available. Cooking time of the immature bean products is shorter than that of dry beans, which is an advantage in fuel-deficient regions. The immature nature of bean vegetable products decreases postharvest storability, which in turn leads to higher marketing margins than for dry beans.

Snap beans are the most important of vegetable bean products due to their wide geographical distribution, relatively large production and their imminent potential as an income source to small farmers. In comparison with other vegetables, snap beans are particularly rich in vitamin A, calcium, phosporus and iron. They form an

important source of vitamins and minerals to many people in the developing world.

Table 1. Characteristics of different edible bean products.

	Dry beans	Green shelled beans	Bean leaves	Snap beans
Protein content (%)	20.4	7.0-10.5	3.6	2.1
Calories/kg	3,020	1,040-1,510	360	290
Vitamin A (I.U./g)	0	0.4	10.0-20.0	2.0
Water (%)	12.3	58.2-70.0	86.8	90.0
Cooking time (minutes)	120	40	10	25
Days from planting to first harvest	90	55	25	40
Yield (kg/ha)	700	1,575	10,000	8,000
Postharvest storability	medium-long	short	short	short

Sources: Bittenbender, 1984; Platt, 1977; Instituto Nacional de Nutrición, 1967; author's estimations.

THE IMPORTANCE OF SNAP BEANS

Statistics on snap beans in the developing world are very deficient. The areas of snap bean production per farm are so small that harvest data are often omitted from agricultural production statistics. Where statistics are available, production is underestimated because of the short cultivation cycle -- if a certain area is planted continuously with snap beans, it may have produced more than four crops rather than one by the end of the year. Instead of estimating the importance of snap beans by studying production statistics, it is often more useful to examine food budget or wholesale market inflow data. Production and consumption data for some countries of particular importance, or for which reliable data are available, are given in Table 2.

Snap bean consumption per country is highly variable, even within continents. In Latin America, Colombia and Chile have high consumption levels but Peru has rather low ones. In Asia, China appears to have high consumption levels but Indonesia and the Philippines low ones. In the latter countries, snap beans are secondary to yardlong beans (Vigna sinensis), which are more heat tolerant and better adapted to growing conditions in these countries as shown by consumption levels of 1.5 and 2.7 kg per capita, respectively.

Data on snap bean production in Africa are very deficient. Reliable data is only available for a few countries in the Mediterranean basin. For other parts of Africa, consumption of immature green pods has been reported (Due et al., 1984), but estimates of national production have not been made. In many parts of Africa specific snap bean varieties appear to be absent and immature dry bean varieties (with more pod fiber) are consumed as green beans.

In Asia reliable data are available for Indonesia, the Philippines and some minor countries. The importance of the crop, however, depends on its role in China and

India, where almost 40% of the world population is living. In China, several sources (e.g. Plucknett and Beemer, 1981) suggest consumption levels between 1.5 and 2.5 kg, resulting in a production of almost 2,000,000 t; however, these sources do not clearly distinguish between P. vulgaris and other species. For India the FAO Production Yearbook (1986) reports a production of only 45,000 t, less than 100 g per person annually. This seems to underestimate its importance, but better production estimates for India have not yet been identified.

Among the countries listed in Table 2, snap bean production already adds up to almost 2,500,000 t. Considering the low figure for India and the number of countries not included in Table 2, a 3,000,000-t estimate of snap bean production in the developing world is probable. This implies an average per capita consumption in the developing world of 0.9 kg.

Snap beans are grown for the domestic market as well as being produced for export. In 1985 and 1986 the USA imported around 10,000 t of snap beans, mainly from Mexico (USDA, 1986). Somewhat older data for Europe (1978/1979) show imports during the winter season of around 30,000 t (ITC, 1981). Imports in Europe are higher than those in the USA because of the absence of suitable winter climates in Europe for snap bean production, such as those present in southern USA. Although the import volumes in these markets are not outstandingly high, they represent considerable amounts of money because of the high prices paid.

In both the U.S. and European markets, prices fluctuated between US$750 and US$1350 per t. The chances for increasing export-oriented snap bean production should be considered rather low. The European market has become more difficult to access with the entrance of Spain and Portugal in the European Economic Community; the American market is increasingly satisfied with domestic produce. As will be shown in the consumption

section of this paper, domestic consumption growth for snap beans looks more promising.

Table 2. Estimated annual snap bean production and consumption in selected developing countries, 1980-1985.

	Yields (kg/ha)	Production (t)	Consumption (kg/capita/yr)	Main source*
Latin America				
Argentina	9,300	41,900	1.3	A
Brazil	7,000	92,000	0.7	B
Chile	7,900	39,500	3.2	A
Colombia	7,000	75,900	2.7	C
Peru	4,300	6,400	0.4	A
Africa				
Egypt	8,720	117,750	2.5	A
Morocco	10,200	17,880	0.9	A
Asia				
China**	10,200	1,465,500	1.5-2.5	D
India**	2,100	44,100	0.1	D
Indonesia	6,200	43,498	0.3	C
Philippines	3,250	19,500	0.4	C
Turkey**	8,250	404,250	6.0-7.0	D

* A, National Production Statistics; B, Market inflow data; C, Food Budget Survey; D, FAO Production Yearbooks 1982-1986. (In case of China, it is not clear whether the reported figures only concern *P. vulgaris*.)

** Preliminary estimates

The monetary value of snap bean production in the developing world is significant. Farm-gate prices tend to fluctuate between US$0.20 and US$0.40 per kg, roughly 50 to 100% of dry bean prices. At the consumer level, prices fluctuate between US$0.35 and US$0.55 per kg, equal to or above dry bean prices. Assuming a snap bean

price of 75% of dry beans at the farm level, the total farm value of the crop in the developing world is some US$900,000,000. At the consumer level, the value would be US$1,500,000,000. This equals about 32% at the producer level or 43% at the consumer level of the dry bean crop in the developing world. These figures should be interpreted with care, because the estimations of Asian production and consumption are rather rough.

As in the case of dry beans, snap beans can have different growth habits, varying from the determinate bush growth habit to the indeterminate climbing habit. In the developing world the majority of snap beans are of the indeterminate climbing type. Although the cultivation of this type is difficult to mechanize, it offers the advantage to the farmer of higher yields per hectare with a harvest spread of some six weeks or more. This staggered harvesting of snap beans allows the to adapt his supply to changing daily fresh market conditions thereby spreading his marketing risk over a longer time period.

Snap beans in the tropics are mainly produced by small farmers, due to two factors. Firstly, snap beans are often supplied to rather thin and unstable markets, subdued by severe quality exigencies. Large farmers cannot supply such a market without destabilizing it even further, and they also have severe difficulties in sufficient attention to quality. Only where snap bean production is integrated with a processing or export industry (e.g., Turkey), can large-scale farmers start to grow snap beans.

Secondly, snap bean production is very labor intensive and, because of the dominating indeterminate climbing growth habit, difficult to mechanize. Preliminary production studies in Colombia, Taiwan and the Philippines show labor needs per hectare of 241, 680 and 580 man-days per crop, which is more than double what is needed in a maize/beans or potato crop (Table 3). These labor needs are far higher for climbing beans than for bush beans, which can be mechanized almost

completely. Market access and production technology limitations interact to maintain snap beans as a small farm crop.

Table 3. Production parameters of snap beans and other crops, Colombia 1980-1985.

	Labor days (/ha)	Input costs (US$/ha)	Returns (US$/ha)	Returns (US$/ha/month)
Snap beans	241	1,218	982	327
Maize/beans	108	156	155	16
Potato	119	625	1,667	278
Wheat	30	221	32	5
Barley	35	192	209	42

Source: CIAT, Bean Economics, internal data

Consequently, snap bean plots are small, often less than a hectare. Fertility levels of the plots tend to be high, due to choice of site or very high inputs of organic and inorganic fertilizers. These plots are intensively managed and may include five different crops in a single year. Snap beans are often rotated with other climbing crops, like tomato and cucumber, because this improves the use of the trellising structure.

The snap bean grower may cultivate a small but costly piece of land, because production is often concentrated in highly valued areas close to the urban markets. Also, the snap bean grower needs large amounts of capital to finance his inputs (seed, fertilizer, chemical control means). In the previously mentioned production studies, fertilizer costs were more than US$500 in Colombia and almost US$400 in the Philippines. Chemical control costs were close to US$200 in both cases, while seed costs US$125 in the Philippines and

US$280 in Colombia. A final important input, though not always paid for, is irrigation water. Snap beans are not very drought resistant and the high costs of other inputs are only justified if irrigation water is available to assure reasonable yields. In case production circumstances allow a stable yield, snap beans offer a considerable income to the farmer in exchange for the use of a small piece of land during a short period of time (Table 3).

CHEMICAL CONTROL

Many vegetable species presently grown in the tropics, including snap beans, were not specifically developed for those areas but rather were transferred directly from the temperate zones. This is also the case with snap beans. Although P. vulgaris originated in the tropics, almost all snap bean varieties were developed in the USA and Europe. Consequent poor adaptation to the tropical medium coupled with intensive cultivation has often resulted in high insect and disease pressure. Rust, anthracnose and angular leaf spot are major snap bean diseases; white fly, leafhoppers, stemborers and leafminers are very damaging insects. Insect and disease pressure not only decreases the yields of the plot but also the quality and value of the produce.

Snap beans are a highly commercial crop, predominantly grown for the market. Since a successful snap bean crop, even on a small area, represents a considerable cash income, farmers are willing to invest in chemical control. In order to prevent insect and disease losses, extremely high and frequent doses of insecticides and fungicides are commonly used. Biweekly applications have been reported in Indonesia and Colombia (e.g., Davis, 1987).

The intensive chemical control in snap bean production is causing a number of problems. Firstly, the ecological balance of production areas is disturbed and the sustainability of cropping systems compromised. As a

result of the intensive control methods, pest resistance, resurgence and substitution occur. In this way the existing plant protection problems are often exchanged for a new set of often more complicated problems.

Secondly, the high chemical control intensity risks poisoning the labor force, affecting not only the persons that apply the chemicals, but also those active in other cultural practices. Often women of reproductive age and children are involved in these activities.

Thirdly, residual pesticides might put the snap bean consumer at risk. The nervous system and other parts of the human body might be affected by the intake of residuals, even though residuals are reduced by cooking the snap beans before consumption.

Finally, chemical control becomes a routine activity. Farmers do not assess potential damage before spraying but use chemical control preventively. Pesticides might be applied when there is actually no need for them. This affects the profitability of snap bean production.

The costs of intensive chemical control does not only include the monetary costs of the inputs, but also the environmental costs, the medical costs of treating poisoned people and the human costs from suffering irreversible or reversible toxification. Strategies to overcome the problems of intensive chemical control are urgently needed. Presently integrated control strategies appear most appropriate. These strategies could lead to decreased chemical control frequencies by monitoring snap bean production and applying chemicals only when certain thresholds have been passed.

Since excessive chemical control is due to the susceptibility of present germplasm, a program of breeding for insect and disease resistance, as well as for general adaptation to the tropical circumstances, is the other necessary component in the development of

integrated control strategies. It should be clear that the justification for resistance breeding is very different for snap beans than for dry beans. In dry beans it is important because farmers cannot pay the inputs; in snap beans it is important because farmers presently rely too heavily on chemical control.

PROCESSING

In the developed countries most snap beans are processed before being sold to the final consumer. Processing most commonly takes the form of canning or freezing. In the developing world processing is less important for a number of reasons.

In many countries snap beans can be grown year round because seasonal variability is low. Consequently there is no specific harvest period when snap beans become available in large quantities at a low price. Neither is there a period in the year when fresh snap beans are in low supply and command a high price. The feasibility of processing as a storage mechanism is highly reduced.

Processed snap beans have shorter preparation time and offer increased consumer convenience. In developing countries reduced preparation time is not as overriding a consideration as it is in developed countries.

The cost of processing adds considerably to the final price of the product. Processed snap beans happen to be more expensive than fresh snap beans. Most consumers in the developing world are poor and will not be attracted by a more expensive substitute, just because it is processed.

A final reason is the difficulty of getting an adequate supply of snap beans to be processed. The large number of farms that are needed to obtain sufficient volume will increase the cost of logistic planning and will make quality control more complicated.

MARKETING

The high perishability of snap beans has strongly influenced the evolution of its marketing channels. Since there is no stock to draw on to complement or to reduce existing daily supplies, the market suffers from strong price fluctuations. The short growing cycle of the crop causes these fluctuations to occur within weeks or even days.

The perishable nature of the product increases the risk of postharvest losses to the snap bean trader. These losses take two forms. Because of sales delays, the quality of the product might be reduced. Although the trader is still able to sell, he will have to do so at a discount. At the same time the product will gradually lose some humidity, which in turn lowers its weight, so the trader loses money as the product loses water. Also quality deterioration can be so great that the crop becomes inappropriate for human consumption. This deterioration might be through the occurrence of pathogens or through advanced dehydration and decolorization of the crop.

Snap beans are mostly traded in the developing world by intermediaries with limited sales volumes. These intermediaries are better able to control the quality of the product than large traders and make a more effective effort in speeding up sales. Besides snap beans, many of these traders will handle other vegetable products to spread their energies as well as their risks over a number of activities.

Traditional sales outlets such as market places, neighborhood shops or street vendors play an important role in snap bean distribution. The importance of nontraditional outlets, such as supermarkets, is increasing, especially in Latin America. Snap bean distribution patterns are developing in much the same way as for other vegetable crops. For each country, the importance of specific market outlets depends very much on the overall developments in food retailing.

The perishability of the crop and the small volumes handled per trader have a marked impact on margins. In most countries the price that the urban consumer pays will be double or more the price that the farmer receives.

CONSUMPTION: PRESENT AND POTENTIAL

Snap beans are consumed in many different ways. They are often served alone as a cooked vegetable, but might also be found in salads, soups or stews. Because they are relatively expensive in many countries, snap beans are often considered a luxury to be served on special occasions.

Snap beans is one of a large number of vegetable crops. The importance of vegetable products in the diet increases strongly with rising income, which in turn is associated with the desire for a more balanced and diversified nutrition. In a similar way, the importance of vegetables rises when absolute caloric needs decrease and when availability improves (e.g., in the case of rural vs. urban environments). Most vegetable crops can easily be substituted for each other, in production as well as consumption, with their consumption levels being determined by price, quality and compatibility with other food sources. To fully understand snap bean consumption, the influence of income, urbanization, price and quality will be analyzed here in more detail.

Income and snap bean consumption

Snap bean consumption is strongly income dependent. In Indonesia as well as in Brazil, a ten-fold increase in income leads to a six- or seven- old increase in snap bean consumption. In Colombia consumption per capita is more than seven times higher in the richest than in the poorest income quintile (DRI-PAN, 1981). Among a group of major vegetables eaten in Colombia (cabbage, tomato, carrot, onion, green peas), snap bean consumption responded most to income growth.

The income-dependent nature of snap bean consumption suggests that as the developing world advances, strong consumption increases will occur. For every 10% income growth it might be reasonable to assume a 5% per head consumption growth. The validity of this reasoning can be found in the US consumption level, which is around 3 kg per head annually.

Urbanization and snap bean consumption

Snap bean consumption tends to be higher in urban than in rural areas, mainly due to the higher availability of snap beans but also to the lower energy needs in the urban environment. For example, in Manila consumption is about 2.5 times higher than in the rest of the Philippines. In Colombia, urban consumption is four times higher than rural consumption among the poorest consumers and two to three times higher among the richest. Brazilian data show similar patterns.

Desirable or not, urban migration is an ubiquitous phenomenon in the developing world. In Latin America the great majority of the population is already urban and in Africa and Asia the move from country to city is increasing rapidly. In 1983, 35% of the developing world population lived in towns, with urbanization proceeding at a rate of 1.5% per year. If this tendency continues, it will cause a per capita demand growth for snap beans (at stable prices) of 0.5% per year.

Relative prices and snap bean consumption

Consumption of snap beans is strongly determined by its price relative to other vegetables. On a per kg basis, snap beans are expensive (as shown in Table 4 for some selected countries). Only in Indonesia snap beans were cheaper than tomatoes or carrots, probably because their price was kept down by competition with the yardlong bean. In Colombia snap beans were cheaper than tomatoes because of tomato production problems (diseases).

The high snap bean price stems partly from the marketing margin, which often makes up more than 50% of the consumer price. Postharvest research to reduce marketing costs would be highly appropriate. Another part of the high snap bean prices can be explained by its deficient adaptation and subsequently high production costs. This suggests there is considerable room for cost reducing technology, which through price reductions might further stimulate consumption. Data from Brazil and Colombia, where price elasticities of 0.4 (short-term elasticity) and 0.8 (long-term elasticity), respectively, were estimated do confirm the potential impact of price reductions on consumption.

Table 4. Relative prices of snap beans and some other vegetables in selected countries in selected years.

	Snap beans	Carrot	Tomato	Lettuce	Cabbage	Cauliflower
Brazil (1987)	100	85	57	124	28	63
Colombia (1986)	100	-	114	161	36	84
El Salvador (1982)	100	48	95	128	26	66
Indonesia (1984)	100	113	121	-	49	70
Peru (1985)	100	55	87	-	-	-
Venezuela (1983)	100	59	54	101	54	66

Sources: Wholesale and retail price statistics from different countries.

Snap bean quality

Many different types of snap beans are grown and sold: flat, semiflat or cylindrical pods; curved or straight ones; short or large ones; light green, dark green or yellow ones; small-, intermediate- or large-seeded ones. Pods can be hairy or smooth, completely fiberless or not so. Most markets have specific requests regarding these characteristics. Additionally most markets appreciate a uniform, fresh, clean, insect- and disease-free appearance.

At first glance one might expect similar quality requests for snap beans in the developing world and for snap beans in developed countries. In North America and Western Europe snap beans should be fiberless, without seed development or air holes and as tender as possible. In the developing world, however, quality requests are not necessarily the same. Consumer surveys in Bogota, Colombia, showed that consumers in the low-income strata prefer snap beans with well developed seeds and are willing to compromise on the amount of fiber (CIAT, Bean Economics, internal data). For these consumers snap beans with well developed seeds still supply vitamins and minerals but provide more energy and a greater sense of repletion than fiberless, seedless snap beans.

Supplying snap beans with quality characteristics conforming to the local market is a major key to increasing consumption. Varietal improvement is an important means to this end but needs to be combined with good agronomic and postharvest management. Varietal improvement efforts should take into consideration that for the first 20 years most snap beans in the tropics will be supplied to the fresh market.

SNAP BEANS AND AGRICULTURAL DEVELOPMENT

Snap bean consumption is strongly dependent on income per capita and urbanization degree. It improves the quality of the diet. At the same time snap beans

offer a high income per hectare to predominantly small farmers. Since snap bean production technology has certain parallels to dry bean production technology, it is a crop that facilitates the transition of poor small agricultural producers to wealthier vegetable producers.

Snap beans appear highly compatible with agricultural development. Its development potential can be most easily exploited in small farm production regions, located close to urban markets. In these areas snap beans might form one of the first crops in the development of intensive, less land dependent production systems. As can be observed in the highlands of the Philippines and Indonesia, snap beans might afterwards be replaced by even higher value crops, such as ornamental flowers.

The advantage of climbing snap beans in the fresh market and the problems of mechanizing its production have made the crop a small farm, labor demanding production activity. Development of snap bean production can bring considerable benefits to producers whose resources will not permit an adequate livelihood in traditional agriculture. There is little chance that large farmers will move into snap bean production in case the market potential expands, because the cultural practices of the crop do not fit their needs.

Snap bean development is strongly dependent on the timely availability of seed. Snap bean producers will very probably also grow other vegetable crops and will switch between these crops according to market expectations. The economic harvest comes available in the form of pods and not in the form of seed. Although a farmer can leave part of his field to mature, this will decrease his cash income and will occupy the plot for another month.

In such a situation it cannot be reasonably expected that the farmer saves his own seed. Since snap beans have a short growing cycle, there is a large influence of seed quality on the health of the crop and therefore

on the final production. Seed availability is essential to permit year-round planting and to allow farmers to harvest their whole crop in the form of green pods. The integration of small farmers in a well functioning seed system is also instrumental for the introduction of improved varieties.

IMPLICATIONS FOR RESEARCH

Snap beans presently grown in the tropics are often poorly adapted to the existing agro-ecological conditions. The imported varieties in current use are susceptible to many diseases or are sensitive to photoperiod length. Often they do not flower sufficiently well or the growth habit becomes deformed in tropical conditions. Genetic improvement is a key to the development of better snap bean production systems. Adaptability and disease resistance should have highest priority, while insect resistance, yield potential and nutrient efficiency should have second priority. Drought resistance or nitrogen fixation ability should not receive major attention, because the intensive production systems where snap beans are found most often have access to irrigation and fertilizers. In the genetic improvement of snap beans the importance of consumer quality characteristics cannot be overemphasized. The final value of a snap bean crop is strongly defined by the price that the consumer is willing to pay.

The lead time for genetic improvement is relatively long. In the meantime cultural practices should be developed to provide temporary solutions to adaptability and resistance problems. By the time improved genetic material becomes available, research into cultural practices can be directed towards enhancing the potential of the improved varieties. Cultural practices research involves the development of integrated pest control and biological pest control strategies.

Rotational patterns with other vegetable crops is a second area of attention. In certain areas weed control might be critical. Development of cheap trellising systems would have a large impact on snap bean production costs.

A third important area of research would be postharvest management. This involves the development of appropriate packaging methods in order to prevent bruising, methods to prevent humidity losses and wrinkling and methods to prevent pathogenic development on the pods.

A final area of attention should be the production of high quality seed. What are the conditions at which this seed can best be produced and what are the optimal seed treatments before it is planted? Other questions include the relation between seed color and vigor, the location specificity of varieties and the optimal distribution mechanisms of improved seed.

Snap beans are underresearched in developing countries, unlike some other vegetable crops such as tomatoes and onions. Effective research could improve the appropriateness of the crop in these countries. Consequently, the availability of the crop could improve strongly, allowing present snap bean growers to earn a better income, while encouraging other small farmers to start obtaining part of their income from snap beans. Concurrently such research could contribute to increased vitamin availability for the urban segments of the developing world.

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A00 BOTANY, TAXONOMY AND GEOGRAPHICAL DISTRIBUTION

0001

7102 CARR, D. J. and SKENE, K. G. M. **Diauxic growth curves of seeds with special reference to french beans (*Phaseolus vulgaris* L.).** Australian Journal of Biological Sciences 14:1-12. 1961. Engl., Sum. Engl., 28 Refs., Illus.

Phaseolus vulgaris. **Pods. Seed. Anthesis. Embryo. Growth. Cotyledons.**

The results of growth studies of pods and seeds of a variety of french beans, *Phaseolus vulgaris* L., are reported. Pod growth commences immediately after anthesis and is completed in 16-17 days. Seed growth begins about 9 days after anthesis; and irrespective of whether fresh wt, dry wt, or length is measured, it is diauxic, 2 phases of high growth rate being separated by a lag phase. During the phases of high growth rate, growth is initially exponential but eventually declines. The lag phase lasts about 3 days, from about the 20th to 23rd day. The literature shows that diauxic growth probably occurs in many seeds although few studies have been sufficiently detailed to reveal it. At the onset of the lag phase, extensive modifications are initiated in the metabolism of the seed and fruit, leading to the changes associated with seed maturation (such as a fall in sucrose in pea seeds and of water content of bean pods), which have been widely reported in literature. It is suggested that mechanical restriction imposed by the surrounding structures causes the growth rate of the embryo to slow down (onset of lag phase). During the lag phase a considerable revision of the pattern of metabolism of the seeds must take place; when growth is resumed, all those changes associated with the onset of maturity begin. During this final phase, growth of bean and pea embryos must depend on continued growth of the seed coat, which may be regulated by the hormone production of the embryo itself. (*Author's summary*) A00

0002

11188 COERTZE, A.F. **Introductory aspects on the production of green beans.** Farming in South Africa. Series: The cultivation of vegetables in South Africa. Green Beans and Green Peas no. A.1/1977. 3p. Engl., Illus.

Phaseolus vulgaris. Taxonomy. Production. Yields. Consumption. South Africa.

Brief information is given on the taxonomic position, plant characteristics regarding consumption, economic importance, and production areas of green beans in S. Africa. Between 1970-73 production was estimated at 27,300 t and for 1975, 9000 t were processed from a total production of 37,000 t. Transvaal and Cape Province, that have green bean processing industries, are the highest producing states; other states of minor importance are Orange Free State and Natal, whose production is for the domestic market. *(Summary by C.P.G. Trans. by L.M.F.)* A00 J00

0003

11975 LEE, J.M. **A study of factors influencing interlocular cavitation in pods of snap bean (*Phaseolus vulgaris* L.).** Ph.D. Thesis. Minneapolis, University of Minnesota, 1973. 149p. Engl., Sum. Engl., 107 Refs., Illus.

Phaseolus vulgaris. **Pods. Cultivars. Cell structure. Plant anatomy. Field experiments. Host-plant resistance. Podding. Plant tissues. Anthesis. Yields. Interlocular cavitation. Seed.**

Developmental anatomy and the effect of cultural and environmental factors on the incidence of interlocular cavitation (IC), the formation of cavities between the seed locules, in french beans

were studied in the field, greenhouse and growth chambers during 1969-72. Pod malformation is greater in pods with severe IC and such pods exhibited more tissue separation after processing. Unbalanced swelling of endocarp tissues, which is dependent upon their locations in the pod, combined with decreased periclinal cell division and rapid pod elongation are concluded as the cause of IC. Sequential development of this physiological disorder is illustrated. Susceptibility to IC varies greatly with cv. Cultivar ranking for susceptibility is stable even though highly significant interactions were often found between cv. and other factors, such as planting date, sieve size, irrigation level and growth regulator treatments. IC incidence was markedly influenced by environmental conditions. Heavy rainfall or irrigation at 1st flowering and thereafter increased IC, whereas total pod yields were mostly increased by moderate irrigation levels but were decreased when irrigation was excessive. Low temp during pod development, heavy use of N fertilizers and the late summer-early fall growing season tended to increase IC incidence. IC may be partially or completely eliminated by proper cultural practices such as irrigation control and cv. selection. (*Summary by Dissertation Abstracts*) A00 C02

0004

*MEDINA, J.C.; FRANCO, C.M.; MIYASAKA, S.; INFORZATO, R.; CAMARGO, A.P. DE; LEITAO FILHO, H. DE F.; VIEIRA, C.; BUSS, A.; CARVALHO, B.C.L. DE; BRANDES, D.; DUQUE, F.F.; ZIMMERMANN, F.J.P.; BALDANZI, G.; COSTA, J.G.C. DA; ALMEIDA, L. d'A. DE; PONTE, N.T. DA; GUAZZELLI, R.J.; ADAMS, W.; MALAVOLTA, E. 1972. Simposio brasileiro de feijao, 1, 1972. Anais. Brazil, Universidade Federal de Vicosa. 280p.

B00 PLANT ANATOMY, MORPHOLOGY AND CYTOLOGY

0005

27214. BOLWELL. G.P.; ROBBINS, M.P.; DIXON, R.A. 1985. ELICITOR-INDUCED PROLYL HYDROXYLASE FROM FRENCH BEAN (PHASEOLUS VULGARIS). LOCALIZATION, PURIFICATION AND PROPERTIES. BIOCHEMICAL JOURNAL 229(3):693-699. EN. SUM. EN., 37 REF., IL. (DEPT. OF BIOCHEMISTRY, ROYAL HOLLOWAY COLLEGE, UNIV. OF LONDON, EGHAM HILL, EGHAM, SURREY TW20 OEX, ENGLAND)

THE ENZYME PROLYL HYDROXYLASE, INDUCED IN SUSPENSION-CULTURED CELLS OF FRENCH BEAN BY TREATMENT WITH AN ELICITOR PREPARATION FROM THE PHYTOPATHOGENIC FUNGUS COLLETOTRICHUM LINDEMUTHIANUM, WAS INVESTIGATED. THE ENZYME, WHICH CATALYSES THE HYDROXYLATION OF POLY-L-PROLINE WITH THE STOICHIOMETRIC DECARBOXYLATION OF 2-OXOGLUTARATE, WAS SHOWN TO BE LOCALIZED MAINLY IN SMOOTH ENDOPLASMIC RETICULUM. AFTER SOLUBILIZATION FROM MICROSOMAL MEMBRANES, THE HYDROXYLASE WAS PURIFIED BY ION-EXCHANGE CHROMATOGRAPHY AND AFFINITY CHROMATOGRAPHY ON POLY-L-PROLINE-SEPHAROSE 4B. THE SUBUNIT MR, AS ASSESSED BY SDS/POLYACRYLAMIDE-GEL ELECTROPHORESIS, WAS 65,000, THE SUBUNIT APPARENTLY BEING RECOVERED

AS A DOUBLET; THE SUBUNITS ASSOCIATE UNDER NONDENATURING CONDITIONS TO GIVE AT LEAST A TETRAMER. THE BEAN HYDROXYLASE HAS KINETIC PROPERTIES AND COFACTOR REQUIREMENTS SIMILAR TO THOSE PREVIOUSLY REPORTED FOR THE ENZYME FROM OTHER PLANTS. ELICITOR TREATMENT OF SUSPENSION- CULTURED BEAN CELLS LEADS TO A RAPID INDUCTION OF PROLYL HYDROXYLASE ACTIVITY CONCOMITANT WITH INDUCTION OF A PROTEIN:ARABINOSYL-TRANSFERASE AND INCREASED LEVELS OF AN ARABINOSYLATED HYDROXYPROLINE-RICH PROTEIN. (AS).

0008

21339 DEBOUCK, D.G. 1983. Regulation of flowering processes by some internal correlations in dwarf French bean. Acta Horticulturae 134:125-132. Engl., Sum. Engl., 19 Refs., Illus. [Faculté des Sciences Agronomiques de l'Etat, Laboratoire de Morphogenese Végétale Appliquée, B 5800 Gembloux, Belgium]

Phaseolus vulgaris. Snap beans. Dwarf beans. Flowering. Stems. Branching. Belgium.

For a proper characterization of beans, as well as for future improvements in basic yield potential, it is necessary to understand the process of node formation on stems and the evolution of the axils, either vegetative or floral, at these nodes. Within a pure nonphotoperiodic var. of Phaseolus vulgaris described as determinate, under controlled conditions, a natural though narrow variability appears in the no. of nodes on the main stem. Linked to this no., a clear morphological acropetal gradient to flowering is expressed by the central axillary branches. The vegetative activity of the main stem apex can be slightly extended by the very early removal of the primary leaves. This results in a longer vegetative structure before the main stem terminal raceme, and in a much more important vegetative structure on the central axillary branches. Reversions to vegetative organogenesis can be observed on the last ones. When this treatment is delayed, the mentioned effect disappears on the main stem; it is less marked on the central branches and concentrated at the upper axils. These results throw new light on the way to consider the differences in growth habit and yield potential. (Author's summary) B00

0007

0037 HOFFMAN, J.C. **Morphological variations of snap bean pods associated with weight loss and wilting.** Proceedings of the American Society for Horticultural Science 91:294-303. 1967. Engl., Sum. Engl., 5 Refs., Illus.

***Phaseolus vulgaris*. Pods. Plant anatomy. Wilting. Cultivars. Crop loss causes. Stomata. Cell structure. Field experiments. USA.**

Weight loss of fresh bean pods in open room storage increases in proportion to no. of epidermal hairs, as shown by extensive measurements on 49 varieties and breeding lines. Weight loss of pods also increases along with the increse of no. of broken or missing hairs. Pod characters that show no correlation with wt loss include hair length, stoma count, mesocarp cell diameter, endocarp cell diameter, and depth of mesocarp, endocarp, epidermis and cutin. (*Author's summary*) B00

0008

5502 LEE, J.M. and READ, P.E. **Developmental anatomy of interlocular cavitation in snap beans, *Phaseolus vulgaris* L.** Journal of the American Society for Horticultural Science 100(4):319-325. 1975. Engl., Sum. Engl., 20 Refs., Illus.

Phaseolus vulgaris. **Plant anatomy. Pods. Flowers. Developmental stages. Cultivars. USA.**

Developmental antomy of interlocular cavitation (IC), defined as the formation of cavities in soft parenchymatous endocarp cells between seed locules, was studies in pods of several french bean cultivars grown under various cultural and environmental conditions during the years 1969-72. IC occurred in pods from the stages of rapid pod elongation (6-10 days after anthesis) until the time of pod senescence. Unbalanced swelling of endocarp tissues, combined with decreased periclinal cell division and rapid cell elongation, are concluded to be the causes of IC. In the most commonly observed form, IC also includes the separation of fused endocarmal cells. Pod malformation is greater in pods with severe IC, and such pods exhibited more quality defects after processing. Sequential development of this developmental and physiological disorder is illustrated. *(Author's summary)* B00

0009

22245 NAGAMANI, K.; BHALLA, J.K. 1981. Asynapsis in French beans. Indian Journal of Botany 4(2):206-208. Engl., Sum. Engl., 9 Refs., Illus. [Dept. of Botany, Osmania Univ., Hyderabad 500 007, India]

Phaseolus vulgaris. Snap beans. Mutation. Chromosomes. Irradiation. India.

During a study on induced mutagenesis in French beans using combined treatments of gamma rays followed by Mitomycin-C, 2 asynaptic M_1 plants were observed. These plants were identifiable by various morphological characteristics peculiar to them: the plants were sterile and had crumpled dark green foliage. Flowering was delayed as compared with the control. There was hardly any pod set; the few pods that did set did not produce functional seeds. A cytological study of the pollen mother cells showed 22 univalents instead of the normal 11 bivalents. It could, therefore, be concluded that asynapsis was the cause of the induced sterility. Asynaptic plants could be obtained only with the mentioned combination treatment. The other treatments, both single as well as combined, did not yield such plants. (Author's summary) B00

0010

6390 STRUCKMEYER, B.E., BINNING, L.K. and HARVEY, R.G. **Effect of dinitroanaline herbicides in a soil medium on snap bean and soybean.** Weed Science 24(4):366-369. 1976. Engl., Sum. Engl., 9 Refs., Illus.

Phaseolus vulgaris. Glycine max. **Herbicides. Plant anatomy. Cell structure. Stems. Plant injuries. USA.**

Anatomical studies determined the effect of 0.8, 1.7 and 3.4 kg/ha of penoxalin, AC-92390, oryzalin and trifluralin on the cell structure of french beans *(Phaseolus vulgaris* L. var Tenderette) and soybeans [*Glycine max* (L.) Merr. var Corsoy]. Cellular abnormalities in the swollen and brittle area of the stem of treated plants included thinner walled cells, elongated xylem elements, hypertrophy and hyperplasia of cells, and anomalous rings of cascular tissue in the cortical region. Injury caused by the 4 herbicides was similar in french beans and soybeans. *(Author's summary)* B00 E06

C00 PLANT PHYSIOLOGY

0011

8670 ABOUD-SAUD, A. and OMRAN, A.F. **Effect of gamma radiation on growth and respiration of snap beans** *(Phaseolus vulgaris* L.) Gartenbanwissenschaft 40(5):200-202. 1975. Germ., Sum. Engl., Germ., Fr., Rus., 9 Refs.

Phaseolus vulgaris. **Irradiation. Plant respiration. Germination. Co. Tracers. Sowing.**

When cy. Giza 3 bean seeds were irradiated with 5, 10, 15 or 30 kr, a greater percentage germinated than with untreated seed or seed treated with 50 kr. The same radiation treatments increased the no. of leaves and at later stages the growth of plants from seeds treated with 30 kr was inhibited. 20 days after emergence most plants from treated seed (except with 5 kr respired less than the controls. After 35 days the respiration rate of these plants increased but fell again when they were 50 days old. *(Summary by Field Crop Abstracts)* C00

0012

1350 AQIL, B.A. Physico-chemical studies of cotyledonal cracking in snapbeans (*Phaseolus vulgaris* L.). Ph.D. Thesis. Caldwell, University of Idaho, 1975. 80p. Engl., Sum. Engl., 85 Refs., Illus.

Phaseolus vulgaris. **Cotyledon cracking. Cultivars. Host-plant resistance. Ca. Mg. N. Zn. B. Protein content. Germination. Seed. Plant-growth substances. Plant respiration. USA.**

The cotyledonal cracking index of 16 french bean var. ranged from 0-4. Two resistant and 2 susceptible var. were sampled from different locations. Earliwax was consistently resistant to cracking, but the others varied with environment. Ca and Mg were significantly higher and N slightly higher in the resistant var. No such relationship was found for Zn and B. Protein extracts of 15 var. were resolved by acrylamide gel electrophoresis. Some major and consistent protein bands were present in all var., and minor and variable bands in some. When the electrophoretic gels were scanned at 280 nm, 2 major protein peaks were conspicuous and could be used for grouping var. Electrophoretic profiles of developing seeds indicated fewer light protein bands for immature seeds as compared with many discrete bands in mature seeds. High and low mol wt proteins were about equally distributed in the different developmental stages. No correlation was apparent between protein profiles and cracking susceptibility. There was a higher respiration rate, lower ethylene production and slower water imbibition in germinating seeds of resistant var. Various concentrations of Ca and Mg solutions and selected growth regulators were applied to Slimgreen and Earliwax plants in the greenhouse. The cotyledonal cracking index was modified to some extent. The varietal nature of hard seed character and the dominant effect of environment on this character were also demonstrated *(Summary by Dissertation Abstracts)* C00 E06

0013

28940 AWASTHI, M.D. ; ANAND, L. 1985. Studies on persistence pattern and safety evaluation of synthetic pyrethroids on French bean. Indian Journal of Agricultural Chemistry 18(1):56-62. En., Sum. En., 10 Ref. [Pesticide Residue Laboratory, Indian Inst. of Horticultural Research, Bangalore 560 080, India]

Phaseolus vulgaris. Snap beans. Insecticides. Plant physiological processes. India.

The persistence pattern of a synthetic pyrethroid, fenvalerate, was compared with that of the commonly used insecticide endosulfan on French bean pods during the rainy season at the Indian Institute of Horticultural Research in Hessaraghatta. Endosulfan residues dissipated at a faster rate as compared with fenvalerate following their resp. half-life values of

2.50 and 2.75 days at recommended doses. Residue degradation, however, within the resp. tolerance limits, suggests waiting periods of 1 day for endosulfan vs. 7 days for fenvalerate. (AS)

0014

21050 DIXON, R.A.; DEY, P.M.; LAWTON, M.A.; LAMB, C.J. 1983. Phytoalexin induction in French bean. Intercellular transmission of elicitation in cell suspension cultures and hypocotyl sections of Phaseolus vulgaris. Plant Physiology 71(2):251- 256. Engl., Sum. Engl., 27 Refs., Illus. [Dept. of Biochemistry, Royal Holloway College, Univ. of London, Egham Hill, Egham, Surrey TW20 OEX, England]

Phaseolus vulgaris. Snap beans. Enzymes. Phytoalexins. Hypocotyls.

The induction of enzyme activities related to phytoalexin production was examined in French bean cells separated by a dialysis membrane from equivalent cells directly exposed to macromolecular elicitors. Treatment of hypocotyl sections or cell suspension cultures of dwarf French bean with denatured ribonuclease A resulted in increased extractable activity of L-phenylalanine ammonia-lyase. The induction could be transmitted from treated cells through a dialysis membrane to cells which were not in direct contact with the elicitor. In hypocotyl sections, induction of isoflavonoic phytoalexin accumulation was also transmitted across a dialysis membrane, although levels of insoluble, lignin-like phenolic material remained unchanged in elicitor-treated and control sections. In cell suspension cultures, the induction of phenylalanine ammonia-lyase in cells separated from the elicitor-treated cells by the membrane was accompanied by increases in chalcone synthase and chalcone isomerase activities, enzymes which had been previously implicated in the phytoalexin defence response. There was no intercellular transmission of elicitation in expt. using a biotic elicitor prepared from cell walls of Colletotrichum lindemuthianum. (Author's summary) COO

0015

21574 EL-AFIFI, S.; KERESZTES, A.; LANG, F. 1983. Effects of metobromuron and chlorbromuron on the chlorophyll-protein complexes and chloroplast ultrastructure of French bean and pea seedlings. Photosynthetica 17(3):407-411. Engl., Sum. Engl., 17 Refs., Illus. [Dept. of Plant Physiology, P.O. Box 324, H-1445, Budapest, Hungary]

Phaseolus vulgaris. Irradiation. Chlorophyll. Proteins. Herbicides. Chloroplasts. Nutrient solution. Snap beans.

Germinated seeds of Pisum sativum and Phaseolus vulgaris were grown in the presence of 10^{-4} M metobromuron and chlorbromuron for 6 days in total darkness. The seedlings were then irradiated by white light of 27 W/m^2 for 48 and 72 h. Metobromuron caused a significant reduction in the chlorophyll a content of photosystem 1 (PS 1) in both plant species. Chlorbromuron caused a similar reduction in the relative amount of chlorophyll a of PS 1 only after 72 h of irradiation. The relative amount of the P700 chlorophyll-protein complex apoprotein was slightly reduced after the treatment in both plants. Metobromuron caused chlorosis of bean leaves, and in the yellow regions of the leaves vesicles instead of thylakoids were observed. Alterations in chloroplast ultrastructure were considered to be a result of subsequent action of electron transport blockage. (Author's summary) COO

0016

29666 GARLAND, J.A. ; COX, L.C. 1984. The uptake of elemental iodine vapour by bean leaves. Atmospheric Environment 18(1):199-204. En., Sum. En., 12 Ref., Il.

Phaseolus vulgaris. Snap beans. Air pollution. Leaves. Relative humidity. Temperature. Illumination. Transpiration. Stomata. England.

Deposition of I vapor to Phaseolus vulgaris leaves was measured over a range of conditions of humidity, temp., and illumination. Transpiration measurements were used to deduce stomatal opening. The results showed that stomatal resistance controlled I absorption at RH below 40 percent, but that the rate of absorption of I increased by an order of magnitude when the RH was raised to 80 percent, presumably due to cuticular absorption. After exposure to I at high humidity, a substantial fraction of the I could be washed from the leaves. In Britain, cuticular uptake would probably dominate stomatal uptake of I on most occasions. [AS]

0017

20881 GHONEIM, M.F.; EL-GHARABLY, G.S.; EL-GIBALY, M.H. 1975. The exudation of certain nutrients from snapbean roots under variable moisture and nutrient levels in the soil. Egyptian Journal of Soil Science (Special issue):95-104. Engl., Sum. Engl., 8 Refs., Illus.

Phaseolus vulgaris. Snap beans. Fe. P. Roots. Nutrient transport. Soil moisture. Egypt.

Several expt. were conducted, using a previously developed split-root technique, to test the possibility of nutrient exudation from the roots of snap bean plants. Plants were grown with their roots split into 2 halves. One half was grown in a silty soil supplied with different rates of either P^{32} or Fe^{59} under variable, but constant levels of moisture. The other root portion was immersed in deionized water throughout the exptl. period. After plant harvest, the solution remaining in the cup that originally contained deionized water was assayed for the presence of radiocative P or Fe. Substantial amounts of either elements were detected in the solutions, indicating a marked exudation of these nutrients from the roots of snap bean plants. The exudation of P^{32} was found to he increased as the moisture level in the soils was raised up to 120% of the soil field capacity. Fe secretion attained its max. near the 60% level of soil moisture. The liberation of both elements from snap bean roots was also increased as the level of these elements was raised in the soil. It was also shown that the exudation of both nutrients occurred progressively as time extended, indicating an accumulation of the nutrients released. (Author's summary) COO

001B

4239 GRAY, J.C. and KERKWICK, G.O. The synthesis of the small subunit of ribulose 1,5-bisphosphate carboxylase in the french bean *Phaseolus vulgaris*. European Journal of Biochemistry 44(2):491-500. 1974. Engl., Sum. Engl., 27 Refs., Illus.

Phaseolus vulgaris. Leaves. Enzymes. Proteins. Antisera. Roots. RNA. Amino acids. Chlorophyll.

Ribulose bisphosphate carboxylase is synthesized de novo during the greening process in french bean leaves; synthesis of this enzyme represents about 55% of the soluble protein synthesized, as shown by precipitation of ^{14}C-labeled soluble protein with a specific antiserum to the enzyme. A system in vitro for the completion and release of nascent polypeptides from bean leaf cytoplasmic polysomes was developed; the inclusion of high-speed supernatant and pH 5 enzyme from rat liver was necessary to obtain max incorporation of ^{14}C-labeled amino acids into protein. An

antiserum to the small subunit of ribulose bisphosphate carboxylase precipitated 30% of the ^{14}C-labeled released protein; after dissociation of the precipitate with sodium dodecyl-sulfate, the radioactivity was eluted from Sephadex G-100 in the same vol as authentic small subunit. Cytoplasmic polysomes, active in synthesizing the small subunit, were precipitated by the antiserum to the small subunit and also by an antiserum to the large subunit. (*Author's summary*) C00

0019

26568. GUSTAFSON, S.W. 1984. EFFECTS OF CO2 ENRICHMENT DURING FLOWERING AND PODFILL ON NET PHOTOSYNTHESIS, DRY MATTER ACCUMULATION AND YIELD OF BEANS, PHASEOLUS VULGARIS L. PH.D. THESIS. CORVALLIS, OREGON STATE UNIVERSITY. 105P. EN. SUM. EN., 110 REF., IL.

AVAILABLE PHOTOSYNTHATE WAS INCREASED DURING FLOWERING AND/OR POD FILL IN ORDER TO EXAMINE ITS ROLE AS A LIMITING FACTOR IN DM ACCUMULATION, POD SET, AND SEED YIELD IN BEANS. ALSO, PHOTOSYNTHESIS AND OTHER PHYSIOLOGICAL PARAMETERS OF A SINGLE LEAF WERE MONITORED DURING THE REPRODUCTIVE PERIOD TO BETTER ASSESS THE RESPONSE TO ENRICHMENT. BUSH SNAP BEAN CV. OREGON 1604, GROWN IN THE FIELD OR OUTSIDE IN CONTAINERS, WAS EXPOSED TO CO2 IN OPEN TOP CHAMBERS AT EITHER 300 MICROLITERS/LITER (CONTROL) OR 1250 MICROLITERS/LITER (ENRICHMENT) DURING DAY-LIGHT HOURS FROM FLOWERING TO SEED MATURITY, OVER A PERIOD OF 45 (FIELD) OR 35 (CONTAINER) DAYS. ENRICHMENT WITH CO2 INCREASED NET PHOTOSYNTHESIS 3.6-FOLD IN THE FIELD AND 2.5-FOLD IN THE CONTAINERS OVER THE CONTROLS. ENHANCEMENT OF NET PHOTOSYNTHESIS WAS MAINTAINED DESPITE LARGE ACCUMULATIONS OF LEAF STARCH AND A 50 PERCENT DECREASE IN LEAF CONDUCTANCE. SPECIFIC LEAF WT. OF ENRICHED LEAVES WAS APPROX. 40 PERCENT HIGHER THAN THAT OF CONTROLS AT OR BEFORE POD MATURITY IN FIELD PLANTS, BUT THE DIFFERENCE WAS NOT SIGNIFICANT AT SEED MATURITY. (CIAT).

0020

16037 HARGREAVES, J.A. 1981. Accumulation of phytoalexins in cotyledons of French bean (*Phaseolus vulgaris* L.) following treatment with Triton (T-octylphenol polyethoxyethanol) surfactants. New Phytologist 87:733-741. Engl., Sum. Engl., 21 Refs., Illus.

Phaseolus vulgaris. Plant injuries. Phytoalexins. Cotyledons. Plant tissues. Cytology. Biochemistry. Analysis.

Triton surfactants induced accumulation of phytoalexins in cotyledons of French beans. The degree of accumulation was related to the phytotoxicity of the surfactant, which was dependant upon the length of the polyethoxyethanol side chain. Triton X-35, which induced the production of large amounts of phytoalexins, killed the outer epidermal cells and 2-3 layers of underlying subepidermal cells. Cells adjacent to these dead cells were affected but not killed by this treatment. The main group of isoflavonoids formed was the 5-hydroxyisoflavonoids (kievitone and licoisoflavone A). The 5-deoxyisoflavonoids (phaseollin,

phaseollidin, and phaseollinisoflavan) were present only at low concn. When cotyledons treated with Triton X-35 were incubated in distilled water the major induced isoflavonoids were kievitone, which was located mainly in the cotyledons, and a compound tentatively identified as 2',4',5,7,-tetrahydroxyisoflavone, which was detected in the water medium. These results support the hypothesis that phytoalexin accumulation in the French bean is part of a wound response and involves an interaction between dead cells and their neighboring live cells. *(Author's summary)* C00

0021

12318 HILE, M.M.S. **Physiology, quality, and agronomic performance of snap beans (*Phaseolus vulgaris* L.) and spring wheat (*Triticum aestivum* L.) as affected by environment and several plant growth regulators.** Ph.D. Thesis. Corvallis, Oregon State University, 1976. 193p. Engl., Sum. Engl., 437 Refs., Illus.

Phaseolus vulgaris. **Plant physiology. Agronomic characters. Plant-growth substances. Yields. Pods. Temperature. Nutritional requirements. USA.**

Expt were conducted to determine the effect of environment and several plant growth regulators on the physiology, quality and agronomic performance of french beans and spring wheat. The potassium salts of naphthenic acid and cyclohexanecarboxylic acid received particular attention. No significant increase in bean yield resulted from regulator treatments in the field. Protein content was significantly increased in spring-planted french bean pods by at least one rate of all the regulators stu lied with the exception of potassium cyclohexanecarboxylate, which lowered protein. Several growth regulators produced significant increased of β-carotene content in summer-planted beans, whereas ascorbic acid was significantly reduced by all applications in the spring but not in the summer planting. Controlled environment experiments where high temp and low RH were imposed had little effect on pod protein and β-carotene content. In contrast, ascorbic acid content was drastically reduced the 1st day after exposure to stress conditions. Though plants tended to adjust to their new growing conditions, after 5 days they had not reached levels of ascorbic acid found in unstressed control plants. Treatment with potassium naphthenate tended to lower levels more and retard adjustment to the higher temp. Nutritional quality in french bean pods appeared to be affected more by the prevailing environmental conditions near harvest even though yield varied greatly between cv. and to a lesser extent between dates of planting. Ascorbic acid content appears to be more sensitive to seasonal fluctuation in environment than β-carotene or protein content, as large variations in ascorbic acid content between planting dates were evident. Subjection of cv. to growth at 80 and 50% RH resulted in differences in growth habit though no difference were observed in yield or nutrient content. The relative ranking of yield of cv. in controlled environments differed from that observed in the field though differences in β-carotene and ascorbic acid contents were similar. A comprehensive review of the literature pertaining to the effects of naphthenates on plants is discussed in detail. In addition, an exhaustive summarized review of the effects of naphthenates on biological systems (plants, microorganisms, warm and cold-blooded animals) illustrates the wide range of biological actions of this series of naturally occurring petroleum acids. (*Extracted from summary by Dissertation Abstracts*) C00

0022

8635 KANEMASU, ET and TANNER, C. B. **Stomatal diffusion resistance of snap beans. I. Influence of leaf-water potential.** Plant Physiology 44:1547-1552. 1969. Engl., Sum. Engl., 22 Refs., Illus.

Phaseolus vulgaris. **Stomata. Osmotic potential. Host-plant resistance. Water content. Transpiration. Leaf area. Growth-chamber experiments. Field experiments.**

Concurrent measurements of abaxial and adaxial stomatal resistance and leaf water potentials of

Phaseolus vulgaris in the field and growth chamber showed that the stomata on the 2 surfaces of the leaflet react differently to water deficit. The stomata on the abaxial surface, which are about 7 times more numerous than on the adaxial surface, were not significantly affected at leaf water potentials greater than -11 bars; but with further decrease in leaf water potential, the resistance of the adaxial stomata increased sharply at a leaf water potential of about -8 bars and was constant at higher water potentials. The av stomatal resistance for both surfaces of the leaf, which was the major diffusive resistance to water vapor, helped prevent further decline in leaf water potential. The relation between leaf water potential and stomatal resistance linked the soil water potential to the transpiration stream as needed for soil/plant/atmosphere models. *(Summary by Field Crop Abstracts)* C00

0023

25303. LIETH, J.H. 1982. LIGHT INTERCEPTION, GROWTH DYNAMICS, AND DRY MATTER PARTITIONING IN A PHYTOTRON-GROWN SNAP BEAN (PHASEOLUS VULGARIS L.) CROP: A MODELING ANALYSIS WITH REFERENCE TO AIR POLLUTION EFFECTS. PH.D. THESIS. RALEIGH, NORTH CAROLINA STATE UNIVERSITY. 141P. ENGL. SUM. ENGL., 99 REFS., ILLUS.

SIMPLE EXPONENTIAL DECAY MODELS WERE USED TO DESCRIBE THE VARIATION IN LIGHT ATTENUATION WITHIN A SNAP BEAN CANOPY OVER A 33-DAY PERIOD OF CANOPY DEVELOPMENT. EXTINCTION COEFFICIENTS WERE VARIED OVER TIME AS A FUNCTION OF (1) TOTAL LEAF AREA AND (2) CANOPY HEIGHT, AND NONLINEAR LEAST-SQUARES PROCEDURES WERE USED TO ESTIMATE PARAMETER VALUES FOR THESE MODELS. THE RESPONSE SURFACES GENERATED TO DEPICT CHANGES IN LIGHT ATTENUATION ACCOMPANYING CANOPY DEVELOPMENT ILLUSTRATED THE DYNAMIC NATURE OF CANOPY CLOSURE. A CRITERION INDEX WAS DEFINED TO AID IN ASSESSING THE APPLICABILITY OF THESE MODELS FOR USE IN WHOLE PLANT SIMULATION MODELS, AND AN EVALUATION OF THESE MODELS IS GIVEN BASED ON THIS INDEX, THEIR PREDICTIVE ACCURACY, AND UTILITY FOR USE WITHIN VARYING MODELING FRAMEWORKS. A TECHNIQUE WAS DEVELOPED FOR THE ANALYSIS OF PLANT GROWTH IN EXPT. WHERE A ONE-TIME SHORT-TERM STRESS (SUCH AS GASEOUS AIR POLLUTION EXPOSURE) IS APPLIED DURING THE ONTOGENY OF THE PLANT. THE METHOD WAS WORKED OUT IN DETAIL FOR THE RICHARDS GROWTH FUNCTION AND APPLIED TO GROWTH DATA OF SNAP BEAN EXPOSED TO O3. THIS RESULTED IN THE VALUE FOR THE PERCENTAGE REDUCTION IN THE GROWTH RATE (74 PERCENT FOR THE 0.60 PPM O3 LEVEL) AND AN INDEX FOR THE RECOVERY RATE. RESULTS FROM DIFFERENT STUDIES ARE COMPARABLE. THE TECHNIQUE MAY ALSO BE UTILIZED WITH EFFECTS OTHER THAN STRESSES AND FOR MULTIEPISODIC AND CHRONIC EVENTS. A C-ALLOCATION MODEL FOR THE GROWTH OF A SNAP BEAN CROP WAS DERIVED AND LEAF PHOTOSYNTHESIS WAS PREDICTED USING A NONRECTANGULAR HYPERBOLIC LIGHT RESPONSE CURVE. THE LEAF AREA DISTRIBUTION IN THE CANOPY WAS SIMULATED AND, THUS, ALLOWED UTILIZATION OF A SIMPLE LIGHT INTERCEPTION MODEL.

THIS SCHEME ALLOWED INTEGRATION OVER THE CANOPY TO OBTAIN THE TOTAL DAILY PRODUCTION. WHOLE-PLANT RESPIRATION WAS ESTIMATED USING VALUES OBTAINED FROM THE LITERATURE. ASSIMILATE DISTRIBUTION WAS MODELED WITH AN EMPIRICAL FORMULATION BASED ON THE RATIO OF PLANT PART (ORGAN) DM INCREMENT:TOTAL DRY WT. INCREMENT. THE MODEL CAN BE ADAPTED FOR USE IN STUDIES INVOLVING EFFECTS ON THE LEAF COMPARTMENT OF THE PLANT, IN PARTICULAR OF GASEOUS POLLUTANTS WHICH SHOW VISIBLE INJURY TO THE LEAVES. A PREVIOUS SNAP BEAN MODEL (LIETH) WAS APPLIED TO PHASEOLUS VULGARIS CV. BUSH BLUE LAKE 290 AND WAS VALIDATED. FURTHER MODEL DEVELOPMENT IS DISCUSSED SPECIFICALLY WITH RESPECT TO STUDIES ON AIR POLLUTANT EFFECTS. (AS).

0024

7440 McDANIEL, A.R. **Plant population and spatial arrangement effects on productivity, nutrient status, and micro-climate relationships of snapbeans (*Phaseolus vulgaris* L.).** Ph.D. Thesis. Knoxville, University of Tennessee, 1975. 99p. Engl., Sum. Engl., 74 Refs., Illus.

***Phaseolus vulgaris*. Spacing. Productivity. Nutritional requirements. Plant development. Chlorophyll. Leaves. Field experiments. N. P. K. Ca. Mg. Yields. USA.**

During 1974 the large-leafed french bean cultivar Early Gallatin was used to study growth and yield relationships under varied population (100-200% more than conventional) and spacing systems. The spacings and relative densities employed were 91 x 4 cm (100%); 12 x 3 and 15 x 15 cm (150%); and 46 x 4 and 23 x 8 cm (200%). Three other crops were subjected to extremes in moisture and disease conditions. Competitional effects did not occur until about the flowering stage, which coincided generally with early canopy closure in the higher densities. Additions of leaf area and dry wt/plant were favored by greater available space; but on a land area basis, the higher densities had productivity exceeding the conventional row spacing. Competitional pressure in the highest density suppressed productivity increases over the middle density, except under very favorable growing conditions. In only one case were growth differences noted between spacings within densities. No consistent trends in mean CGR, RGR or NAR were associated with the different populations. Pod maturities and numbers/unit area were little affected by treatment, except under very favorable conditions where vegetative growth encroached on the reproductive period. Over all crops, yield improvements were obtained with higher populations; but only the square, middle-density and wide row, high-density spacings were consistently highest. Fertilizer was broadcast at rates 1.5 times that recommended for normal populations. Petiole analysis throughout the growth periods indicated this was fully sufficient for the highest density. At harvest the leaf, stem and pod contents of N, P, K, Ca and Mg were also unaffected by spacing. Conventional rows left 20-30% of the interrow space exposed at harvest. Light attenuation was a direct function of the LAI and canopy continuity, and intracanopy air temperatures were generally lowered 1-2°C by increasing canopy densities. Surface soil moisture levels did not differ between open and closed canopies, and differences in diffusion resistance related to higher population use of moisture rather than canopy density and were minimal. No dense canopy depletion of CO_2 was observed since soil and ambient air replenishment was apparently quite rapid in this relatively low-growing crop. Shading effects from closer spacing on stomatal densities and chlorophyll contents of basal leaves were not observed. With biological and economic productivity equal to the highest density studied the square, middle-density spacing exhibited better efficiency. Depending on development of a commercially acceptable planter, this

square spacing with less seed investment presents a viable option to currently employed "double-conventional," high-density planting systems. (*Summary by Dissertation Abstracts*) C00 C01

0025

7065 MILLAR, A. A. and GARDNER, W. R. **Effect of the soil plant water potentials on the dry matter production of snap beans.** Agronomy Journal 64(5):559-562. 1972. Engl., Sum. Engl., 11 Refs., Illus.

Phaseolus vulgaris. **Soil water. Dry matter. Growth. Transpiration. Yields. Field experiments. Leaf area. Production.**

The need for greater plant yields and more efficient use of water makes it essential that the relations between soil water content, soil water potential, transpiration rate and plant response be made ever more quantitative. The dry matter (DM) production rate of french beans (*Phaseolus vulgaris* L. var. Bush Blue Lake) growing under field conditions on a sandy soil is analyzed during a drying period. Measurements of plant- and soil-water potentials, DM accumulation and stomatal resistance were made as soil water was depleted, while the transpiration rates were obtained by a model for a loosely structured canopy. The transpiration and DM production rates decreased curvilinearly with soil water potential. When the soil water potential decreased from -0.28 to -0.40 bar, there was 47% reduction in the DM production rate. This is related to the turgor pressure-operated stomatal mechanism. The adaxial stomatal resistances increased at leaf water potentials lower than -8 bars, which coincided with a rapid decrease in the DM production rate. It was found that stomatal closure due to water stress resulted in a greater reduction of growth rate than in transpiration. (*Author's summary*) C00 D01

2686 0026

MORRIS, J. L., CAMPBELL, W. F. and POLLARD, L. H. Relation of imbibition and drying on cotyledon cracking in snap beans, Phaseolus vulgaris L. Journal of the American Society of Horticultural Science 95(5):541-543. 1970. Engl. Sum. Engl. 11 Refs. Illus.

Phaseolus vulgaris. Cotyledon cracking. Plant anatomy. Plant physiology. Cultivars. Plant physiological processes. Germination. Plant breeding. Resistance.

The effect of imbibition and drying rates on cotyledon cracking in snap beans, Phaseolus vulgaris L., was studied. Six snap bean cultivars, representing various degrees of susceptibility to cotyledon cracking, were compared. Data indicated that differences in the rate of imbibition and drying were not responsible for differences in susceptibility to cotyledon cracking. The crack-resistant 'Improved Higrade' and moderately-resistant 'Earliwax' imbibed water faster than the crack-susceptible cultivars. Anatomical studies indicated that cracking was more frequent across the cell walls of the cotyledon cells than along the middle lamellae in all cultivars. (Author's summary).

0027

17897 OLUFAJO, O.O.; DANIELS, R.W.; SCARISBRICK, D.H. 1982. The effect of pod removal on the translocation of ^{14}C photosynthate from leaves in *Phaseolus vulgaris* L. cv Lochness. Journal of Horticultural Science 57(2):333-338. Engl., Sum. Engl., 7 Refs., Illus.

Phaseolus vulgaris. Snap beans. Leaves. CO_2. Pods. Translocation. C. Photosynthesis.

Trifoliate leaves of the dwarf French bean cv. Lochness were exposed under field conditions to ^{14}C during reproductive development. Labelled photosynthate was mainly retained within each nodal unit, the branch pods acting as the main sinks. Sink removal 48 h before exposing the leaves to ^{14}C enhanced translocation to pods above and below the fed node. (*Author's summary*) C00

0028

4360 RICO B., M. **The influence of calcium, sulfur, moisture and temperature on the fiber development of snap beans.** Ph.D. Thesis. College Station, Texas A & M University, 1965. 57p. Engl., Sum. Engl., 47 Refs., Illus.

Phaseolus vulgaris. **Ca. S. Temperature. Water requirements. Pods. Fibre content. Plant anatomy. Statistical analysis. Plant nutrition.**

Two different greenhouse experiments were conducted to determine the influence of some environmental factors on the increments of the fibrous sheath in the green french bean pod, using the variety Wade. Fiber was determined by the standard Food and Drug Administration (FDA) method and measured in grams per 100 grams of green pods. In the 1st experiment, with 4 replications, 2 levels of Ca (high, 1/5) and 3 levels of S (high, 1/5, 1/25) were combined factorially with 3 moisture levels (field capacity, 0.75 F.C.,0.50 F.C.). The base nutrient solution was Hoagland's no. 1.The plants were grown in quartz sand, and nutrient solutions were applied as deemed necessary. Moisture was based on oven dry sand with corrections for plant weights. Pods were harvested at the no. 5 sieve size. Results showed significant moisture x nutrient interactions in all but the no. 2 trial, indicating that these 2 factors do not act independently of each other. Significant differences were also obtained in the last 2 trials between nutrient levels and between moisture levels in the last one. In the 2nd experiment one group of plants was grown under simulated summer temperatures (85-95ºF), while a similar group was grown under spring temperatures (60-70ºF), optimum for beans. Both groups were grown in a regular soil mixture under optimal moisture. Pods were harvested at sieve sizes 2-6. Fiber content of the pods from the hot environment was significantly higher (at the 0.01 level) than that of pods from the mild enrironment. From both hot and mild treatments, samples of pods sieve size 2-6 were gathered, killed, dehydrated and embedded in paraffin; sections were then cut and prepared for anatomical studies. These studies disclosed the fact that increase in fiber in the mature pod occurs by differentiation, via cell wall deposition, of bordering endocarp cells. Increase in fiber may occur prematurely due to high temperatures, such as those prevalent in the summer. A close relationship was found between fiber as determined by the FDA method and fiber as observed anatomically. Indirect evidence indicates that the fibrous sheath later becomes the dehiscence mechanism of the dry pod. Further anatomical studies with very young pods showed that the fibrous sheath in the french bean arise at anthesis at the outer endocarp and not, as was expected on the basis of previous work, at the outer mesocarp. These studies corroborate previous findings by other investigators that the fiber extracted in fiber determinations is the same sidewall fiber observed in pod sections. (*Author's summary*) C00 D01

0029

23919 SANTOS V., J.C. 1984. Efecto de cortes de ejotes y remoción de flores en un frijol (Phaseolus vulgaris L.) ejotero de hábito determinado. (Effect of pod cutting and flower removal on a determinate snap bean cultivar). Tesis Mag.Sc. Chapingo, México, Colegio de Postgraduados. 117p. Span., Sum. Span., 60 Refs., Illus.

Phaseolus vulgaris. Snap beans. Nutrient solution. Abscission. Flowers. Pods. Yields. Dry matter. Leaf area. Growth. Mexico.

An expt. was carried out with plants of snap bean cv. Black Valentine of determinate habit, cultivated in hydroponic solution with substrate under greenhouse conditions to determine the effect of cutting green and dry pods on vegetative growth and pod production. Treatments consisted in the removal or not of pods during the 1st 3, 5, and 7 days after flowering. The plants whose pods were cut green presented a redistribution of DM by producing new vegetative organs (branches, leaves, and roots). The highest ratio of accumulated dry wt. (including fallen organs) occurred in the vegetative structures (827), while in plants whose dry pods had been

harvested, the accumulated dry wt. was directed toward the pods (65%). The no. of normal pods was statistically the same. However, dry wt. of cut green pods was 1/3 that of harvested dry pods. In flower removal treatments performed in plants whose pods were harvested dry, the highest flower removal levels produced an increase in the no. and dry wt. of the vegetative structures, principally of the leaves. However, the no. and dry wt. of harvested normal pods were not affected significantly. Flower removal in plants whose pods were cut green had no significative effect on branches, leaves, and roots, nor on the no. and dry wt. of the pods cut green. [AS (extract)-CIAT]

0030

8448 SHOWALTER, R.K. **Detachment characteristics of snap bean pods and pedicels.** Proceedings of the Florida State Horticultural Society 83:248-252. 1970. Engl., Sum. Engl., 12 Refs.

Phaseolus vulgaris. **Plant anatomy. Pods. Abscission. Cultivars. Field experiments. Harvesting. Mechanization. Plant injuries.**

Harvester, Provider and Astro varieties of french beans were evaluated during one season for pod detachment location during mechanical harvesting. Pods were separated from the plant stems at 4 locations: in the stem, between stem and pedicel, between pod and pedicel, and in the pod. One-fifth of the Provider detachments were in broken pods compared with 1/3 of the Harvester Astro detachments. Attached stems were found on 11% of the Harvester pods and 1% of the Providers. Significant correlations were found between pod wt, pedicel diameter and detachment force for 5 varieties of french beans harvested at widely varying maturities. As the pods and pedicels increased in size, detachment force also increased. *(Author's summary)* C00

0031

12317 TSAO, S.J. **The inheritance of photoperiodism in snap bean (*Phaseolus vulgaris*).** Ph.D. Thesis. Honolulu, University of Hawaii, 1977. 67p. Engl., Sum. Engl., 72 Refs., Illus.

Phaseolus vulgaris. **Inheritance. Photoperiod. Light. Flowering. Field experiments. Crossbreeding. Temperature. Genes. Backcrossing. Statistical analysis. USA.**

The heredity of photoperiodic response of flowering in *Phaseolus vulgaris* was studied. The parents were classified into 3 types according to their photoperiod sensitivity -- day-neutral (flower at any day length), intermediate (require a night > 11.5 h), and sensitive (require a night > 12 h). Crosses between parents of the same phenotype generally produced F_1 and F_2 progenies that showed no segregation. The segregation patterns for photoperiodic response were determined for larger no. of individuals by planting during the summer when days are too long for floral induction and assuming that each plant begins to flower when the day length has shortened to the critical length required by that plant. Temp within the range experienced in the field were found to have an insignificant effect. It is postulated that the inheritance of the photoperiodic response in these lines is determined by at least 4 major gene loci with dominance, epistasis and independent segregation. A dominant N gene is postulated that permits flowering at any day length. If the recessive n gene or a dominant inhibitor of the N gene, I_N, are present, there is an intermediate day length requirement for flowering. A dominant Q gene that intensifies the short day-length requirement is also postulated. If the recessive q gene or a dominant inhibitor of the Q gene, I_Q are present, the day-length requirement again is of the intermediate type. The day-neutral and intermediate parents therefore differ by 2 genes (at the N and I_N loci), and the intermediate and sensitive parents differ by another 2 genes (at the Q and I_Q loci) -- that the day-neutral and sensitive parents differ by a total of 4 genes. It is likely that additional genes with smaller effects may also be involved. *(Summary by Dissertation Abstracts)* C00 G00

2707 0032

WATADA, A. E. and MORRIS, L. L. Growth and respiration patterns of snap bean fruits. Plant Physiology 42(6): 757-761. 1967. Engl. Sum. Engl. 16 Refs. Illus.

Phaseolus vulgaris. Plant physiological processes. Plant respiration. Plant anatomy. Seeds. Laboratory experiments. U.S.A.

The relationship of respiration and growth of seed, pericarp tissue and whole fruit of snap beans (Phaseolus vulgaris L.) was studied. The whole fruit exhibited an apparent climacteric type of respiration pattern. This pattern resulted from an increase in CO_2 production by the enlarging seed followed by a rapid decrease in CO_2 evolution by the pericarp tissue, and the pattern was not associated with any concomitant increase in ethylene production. Therefore, the apparent climacteric respiration pattern of a developing baan fruit is not comparable to the phenomenon that occurs in other ripening fruits. (Author's summary).

0033

22947 WEEDEN, N.F. 1984. Distinguishing among white seeded bean cultivars by means of allozyme genotypes. Euphytica 33(1):199-208. Engl., Sum. Engl., 16 Refs., Illus. [Dept. of Seed & Vegetable Sciences, New York State Agricultural Experiment Station, Cornell Univ., Geneva, NY 14456, USA]

Phaseolus vulgaris. Snap beans. Cultivars. Genotypes. Enzymes. Seed. USA.

Allozyme genotypes were determined at 10 loci for 90 cv. of white-seeded snap beans. Within cv. the loci were homozygous and usually monomorphic, permitting the characterization of most cv. by a single set of allozymes. A total of 72 allozyme combinations were observed among the cv. tested, and 52 (58%) of the cv. could be uniquely distinguished by allozyme genotype alone. The remaining 38 lines could be separated into small groups of 2-5 cv. each. (Author's summary) C00

C01 Plant Nutrition

0034

27457. AITKEN, R.L.; BELL, L.C. 1985. PLANT UPTAKE AND PHYTOTOXICITY OF BORON IN AUSTRALIAN FLY ASHES. PLANT AND SOIL 84(2):245-257. EN. SUM. EN., 27 REF., Il. [DEPT. OF AGRICULTURE, UNIV. OF QUEENSLAND, ST. LUCIA, QLD. 4067, AUSTRALIA]

FRENCH BEAN CV. REDLAND PIONEER AND CHLORIS GAYANA CV. PIONEER WERE GROWNIN GLASSHOUSE EXPT. TO EXAMINE THE POTENTIAL FOR PHYTOTOXICITY OF B IN A RANGE OF AUSTRALIAN FLY ASHES. IN EACH EXPT., THE ASHES USED WERE EITHER UNTREATED, LEACHED, OR ADJUSTED TO PH 6.5 AND SUBSEQUENTLY LEACHED. IN THE 1ST EXPT., THE YIELD AND B STATUS OF PLANTS GROWN ON 5 FLY ASHES MIXED (5 AND10 PERCENT BY WT.) WITH AN ACID-WASHED SAND WERE MEASURED. IN A SUBSEQUENT EXPT., A FLY ASH WAS MIXED (0, 15, 30, 70, AND 100 PERCENT BY WT.) WITH A SANDY LOAM, AND THE YIELD AND MINERAL COMPOSITION OF PLANTS GROWN ON THESE MIXTURES DETERMINED. ALTHOUGH THE AVAILABLE WATER CAPACITY OF

THE SOIL WAS SUBSTANTIALLY INCREASED BY FLY ASH ADDITION, INCORPORATING LARGE PROPORTIONS OF UNTREATED FLY ASH RESULTED IN POOR PLANT GROWTH PRIMARILY DUE TO B TOXICITY. IN BOTH EXPT., LEACHING THE ASH REDUCED THE POTENTIAL FOR B TOXICITY, WHEREAS ADJUSTMENT OF THE PH TO 6.5 AND SUBSEQUENT LEACHING OF THE FLY ASH RESULTED IN PLANTS WITH NORMAL LEVELS OF B. [AS [EXTRACT]]. C01

0035

23639 BENNETT, J.H.; KRIZEK, D.T.; WERGIN, W.P.; FLEMING, A.L.; MIRECKI, R.M.; WYSE, R.E. 1984. Physiological and ultrastructural changes in the chloroplasts of snap bean plants under LPS lamps during chlorosis and regreening. Journal of Plant Nutrition 7(1-5):819-832. Engl., Sum. Engl., 20 Refs., Illus. [Plant Stress Laboratory, Agricultural Research Service, United States Dept. of Agriculture, Beltsville, MD 20705, USA]

Phaseolus vulgaris. Leaves. Photosynthesis. Chlorophyll. Chlorosis. Photoperiod. Mineral deficiencies. Fe. Chloroplasts. Plant nutrition. Snap beans. USA.

Fe chlorosis-like symptoms developed in the terminal leaves of Phaseolus vulgaris cv. Astro plants grown in growth chambers under low-pressure Na lamps which are deficient in UV and blue wavelengths. The addition after 1 wk. of full-strength Hoaglands No.1 nutrient solution or Peter's 20-20-20 (NPK) fertilizer resulted in the degradation of maturing chloroplasts in the terminal leaves. Well-formed grana were degraded and chlorophyll and protein were lost. Soil application of 2 mM N-[2-(2-oxo-1-imidazolidinyl) ethyl]-N'-phenylurea (IDU) + 5 mM urea + foliar application of 10 mM sucrose promoted regreening. It was concluded that chlorosis in low-pressure Na-grown plants results from photodegradation of the more mature chloroplasts rather than from inhibition of lamellar development due to Fe deficiency. (Author's summary) C01

1554 0036

BERRÍOS, L. and BERGMAN, E.I. La influencia de magnesio en el análisis foliar, rendimiento y calidad de habichuelas tiernas (Phaseolus vulgaris L.) (The influence of magnesium on leaf composition, yield and quality of snap beans (Phaseolus vulgaris L.) Proceedings of the Caribbean Region. American Society for Horticultural Science 11:151-158. 1968. Span; Sum. Span. Engl. 9 Refs.

Phaseolus vulgaris. Plant nutrients. Minerals. Fertilizers. P. K. Ca. Mg. Mn. Fe. Cu. Al. Zn. N. Growth. Plant development. Mineral deficiencies. Chlorosis. Pods. Leaves.

Four different experiments were conducted to study the influence of magnesium on leaf composition, yield, and quality of snap beans (Phaseolus vulgaris L). Leaves were analyzed spectrometrically for P, K, Ca, Mg, Mn, Fe, Cu, Al, Sr, and Zn and by Kjeldahl for N. The growth measurements taken were green weight, yield, number, length, and curvature of graded pods. In Experiment I nutrient solutions with three levels of Mg (0, 48, 144 ppm) were used in order to produce uniform bean seeds of the variety 'Tendergreen' containing three levels of Mg for later use in Experiment III. In experiment II the influence of Mg under field conditions on the earlier mentioned factors was studied on 14 bean varieties. The influence of Mg and soil moisture on leaf composition, yield, and growth of bean plants grown from seeds of different Mg content was studied under growth chamber conditions in Experiment III. Experiment IV was established to measure the influence of Mg on the earlier mentioned factors on nine bean varieties when grown in nutrient solution. Mg deficiency symptoms of snap beans were characterized by an initial distinctive interveinal chlorosis followed by brownish spots, stunted growth and defoliation in combination with retarded flowering, shorter and stubbier root devel-

opment, and a cytological atrophy of the first layer of the mesocarpic cells. Leaves from beans grown in low levels of Mg had a leaf content of .05% to .10% Mg. these showing an imbalanced chemical composition. By increasing Mg concentration in the solution there was an increase in leaf and seed Mg content. An antagonistic effect of Mg with K, Fe, B, and Zn was also found. The Mg treatments affected significantly the green weight, yield, number and length of graded pods of nine varieties planted in nutrient solutions. The soil application of 48 or 96 lbs per acre of Mg under field conditions produced no significant effects except for length of U.S. No.1 pods. However, it was found that varieties varied highly significantly in leaf composition, green weight, as well as in yield number, length and curvature of graded pods. The varieties 'Harvester','Cornelli 14', and 'Tenderette' were among the best. Leaves of field grown beans were higher in Ca, Al, and Sr, but lower in P, K, B, and Zn, than those plants grown in nutrient solution. The leaf composition showed that Mg treatments affected significantly K, Mg and Al under low moisture and only Mg with high moisture treatment. High moisture treatments increased leaf P, Ca, B, Sr, and Mg while K, N, Mn, and Fe were decreased. The Mg seed level was observed to influence the early but not the overall plant growth. It was found that seed composition of 15 varieties analyzed was higher in P content than leaf composition but lower in all other measured elements. The variety showing the latest developing and least amount of Mg deficiency was found to contain the highest Mg seed concentration. (Author's summary)

0037

23044 BHIVARE, V.N.; NIMBALKAR, J.D. 1984. Salt stress effects on growth and mineral nutrition of French beans. Plant and Soil 80(1):91-98. Engl., Sum. Engl., 29 Refs. [Dept. of Botany, Shivaji Univ., Kolhapur 416 004, India]

Phaseolus vulgaris. Snap beans. pH. Na. Deficiencies. Salinity. Plant development. Growth. Dry matter. Micronutrients. India.

An expt. was designed to study the effects of sodium chloride and sodium sulphate on growth and inorganic contents in Phaseolus vulgaris cv. Vaghya. Except at 2.5 and 5.0 deci siemens/m Na_2SO_4, other concn. of both the salts proved to be inhibitory. NaCl lowered the chlorophyll content while the opposite occurred with Na_2SO_4. Both salts caused an increase in leaf thickness and MC. Na, Ca, Fe, and Mg contents were high while those of N, K, Cu, and Zn were low. P and Mn contents showed a differential response. (Author's summary) COl

0038

25665. BOYLE, J.F.; SMITH, C.B. 1985. GROWTH AND LEAF ELEMENTAL COMPOSITION OF SNAPBEANS AS AFFECTED BY APPLIED ZINC AND INTERACTING FERTILIZERS. COMMUNICATIONS IN SOIL SCIENCE AND PLANT ANALYSIS 16(5):501-507. ENGL. SUM. ENGL., 17 REFS. [DEPT. OF HORTICULTURE, PENNSYLVANIA STATE UNIV., UNIV. PARK, PA 16802, USA]

BUSH BLUE LAKE 47 SNAP BEANS WERE GROWN IN 1980 WITH 12 FERTILIZER TREATMENTS AT 3 SITES IN PRODUCTION AREAS OF NE PENNSYLVANIA (USA) WHERE THE SOIL PH WAS 6.6-6.7 AND SOIL P LEVELS WERE HIGH. THE APPLICATION OF ZN AT 11.2 KG/HA AS SULFATE, CHLORIDE, OXIDE, OR CHELATE DID NOT INCREASE SNAP BEAN YIELDS. LEAF ZN WAS INCREASED MORE EFFECTIVELY BY APPLIED ZN SULFATE OR CHLORIDE THAN BY ZN OXIDE WHILE ZN CHELATE DID NOT INCREASE LEAF ZN. THE APPLICATION OF P LOWERED LEAF ZN AT 2 SITES. N APPLIED AS AMMONIUM SULFATE

INCREASED LEAF ZN AND MN BUT WHEN N WAS APPLIED AS UREA, ONLY LEAF MN WAS ENHANCED. WHEN LIME WAS APPLIED, LEAF ZN AND MN WERE LOWERED AT ONLY 1 SITE. [AS].

0039

1550 BUREN, J.P. VAN and PECK, N.H. **Effect of calcium level in nutrient solution on quality of snap bean pods.** Proceedings of the American Society for Horticultural Science 82:316-321. Engl., Sum. Engl., 13 Refs.

Phaseolus vulgaris. Plant nutrients. Fertilizers. Ca. Pods. Minerals. Analysis. Laboratory experiments. Nutrient solution.

Tendercrop french beans were grown in quartz sand with nutrient solution supplying Ca at different levels and from different sources. Treatments with $CaSO_4$ produced more pods, greater weight/pod and a greater weight of pods/plant than similar treatments with $CaCl_2$. The Ca concentration in bean pods was increased when the Ca level in the nutrient solution was raised. Higher Ca levels in the nutrient solutions resulted in firmer canned pods that had less tendency to slough and split than did pods produced in the low Ca treatments. *(Author's summary)* C01

0040

17821 BUSADA, C.J.; JONES JUNIOR, J.B.; MILLS, H.A. 1982. **Major element uptake by snap bean grown in nutrient culture with varying nitrogen solution treatments.** Journal of Plant Nutrition 5(1):63-71. Engl., Sum. Engl., 12 Refs., Illus.

Phaseolus vulgaris. Snap beans. Nutrient solution. Nutrient absorption. N.

Snap bean cv. Blue Lake was grown for 6 wk. in nutrient solutions containing equal rates of N as $Ca(NO_3)_2$ and $(NH_4)_2SO_4$. When the N supply was 75 ppm for the 1st 3 wk. and 150 ppm thereafter, a marked preference for NO_3 was noted, especially after the N rate was increased. When the N supply was inadequate, however, (35-75 ppm) the preference for NO_3 was small. The % increase in NO_3 uptake over NH_4 uptake with increasing N supply was similar to the increase in K content of the plants at 6 wk. Absorption of both forms of N peaked in week 4. *(Summary by Field Crop Abstracts)* C01

0041

23905 DAVE, I.C.; KANNAN, S. 1981. **Influence of boron deficiency on micronutrients absorption by Phaseolus vulgaris and protein contents in cotyledons.** Acta Physiologiae Plantarum 3(1):27-32. Engl., Sum. Engl., 19 Refs., Illus. [Biology & Agriculture Division, Bhabha Atomic Research Centre, Bombay 400 085, India]

Phaseolus vulgaris. Snap beans. Nutrient solution. B. Mineral deficiencies. Nutrient uptake. Translocation. Fe. Zn. Cotyledons. Protein content. India.

A marked reduction in the absorption of Fe and Mn, but an increase in Zn uptake, was recorded in 3-wk.-old Phaseolus vulgaris plants when raised in a B-deficient Steinberg nutrient medium. Results showed that the transport of Fe, Mn, and Zn increased in the trifoliate leaves whereas the transport to the entire shoot decreased. In another expt., albumins and globulins of cotyledons sampled from 5-day-old bean seedlings were resolved into their subunits on polyacrylamide/SDS gels. While the content increased almost in all the fractions, globulins were marked by qualitative changes, especially in high mol. wt. region in B-deficient plants. These studies reveal that B is involved in the physiological processes controlling the uptake and transport of Fe, Mn, and Zn in bean plants, and also in the mobilization of reserve proteins. (Author's summary) C01

0042

1827 DOWDY, R.H. *et al.* **Growth and metal uptake of snap beans grown on sewage sludge-amended soil: a four-year field study.** Journal of Environmental Quality 7(2):252-257. 1978. Engl., Sum. Engl., 18 Refs., Illus.

Phaseolus vulgaris. **Zn. Cu. Cd. Nutrient absorption. Plant development. Trace elements. pH. Yields. Mineral content. Leaves. Plant tissues. Water requirements. Human nutrition. Nutritive value.**

To establish the consequence of land application of sewage sludge on the extent of sludge-borne metal accumulation in the food chain, long-term trace metal accumulations in edible french bean (*Phaseolus vulgaris* var. Tendergreen) tissue were measured, over a 4-yr period, for beans grown on a sludge-amended sandy Udorthentic Haploboroll soil. For the 1st phase of this study, a total of 0, 350, 700 and 1400 t/ha of anaerobically digested sludge were applied in 3 equal applications. The 2nd phase of the study consisted of a single sludge application of 0, 112, 225 and 450 t/ha. Crop yields increased as rates of sludge application increased under both cultural systems and often exceeded those of a well-managed, fertilized control. The Zn and Cu contents of edible tissue increased as rates of sludge application increased, reaching an apparent max value from which they did not decrease once sludge applications ceased. Cadmium levels in edible tissue did not respond directly to sludge applications and never exceeded 0.1 µg Cd/g tissue. (*Author's summary*) C01 H00

0043

18099 EL-GHARABLY, G.A.; EL-RAZEK, M.A. 1982. Responses of snapbeans to applications of P and Fe in calcareous soil. Journal of Plant Nutrition 5(4/7): 721-728. Engl., Sum. Engl., 23 Refs., Illus.

Phaseolus vulgaris. Laboratory experiments. Snap beans. P. Fe. Mineral deficiencies. Nutrient absorption. Growth.

A greenhouse pot exptl. was conducted with various levels and combinations of P and Fe being applied to a sandy calcareous soil in which snap beans were grown as a test crop for growth response and nutrient uptake. P, Fe, Ca, Mg, Mn, and Zn were determined on the 21- and 35-day old snap beans and DM yield was recorded separately for tops and roots. Symptoms of Fe deficiency developed on plants in those pots where no Fe was applied. With the application of 20 ppm Fe, the symptoms were prevented. Max. plant growth was obtained when 150 ppm P was added. The mineral content of snap bean plants was affected by increased levels of applied P and Fe. Significant interactions were found between P and Fe treatments for most of the characteristics measured. High Fe decreased Zn and Mn in plants and high P decreased them further. (*Author's summary*) C01

0044

20879 EL-LEBOUDI, A.; MAKSOUD, A.; MIDAN, A. 1976. A note on the interaction between nitrogen and phosphorus for snap bean plants. Egyptian Journal of Soil Science 16(1):21-35. Engl., Sum. Engl., 18 Refs.

Phaseolus vulgaris. Snap beans. N. P. Fertilizers. Ammonium sulphate. S. Dry matter. Leaves. Stems. Roots. Pods. Nitrogen-fixing bacteria. Rhizobium. Yield components. K. Egypt.

A study was carried out on snap beans at the Faculty of Agriculture Farm, Ains Sham U., at Shebien El-Kom (Egypt) to determine their response to phosphate and N when grown on a clay loam alluvial soil. In P expt., 32 kg P/feddan (1 feddan = 0.42 ha) as superphosphate were applied either once or twice; in N expt., on the other hand, N was either added at a rate of 20 kg/feddan as ammonium sulphate or induced by inoculation with Rhizobium. Control treatments with no fertilization were included in each expt.

Results showed a general favorable effect for N on growth nutritional status and yield of snap bean plants. (Author's summary) C01

0045

20878 EL-LEBOUDI, A.; MAKSOUD, A.; MEETKESS, A.; MIDAN, A. 1974. Fertilization and chlorophyll-carbohydrate status in snap bean plants. Agricultural Research Review (Egypt) 52(5):109-115. Engl., Sum. Engl., 8 Refs.

Phaseolus vulgaris. Snap beans. Fertilizers. N. P. K. Mn. Micronutrients. Rhizobium. Nitrogen-fixing bacteria. Chlorophyll. Leaves. Pods. Seeds. Carbohydrate content. Egypt.

A study was conducted to investigate at the Soil and Matter Research Institute, Agricultural Research Center (Egypt) the effect of N, P, K, and Mn fertilization on the chlorophyll and carbohydrate contents in the leaves and pods of snap beans grown on a clay loam soil for 2 successive years. Results revealed a promoting effect for P, N, K, Mn, and Rhizobium inoculation on the chlorophyll and carbohydrate contents of the investigated plants; however, a significant effect was only observed with N fertilization or Rhizobium application. Data also revealed no interactions between P and any of the tested growth elements regarding the examined parameters. (Author's summary) C01

0046

1548

FLEMING, J.W. Factors influencing the mineral content of snap beans cabbage, and sweet potatoes. Fayetteville, Arkansas. Agricultural Experiment Station. Bulletin no.575. 1956 14p. Engl. Sum. Engl. 9 Refs.

Phaseolus vulgaris. Mineral content. Composition. Minerals. K. Ca. P. Mg. Dry matter. Plant nutrients. Analysis. Fertilizers. Nutritional requirements. Field experiments.

The results of three greenhouse and two field experiments are presented to show the effect of the application of potassium, calcium, and phosphorus on the uptake of these elements by beans, cabbage, and sweet potatoes. The plant content of each element studied varied widely between experiments. The lowest and highest values, in percentage of dry matter, for each element in bean pods were: potassium, 1.86 and 3.10; calcium, 0.101 and 0.525; and phosphorus, 0.295 and 0.739. Increasing concentrations of potassium, calcium, and phosphorus in nutrient solutions increased the content of the respective nutrient in the bean pods, tops, and roots. The calcium content of the bean tops decreased with increasing concentrations of potassium in the nutrient solution. The phosphorus content of bean tops and the calcium and magnesium contents of pods increased as the light intensity decreased. Potassium and phosphorus applications to the soil in field experiments increased the percentage of the respective nutrients in bean pods, cabbage, and sweet potato storage roots. At the levels used calcium, potassium, and phosphorus applied to the soil in field experiments had no influence on the calcium content of bean pods, cabbage, or sweet potato storage roots. Di-hydrogen ammonium phosphate applied as foliar spray resulted in an increase in the phosphorus content and a decrease in the calcium and magnesium content of the bean plant. The green weight per plant of bean pods, leaves, and stems decreased with the high level of phosphorus uptake. (Author's summary).

4323

0047

FOY, C. D., FLEMING, A. L. and GERLOFF, G. C. Differential aluminum tolerance in two snap bean varieties. Agronomy Journal 64(6):815-818. 1972. Engl. Sum. Engl. 15 Refs. Illus.

Phaseolus vulgaris. pH. Plant nutrition. Resistance. Roots. Al. Mg. K. Ca. P. Mineral deficiencies. Nutrient solution. Toxicity. Analysis. Laboratory experiments.

Two snapbean (Phaseolus vulgaris L.) varieties, shown previously to differ in tolerance to acid, Al-toxic Bladen soil, were tested more specifically for Al tolerance in nutrient cultures. The Bladen soil-tolerant 'Dade' variety was much more tolerant to Al than Bladen-sensitive 'Romano.' For example, with 8 ppm Al added, at initial pH 4.8, top and root yields of Dade were 94 and 107%, respectively, of those with no Al. Corresponding top and root yields of Romano were only 53 and 59%, respectively, of those with no Al. With 8 ppm Al added, the total Ca uptake values for Dade tops and roots were 98 and 131%, respectively, of those with no Al; corresponding values for Romano tops and roots were only 25 and 22%, respectively. Aluminum added at 6 or 8 ppm also reduced Ca concentrations in tops and roots of Romano by 30 to 50%, but had little effect on those of Dade. Differential Al tolerance was not related to differential pH changes in nutrient solutions or to Al concentrations of plant tops or roots. With 8 ppm Al added the P concentrations in Romano tops and roots were 60 and 14% higher, respectively, than those of Dade. Aluminum added at 4 ppm decreased stem exudate production of Romano by 66% but did not affect that of Dade. The same Al treatment reduced concentrations of Ca, Mg, K, and P in Romano exudates by 66, 42, 80, and 76%, respectively, but either decreased or failed to affect those of Dade. Lower concentrations of these elements in stem exudates of Al-injured Romano plants were not associated with immobilization in roots. The 4 ppm Al treatment decreased Ca concentrations in Romano root cell walls, mitochondria, supernatant, and total roots by 55, 68, 51, and 43%, respectively. The same treatment decreased the Ca concentration in Dade root cell walls by only 27% and that in total roots by 8%, and actually increased the Ca concentration in mitochondria and supernatant fractions by 21 and 63%, respectively. Reduced Ca uptake appears to be a good indicator of Al sensitivity in the two snapbean varieties studied. (Author's summary).

0048

27203. GARG, O.K.; HEMANTARANJAN, A.; RAMESH, C. 1986. EFFECT OF IRON AND ZINC FERTILIZATION ON SENESCENCE IN FRENCH BEAN [PHASEOLUS VULGARIS L.]. JOURNAL OF PLANT NUTRITION 9[3-7]:257-266. EN. SUM. EN., 26 REF. [DEPT. OF PLANT PHYSIOLOGY, INST. OF AGRICULTURAL SCIENCES, BANARAS HINDU UNIV., VARANASI-221005, INDIA]

IN GREENHOUSE EXPT., APPLICATIONS OF FE AND/OR ZN IN THE FORM OF FERROUS SULPHATE AND ZINC SULPHATE INDUCED INCREASED CHLOROPHYLL A AND B CONCN., IAA, NITRATE REDUCTASE ACTIVITY, AND DM YIELD OF FRENCH BEAN PLANTS. FE AND ZN COMBINED WERE MORE EFFECTIVE IN DELAYING LEAF SENESCENCE COMPARED WITH CONTROLS. CHLOROPHYLL DESTRUCTION WAS MORE RAPID AT THE POSTFLOWERING STAGE IN CONTROL PLANTS, LEADING TO EARLY SENESCENCE AND REDUCED PHOTOSYNTHETIC DURATION. A RAPID DECLINE IN NITRATE REDUCTASE ACTIVITY AND IAA CONCN. IN CONTROL PLANTS AFTER THE 50-DAY GROWTH STAGE FURTHER INDUCED SENESCENCE. FE ALONE AND COMBINED WITH ZN APPEARED TO CONTRIBUTE TO THE INHIBITION OF SENESCENCE IN FRENCH BEAN PLANTS. [AS]. Col

0049

20672 GUPTA, U.C. 1983. Boron deficiency and toxicity symptoms for several crops as related to tissue boron levels. Journal of Plant Nutrition 6(5):387-395. Engl., Sum. Engl., 13 Refs. [Research Branch, Agriculture Canada, Charlottetown, P.E.I., Canada C1A 7N8]

Phaseolus vulgaris. Snap beans. B. Plant development. Mineral deficiencies. Toxicity. Fertilizers. Canada.

Greenhouse expt. were conducted to study B deficiency and toxicity symptoms related to B levels in the plants for several crops which included Phaseolus vulgaris (snap bean cv. Eastern Butterwax). A factorial randomized block design was used with 4 replicates and 4 B treatments (0, 1, 2, and 4 ppm B). B deficiency (with no added B) in beans appeared as yellowing of tops associated with slow flowering and pod formation; this deficiency was related to 12 ppm B in tops at prebloom and 13 ppm B in tops at harvest. B toxicity reduced growth and burned older leaves, especially on the edges, at 2 and 4 ppm B. Such toxicity was related to more than 125 ppm B in tops at bloom and to 265 ppm B in tops at harvest. [CIAT] C01

0050

5837 HALL, T.C. **Protein, amino acid and chlorophyll metabolism during the ontogeny of snap beans.** American Society for Horticultural Science. Proceedings 93 379-387 1969. Engl., Sum. Engl., 14 Refs.

Phaseolus vulgaris. **Chlorophyll. Protein content. Amino acids. Metabolism. Roots. Stems. Leaves. Pods. Seed. Age.**

Analyses of protein, amino acid and chlorophyll content of roots, stems, leaves and fruits of french beans were made at intervals during the development of the plant to determine the times at which marked changes in these metabolites occurred. Protein accumulation in the fruit was of particular interest and is discussed in relation to the amino acid and chlorophyll changes in the various regions of the plant. *(Author's summary)* C01

0051

21062 IU, K.L.; PULFORD, I.D.; DUNCAN, H.J. 1982. Influence of soil waterlogging on subsequent plant growth and trace metal content. Plant and Soil 66(3):423-427. Engl., Sum. Engl., 16 Refs. [Agricultural Chemistry Section, Univ. of Glasgow, Glasgow G12 8QQ, Scotland]

Phaseolus vulgaris. Snap beans. Fe. Cu. Zn. Mn. Co. Mineral content. Plant nutrition. Soil moisture. Nutrient uptake. Tracers. Plant physiology. Soil analysis. Scotland.

The uptake of trace metals by French bean and maize was measured on 2 soils subjected to various waterlogging regimes: (1) soil maintained at 60% field capacity; (2) periodic waterlogging (1 wk. waterlogged and 1 wk. freely drained); (3) continuous waterlogging. Fe, Mn, and Ca uptake in both crops increased due to soil waterlogging. Zn was taken up in preference to Cu by French beans, while maize took up Cu preferentially. The ability to take up trace metals was related to ease of extractability from the soil for Mn, Fe and Co, but not for Zn or Cu. (Author's summary) C01

0052

27396. KEEFER, R.F.; SINGH, R.N.; HORVATH, D.J. 1986. CHEMICAL COMPOSITION OF VEGETABLES GROWN ON AN AGRICULTURAL SOIL AMENDED WITH SEWAGE SLUDGES. JOURNAL OF ENVIRONMENTAL QUALITY 15(2):146-152. EN. SUM. EN., 25 REF. [DIVISION OF PLANT & SOIL SCIENCES, BOX 6108, WEST VIRGINIA UNIV., MORGANTOWN, WV 26506, USA]

HEAVY METALS WERE ANALYZED IN EDIBLE AND NONCONSUMABLE PARTS OF

RADISH, CARROTS, CABBAGE, GREEN BEANS, SWEET CORN, AND TOMATOES GROWN ON A SANDY LOAM SOIL TO WHICH 4 SEWAGE SLUDGES WERE APPLIED IN THE FIELD [POINT PLEASANT, WEST VIRGINIA, USA] AT 90 AND 180 T/HA. RESULTS [TABULATED IN DETAIL] INDICATED THAT CD, CR, AND PB CONCN. IN THE EDIBLE PARTS OF THE VEGETABLES FROM SLUDGE-TREATED PLOTS WERE NO MORE THAN 1.0 MG/KG ABOVE THOSE FROM THE UNTREATED CONTROL PLOTS. NI CONCN. IN VEGETABLES FROM PLOTS RECEIVING 2 OF THE SLUDGES WERE SIGNIFICANTLY HIGHER THAN IN THE CONTROLS FOR BOTH EDIBLE AND NONCONSUMABLE PARTS OF MOST OF THE VEGETABLES GROWN. MORE NI WAS ABSORBED BY VEGETABLES GROWN ON A PLOT TREATED WITH A SLUDGE THAT WAS RELATIVELY LOW IN TOTAL NI [270 MG/KG] THAN WITH A SLUDGE THAT CONTAINED MORE THAN 47 TIMES AS MUCH TOTAL NI. CU AND ZN LEVELS IN VEGETABLES GROWN ON SOME SLUDGE-TREATED SOILS WERE ELEVATED; HOWEVER, THESE WERE NOT HIGH ENOUGH TO CAUSE ALARM. [AS [EXTRACT]]. C01

0053

0188-2970 KISH, A.J., OGLE, W.L. and LOADHOLT, C.B. A prediction technique for snap bean maturity incorporating soil moisture with the heat unit system. Agricultural Meteorology 10(3):203-209. 1972. Engl., Sum. Engl., 14 Refs., Illus.

Phaseolus vulgaris. Temperature. Climatic requirements. Plant development. Flowering. Soil requirements. Water requirements (plant). Field experiments. Soil water. Maturation.

Field experiments were conducted at Clemsom University in 1966 to study the accuracy of the heat unit system in predicting maturity dates of french beans. The growing degree-h method was found to be unreliable in predicting the maturity for 3 plantings of Harvester and Tendercrop french beans. Indications were that other environmental factors, in addition to temperature, affected the maturity of this crop. The available soil moisture for each of the 3 plantings varied greatly. Because of the unreliability of the heat unit method, it was decided to integrate the available soil moisture parameter into the degree-h method. The formula that gave the smallest coefficient of variation was one using the daily heat unit multiplied by a ratio of the daily available soil moisture to a constant soil moisture value. Literature does not reveal the available soil moisture level at which french beans begin to suffer a reduction in growth and development. Determination of this level was done experimentally. It was found that the optimum available soil moisture level to be used as the constant soil moisture value in the formula was in the 57-59% range. Predicting the maturity of french beans was improved by integrating available soil moisture into the heat unit system. This improvement can be used to advantage by the bean grower or processor. *(Author's summary)* C01 D01

0054

22548 KOHNO, Y.; FOY, C.D. 1983. Manganese toxicity in bush bean as affected by concentration of manganese and iron in the nutrient solution. Journal of Plant Nutrition 6(5):363-386. Engl., Sum. Engl., 16 Refs., Illus. [Plant Stress Laboratory, Plant Physiology Inst., United States Dept. of Agriculture, Beltsville, MD 20705, USA]

Phaseolus vulgaris. Nutrient solution. Mn. Toxicity. Mineral deficiencies. Fe. Snap beans. Symptomatology. Leaves. Growth. Plant nutrition. Translocation. Nutrient uptake. USA.

An expt. was conducted to clarify the relationship between Mn toxicity and Fe deficiency in bush snap bean cv. Wonder Crop No. 2. Seedlings were grown in full strength Hoagland No. 2 solution at pH 6.0 for 10 days. Six concn. of Mn as $MnCl_2.4H_2O$ were used in combination with 3 concn. of Fe as FeEDTA. Toxicity symptoms induced by low levels of Mn (0.1 ppm and above) are included. Results indicated that the chlorosis on bush bean leaves induced by excessive Mn in the nutrient solution was due to the excessive accumulation of Mn and not to Fe deficiency. (Extracted from author's summary) C01

0055

10355 LATTERELL, J.J., DOWDY, R.H. and LARSON, W.E. **Correlation of extractable metals and metal uptake of snap beans grown on soil amended with sewage sludge.** Journal of Environmental Quality 7(3):435-440. 1978. Engl., Sum. Engl., 11 Refs.

Phaseolus vulgaris. **Zn. Cd. Cu. Nutrient absorption. Leaves. Micronutrients. Soil analysis.**

Anaerobically digested sludge was applied to sandy Udorthentic Haploboroll soil as single applications (0, 112, 225 or 450 t/ha) or as 3 annual sludge applications (accumulated total, 0, 350, 700 or 1400 t/ha). In both cases sludge-borne trace metals were correlated to trace metal uptake by french beans (*Phaseolus vulgaris* cv. Tendergreen) and soil OM. There was a correlation between the extractable Zn in the sludge and the Zn content of edible bean tissue and bean leaf tissue, and between extractable Cu and Cd concentrations and edible bean tissue. (*Summary by Horticultural Abstracts*) C01

0056

9052 McELHANNON, W.S. and MILLS, H.A. **The influence of N concentration and NO_3/NH_4 ratio on the growth of lima and snap bean and southern field pea seedlings.** Communications in Soil Science and Plant Analysis 8(8):677-687. 1977. Engl., Sum. Engl., 6 Refs., Illus.

Phaseolus vulgaris. **N. Legume crops. Growth. Ammonium sulphate. Nutrient solution. Roots. Seedlings. Toxicity. Leaves.**

Lima and french beans and southern field peas were cultured in a modified Hoagland's solution for 14 days with N supplied as $Ca(NO_3)_2$ and/or $(NH_4)_2SO_4$ at 3 N concentrations and 5 ratios of NO_3 to NH_4. The ratio of NO_3/NH_4, rather than the N concentrations, influenced seedling growth of these vegetable legumes. Maximum seedling growth of lima bean was generally obtained with all combinations of NO_3 and NH_4. A preference for 75% NO_3 and 25% NH_4 was observed for french beans. Southern field pea growth was reduced only when all the N was supplied as 100% NH_4. Ammonium toxicity symptoms, lesions and severe wilting, developed with french beans and southern field peas within 14 days when cultured with 100% NH_4. Lima beans, though reduced in growth, exhibited a tolerance to the 100% NH_4 treatment. (*Author's summary*) C01

0057

8218 MACK, H.J., FANG, S.C. and APPLE, S. B. **Effects of soil temperature and phosphorus fertilization on snap beans and peas.** Proceedings of the American Society for Horticultural Science 84:332-338. 1964. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. **Soil temperature. P. Growth. Fertilizers. Mineral content. Production. Laboratory experiments. USA.**

Five experiments were conducted in the greenhouse on french beans and peas in which soil temperatures of 62 and 78° F were maintained in 2 experiments and soil temperatures of 54, 62, 70

and 78° maintained in 3. Phosphorus rates were 0 and 70 lb P/acre; in one experiment P rates were as high as 280 lb/acre. In the 5 experiments, an increase in soil temperature from 54 to [illegible]°F increased dry wt of french beans from 60-850%, whereas dry wt of peas were increased little or reduced from 7-18%. A similar trend for the P content of plants with soil temperature was found. Increases in dry wt and P content of peas from applications of P fertilizer were, in general, similar at the 4 soil temperatures. Applications of high rates of P fertilizer did not compensate for the inhibitory effect of the lowest soil temperature (54° F) on growth of french beans. Increases in dry wt and total P recovered in plants from P fertilization were greater for beans than for peas. Responses of plants to added P and to an increase in soil temperature were usually greater in experiments conducted under conditions of longer duration and higher intensity of light in spring months than under conditions of lower light intensity and shorter duration found during winter months. *(Author's summary)* C01 D01

0058

12689 MACKAY, D.C. and LEEFE, J.S. **Optimum leaf levels of nitrogen, phosphorus and potassium in sweet corn and snap beans.** Canadian Journal of Plant Science 42:238-246. 1962. Engl., Sum. Engl., 26 Refs., Illus.

Phaseolus vulgaris. Zea mays. **N. P. K. Analysis. Developmental stages. Plant nutrition.**

Optimum nutrient levels were derived by comparing the polynomial regression curves relating leaf analyses and crop yields with rates of applied NPK. Uppermost mature leaves were used for analysis, and samples were collected at specific physiological stages of development. In 2 seasons the optimum levels in sweet corn differed by 7, 25 and 9%, and in french beans by 12, 29 and 11% for NPK, resp. A low moisture supply was generally associated with lower optimum levels for all 3 nutrients, but "excess" moisture had only slight effects on these levels for any nutrient. Optimum nutrient levels, calculated from sample moisture conditions, were, for the tassel-emerging stage of sweet corn, 3.5, 0.38 and 2.5% , and at the early flower stage of french beans 5.1, 0.40 and 2.0% for NPK, resp. At the 6th-7th leaf stage of sweet corn optimum levels were higher for N and K but lower for P (3.8, 3.1 and 0.34%, resp.); at the pollen-shedding stage the levels were only slightly different from that at tassel emergence. *(Author's summary)* C01 D01

0059

5108 NAIDOO, G., STEWART, J. McD. and LEWIS, R.J. **Accumulation sites of Al in snapbean and cotton roots.** Agronomy Journal 70(3):489-492. 1978. Engl., Sum. Engl., 23 Refs., Illus.

Phaseolus vulgaris. **Al. P. Roots. Analysis. Nutrient solution. Toxicity. Micronutrients. Plant injuries. Laboratory experiments. Plant physiological disorders.**

Aluminum toxicity is an important growth-limiting factor in many acid soils. The exact site of Al injury within roots is unknown. The objective of this study was to determine the site of Al injury within roots of french bean cv. Dade and Romano and cotton cv. Hancock treated for 12 days with 20 mg/liter Al in nutrient solution at pH 4.6. Location of Al and other elements in roots was determined by X-ray microanalysis on a scanning electron microscope. Linear scans across root sections revealed that Al and P coprecipitate on or in the outer cells of the root cap. The major elements detected in spot analysis of nuclei, cytoplasm and cell walls were Al, P, S and Ca. Comparison of analyses on the 3 main cell structures revealed that the greatest concentration of Al was in the nucleus. Within the cells, Al probably accumulates by ionic exchange onto esteric P in the nucleic acids and membrane lipids. In the nuclei, Al probably reduces or inhibits cell division by interference with nucleic acid replication. *(Author's summary)*C01 E06

0060

14743 NAIDOO, G. **Aluminum toxicity in two snapbean varieties.** Ph.D. Thesis. Knoxville, The University of Tennessee, 1976. 110p. Engl., Sum. Engl., 81 Refs., Illus.

Phaseolus vulgaris. **Cultivars. Al. Toxicity. Host-plant resistance. Plant development. Plant nutrition. Growth. Roots. Leaves. Plant tissues. Composition. P. K. Yields. Analysis. Electron microscopy.**

The mechanism of Al tolerance in plants was investigated in a series of greenhouse expt. which compared 2 var. of snap beans that were differentially tolerant to Al. The more tolerant Dade var. was compared to Romano with respect to growth, mineral nutrition, pH, total acidity, Al fixation by root macerates, organic acid content, morphological effects of Al, and to location of Al and P in roots. To compare the 2 var. with respect to growth and mineral nutrition, seedlings were grown in 1/5 strength Hoagland's nutrient solution (pH 4.8) at 0, 4, 8, and 12 ppm added Al for 10 days. The Al treatments reduced yields and the concn. of P and Mg in roots and tops of both var. In both var., the Al treatments generally increased the K concn. in roots and tops. In the Romano var. Al decreased the Ca concn. in roots and tops. The Al-tolerant Dade var. had a significantly higher root wt. than Romano at 12 ppm added Al. Comparison of the pH, titratable acidity, Al-fixing capacity of root macerates and citric and malic acid concn. revealed no major differences between var. Plants of both var. treated for 12 days at 20 ppm Al at pH 4.6 exhibited typical symptoms of Al toxicity. These included upward curling of roots; root discoloration; significant reductions in root and top growth; inhibition of lateral root growth; abnormally dark green leaves and gelatinous root tips. The Romano var. also showed purple coloration of stems and petioles. Anatomical changes induced by Al included swelling of root tips; curling backward and detachment of root caps; disorganization of cells in the root cap and meristem and loss of cell contents of root cap cells. The relative degree of Al injury was greater in the susceptible Romano var. Elemental distribution in Dade and Romano snap bean roots, treated for 12 days with 20 ppm added Al, was determined by staining with Mo and by energy dispersive analysis for X-rays generated in the scanning electron microscope. The results of both techniques revealed that young meristematic tissues of the root tip are the sites of Al action. The location of Al was identical to that for P, suggesting the precipitation of P by Al. High concn. of Al and P were found on the root surface and within the root cap. There was no relationship between the distribution of Al and that of Ca, Mg or K. Al was located in cell walls, cell contents and in nuclei of root cap and meristematic cells. It is suggested that Al disrupts the cell division process in the nucleus. The ability to maintain adequate levels of P in tops, and the capacity to exclude a major part of the Al from sensitive root tissues by regeneration of root cap cells probably account for the greater tolerance of the Dade var. to Al. *(Author's summary)* C01 C02

0061

11969 PALANIYANDI, R. **Nutrient interaction studies in snap beans (*Phaseolus vulgaris* L.).** Ph.D. Thesis. University Park, Pennsylvania State University, 1976. 116p. Engl., Sum. Engl., 98 Refs.

Phaseolus vulgaris. **N. P. K. Ca. Mg. Zn. Micronutrients. Leaves. Mineral content. Plant nutrition. Stems. Roots. Soil analysis. Pods. Yields. Growth. USA.**

Five greenhouse expt were conducted to study the growth responses of french bean cv. Bush Blue Lake in soils of low fertility as related to nutrient contents and certain nutrient element interactions when different nutrients were supplied. In Expt I-III the interaction of the 3 N sources (ammonium nitrate, ammonium sulfate and sodium nitrate) with combinations involving P, P + K and in some treatments additions of Mg or Mg + Ca were studied using triple superphosphate, muriate of potash, Magox and calcium chloride, resp.. N, P, K and Ca were broadcast at the rate of 100 lb/ac (in Expt II, K at 50 lb/ac) and Mg at 150 lb/ac. The 1st 5 treatments of Expt IV and V were designed to study the interaction of N and P, added as

ammonium nitrate and triple superphosphate, resp., with K as chloride, sulfate or nitrate. In Expt IV, in further treatments, sodium was substituted for K to supply chloride or sulfate in a quantity equal to that of corresponding K treatment. A treatment where Mg as Magox was added to NP treatment with KCl was also included. In Expt V, further treatments involved Mg added to the basic NP treatment as chloride, sulfate or nitrate. N, P and K were banded at the rate of 50 lb/ac while Mg was supplied at rates of 50 and 40 lb/ac in Expt IV and V, resp. Fresh wt of vines and pods of all expt were recorded separately (Expt IV was terminated at flowering stage). Oldest trifoliate leaves were analyzed for 12-14 elements. In Expt IV and V, all plant parts were analyzed giving the total plant content of several nutrient-elements and the portions of each element in a particular tissue. In Expt III-V, soil pH, available soil Mn and root CEC were determined at the end of expt. In Expt IV, tissue pH of leaf, stem and root samples was measured. In treatments involving applied N and P, significant increases in vigor, yield, leaf Ca, Mg, Mn and Zn contents were shown. Added sodium nitrate resulted in somewhat lower vigor and considerably lower yields when compared to ammonium nitrate or sulfate. Ammonium sulfate treatments resulted in considerably higher leaf K, Mn and Zn and lower Ca and Mg contents when compared to those of sodium nitrate. The soil pH was significantly lower and the available soil Mn significantly higher when ammonium sulfate was compared to sodium nitrate. Ammonium nitrate treatments had intermediate effects. Tissue acidity or root CEC was not related to any applied nutrients. Adding K to the basic NP treatments increased vigor considerably with all N sources but yield only with sodium nitrate. Added K, regardless of source, substantially increased leaf K and decreased P, Ca, B and particularly Mg contents. It was shown clearly that it was the K that depressed Mg uptake and not its accompanying anion and that it was the chloride and not K that enhanced Mn uptake. Adding Mg to the basic NP treatments tended to increase vigor and, with sodium nitrate, considerably reduced yield. Added Mn, regardless of source, substantially increased leaf Mg but did not reduce K level significantly. Mg, added as Magox or magnesium nitrate, increased soil pH and decreased available soil Mn and leaf Mn level. Adding K and Mg together to basic NP treatments did not affect growth response or increase leaf Mg content. Added Ca had no effect on other nutrients. In treatments involving chloride, leaf Mn content was increased and P and B contents decreased consistently. Leaf Ca level was reduced when sulfate was added. The total plant contents of several nutrients were reasonably well correlated to the corresponding leaf conen but were increased to a much greater extent by various treatments. (*Summary by Dissertation Abstracts*) C01

0062

18098 PATRICK, J. W. 1981. An in vitro assay of sucrose uptake by developing bean cotyledons. Australian Journal of Plant Physiology 8(2):221-235. Engl., Sum. Engl., 41 Refs., Illus.

Phaseolus vulgaris. Plant assimilation. Snap beans. Cotyledons. Sucrose.

An in vitro procedure, based on net rates of sucrose uptake from [^{14}C]sucrose solutions, was developed to determine the in vivo sucrose uptake rates of French bean cotyledons. Net rates of in vitro sucrose uptake exhibited saturation kinetics and temp. dependency with Q_{10} values in the range 1.5-2.0. Optimal rates of net sucrose uptake were obtained in unbuffered media containing sucrose alone. Under sink-limited growth conditions, where in vivo free-space sucrose conen. saturated (90-145 mM) the sucrose uptake process, the in vitro procedure could account for in vivo gains of sucrose by the cotyledons. (Author's summary) C01

0063

3088 SHEA, P.F. Genetic control of potassium nutrition in snap beans, *Phaseolus vulgaris* L. Ph.D. Thesis. Madison, University of Wisconsin, 1966. 123p. Engl., Sum. Engl., 98 Refs., Illus.

Phaseolus vulgaris. **K. Na. Nutrient absorption. Plant tissues. Hybridizing. Hybrids. Genetics. Mineral deficiencies. Chlorosis. Leaves. Nutrient solution. Cultivars. Mineral content. Seed. Cotyledons. Inheritance. Seed color. Seed characters. Laboratory experiments. USA.**

Strains of french beans were selected for efficiency in K utilization by screening plants in nutrient solutions containing 5 ppm K. Large differences in seed size were found among the selected strains. Although a significant regression was shown for the dry wt of the tops of these plants on original seed wt, the efficiency response was independent of seed size. There was no indication that Na substituted for K when the supply of the latter was limited. Na contents in the roots were 20-40 times higher than in the tops. Segregation data for the F_1, F_2 and backcross progenies supported a single-gene difference between inefficient strains 38 (Mexico) and 63 (Canada) and the efficient strain 66 (Germany). No cytoplasmic effects were obtained in the reciprocal progenies. The gene k_e was proposed to designate the efficienty locus; thus the efficient genotypes carry the homozygous recessive k_e k_e. Complete dominance occurs at this locus. The response of the F_1 hybrid between efficient strains 58 and 66 is evidence for allelism of the efficiency gene between these strains. Since the range of K contents in the tops of individual plants was similar over the 6 rating classes for each set of progeny, differential response to low K nutrition must be associated with efficiency in K utilization rather than in K uptake. The significance of these findings is discussed with respect to gene action, evolution and increased efficiency in the production of economic crops. (*Author's summary*) C01 G01

0064

5643 TERMAN, G.L., ALLEN, S.E. and BRADFORD, B.N. Nutrient dilution-antagonism in corn and snap beans in relation to rate and source of applied potassium. Soil Science. Society of America. Proceedings 39:680-685. Engl., Sum. Engl., 12 Refs., Illus.

Phaseolus vulgaris. *Zea mays*. **Plant nutrition. K. N. P. Yields. Leaves. Nutrient absorption. Mineral deficiencies.**

Greenhouse pot experiments were conducted to compare responses of maize (*Zea mays* L.) and found beans (*Phaseolus vulgaris* L.) to 0 to 1,600 mg of K/pot (3 kg of soil/pot) as KNO_3, KCl and K_2SO_4 on K-deficient soils. Marked responses, which were similar among sources, were obtained to applied K, except for a toxic salt effect of 1,600 mg of K as KCl. Marked reciprocal K-N, K-P, K-Ca and K-Mg relationships with yield response to rates of applied K were attributed to both dilution and ion antagonism. The latter was most pronounced at higher K rates, giving little or no additional yield response and resulting in decreased Ca, Mg or P uptake. There was a close relationship between total N and total cation concentrations in maize leaves but not in bean leaves. This difference is attributed to abosorption of much of the N as NO_3-N by maize and as biologically fixed NH_2-N by french beans. (*Author's summary*) C01

0065

1154 TOMPKINS, D.R., FLEMING, J.W. and HORTON, R.D. **Growth regulators and snap beans.** Arkansas Farm Research 21(3):8. 1972. Engl., Illus.

Phaseolus vulgaris. **Plant-growth substances. Flowering. Yields. Growth.**

In field trials, *Phaseolus vulgaris* plants were treated with 0, 14, 28 or 44 ppm CTBP (5-chloro, 2-thenyl, tri-*n*-butyl-phosphonium chloride) when the 1st flowers opened. CTBP increased the no. of pods set; yields after correction for large and small pods were increased from 4.5 and 4.4 t/ac without CTBP to 5.2 and 5.3 t/ac with 28 ppm CTBP. CTBP reduced plant height but did not affect pod K, Mg or P contents or quality. (*Summary by Field Crop Abstracts*) C01

0066

18093 TYLER, L.D.; McBRIDE, M.B. 1982. **Influence of Ca, pH and humic acid on Cd uptake.** Plant and Soil 64(2):259-262. Engl., Sum. Engl., 17 Refs.

Phaseolus vulgaris. **Nutrient absorption. Cd. Ca. pH. Snap beans. Nutrient solution. Translocation.**

Solution culture expt. were conducted to examine the effect of naturally occurring components of soil solutions such as Ca-ion, H-ion, and organic acids on the Cd uptake of maize and snap beans. An increase in the Ca-ion concn. of solution cultures depressed the translocation of Cd from roots to tops of snap beans and maize but had no apparent effect on the absorption of Cd by roots. Suppression of Cd translocation by Ca was less marked for the maize than for the beans. Addition of humic acid to the solution decreased the Cd activity in solution and the subsequent absorption of Cd by maize roots, indicating that Cd-ion activity in solution directly affects Cd uptake. *(Author's summary)* C01

0067

8568 WALSH, L. M., EDHARDT, W. H. and SEIBEL, H. D. **Copper toxicity in snapbeans** (*Phaseolus vulgaris* L.). Journal of Environmental Quality 1(2) 197-200. 1972. Engl., Sum. Engl., 14 Refs., Illus.

Phaseolus vulgaris. **Cultivation. Cu. Germination. Toxicity. Soil analysis. Cultivars. Experiment design. Leaves. Stems. Pods. Yields. Nutrient absorption. Soil fertility. Field experiments.**

A 2-yr field experiment was conducted to determine whether Cu applied for pathogen control could accumulate to a level that would be toxic to french beans. Copper sulfate and $Cu(OH)_2$ were applied at rates varying from 0-486 kg/ha of Cu on a Plainfield loamy sand to approximate 1, 3, 9, and 27 yr of fungicidal treatment. Correlation and regression analyses were used to compare the amount of Cu extracted from the soil by 3 extraction procedures (0.1N HCl, EDTA and DTPA) with crop yield and the concentration of Cu in french bean tissue. Rates of up to 54 kg/ha Cu had no deleterious effect on yield in either year. Slight yield decreases were noted when the rate of Cu exceeded 130 kg/ha, and a marked reduction in yield occurred when 405 kg/ha of Cu as $Cu(OH)_2$ or 486 kg/ha of Cu as $CuSO_4$ was applied. Yield decreases were similar the 1st and 2nd yr after Cu application, indicating that Cu toxicity was not being ameliorated over a 2-yr period of time. Soil Cu and yield were highly correlated for each of the extraction methods. Based on the regression equations, a significant yield depression was obtained when HCl- or DPTA-extractable Cu exceeded 20 ppm, and when EDTA-extractable Cu exceeded 15 ppm. Soil Cu extracted by each extraction procedure was highly correlated with Cu in the leaf tissue, especially for the immature 1st trifoliate leaf. Yield reductions were noted when the Cu concentration in the seedling trifoliate increased from 20 to 30 ppm, and severe toxicity was observed at tissue concentrations in excess of 40 ppm Cu. *(Author's summary)* C01

C02 Plant Development

0068

23999 AL-RUBEAI, M.A.F.; GODWARD, M.B.E. 1982. Effects of acute gamma irradiation of dormant seeds on the growth and yield of 4 varieties of French beans (Phaseolus vulgaris L.). Genética Ibérica 34(1-2):83-100. Engl., Sum. Engl., 25 Refs., Illus. [Dept. of Botany, Faculty of Science, Univ. of Garyounis, Benghazi, Libya]

Phaseolus vulgaris. Snap beans. Irradiation. Plant anatomy. Seed. Germination. Roots. Cultivars. Yields. Yield components. Lybia.

Dose response in the M_1 generation of 4 Phaseolus vulgaris var. (Cordon, Masterpiece, Swiss Blanc, and The Prince), after seed exposure to acute

doses of gamma radiation, was assessed using morphological criteria. Lethal doses did not affect the onset of germination. LD_{50} values for survival were 8.5, 12.5, 12.5, and 9.0 kR for Cordon, Masterpiece, The Prince, and Swiss Blanc, resp. Decreases in the rate of root and shoot growth, fresh and dry wt., no. of leaves/plant, and a lengthening of time to flowering were observed. The no. of pods/plant was the most sensitive indicator among yield components. Other alterations included the homogeneity of the populations and changes in the no. of leaflets, accompanied mostly by changes in leaf shape. [AS]

0069

24892 BATES, E.M.; HENNESSEY JUNIOR, J.P. 1979. On the use of solar radiation and temperature models to estimate the snap bean maturity date in the Willamette Valley. Salt Lake City, UT., National Oceanic and Atmospheric Administration. Technical Memorandum NWS WR-145. 32p. Engl., Sum. Engl., 11 Refs., Illus.

Phaseolus vulgaris. Snap beans. Solar radiation. Temperature. Growth. Maturation. Phenology. Planting. Timing. Cultivars. Harvesting. USA.

Phenological and climatological data were used to evaluate some of the available models that explain the growth and development of snap bean plants. In order to insure that processors have an orderly flow of snap beans into the processing plants, planting dates must be established and scheduled so that there are successively maturing crops in the harvest season. Thus, if a method based on climatological variables is available to estimate the date of maturity, using the desired schedule of harvest dates, it is possible to determine dates needed to meet this harvest schedule. [CIAT]

0070

16798 BINNIE, R.C.; CLIFFORD, P.E. 1981. Flower and pod production in *Phaseolus vulgaris*. Journal of Agricultural Science 97:397-402. Engl., Sum. Engl., 19 Refs.

Phaseolus vulgaris. Flowering. Podding. Flowers. Pods. Abscission. Seeds. Cultivars. Yield components. Plant physiological processes.

A series of glasshouse and growth cabinet expt. were carried out to investigate aspects of flower and pod production in French beans. Abscission of flowers and immature pods varied between 45-80% in the 7 cv. tested, with flowers which opened 1st being most likely to produce mature pods. Seed yield was only slightly reduced and sometimes increased by the removal of opened flowers for periods of up to 15 days from the start of anthesis depending on the conditions under which plants are grown. It was demonstrated that plants compensated for flower removal by setting pods from flowers which opened later. Similarly, when opened flowers were removed from alternate nodes, plants compensated by setting pods from flowers which opened on nodes not being deflowered. The physiological basis for premature abscission of reproductive structures in grain legumes is discussed. *(Author's summary)* C02

5048 0071

CAMPBELL, R.E. and GREIG, J.K. Selected growth regulators increase yield of snap beans. Hortscience 9(1):71-72. 1974. Engl. Sum. Engl. 7 Refs.

Phaseolus vulgaris. Plant-growth substances. Flowering. Productivity. Harvesting. Field experiments. Chlorosis. Pods.

A single foliar spray of 5-chloro-2-thenyl, tri-n-butyl-phosphonium chloride (CTBP), 90% soluble powder; tetrahydrofurfuryl isothiocyanate (CHE 8570), 47%

emulsifiable concentrate; 5-bromo, 2-thenyl, tributyl-ammonium chloride (CHE 9064), 50% wettable powder; or 2,3,5-triiodobenzoic acid (TIBA), 14.2% emulsifiable concentrate, was applied when first flowers opened of 'Salem' and 'Top Crop' snap beans (Phaseolus vulgaris L.). Treatments of CHE 9064 at 8.72 g/ha and TIBA at 2.32 g/ha significantly increased yield of spring-planted 'Salem' in 1971. Treatments of CHE 8570 and CHE 9064 at 11.62 g/ha significantly increased yields of spring-planted 'Top Crop' in 1972 due to increased pod set. Foliage samples at harvest showed no physiologically significant increase in P, K, Ca, Mg, Fe, or Zn for the treated plants compared with the controls. (Author's summary)

0072

14747 CAMPBELL, R.E. Some effects of selected growth regulators on pod set, yield and nutrient uptake of snap beans *(Phaseolus vulgaris* L.). Ph.D. Thesis. Manhattan, Kansas State University, 1972. 81p. Engl., Sum. Engl., 61 Refs., Illus.

Phaseolus vulgaris. Plant-growth substances. Nutrient absorption. Plant assimilation. Yields. Mineral content. Analysis. Toxicity. Green-house experiments. Field experiments. USA.

Information of the effects of growth regulating compounds on vegetable crops is limited. Their effects will differ due to chemical, crop species, cv.,and environmental conditions. These factorial studies were conducted in 1971 and 1972 with bush snap beans. Three greenhouse studies and 5 field studies were conducted. The objectives of these studies were: (1) to determine the effect of the materials on yield; (2) to determine if yield difference was due to differences in pod set or pod size; (3) to evaluate the accumulation of different nutrient elements in the plant leaves; (4) to determine optimum rates of application of the growth regulators CHE 8728, CHE 9064, CHE 8570 or TIBA at various rates of application depending upon the chemical increased snap bean yields. The proper time of application for these materials appeared to be in the early to mid-bloom stage or approx. 2 wk. prior to harvest. Outdoor variations in environmental conditions and seasonal changes had an influence on the action of the materials. Yield differences due to treatment were greater when crops grew under av. to below av. conditions rather than under very favorable or very adverse environmental conditions. Cv. response needs to be studied further. Yield increases were due to increased pod set rather than increased pod size. Only one material, CHE 9064, seemed to have an effect on increasing pod size. TIBA delayed pod size development. The trifoliolate leaves were analyzed for P, K, Ca, Mg, Fe, and Zn in the nutrient content study. There was no significant difference in nutrient content from any of the treatments except Ca in field study I. The reason for differences with this element in only this study is not fully understood. Nutrient analysis possibly should be done on lower leaf tissue, leaf and stem tissue, or leaf and pod tissue rather than on trifoliolate leaves alone. Fe concn. was highest in plants treated with TIBA in 2 studies, but significant differences did not occur. Some phytotoxic effects were observed with CHE 8728, CHE 9064 and TIBA at higher rates of application. CHE 8728 caused marginal chlorosis shortly after application while CHE 9064 or TIBA treatments resulted in twisting of the stem and pod. *(Author's summary)* C02

0073

23621 DAVIES, W.J.; VAN VOLKENBURGH, E. 1983. The influence of water deficit on the factors controlling the daily pattern of growth of Phaseolus trifoliates. Journal of Experimental Botany 34('45):987-999. Engl., Sum. Engl., 46 Refs., Illus.

Phaseolus vulgaris. Snap beans. Seedlings. Water stress. Light. Leaves. Cell walls. Growth. Stomata. Temperature. United Kingdom.

In liquid culture expt. in which Phaseolus vulgaris seedlings were grown under controlled temp. and irradiance, daily variation in growth of the 1st trifoliate leaves was measured. Growth, water relationships, stomatal behavior, cell wall extensibility, and the yield threshold for growth were investigated. Leaf growth rate was significantly enhanced within a few hours of the start of the light period and over a similar time a small

decrease in leaf turgor and an increase in cell wall plasticity was noted. Under conditions of restricted availability of water to leaves, dark growth rates were slightly enhanced, but growth rates in light were significantly reduced. Reduced growth rates in plants cooled to restrict water availability to the leaves resulted from changes in cell wall structure and/or properties. The control of leaf growth in plants developing water deficits is discussed. (Summary by Soils and Fertilizers) C02

0074

2618 DEAKIN, J. R. Association of seed color with emergence and seed yield of snap beans. Journal of the American Society of Horticultural Science 99(2):110-114. 1974. Engl., Sum. Engl., 9 Refs., Illus.

Phaseolus vulgaris. Rhizoctonia solani. Host-plant resistance. Seed. Seed color. Emergence. Productivity. Plant development. Phaseollin. Phytoalexins. Cultivars. Diseases and pathogens. Field experiments. Yields. USA.

Field tests involving 47 pairs of french bean breeding lines, near isogenic except for differences in seed color, demonstrated that sublines with colored seeds were superior to their white-seeded counterparts in emergence and seedling vigor. In 11 yield comparisons between colored and white-seeded isogenic sublines, the colored sublines outyielded their white-seeded counterparts by an average of 67%. Covariance techniques were used to adjust yields to remove stand effects. The results suggested that differences in stand based on seed color was a major factor effecting yield. (*Author's summary*) C02 G03 E03

0075

23623 DICKSON, M.H.; BOETTGER, M.A. 1984. Effect of high and low temperatures on pollen germination and seed set in snap beans. Journal of the American Society for Horticultural Science 109(3):371-374. Engl., Sum. Engl., 11 Refs. [Dept. of Seed & Vegetable Sciences, New York State Agricultural Experiment Station, Geneva, NY 14456, USA]

Phaseolus vulgaris. Temperature. Germination. Pollen. Snap beans. Cultivars. Ovules. Yields. Seed. Plant fertility. USA.

Pollen germination in vivo in beans was less at 8 and 12°C than at 18. There were large cv. differences, and germination at 9 AM was no different from that at 3 PM. Pollen from bean flowers grown in the greenhouse at 21/18°C day/night was transferred to plants in bloom at combinations of 8, 10, and 12°C night, and 20, 25, and 30°C day. Pollen from plants at the 8 temp. combinations also was used to pollinate plants in the greenhouse. Pollen from plants grown at 30°C, as compared with 20 and 25°C, resulted in reduced seed yields. Conversely, viable pollen transferred to plants at 30°C reduced set insignificantly. Combinations of 30/8°C day/night resulted in the lowest yields. Low night temp. appeared to inhibit ovule viability. In contrast, high temp. reduced pollen viability. NY 5-161 and OSU 1604 were more stable than BBL 47, BBL 92, and PI 165426 at both high and low temp. (Author' summary) C02

0076

10659 FARLOW, P.J., BYTH, D.E. and KRUGER, N.S. The effect of temperature on seed set and in vitro pollen germination in french beans (*Phaseolus vulgaris* L.). Ormiston, Queensland, Department of Primary Industries, 1978. 15p. Engl., 31 Refs.

Paper presented at Bean Improvement Workshop, Sydney, Australia, 1978.

Phaseolus vulgaris. Pollination. Temperature. Germination. Pollen. Plant development.

The effect of temp on pollen development, germination and embryonic tube growth in

french beans was investigated. To measure these effects, 2 samples were taken of 2 var. (Tweed Wonder and Autumn Crop) using 2 techniques: the hanging drop and agar smear techniques. The samples were maintained at temp ranging from 4.5-38.3°C. The max % of germination and the greatest embryonic tube growth occurred at 7.2 and 16.7°C, resp. The % of pollen burst increased with higher temp. To measure the effect of environmental conditions on pod formation and gamete development, 18 plants of var. Redland Pioneer were grown under greenhouse day/night conditions of 12/12 h, 25°/22°C (± 1.2°C) and 80/90% RH and another in environment control cabinet under day/night conditions (12/12 h, 16.1°/12.8°C (± 1.2°C) and 80/90% RH). Days before the anthesis, 40 flowers of plants within each environment were emasculated manually and pollinated, using pollen from both environments. Four cross combinations were made. Plants under colder conditions presented a greater no. of aborted ovules. To measure the effect of high temp on pollen viability, flowers were immersed in hot water 48°C during 2, 14, 38 and 62 h intervals. There was no pollen germination in the 38- and 62-h treatments. A selective technique for heat tolerance could be provided by measuring pollen germination % at high temp. *(Summary by L.E.A. Trans. by L.M.F.)* C02

0077

6041 FATTAH, M.A.A.A., NASSAR, S.H. and HANAFY, M.S.N. **Evaluation of some snap bean varieties. I. Growth, flowering and yielding ability.** Agricultural Research Review 52(3):107-124. 1974. Engl., Sum. Engl., 9 Refs., Illus.

Phaseolus vulgaris. **Growth. Flowering. Yields. Spacing. Anthesis. Yield components. Agronomic characters. Cultivars. Egypt.**

The effect of 3 planting dates (Sept., Oct., Nov.) and 2 sowing methods (using one or both sides of the ridge) on 5 introduced french bean var., as well as the locally bred Giza 3, was studied from 1967-69. Detailed data on plant growth and flowering patterns are given for the 6 var. As for yielding ability, wt of green pods/plant decreased with delayed planting date. Giza 3 and Seminole yielded the heaviest green pods. Planting on both sides of the ridge gave highest yields. Specific recommendations are made for the best var. according to their agronomic characteristics.. *(Summary by T.M.)* C02

0078

11110 GAGE, J.F. Effect of pod removal on flower production in french bean (*Phaseolus vulgaris*). Queensland Journal of Agricultural and Animal Sciences 35(1):63-68. 1978. Engl. Sum. Engl., 6 Refs., Illus.

Phaseolus vulgaris. **Pods. Flowers. Plant development. Petioles.**

Selective removal of small pods after petal fall had no effect on flower production from pot-grown plants of french bean cv. Redlands Pioneer for the period up to the 16th day from the start of flowering. After this time flower production was reduced on plants bearing a restricted no. of pods, but where no pods were removed, flowering ceased. It is suggested that young pods in which cell division was rapid but cell expansion was slow did not significantly compete with flowers for assimilates. However, when rapid pod expansion started, assimilate supply to developing flower buds was drastically reduced causing bud abortion. The significance of this in the field is discussed. *(Author's summary)* C02

0079

13141 HARDWICK, R.C.; INNES, N.L. 1975. It's by no means an easy start for the bean seed. Commercial Grower 12:416-417. Engl., Illus.

Phaseolus vulgaris. P. coccineus. Growth. Seed. Cultivars. Germination. Emergence. Drought. Nitrogen fixation. Selection. Yields. Snap beans. England.

Recent developments in the present understanding of the growth and agronomy of dwarf French beans and Phaseolus coccineus conducted at the National Vegetable Research Station, Wellesbourne, England, are described. Bean seeds and seedlings are affected in the seedbed by excess moisture or by

drought. In a trial using 8 var. of dwarf French bean, over 95% germination was observed under lab. conditions while in the field, over 90% germination was recorded for 6 var. but only 75 and 60% for the other 2. Aspects related to the potential of N fixation and limitations to the growth and development of the crop in the region are mentioned. At Wellesbourne over 300 accessions of P. vulgaris were selected for their ability to grow well at low temp. and the yield of 10 promising selections under British conditions was evaluated. (Summary by EDITEC. Trans. by L.M.F.) C02

0080

5646 HEGWOOD, D.A. **Cultivar effects on leaf and fruit mineral composition in snapbeans, *Phaseolus vulgaris*.** Comunications in Soil Science and Plant Analysis 3(2):123-139. 1972. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. **Mineral content. Leaves. Pods. Ca. Al. Mo. Mg. K. Zn. P. Statistical analysis. Analysis. Productivity. Soil fertility. Yields.**

Eleven french beans cultivars were grown on an acidic Tifton loamy sand to compare yielding ability and leaf and fruit mineral element composition and to determine whether leaf composition was associated with yield. A strong cultivar effect on leaf mineral element composition at full bloom and harvest and in fruit tissue was noted. The Ca and Sr level of leaf tissue at harvest positively associated with yield, and yields varied significantly with cultivars. Significant correlations were obtained among many of the elements. *(Author's summary)* C02

0081

25896. HEMANTARANJAN, A.; VAISHAMPAYAN, A. 1984. EFFECT OF CYTOKININ AND VARIOUS INORGANIC CATIONS ON THE POLYAMINE CONTENT OF FRENCH BEAN (PHASEOLUS VULGARE L.) COTYLEDONS. BIOCHEMIE UND PHYSIOLOGIE DER PFLANZEN 179(7):553-559. ENGL. SUM. ENGL., 30 REFS. (LABORATORY OF PLANT PHYSIOLOGY, INST. OF AGRICULTURAL SCIENCES, BANARAS HINDU UNIV., VARANASI-221005, INDIA)

THE EFFECTS OF KINETIN (4.7 X 0.0001 MOLAR) AND 6-BENZYLADENINE (2.22 X 0.0001 MOLAR) WERE FOUND TO INCREASE CA. 2-FOLD THE PUTRESCINE CONTENT IN COTYLEDONS OF FRENCH BEAN SEEDLINGS GROWN FOR 3 DAYS UNDER FLUORESCENT LIGHT. SEVERAL INORGANIC IONS (K+, NA+, CA++, MG++) AT A CONCN. OF 3 X 0.01 MOLAR AND ZN++ AT 0.35 MICROMOLAR REDUCED THE PUTRESCINE CONTENT. THE COMBINATION OF KINETIN WITH 2 (K+ AND ZN++) OF SEVERAL INORGANIC IONS AT THE SAME LEVEL MARKEDLY INCREASED THE SPERMINE CONTENT, BUT THE PUTRESCINE CONTENT DECREASED; CA AND MG IONS WERE NOT VERY EFFECTIVE. THE PHYSIOLOGICAL SIGNIFICANCE OF THESE FINDINGS IS DISCUSSED. (AS).

0082

19005 KANTHARAJ, G.R.; MAHADEVAN, S.; PADMANABAN, G. 1979. Early biochemical events during adventitious root initiation in the hypocotyl of Phaseolus vulgaris. Phytochemistry 18(3):383-387. Engl., Sum. Engl., 14 Refs., Illus.

Phaseolus vulgaris. Snap beans. Auxins. Rooting. RNA. Proteins.

IBA initiates roots in the hypocotyl of French bean. The response is dependent on the concn. of IBA and the duration of exposure to the hormone. IBA enhances the rate of total protein synthesis in approx. 30 min after exposure of the hypocotyl segments to the hormone. There is no detectable change in total or poly(A)-containing RNA synthesis in this period, although significant increases are seen 2 h after hormone pretreatment. The early IBA-mediated increase in protein synthesis (30 min) is not sensitive to actinomycin D, but the antibiotic blocks the increase manifested 2 h after hormone pretreatment. Inhibition of early protein synthesis by cycloheximide depresses and delays root initiation. Cytosol prepared from IBA-treated hypocotyl tissue stimulates protein synthesis in vitro to a greater extent than that of the control. (Author's summary) C02

0083

*KEMP, M.S. ; RIUS-ALONSO, C.; WAIN, R.L. 1976. Studies on plant growth-regulating substances. 43. 2-Chloro-3-phenoxypropionitriles. Annals of Applied Biology 83(3):447-453.

0084

1402 KERR, L.B., CAMPBELL, W.F. and POLLARD, L.H. **Reduction of flat-podded rogues in seed lots of snap bean.** HortScience 8(3):216-217. 1973. Engl., Sum. Engl., 6 Refs.

Phaseolus vulgaris. Podding. Seed. Pods. Cultivars.

Measurable differences in length, width and depth of bean seeds from normal and flat-podded rogues were observed. Selective milling removed more than 1/2 the seeds that would have given rise to flat pods, resulting in faster and easier field roguing in subsequent crops. This method is suitable only for stock seed purification because of the high loss (60-90%) of normal seed. (*Author's summary*) C02

0085

27091. LADROR, U.; DYCK, R.L.; SILBERNAGEL, M.J. 1986. EFFECTS OF OXYGEN AND TEMPERATURE DURING IMBIBITION ON SEEDS OF TWO BEAN LINES AT TWO MOISTURE LEVELS. JOURNAL OF THE AMERICAN SOCIETY FOR HORTICULTURAL SCIENCE 111(4):572-577. EN. SUM. EN., 30 REF., IL. (DEPT. OF PLANT BIOLOGY, UNIV. OF ILLINOIS, URBANA, IL 61801, USA)

LOW TEMP. AND O STRESSES WERE IMPOSED DURING THE 1ST 48 H OF GERMINATION ON 2 SNAP BEAN LINES, STRESS-TOLERANT (PI-165426-BS) AND STRESS-SENSITIVE (GOLDCROP). AT 22 DEGREES CELSIUS, O2 CONCN. OF 0, 1, AND 2 PERCENT INCREASED LEAKAGE FROM THE SEEDS, DELAYED EMERGENCE, AND REDUCED GROWTH, COMPARED WITH 5 AND 21 PERCENT O2. THESE EFFECTS WERE AGGRAVATED BY REDUCING THE INITIAL SEED MOISTURE FROM 12 TO 8 PERCENT IN GOLDCROP, BUT NOT IN PI-165426-BS. AT 10

DEGREES CELSIUS, THE EFFECT OF O DEFICIENCY WAS MINIMIZED. LOW TEMP. INHIBITED GROWTH DF GOLDCROP, BUT NOT OF PI-165426-BS, AND INCREASED LEAKAGE FROM SEEDS OF BOTH LINES. THE SURVIVAL OF SEEDS EXPOSED TO THE LOW TEMP. DECREASED WHEN INITIAL SEED MOISTURE WAS REDUCED FROM 12 TO 8 PERCENT. FLOODING THE SEEDS FOR 24 H INCREASED LEAKAGE AND REDUCED EMERGENCE AND GROWTH MUCH MORE THAN 24 H OF COMPLETE ANOXIA. SINCE THE EFFECTS OF ANOXIA ARE DIFFERENT THAN FLOODING INJURY, A MECHANISM OF FLOODING INJURY NOT RELATED TO D DEFICIENCY IS DISCUSSED. [AS].

0086

27796. LEE, E.H.; BYUN, J.K.; WILDING, S.J. 1985. A NEW GIBBERELLIN BIOSYNTHESIS INHIBITOR, PACLOBUTRAZOL [PP333], CONFERS INCREASED SO2 TOLERANCE ON SNAP BEAN PLANTS. ENVIRONMENTAL AND EXPERIMENTAL BOTANY 25[3]:265-275. EN. SUM. EN., 33 REF., IL. [PLANT STRESS LABORATORY, PLANT PHYSIOLOGY INST., U.S. DEPT. OF AGRICULTURE, BELTSVILLE, MD 20705, USA]

A SO2-SENSITIVE SNAP BEAN CV., BUSH BLUE LAKE 290, WAS TREATED WITH A NEWEXPTL. PLANT GROWTH REGULATOR, PACLOBUTRAZOL, A GIBBERELLIN BIOSYNTHESIS INHIBITOR THAT HAS BEEN FOUND TO BE A HIGHLY POTENT PROTECTANT AGAINST SO2- INDUCED INJURY TO PLANTS. THE SO2 TOLERANCE INDUCED BY PACLOBUTRAZOL WAS REVERSED BY SUBSEQUENT APPLICATIONS OF GA. THE DEGREE OF REVERSIBILITY WAS RELATED TO THE DURATION OF TREATMENT AND THE CONCN. OF THE RESP. GA AND PACLOBUTRAZOL. THE DATA SHOW THAT THE SUSCEPTIBILITY OR TOLERANCE OF SENSITIVE PLANTS TO SO2 STRESS CAN BE MANIPULATED BY TREATMENT WITH THIS GROWTH REGULATOR AND THE PLANT HORMONE GA. [AS].

0087

26094. LIETH, J.H.; REYNOLDS, J.F. 1984. A MODEL OF CANOPY IRRADIANCE IN RELATION TO CHANGING LEAF AREA IN A PHYTOTRON-GROWN SNAP BEAN [PHASEOLUS VULGARIS L.] CROP. INTERNATIONAL JOURNAL OF BIOMETEOROLOGY 28[1]:61-71. ENGL. SUM. ENGL., 30 REFS., ILLUS. [BLACKLAND RESEARCH CENTER, BOX 748, TEMPLE, TX 76503, USA]

SIMPLE EXPONENTIAL DECAY MODELS WERE USED TO DESCRIBE THE VARIATION IN IRRADIANCE PROFILES WITHIN A SNAP BEAN CANOPY OVER A 33-DAY PERIOD OF CANOPY DEVELOPMENT. THE EXTINCTION COEFFICIENTS OF THESE MODELS WERE VARIED OVER TIME AS A FUNCTION OF CHANGING CANOPY LEAF AREA; NONLINEAR LEAST-SQUARES PROCEDURES WERE USED TO ESTIMATE PARAMETER VALUES. THE RESULTANT MODEL RESPONSE SURFACES DEPICT THE

CHANGES IN CANOPY IRRADIANCE THAT ACCOMPANY CANOPY MATURATION AND ILLUSTRATE THE DYNAMIC NATURE OF CANOPY CLOSURE. A CRITERION INDEX IS DEFINED TO AID IN ASSESSING THE APPLICABILITY OF THESE MODELS FOR USE IN WHOLE-PLANT SIMULATION MODELS, AND AN EVALUATION OF THESE MODELS IS GIVEN BASED ON THIS INDEX, THEIR PREDICTIVE ACCURACY, AND THE UTILITY FOR USE WITHIN VARYING MODELING FRAMEWORKS. [AS].

0088

14202 MAKUS, D.J. and SHANNON, C. **Temperature and photoperiod effects on abscisic acid content in "Earliwax" snapbean seed.** HortScience 14(6):732-733. 1979. Engl., Sum. Engl., 7 Refs., Illus.

Phaseolus vulgaris. **Plant physiology. Temperature. Photoperiod. Plant-growth substances. Seed. USA.**

Seeds from plants of "Earliwax" snap bean stressed at 46°C during the reproductive cycle had higher ABA levels (285 ng/g) than those of plants stressed at lower temp. (257 ng/g at 41°C, 249 ng/g at 35°). Higher levels of ABA in seeds also resulted when more mature plants were stressed. A trend towards higher levels of ABA/g seed was observed in plants grown under 16 h days (219 ng/g) as opposed to 10 h days (139 ng/g). *(Author's summary)* C02

0089

22244 MANDAL, K.; BASU, R.N. 1982. Involvement of ethylene in synergism between indoleacetic acid & indole in adventitious root formation. Indian Journal of Experimental Biology 20(2):147-151. Engl., Sum. Engl., 23 Refs., Illus. [Univ. College of Agriculture, Calcutta Univ., 35 Ballygunge Circular Road, Calcutta 700 019, India]

Phaseolus vulgaris. Snap beans. Seedlings. Rooting. Auxins. Indolacetic acid. India.

Direct evidences on the involvement of ethylene in the synergism between IAA and indole 14,15 are presented and discussed. Indole was found to greatly synergize the action of IAA in the rooting of French bean cuttings. The ethylene-releasing chemical ethephon (2-chloroethylphosphonic acid) shows partial simulation of the root-promoting effect of indole in the time-course studies. Results further confirm that the synergists act in the dedifferentiation phase of root formation while auxin is specifically required in the subsequent determination and organization phases of rooting. (Author's summary) C02

0090

24440 MANDAL, K.; DHAR, N.; BASU, R.N. 1981. Role of polyphenol oxidase in rooting of cuttings. Indian Journal of Horticulture 38(3-4):184-186. Engl., Sum. Engl., 6 Refs. [Univ. College of Agriculture, Univ. of Calcutta, 35 Ballygunge Circular Road, Calcutta-700 019, India]

Phaseolus vulgaris. Snap beans. Rooting. Auxins. Inhibitors. India.

Synergism between IAA and the synergists, indole and caffeic acid, in Phaseolus was not influenced by the reducing agents which inhibited the activity of the polyphenol oxidases. Oxidation of auxin and synergist mixture by a polyphenol oxidase preparation did not influence the extent of synergism. (Author's summary) C02

0091

4243 MATTHEWS, S. and BRADNOCK, W.T. **Relationship between seed exudation and field emergence in peas and french beans.** Horticultural Research 8:89-93. 1968. Engl., Sum. Engl., 12 Refs., Illus.

Phaseolus vulgaris. **Seed. Emergence. Soil water. Soil temperature. Germination. Laboratory experiments. Field experiments. Soluble carbohydrates.**

A significant negative correlation was found between the field emergence of seed samples of peas and french beans and the readiness with which seeds from the samples yielded electrolytes to seed-steep water. Samples that exuded electrolytes readily, as measured by the electrical conductivity of seed-steep water after 24 h, gave low emergence counts in the field. In the case of peas a similar relation was found between emergence and the exudation of soluble carbohydrates. (*Author's summary*) C02

0092

24293 MAUK, C.S.; BREEN, P.J.; MACK, H.J. 1984. Flowering-pattern and yield components at inflorescence nodes of snap bean as affected by irrigation and plant density. Scientia Horticulturae 23(1):9-19. Engl., Sum. Engl., 16 Refs., Illus. [Botany Dept., U. of Michigan, Ann Arbor, MI 48109, USA]

Phaseolus vulgaris. Flowering. Inflorescences. Snap beans. Irrigation. Planting. Spacing. Yields. Yield components. USA.

Results of a 2 x 2 factorial expt. on bush snap bean Oregon 1604 are reported. Treatments were 2 contrasted irrigation regimes and 2 contrasted plant densities, applied in 1978 and repeated in 1979. Data were collected on the no. of flowers and pods, and pod size, at each node of the terminal inflorescence (6-T) of the main stem, and at each node of the oldest inflorescence (2-A) at node 2. High and low plant densities were 45 and 18 plants/m^2 in 1978 and 54 and 33 plants/m^2 in 1979. High temp., frequently above 32°C, prevailed during bloom and pod development in 1978, but for the most part occurred only during the week prior to bloom in 1979. Inflorescences 6-T and 2-A usually formed 4 and 3 raceme nodes, resp., in 1978 and 3 and 2 raceme nodes in 1979. The flowers at the proximal nodes of each inflorescence all opened within a few days of one another (duration of flowering at proximal nodes between 3-5 days); flowering and periods of adjacent nodes overlapped and the flowering period increased acropetally within the inflorescence (duration of flowering at distal nodes between 7-13 days). In general, no. of flowers, pods formed and harvested, and % set decreased acropetally within each inflorescence. The rate of acropetal decline was lessened by high irrigation or low plant density. In both years, high irrigation increased the % set of all raceme nodes of the 2-A inflorescences, but few other consistent effects between years were observed. The 2 most proximal raceme nodes together produced 93% or more of the yield of each inflorescence. High irrigation significantly increased the total no. of pods harvested from these raceme nodes of inflorescences 6-T and 2-A, and low density had a similar effect on 2-A. (Author's summary) C02

0093

25E69. MOHANDAS, S. 1985. EFFECT OF PRESOWING SEED TREATMENT WITH MOLYBDENUM AND COBALT ON GROWTH, NITROGEN AND YIELD IN BEAN (PHASEOLUS VULGARIS L.). PLANT AND SOIL 86(2):283-285. ENGL. SUM. ENGL., 9 REFS. [INDIAN INST. OF HORTICULTURAL RESEARCH, 255 UPPER PALACE ORCHARDS, BANGALORE-80, INDIA]

BEAN SEEDS OF CV. BURPEES STRINGLESS WERE SUBJECTED TO 2 CYCLES OF PRESOWING SOAKING AND DRYING TREATMENTS WITH SODIUM MOLYBDATE AND COBALT NITRITE AT 1 AND 5 PPM CONCN. USED SEPARATELY AND ALSO IN COMBINATION. SODIUM MOLYBDATE 2 PPM AND COBALT NITRITE 1 PPM USED SINGLY PROVED BETTER THAN THE REMAINING TREATMENTS WITH RESPECT TO NODULATION, DM, N, AND YIELD. COMBINED TREATMENT WITH SODIUM MOLYBDATE AND COBALT NITRITE DID NOT PRODUCE ADDITIVE EFFECT ON ANY PARAMETER STUDIED COMPARED WITH THEIR USAGE ALONE. (AS).

0094

9667 MOSLEY, A.R. **Responses of the bush snap bean (*Phaseolus vulgaris* L.) to population density and planting arrangement.** Ph.D. Thesis. Corvallis, Oregon State University, 1972. 117p. Engl., Sum. Engl., 167 Refs., Illus.

Phaseolus vulgaris. **Dwarf beans. Spacing. Growth. Flowering. Pods. Yields. Composition. Leaves. Stems. Carbon fixation. Field experiments. Laboratory experiments. Soluble carbohydrates. N. Photosynthesis. Plant respiration. USA.**

In french bean var. Gallatin-50, yield/acre increased and yield/plant and pod size decreased with increase in density from 2.62 to 9.6 plants/ft^2. Increase in yield was due to an increase in no. of pods/unit area and was positively correlated with LAI. At higher densities, the range of pod maturity appeared to be smaller and duration of flowering shorter than at low densities. Plant size and no. of plant parts decreased with increasing density and growth, and development began to terminate at anthesis. Leaf and stem sugar contents increased and leaf N contents decreased with increasing density and starch contents tended to increase, but the change was not significant. Leaf sugar content decreased rapidly at anthesis in one experiment. In both field and laboratory experiments, CO_2 fixation/unit leaf area decreased, fixation/unit area increased, rate of photosynthesis at flowering increased and at pod maturity decreased with increasing density. (*Summary by Field Crop Abstracts*) C02 C03 D02

0095

8624 NIGHTINGALE, A.E., GRAHAM, E.T. and BLACKHURST, H.T. **Fiber development in snap bean (*Phaseolus vulgaris* L. cv.'Wade') as influenced by *N*-dimethyl amino succinamic acid sprays and moisture stress.** American Society for Horticultural Science. Proceedings. 92:426-431. 1968. Engl., Sum. Engl., 8 Refs., Illus.

Phaseolus vulgaris. **Plant-growth substances. Developmental stages. Pods. Growth. Fibre content. Statistical analysis. Experiment design. Laboratory experiments.**

In glasshouse experiments, pod fiber content was significantly reduced by *N*-dimethylamino succinamic acid applied as a spray at 1000 mg/liter solution. Fiber content was not significantly affected by concentrations of 2500 and 4000 mg/liter or by time of application or soil moisture content. (*Summary by Field Crop Abstracts*) C02

0096

27293. POWELL, A.A.; OLIVEIRA, M. DE A.; MATTHEWS, S. 1986. THE ROLE OF IMBIBITION DAMAGE IN DETERMINING THE VIGOUR OF WHITE AND COLOURED SEED LOTS OF DWARF FRENCH BEANS (PHASEOLUS VULGARIS). JOURNAL OF EXPERIMENTAL BOTANY 37(178):716-722. EN. SUM. EN., 13 REF., IL. (DEPT. OF AGRICULTURE, UNIV. OF ABERDEEN, ABERDEEN AB9 1UD, SCOTLAND)

SEEDS OF DWARF FRENCH BEANS SHOWED EVIDENCE OF DAMAGE AFTER IMBIBITION IN WATER IN THE FORM OF DEAD TISSUE AND HIGH SOLUTE LEAKAGE. DAMAGE WAS MORE EXTENSIVE IN SEEDS OF A CV. WITH WHITE TESTAE (TENDERETTE) BOTH AT 20 DEGREES CELSIUS AND WITH THE INITIAL 6 H IMBIBITION AT 4 DEGREES CELSIUS WHERE DAMAGE WAS MORE SEVERE, WHEREAS A CV. WITH BROWN TESTAE (PROVIDER) WAS DAMAGED ONLY AFTER THE 4 DEGREES CELSIUS TREATMENT. TENDERETTE IMBIBED MORE RAPIDLY THAN PROVIDER IN BOTH IMBIBITION TREATMENTS. SIGNIFICANT CORRELATIONS WITHIN EACH CV. OF BOTH SOLUTE LEAKAGE (POSITIVE) AND THE EXTENT OF LIVING TISSUE (NEGATIVE) WITH THE RATE OF WATER UPTAKE, AND THE REDUCED DAMAGE WHEN SEEDS IMBIBED SLOWLY IN POLYETHYLENE GLYCOL INDICATED THAT THIS WAS IMBIBITION DAMAGE DUE TO RAPID WATER UPTAKE. DIFFERENCES IN THE RATES OF WATER UPTAKE WERE ALSO OBSERVED IN SAND AT 15 AND 20 PERCENT MC WHERE RAPID IMBIBITION WAS ASSOCIATED WITH REDUCED GERMINATION AND THE PRODUCTION OF MORE ABNORMAL SEEDLINGS. A TEMP. OF 4 DEGREES CELSIUS DURING THE 1ST 6 H GERMINATION IN SAND AT 15 PERCENT MC ALSO REDUCED GERMINATION, PARTICULARLY IN TENDERETTE. IT IS SUGGESTED THAT THE MORE RAPID WATER UPTAKE BY WHITE-SEEDED CV. OF DWARF FRENCH BEANS AND THEIR GREATER SUSCEPTIBILITY TO IMBIBITION DAMAGE ARE RESPONSIBLE FOR THEIR LOW VIGOR. (AS).

0097

27294. POWELL, A.A.; OLIVEIRA, M. DE A.; MATTHEWS, S. 1986. SEED VIGOUR IN CULTIVARS OF DWARF FRENCH BEAN (PHASEOLUS VULGARIS) IN RELATION TO THE COLOUR OF THE TESTA. JOURNAL OF AGRICULTURAL SCIENCE 106(2):419-425. EN. SUM. EN., 15 REF., IL. (DEPT. OF AGRICULTURE, UNIV. OF ABERDEEN, ABERDEEN AB9 1UD, SCOTLAND)

DIFFERENCES IN THE FIELD EMERGENCE OF 30 COMMERCIAL SEED LOTS OF DWARF FRENCH BEANS WERE ASSOCIATED WITH THE COLOR OF THE TESTA; THE 11 LOTS WITH A WHITE TESTA HAD A LOWER MEAN FIELD EMERGENCE (67) COMPARED WITH LOTS WITH BLACK (11 LOTS) OR BROWN (8 LOTS) TESTAE (91 PERCENT EACH). THE WHITE-SEEDED LOTS ALSO HAD HIGHER LEACHATE CONDUCTIVITIES (MEAN 42 MICROSIEMENS/CM/G) AND IMBIBED MORE RAPIDLY (AN AV. 43 PERCENT WT. INCREASE AFTER 6 H IMBIBITION) THAN BLACK- OR BROWN-SEEDED LOTS (AV. 25 MICROSIEMENS/CM/G; 30 PERCENT WT. INCREASE). IN 2 SUCCESSIVE IMBIBITION CYCLES SEEDS OF PROVIDER (BROWN TESTAE) TOOK UP WATER FAR MORE RAPIDLY IN THE 2ND IMBIBITION (78 PERCENT
WT. INCREASE AFTER 3 H) THAN IN THE 1ST (25 PERCENT WT. INCREASE). THE COLORED TESTAE NORMALLY ADHERE VERY TIGHTLY TO THE

COTYLEDONS BUT WERE LOOSENED FOLLOWING THE 1ST IMBIBITION LEADING TO A MORE RAPID UPTAKE OF WATER. THE RAPID IMBIBITION OF TENDERETTE (WHITE TESTAE), WHICH HAS A LOOSE FITTING TESTA EVEN IN THE DRY SEED, WAS INCREASED ONLY SLIGHTLY BY A 2ND IMBIBITION. WHEN SEEDS WERE IMBIBED FROM ONE END ONLY FROM WHICH THE TESTA WAS REMOVED, TENDERETTE IMBIBED RAPIDLY (90 PERCENT WT. INCREASE AFTER 12 H) WHEREAS IN PROVIDER THE TIGHTLY ADHERING TESTA LIMITED THE RATE OF WATER UPTAKE (42 PERCENT WT. INCREASE AFTER 12 H) DESPITE THE READY ACCESS TO WATER OF THE SEED. IT IS SUGGESTED THAT THE DEGREE OF ADHERENCE OF THE TESTA TO THE COTYLEDONS IS THE MAJOR FACTOR INFLUENCING THE RATE OF IMBIBITION OF DWARF FRENCH BEANS CV. DIFFERING IN TESTA COLOR. ITS ROLE IN DETERMINING SEED VIGOR IS DISCUSSED. (AS).

0098

16727 PRAKASH, K.S.; RAM, H.H. 1981. Path-coefficient analysis of morphological traits and developmental stages in French-bean. Indian Journal of Agricultural Sciences 51(2):76-80. Engl., Sum. Engl., 8 Refs.

Phaseolus vulgaris. Snap bean. Seed production. Yields. Yield components. Agronomic characters. Developmental stages. Statistical analysis.

Observations on morphological traits and durations of vegetative and reproductive stages of 28 germplasm lines of French bean were subjected to path analysis assuming the yields of green pods and dry seed separately as final products. None of the vegetative intervals had a significant phenotypic correlation with seed yield. The same was true for the yield of green pods except for duration of vegetative stage V_5 (5 nodes on the main stem including primary leaf node), which had a significant negative correlation (−0.395). None of the intervals between the reproductive stages were correlated with the yield of green pods; but the no. of days in the reproductive state R_3 (pod 2.50-2.75 cm long at 1st blossom position) had a significant negative correlation (−0.462) with the yield of dry seed. The direct effect of V_5 and R_3 primarily accounted for the correlations. Green pod yield was highly associated with plant height, green pods/plant, and wt. of green pod. Dry seed yield was positively correlated with plant height, plant spread, dry pods/plant, and seeds/pod. The no. of pods/plant assumed a major role in determining green and dry seed yield simultaneously. The direct effect of seed wt. on dry seed yield was counterbalanced by its negative indirect effect via pods/plant and seeds/pod. *(Author's summary)* C02 D00

0099

13545 RICE JUNIOR, R.P. and PUTNAM, A.R. Temperature influences on uptake, translocation, and metabolism of alachlor in snap beans (*Phaseolus vulgaris*). Weed Science 28(2):131-233. 1980. Engl., Sum. Engl., 13 Refs.

Phaseolus vulgaris. Nutrient absorption. Herbicides. Temperature. Germination. Analysis. Plant tissues. USA.

The uptake, translocation, and metabolism of ^{14}C-alachlor [2-chloro-2',6'-diethyl-*N*-(methoxymethyl)acetanilide] by germinating and emerged snap bean seedlings were monitored under 16-h daylength (21 klux) comparing 16°C night/21°C day and 27°C night/32°C day temp regimes. Total uptake of ^{14}C-alachlor by germinating snap beans was greater under the higher temp, however, the compound was localized primarily in the roots where it was rapidly metabolized. At the lower temp, the label was located in approx equal amounts in all plant parts except cotyledons and significantly less of the alachlor was metabolized. Root

uptake of ^{14}C-alachlor and translocation of labeled compounds to the shoots were significantly greater under the higher temp. Approx 60% of ^{14}C-alachlor was shown to volatilize from a watchglass after 48 h at 27°C. After volatilization, uptake of ^{14}C-alachlor occurred in adjacent snap bean plants in a closed system. *(Author's summary)* C02

0100

22652 SAMIMY, C.; TAYLOR, A.G. 1983. Influence of seed quality on ethylene production of germinating snap beans. Journal of the American Society for Horticultural Science 108(5):767-769. Engl., Sum. Engl., 11 Refs., Illus. [Dept. of Seed & Vegetable Sciences, Cornell Univ., Geneva, NY 14456, USA]

Phaseolus vulgaris. Seed characters. Seed vigor. Germination. Ethylene production. Snap beans. Storage. Timing. USA.

Deterioration of snap bean seed quality during accelerated aging at 42°C and 100% RH was accompanied by a decline in germination, radicle emergence, hypocotyl length, and ethylene production. Field emergence of 5 seed lots had a highly significant correlation with ethylene production rates when measured after 22.0-23.5 h of imbibition at 25°C. Seed lots that produced low levels of ethylene emerged poorly in the field. Results indicate that determination of ethylene production of imbibed seeds might be a useful method for detecting changes in seed vigor. (Author's summary) C02

0101

27288. SIDDIQUE, M.A.; GOODWIN, P.B. 1985. CONDUCTIVITY MEASUREMENTS ON SINGLE SEEDS TO PREDICT THE GERMINABILITY OF FRENCH BEANS. SEED SCIENCE AND TECHNOLOGY 13(3):643-652. EN. SUM. EN., FR., DE., 7 REF., IL. [DEPT. OF HORTICULTURE, BANGLADESH AGRICULTURAL UNIV., MYMENSINGH, BANGLADESH]

SOAKING OF INDIVIDUAL SEEDS IN 80 ML OF DISTILLED WATER FOR 16 H AT 25 DEGREES CELSIUS WAS FOUND OPTIMAL FOR JUDGING SEED QUALITY IN SNAP BEAN BY THE ELECTRICAL CONDUCTIVITY TEST. A CONDUCTIVITY LEVEL OF 165 MICROMHOS/CM/G DRY SEED WAS CONSIDERED AS THE CRITICAL LEVEL FOR BEAN CV. APOLLO. SEEDS SHOWING AN ELECTRICAL CONDUCTIVITY VALUE LESS THAN THE CRITICAL LEVEL WERE CLASSED IN THE LOW CONDUCTIVITY GROUP. THE PERCENTAGE SEED IN THE LOW CONDUCTIVITY GROUP AND THE PERCENTAGE NORMAL SEEDLINGS OBTAINED IN THE SEEDLING EVALUATION TEST WERE HIGHLY CORRELATED. THIS INDICATES THAT THE TEST CAN BE USED AS A PREDICTOR. [AS].

0102

19726 SIDDIQUE, A.; GOODWIN, P.E. 1982. Role of cotyledons on the development of seedling vigour in snap beans (Phaseolus vulgaris L.). Bangladesh Journal of Botany 11(2):67-92. Engl., Sum. Engl., 11 Refs., Illus. [Dept. of Horticulture, Bangladesh Agricultural Univ., Campus P.O., Mymensingh, Bangladesh]

Phaseolus vulgaris. Snap beans. Cotyledons. Seedlings. Plant development. Timing. Water content. Mineral content. N. Starch content.

Two expt. were conducted to evaluate the changes in snap bean cotyledons during seedling development and associated influence on seedling vigor. The role of intact cotyledons on the development of seedling vigor in snap

beans is defined. In the 1st expt., seeds of bean cv. Apollo were sown in wooden boxes in a randomized complete block design with 3 replications and 6 treatments (no. of days from sowing, 0, 6, 8, 10, 12, and 14 days). Seedlings were uprooted on scheduled days and the cotyledons were removed and weighed immediately. MC and dry wt./pair of cotyledons were determined in a random sample of cotyledons. MC, dry wt., total N content, and starch content were determined for 0-day samples. The 2nd expt. was conducted using a factorial randomized complete block design with 4 levels of treatment in one factor (8, 10, 12, and 14 days from sowing) and 2 levels in the other (cotyledons left intact; cotyledons removed from the seedlings on day 6). Measurements were taken on seedling length, leaf area, fresh and dry wt. of the seedling top and entire seedling without the cotyledons. Snap bean seedlings with a pair of intact cotyledons developed normally. The cotyledons lost stored reserves as the seedling developed. Loss of DM was approx. 90% by day 14 from the date of sowing. When the cotyledons were removed on emergence, the growth of the seedling was drastically reduced, suggesting that the normal vegetative development of the seedling takes place at the expense of the stored reserves of the cotyledons. (Summary by L.M.F.) C02

0103

7620 SINGH, J. N. and MACK, H. J. **Effects of soil temperatures on growth, fruiting and mineral composition of snap beans.** Proceedings of the American Society for Horticultural Science 88:378-383. 1966. Engl., Sum. Engl., 11 Refs.

Phaseolus vulgaris. **Growth. Podding. Soil temperature. Flowers. Pods. Analysis. P. K. Ca. Mg. N. Plant nutrition. Roots. Yields.**

An evaluation was made of the effects of fluctuating and constant soil temperatures (ranging from 50-90°F) on growth, flowering, fruiting and yield of french beans var. Tendercrop in 2 greenhouse experiments using water-bath temperature tanks. Best results were obtained at temperatures of 75-85°. Growth at diurnally fluctuating soil temperatures of 60-70° and 70-80° was about the same as at corresponding mean constant temperatures. Shoot and root dry wt and P and K contents of shoots increased under high soil temperatures. There was no consistent effect of soil temperature on N, Ca and Mg contents. *(Author's summary)* C02

0104

9011 SMITTLE, D.A. and WILLIAMSON, R.E. **Influence of seed characteristics on snap bean growth and yield response.** HortScience 12(4):317-319. 1977. Engl., Sum. Engl., 11 Refs.

Phaseolus vulgaris. **Seed characters. Growth. Yields. N. P. K.**

Seeds of french beans (*Phaseolus vulgaris* var. Avalanche) were separated into 3 length or 3 diameter groups and then each group separated into 3 classes based on aerodynamic properties. The grading procedure resulted in seed grades having large differences in physical characteristics, growth and yield responses. Yield response potential of french beans was determined primarily by seed wt. A grading method utilizing size grading based on seed diameter followed by aspiration in a vertical air column was the most effective method of eliminating seed with low yield potential. (*Author's summary*) C02 D04

0105

27437. TAYLOR, A.G.; SAMIMY, C.; KENNY, T.J. 1985. VIGOR OF SNAP BEAN SEEDS: RELATIONSHIP OF LABORATORY TESTS TO FIELD EMERGENCE. BEAN IMPROVEMENT COOPERATIVE. ANNUAL REPORT 28:28-29. EN. 1 REF. [DEPT. OF HORTICULTURAL SCIENCES, NEW YORK STATE AGRICULTURAL EXPERIMENT STATION, GENEVA, NY 14456, USA]

SEVERAL LAB. TESTS USED TO ASSESS SNAP BEAN SEED VIGOR (STANDARD GERMINATION, ACCELERATED AGING, CONDUCTIVITY, AND COLD TESTS) WERE EVALUATED AT THE NEW YORK STATE AGRICULTURAL EXPT. STATION IN GENEVE (USA) TO DEVELOP A TECHNIQUE THAT COULD BE PROVIDED ON A SERVICE BASIS BY THE NEW YORK SEED TESTING LAB. THE 4 TESTS WERE PERFORMED ON 25 AND 13 SAMPLES OBTAINED FROM COMMERCIAL SEED LOTS IN NEW YORK IN 1982 AND 1983, RESP. ALL SAMPLES WHICH GERMINATED BELOW 70 PERCENT, THE MIN. STANDARD GERMINATION FOR SNAP BEANS, WERE DELETED FROM THE ANALYSIS. BASED ON SEVERAL YEARS OF WORK WITH SEED VIGOR TESTS, THE COLD TEST HAS BEEN CONSISTENTLY SHOWN TO RANK SEED LOT PERFORMANCE IN SNAP BEANS. THIS TEST IS PERFORMED BY SOWING SEEDS AT 2 CM DEPTH IN A 1:1:1 (PEAT, SAND, AND FIELD SOIL) SOIL MEDIA, AND IS NOW OFFERED AS A ROUTINE SERVICE PROVIDED BY THE NEW YORK STATE SEED TESTING LAB. (CIAT).

D106

4182 TAYLOR, W.H. **Bees and flower-fertilization; the case of beans and peas.** New Zealand Journal of Agriculture 12:203-205. 1919. Engl.

Phaseolus vulgaris. **Flowers. Pollination. Plant fertility. Dwarf beans. Plant reproduction. Bees.**

Pollination by bees is described for *Phaseolus coccineus* (*P. multiflorus* and *P. vulgaris*). In the former self-fertilization cannot occur unless the wing petals are depressed, thus requiring bees or other heavy insects. Since bees do not detect flowers until a great no. have expanded, 1st flowers often do not set seeds. Large bees sometimes perforate the corollas since they cannot penetrate the flowers; in this case, no beans would be formed. *P. vulgaris* is characterized by self-fertilization; however, cross-pollination by bees does occur so that different lines grown in close proximity will not remain entirely pure. (*Summary by T.B.*) C02 G00

D107

8588 TOYA, D.K. *et al.* **The influence of processing and maturity on volatile components in bush snap beans, *Phaseolus vulgaris* L.** Journal American Society Horticultural Science 99(6):493-497. 1974. Engl., Sum. Engl., 18 Refs., Illus.

Phaseolus vulgaris. **Maturation. Dwarf beans. Anthesis. Cultivars.**

The concentrations of 17 volatile components in canned, frozen and fresh french bean pods were determined for 3 cultivars. Only 1-octen-3-ol differed quantitatively, FN14 contained the most, followed by 58-110 and G50. (*Summary by Plant Breeding Abstracts*) C02

D108

23655 VAN VOLFINBURGH, E.; DAVIES, W.J. 1983. Inhibition of light-stimulated leaf expansion by abscisic acid. Journal of Experimental Botany 34(144):835-845. Engl., Sum. Engl., 26 Refs., Illus. [Botany Dept., EB-15, Univ. of Washington, Seattle, WA 98195, USA]

Phaseolus vulgaris. Inhibitors. Light. Snap beans. Growth. Leaf area. Leaves. Cell walls. USA.

ABA applied to intact bean leaves or to isolated leaf discs inhibits light-stimulated cell enlargement. This effect may be obtained with 10^{-4} mol ABA/m^3, but is more significant at higher concn. The inhibition of

disc expansion by ABA is greater for discs provided with an external supply of sucrose than for discs provided with KCl, and may be completely overcome by increasing the KCl concn. externally to 50 mol/m^3. Decreased growth rate of ABA-treated tissue is not correlated with loss of solutes from growing cells, but is correlated with a decrease in cell wall extensibility. ABA does not prevent light-stimulated acidification of the leaf surface and stimulates the acidification of the external solution by leaf pieces. However, the capacity of the cell walls to undergo acid-induced wall loosening is diminished by ABA treatment. The possibility that ABA acts directly by inhibiting growth processes at the cellular level, or indirectly by causing stomatal closure, is discussed. (Author's summary) C02

C03 Chemical Composition, Methodology and Analyses

0109

21083 ABOU-FADEL, O.S.; MILLER, L.T. 1983. Vitamin retention, color and texture in thermally processed green beans and Royal Ann cherries packed in pouches and cans. Journal of Food Science 48(3):920-923. Engl., Sum. Engl., 10 Refs. [4644 Soria Drive #1, San Diego, CA 92115, USA]

Phaseolus vulgaris. Vitamin content. Thiamin. Nutritive value. Processing. Canned beans. Storage. Temperature. Snap beans. USA.

Thiamin, ascorbic acid, and vitamin B-6 retention were determined in pouched and canned green beans immediately after processing and after storage at 24-26° or 38°C. Ascorbic acid and vitamin B-6 retention were also determined in pouched and canned cherries before and after storage at 24-26°C. There were significantly more thiamin and ascorbic acid in drained pouched green beans, and more ascorbic acid in drained pouched cherries than in canned ones. Vitamin B-6 values in the solids of pouched and canned products were not significantly different. These 3 vitamins were significantly reduced in drained pouched and canned green beans after storage at 38°C. Vitamin B-6 was significantly reduced in stored cherries. Compared with canned products, the pouched products were brighter and firmer in texture. (Author's summary) C03

0110

27458. AKIL, S.A.; OSLUND, C.R. 1980. ELECTROPHORETIC PROTEIN PROFILES OF MATURE AND DEVELOPING SNAPBEAN [PHASEOLUS VULGARIS L.] SEEDS. REVISTA BRASILEIRA DE BIOLOGIA 40[2]:277-282. EN. SUM. EN., PT., 9 REF., IL.

PROTEIN EXTRACTS FROM COTYLEDONS OF 15 SNAP BEAN CV. WERE RESOLVED BY ACRYLAMIDE GEL ELECTROPHORESIS. THERE WERE SOME MAJOR AND CONSISTENT PROTEIN BANDS PRESENT IN ALL THE CV., AND MINOR AND VARIABLE BANDS IN SOME CV. THIS PROCEDURE WAS NOT CONSIDERED PRACTICAL FOR IDENTIFYING CV. WHEN THE ELECTROPHORETIC GELS WERE SCANNED WITH UV LIGHT AT 280 NM 2 MAJOR PROTEIN PEAKS WERE CONSPICUOUS. THESE COULD BE USED IN GROUPING OR SEPARATING BEAN CV. PROTEIN PATTERNS OF DEVELOPING SNAP BEAN SEEDS INDICATED FEWER LIGHT PROTEIN BANDS WITH IMMATURE SEEDS COMPARED WITH MANY DISCRETE BANDS IN MATURESEEDS. PRESUMABLY FUNCTIONAL PROTEINS OF YOUNGER

SEEDS APPEARED TO BE DIFFERENT FROM RESERVE PROTEINS OF MATURE SEEDS. KJELDAHL N [DRY WT. BASIS] AND EXTRACTABLE PROTEINS DECREASED WITH INCREASING SEED MATURITY. HIGH AND LOW MOL. WT. PROTEINS WERE ABOUT EQUALLY DISTRIBUTED IN DIFFERENT DEVELOPMENTAL STAGES. [AS].

0111

29105 ANDERSON, J.M. 1985. Simultaneous determination of abscisic acid and jasmonic acid in plant extracts using high-performance liquid chromatography. Journal of Chromatography 330[2]:347-355. En., Sum. En., 22 Ref., Il. [United States Dept. of Agriculture, Depts. of Crop Science & Botany, 3127 Ligon Street, North Carolina State Univ., Raleigh, NC 27607, USA]

Phaseolus vulgaris. Snap beans. Analysis. Laboratory experiments. Plant growth substances. USA.

A high-performance liquid chromatographic assay for the simultaneous determination of ABA and jasmonic acid from extracts of soybean, snap beans, lima beans, and broccoli is described. The presence of ABA and jasmonic acid in tissue extracts was also supported by chromatographic identification of corresponding methyl and ethyl esters following esterification. [AS [extract]]

0112

17894 AVILA-RINCON, M.J.; GOMEZ-RODRIGUEZ, M.V.; ALVAREZ-TINAUT, M.C. 1981. Effect of B and GA_3 treatments on growth and B, Cu, Mn, and Zn distribution in dwarf bean (*Phaseolus vulgaris*, L.) plants. 1. Vegetative stage of development. Anales de Edafología y Agrobiología 40(7/8):1303-1313. Engl., Sum. Engl., Span., 30 Refs., Illus.

Phaseolus vulgaris. Nutrient solution. B. Gibberellins. Growth. Mineral content. Cu. Mn. Zn. Snap beans. Dwarf beans. Analysis. Plat physiological disorders. Toxicity.

Growth (dry wt. and stem elongation) and B, Cu, Mn, and Zn contents were measured in plants of dwarf bean cv. Contender grown in hidroponic solution with B concn. ranging from deficient (0.1 ppm) to moderately toxic (5.0 ppm). Stem apexes of B-deficient and normal plants were treated with GA_3 (5 ng/plant). Plants were harvested when flower buds began to form. The effect of B on stem elongation was positive, the slightly toxic B level enhancing stem elongation above the control, even when these plants showed symptoms of toxicity. However, the highest B level resulted in other detrimental effects such as the detected decrease in plant absorption of Zn and Cu, which neutralized the positive effect. The effect of B on stem elongation could be related to gibberellin metabolism or action in plants, since the shortening of stems of B-deficient plants could be reverted by GA_3 application. Toxic B levels (provided not to be too severe) seemed to have the same effect as GA_3 application on stem elongation. However, stem elongation responses to GA_3 application did not involve changes in B content or distribution. A direct synergistic interaction existed between B and Mn at the level of root uptake. Mn concn. and content in roots were correlated to B content and concn. in roots and in the solution. Roots seem to regulate Mn transport to the stem. Mn content in stems was approx. the same for all the treatments. *(Author's summary)* C03 C02

0113

17895 AVILA-RINCON, M.J.; ROMERO, L.; ALVAREZ TINAUT, M.C. 1981. Effect of boron and GA_3 treatments on growth and B, Cu, Mn and Zn contents in dwarf bean plants. 2. Reproductive stage of development. Anales de Edafología y Agrobiología 40(7/8):1315-1322. Engl., Sum. Span., Engl., 23 Refs., Illus.

Phaseolus vulgaris. Nutrient solution. B. Gibberellins. Growth. Mineral content. Cu. Mn. Zn. Plant physiological disorders. Analysis. Plant reproduction. Snap beans. Dwarf beans. Toxicity.

Yield (dry wt. and no. of flowers and fruits), and B, Cu, Mn, and Zn contents were measured in plants of dwarf snap bean cv. Contender grown in hydroponic solution with different levels of B ranging from deficient (0.1 ppm) to moderately toxic (5.0 ppm). Stem apexes of B-deficient and normal plants were treated with GA_3 (5 ng/plant). Plants were harvested in the reproductive stage of development, when some fruits were totally formed but new flowers were still appearing. Levels of B or GA_3 application did not result in significant differences in yield, Mn content or distribution. B content in plant parts was closely correlated to the B concn. in the solution. A direct negative effect of toxic and deficient B levels on Zn transport to leaves was observed during the reproductive stage. Toxic treatments of B resulted in an extra mobilization of Cu from leaves. This mobilization is attributed to the pigment biosynthesis required for flower formation. *(Author's summary)* C03 C02

0114

17871 BAKKEN, T.J.; BOE, A.A. 1982. Two bioassay techniques for determining abscisic acid concentrations. Journal of the American Society for Horticultural Science 107(1):109-112. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. Snap beans. Embryo. Analysis. Composition.

Two bioassay techniques for determining ABA concn. are reported. One used snap bean cv. Improved Tendergreen embryos while the other used lettuce (Lactuca sativa) hypocotyls. The bean embryo assay requires that seeds 1st be soaked overnight, then the embryos excised and placed in known concn. of synthetic (RS)-ABA for 24 h, and finally measured. Seven concn. were tested: 0.01, 0.1, 0.5, 1.0, 10, 50, and 100 micrograms/ml with 3 replications/treatment and 5 embryos/replication. The lettuce hypocotyl assay utilizes seeds incubated for 48 h, then placed in known concn. of (RS)-ABA for 72 h and finally measured. A dose-response curve of each bioassay may then be used to determine unknown concn. of ABA. The bean embryo test was more rapid, but the lettuce hypocotyl assay was simpler and more sensitive. Elongation of bean embryos and lettuce hypocotyls was inversely correlated to the log concn. of (RS)-ABA within the range of 0.01-100 and 0.01-100 micrograms/ml, resp. (Author's summary) C03

0115

28981 BOLWELL, G.P. ; SAP, J.; CRAMER, C.L.; LAMB, C.J.; SCHUCH, W.; DIXON, R.A. 1986. L-Phenylalanine ammonia-lyase from Phaseolus vulgaris: partial degradation of enzyme subunits in vitro and in vivo. Biochimica et Biophysica Acta 881(2):210-221. En., Sum. En., 25 Ref., Il. [Dept. of Biochemistry, Royal Holloway College, Univ. of London, Egham Hill, Egham Surrey, TW20 0EX, England]

Phaseolus vulgaris. Snap beans. Enzymes. Colletotrichum lindemuthianum. Analysis. Laboratory experiments. England.

L-Phenylalanine ammonia-lyase was purified from suspension cultured cells of French bean which had been exposed to polysaccharide elicitor preparations from the cell walls of the phytopathogenic fungus Colletotrichum lindemuthianum. After preliminary purification by ammonium sulphate fractionation and gel filtration, the enzyme was further purified by (a) ion-exchange chromatography followed by chromatofocussing, (b) chromatography on rabbit anti-(phenylalanine ammonia-lyase) Immunoglobuline G, or (c) affinity chromatography on L-aminooxy(p-hydroxyphenyl)propionic acid (or L-tyrosine) linked to epoxyactivated Sepharose 6B via the phenolic hydroxyl group. The purified enzyme preparations exhibited subunit Mr values of 77 000, 70 000, and 53 000, the relative proportions of these depending upon the enzyme source, length of time taken for purification, and inclusion of freeze-thaw steps. Four forms of the enzyme, differing in pI value, were resolved by chromatofocussing, although all forms from the same preparation consisted of similar proportions of the different subunit Mr forms. Peptide mapping and freeze-thaw studies indicate that the Mr 77 000 native phenylalanine ammonia-lyase subunit is inherently unstable in vitro and breaks down to yield the lower Mr partial degradation products. Such products could also be observed following in vitro translation of phenylalanine ammonia-lyase mRNA. Pulse-chase expt. indicated that the 77 000 to 70 000 to 53 000 subunit interconversion also occurs in vivo. [AS]

0116

21139 BROWN, J.W.S.; OSBORN, T.C.; BLISS, F.A.; HALL, T.C. 1982. Bean lectins. 1. Relationships between agglutinating activity and electrophoretic variation in the lectin-containing G2/albumin seed proteins of French bean (Phaseolus vulgaris L.). Theoretical and Applied Genetics 62(3):263-272. Engl., Sum. Engl., 15 Refs., Illus. [Agrigenetics Corporation, Agrigenetics Research Park, 5649 East Buckeye Road, Madison, WI 53716, USA]

Phaseolus vulgaris. Cultivars. Protein content. Biochemistry. Analysis. Seeds. Amino acids. Snap beans. USA.

Single seeds of 107 bean cv. were analyzed by 2-dimensional electrophoresis. The cv. could be classified into 8 groups by virtue of their G2/albumin electrophoretic patterns. The polypeptide compositions of these types were largely interrelated having particular polypeptides in common. It was possible to correlate the G2/albumin patterns with agglutinating activity of cow and rabbit blood cells as measured by the agglutination ratio (min. concn. of extract required to agglutinate cow blood cells:min. concn. of extract required to agglutinate rabbit blood cells). The active lectin polypeptides were identified by extracting lectins from agglutinated erythrocytes and by comparing the qualitative similarities and differences of the G2/albumin patterns and their agglutination activities. A reference catalogue of 107 bean cv., giving their phaseolin and G2/albumin electrophoretic patterns, and agglutination ratios, is presented. (Author's summary) C03

0117

17847 BROWN, J.W.S.; MA, Y.; BLISS, F.A.; HALL, T.C. 1981. **Genetic variation in the subunits of globulin-1 storage protein of French bean. Theoretical and Applied Genetics 59(2):83-88.** Engl., Sum. Engl., 28 Refs., Illus.

Phaseolus vulgaris. **Proteins. Analysis. Snap beans. Composition. Genetics. USA.**

Charge and mol. wt. heterogeneity of globulin-1 (G1) polypeptides of french beans was revealed by SDS-polyacrylamide gel electrophoresis (SDS-PAGE). Different bean cv. were classified into 3 groups on the basis of their protein subunit composition: Tendergreen, Sanilac, and Contender. Nine distinct major bands ($\alpha 51$, $\alpha 49$, $\alpha 48.5$, $\beta 48^T$, $\beta 48^S$, $\beta 47$, $\gamma 45.5$, $\gamma 45^S$, and $\gamma 45^C$) and 2 minor bands ($\gamma 46^T$ and $\gamma 46^S$) were found to account for the 3 profiles seen on 1-dimensional SDS-PAGE. Two-dimensional analysis revealed these 11 protein bands to be composed of a min. of 14 distinct protein subunits. Tendergreen and Sanilac types differ in their G1 polypeptide composition. The protein patterns of the Contender types are intermediate, containing many protein subunits found in the patterns of the Tendergreen and Sanilac types, suggesting a genetic and evolutionary relationship. *(Author's summary)* C03

0118

18537 BROWN, J.W.S.; OSBORN, T.C.; BLISS, F.A.; HALL, T.C. 1981. **Genetic variation in the subunits of globulin-2 and albumin seed proteins of French bean.** Theoretical and Applied Genetics 60(4):245-250. Engl., Sum. Engl., 20 Refs., Illus.

Phaseolus vulgaris. Proteins. Analysis. Cultivars. Seed. Genetics. Snap beans.

Globulin-2 and albumin fractions of the seed protein of Phaseolus vulgaris were analyzed by 2-dimensional electrophoresis. These fractions had major polypeptides in common but differed in their minor components. Two groups of polypeptides were identified in 10 of the 11 cv. studied: Tendergreen G2 and Sanilac G2. Their presence in the seed was correlated with hemagglutinating activity and at least some of these polypeptides corresponded to lectin proteins. (Extracted from author's summary) C03

0119

21084 CHEN, K.-H.; McFETTERS, R.F.; FLEMING, H.P. 1983. Complete heterolactic acid fermentation of green beans by Lactobacillus cellobiosis. Journal of Food Science 48(3):967-971. Engl., Sum. Engl., 18 Refs., Illus. [USDA-ARS, P.O. Box 5578, Raleigh, NC 27650, USA]

Phaseolus vulgaris. Snap beans. Fermentation. Culture media. Analysis. Sugar content. Fructose. Glucose. Sucrose. Inoculation. Temperature. USA.

Conditions which will result in complete fermentation of sugars in green beans by heterolactic acid bacteria are defined. The time course of substrate and product changes during fermentation is analyzed in detail. Only Lactobacillus cellobiosus, among 6 strains of heterofermentative lactic acid bacteria, removed all fermentable sugars from green beans. Proper blanching of beans was required to prevent growth by natural lactic acid bacteria. An inoculum of 10 colony forming units L. plantarum/ml and 10^6 colony forming units L. cellobiosus/ml resulted in formation of twice as much lactic acid as inoculation with L. cellobiosus alone. A max. of 3.74% sugar was metabolized by L. cellobiosus in bean juice containing 2.5% NaCl and 0.08% acetic acid. Fructose was nearly quantitatively reduced to mannitol with a concomitant accumulation of acetic acid. Ethanol was not observed until most of the fructose was metabolized. L. cellobiosus-fermented beans had a more mild acid flavor than beans fermented with L. plantarum. (Author's summary) C03

0120

18533 CRIVELLI, G.; MAESTRELLI, A.; BERTOLO, G.; ALLAVENA, A. 1979. Ricerche sul comportamento alla congelazione degli ortaggi. 6. Nuovi contributi sull'idoneita varietale dei fagiolini. (Response of vegetables to quick-freezing. 6. New contributions on suitability of green bean cultivars). Annali dell'Istituto Sperimentale per la Valorizzazione Tecnologica dei Prodotti Agricoli 10:29-35. Ital., Sum. Ital., Engl., 3 Refs., Illus.

Phaseolus vulgaris. Cultivars. Snap beans. Seed characters. Organoleptic analysis.

Six green bean cv. (Stip, selections 1099, 1070, 1030, 1080, and 1033) were compared, with cv. Amboy as check, to determine their suitability for quick freezing. All were blanched, frozen, stored for 12 mo., and cooked. Color, appearance, consistency, and taste were evaluated organoleptically and results for separate and total scores were tabulated as well as extent of deformation. Further tabulation presents extent of skin sloughing determined by the method of Van Buren et al. It is concluded from all these tests that cv. Stip and selection 1099 were similar to cv. Amboy in suitability for quick freezing. (Summary by Food Science and Technology Abstracts) C03

0121

13526 DEBOST, M. and CHEFTEL, J.C. Tin binding in canned green beans. Journal of Agricultural and Food Chemistry 27(6):1311-1315. 1979. Engl., Sum. Engl., 34 Refs., Illus.

Phaseolus vulgaris. Sn. Canned beans. Enzymes. Toxicity. Laboratory experiments. Analysis.

Tin distribution was studied in green beans from detinned cans and in tin-free green bean puree incubated, under nitrogen, with stannous citrate. Tin was determined by colorimetry of a phenylflurorone-Sn^{4+} complex. Canned beans were drained, homogenized, and centrifuged. Approximately 90% of the total Sn remained in the drained beans. Ninety % of this Sn was recovered in the centrifugation sediment (up to 21 mg of Sn/g dry wt) and could not be extracted from it by acid, alkaline, or saline solutions. Ethylenediaminetetraacetic (0.2 M) and 0.05 M cysteine solutions released resp. 39 and 30% of this bound Sn. Pectinases plus cellulases, or α-amylase plus glucoamylase, released no Sn; proteases released up to 13%. The model system yielded similar results. In both cases, stannous ions appear to be strongly bound to insoluble bean constituents otherwise than by electrostatic attraction or physical adsorption. Such bindings may account for the absence of toxicity of Sn in solid canned foods. *(Author's summary)* C03

0122

15873 DIXON, R.A.; BROWNE, T.; WARD, M. 1980. Modulation of L-phenylalanine ammonia-lyase by pathway intermediates in cell suspension cultures of dwarf French bean (*Phaseolus vulgaris* L.). Planta 150:279-285. Engl., Sum. Engl., 27 Refs., Illus.

Phaseolus vulgaris. Plant physiological processes. Plant physiological disorders. Enzymes. *Colletotrichum lindemuthianum.* Host-plant resistance. Biochemistry. Analysis. Plant tissues. Culture media. Laboratory experiments.

The increase in extractable phenylalanine ammonia-lyase (PAL;EC 4.3.1.5.) activity induced in French bean cell suspension cultures in response to treatment with autoclaved ribonuclease A was inhibited by addition of the phenylpropanoid pathway intermediates cinnamic acid, 4-coumaric acid, or ferulic acid. The effectiveness of inhibition was in the order cinnamic acid > 4-coumaric acid > ferulic acid. Cinnamic acid also inhibited the PAL activity increase induced by dilution of the suspensions into an excess of fresh culture medium. Addition of low concn. ($< 10^{-5}$ M) of the pathway intermediates to cultures at the

time of application of ribonuclease gave variable responses ranging from inhibition to 30-40% stimulation of the PAL activity measured at 8 h. Following addition of pathway intermediates to cultures 4-5 h after ribonuclease treatment, rapid increases followed by equally rapid declines in PAL activity were observed. The cinnamic acid-stimulated increase in enzyme activity was unaffected by treatment with cycloheximide at a concn. which gave complete inhibition of the ribonuclease-induced response. However, cycloheximide completely abolished the subsequent decline in enzyme activity. Treatment of induced cultures with α-aminooxy-β-phenylpropionic acid resulted in increased but delayed rates of enzyme appearance when compared to controls not treated with the phenylalanine analogue. The results are discussed in relation to current views on the regulation of enzyme levels in higher plants. *(Author's summary)* C03

0123

5778 GARDINER, K.D. Alcohol-insoluble-solids and dry-matter contents in the assessment of quality and maturity in French beans. Journal of Horticultural Science 45:163-174. 1970. Engl., Sum. Engl., 14 Refs., Illus.

Phaseolus vulgaris. Dry matter. Harvesting. Pods. Yields. Laboratory experiments.

Alcohol-insoluble-solids (AIS) and dry matter (DM) contents were determined in 15 french bean (*Phaseolus vulgaris*) cultivars grown at 3 locations from 1966-68. The standard deviation of AIS and DM determinations was ±0.11 and ±0.06, respectively. The effect of variation (from 80%) in the alcohol concentration used in the AIS estimation was investigated. Concentrations of the order of 88% overestimated the AIS content by 4% on average. The relationship between AIS and DM values was investigated. A regression of AIS on DM was carried out on 550 samples from trials over the 3 seasons and a single equation was derived for each season. A correlation coefficient of 0.99 and a standard error of estimate of ± 0.30 was obtained for these equations. In special maturity trials in 1967-68, 3 cultivars (Processor, Meteor and Tenderlong) were harvested twice weekly as the crop matured. An analysis of variance on AIS and DM values showed that both tests were reliable indices of maturity. *(Author's summary)* C03

0124

20890 GIBRIEL, A.Y.; ASHMAWI, H.; SOLIMAN, S.A.; ABD-EL AL, A.T.H. 1976. Bacteriological flow sheets and identification of major spore-former contaminants in some Egyptian canned products. Annals of Agricultural Science (Egypt) 5:145-153. Engl., Sum. Engl., 4 Refs.

Phaseolus vulgaris. Snap beans. Canned beans. Analysis. Egypt.

Samples of canned orange juice, tomato concentrate, mango and guava juice, and green beans, obtained from one of the leading canning factories in Egypt, were bacteriologically examined. Bacteriological flow sheet analysis was used for canned green beans. Major sources of contamination were found in the production line. Aerobic mesophilic and thermophilic counts were 102 x 10^3 and 101 x 10^2, resp. Anaerobic mesophilic and thermophilic counts were 26 and 49/ml, resp. The spore formers present, Bacillus subtilis, B. megaterium, B. coagulans, and B. stearothermophillus, were isolated from a hard swell which developed during the routine incubation period at the plant. (Summary by F.G.) C03

0125

27071. KERMASHA, S.; VAN DE VOORT, F.R.; METCHE, M. 1986. CHANGES IN LIPID COMPONENTS DURING THE DEVELOPMENT OF THE FRENCH BEAN SEED (PHASEOLUS VULGARIS). JOURNAL OF THE SCIENCE OF FOOD AND AGRICULTURE 37(7):652-658. EN. SUM. EN., 34 REF., IL.

[DEPT. OF FOOD SCIENCE & AGRICULTURAL CHEMISTRY, MACDONALD CAMPUS, MCGILL UNIV., 21111 LAKESHORE ROAD, STE ANNE DE BELLEVUE, QUEBEC, CANADA H9X 1C0]

CHANGES IN LIPID CLASSES AND FATTY ACID COMPOSITION AND DISTRIBUTION HAVE BEEN MONITORED DURING THE GERMINATION, DEVELOPMENT, AND MATURATION OF FRENCH BEAN SEED. A LIPASE ACTIVITY PROFILE OVER TIME WAS ALSO DETERMINED. UNGERMINATED SEEDS CONTAINED HIGH LEVELS OF TRIGLYCERIDES AND FREE FATTY ACIDS, BUT LOW LEVELS OF POLAR LIPIDS, MONOGLYCERIDES, AND DIGLYCERIDES. FIVE DAYS AFTER GERMINATION THERE WAS A DECREASE IN THE QUANTITY OF TRIGLYCERIDES AND FREE FATTY ACIDS AND A CONCOMITANT INCREASE IN THE LEVELS OF MONOGLYCERIDES, DIGLYCERIDES, AND POLAR LIPIDS. AS DEVELOPMENT AND MATURATION PROGRESSED, TRIGLYCERIDES INCREASED SUBSTANTIALLY AT THE EXPENSE OF MONO- AND DIGLYCERIDES. UNGERMINATED SEEDS CONTAINED HIGH LEVELS OF C20-C22 FATTY ACIDS WHICH DECREASED AFTER GERMINATION WITH A CONCOMITANT INCREASE IN C16-C18 UNSATURATED FATTY ACIDS. A STUDY OF THE FATTY ACID DISTRIBUTION AMONG THE DIFFERENT CLASSES OF LIPIDS DEMONSTRATED THAT 55 PERCENT OF THE UNSATURATED FATTY ACIDS IN THE UNGERMINATED SEEDS WERE PRESENT IN THE TRIGLYCERIDES, WHEREAS THE REMAINDER WERE DISTRIBUTED AMONG THE MONO- AND DIGLYCERIDES AS WELL THE OTHER LIPID CLASSES [FREE FATTY ACIDS, POLAR LIPID, AND STEROLS]. FIVE DAYS AFTER GERMINATION, THE MAJORITY OF THESE UNSATURATED FATTY ACIDS WERE FOUND IN THE GLYCERIDE FORM. OVERALL, THE LIPID CLASSES AND FATTY ACID COMPOSITION AND DISTRIBUTION CHANGES DURING DEVELOPMENT AND MATURATION OF THE FRENCH BEAN SEED INDICATED THAT IT SHARES MANY OF THE CHARACTERISTICS OF SOYBEAN DEVELOPMENT. [AS].

0126

8381 KLEIN, B.P. **Isolation of lipoxygenase from split pea seeds, snap beans, and peas.** Journal of Agricultural and Food Chemistry 24(5):938-942. 1976. Engl., Sum. Engl., 36 Refs., Illus.

Phaseolus vulgaris. **Seed. Analysis. Proteins. Enzymes. Ammonium sulphate. Isolation. Laboratory experiments.**

Lipoxygenase was isolated from dried split pea seeds, frozen raw peas and french beans by ammonium sulfate fractionation, gel filtration and ion-exchange chromatography. Split pea seed lipoxygenase was purified 19-fold; 22% of the original activity was recovered. Raw vegetable lipoxygenases were partially purified by a modified procedure using Ca^{2+} in the extraction, which appeared to stabilize the enzyme. French bean lipoxygenase was purified 3-fold, recovering 8% of the original activity. Pea lipoxygenase was purified 9-fold, recovering 3% of the activity. The enzymes were characterized by the determination of pH optima, behavior on polyacrylamide gels and limited kinetic studies. *(Author's summary)* C03

0127

26585. KUNWAR, R.; SINGH, R.; SINHA, M.M. 1984. STUDIES ON MINERAL COMPOSITION AND PROTEIN CONTENT IN FRENCH BEAN (PHASEOLUS VULGARIS L.). PROGRESSIVE HORTICULTURE 16(1-2):116-119. ENGL., SUM. ENGL., 6 REFS. (GOVERNMENT VALLEY FRUIT RESEARCH STATION, SRINAGAR GARHWAL, UTTAR PRADESH PIN 246174, INDIA)

FIFTEEN FRENCH BEAN CV. COMMONLY GROWN IN THE HILLS OF UTTAR PRADESH, INDIA, WERE EXAMINED FOR GRAIN MINERAL AND PROTEIN CONTENTS. MEAN VALUES WERE 2.76, 0.11, 1.60, 0.22, 0.47, AND 23.53 PERCENT N, P, K, CA, MG, AND CP, RESP. SEMIDWARF CV. SHOWED THE HIGHEST PROTEIN CONTENT FOLLOWED BY DWARF BEANS, WHEREAS TALL BEANS HAD A LOW CONTENT. THE SAME WAS TRUE WITH RESPECT TO P AND K CONTENTS. CA AND MG CONCN. WERE HIGHEST IN TALL AND DWARF BEANS, RESP. POSITIVE SIGNIFICANT CORRELATIONS WERE OBSERVED BETWEEN PROTEIN AND N (R = +0.92) AND BETWEEN N AND MG (R = +0.67); MEDIUM CORRELATION WAS OBSERVED BETWEEN PROTEIN AND MG (R = D + 0.55). (AS).

0128

7189 LAFUENTE, B., CARBONELL J.V. and PINAGA, F. **Influencia de las condiciones de secado en la calidad de las judias verdes liofilizadas.** *(The effect of drying on the quality of lyophilized green beans).* Revista de Agroquimica y Tecnologia de Alimentos 8(3):371-380. 1968. Span., Sum. Span., 5 Refs., Illus.

Phaseolus vulgaris. **Vitamin content. Temperature. Analysis. Laboratory experiments.**

The influence of sulfitation, type of cut (transverse or longitudinal), loading density, temperature of the radiant plates of the lyophilizer and the caliber of the cut samples on the drying cycle and the quality of the lyophilized green beans was studied using Blue Lake beans. In the samples cut transversely, sulfitation improved substantially the retention of vitamin C and the color, making it possible to obtain a higher ratio of reconstitution. This effect was less noticeable when the beans were cut longitudinally. The use of higher loading densities (2.5-10 kg/m^2) made it possible to improve plant capacity since by increasing the load capacity, drying time increased in less proportion. Of all the variables studied, temperature of the plates was the factor that influenced the speed of the process most. At 70°C, drying time was approx. 1/2 the time required at 40°C. In the case of cut beans, this effect was less noticeable in those cut longitudinally since the required drying time was shorter. The use of higher temperatures also favors the retention of vitamin C and color as a result of the reduction in drying time; nevertheless, the organoleptic quality of the product is considerably less. This lessening in quality is practically eliminated when a sulfitation treatment is used beforehand. *(Author's summary. Trans. by T.M.)* C03

0129

21321 MARTIN-VILLA, C.; VIDAL-VALVERDE, C.; ROJAS-HIDALGO, E. 1982. High performance liquid chromatographic determination of carbohydrates in raw and cooked vegetables. Journal of Food Science 47(6):2086-2088. Engl., Sum. Engl., 25 Refs. [Servicio de Nutrición, Clínica Puerta de Hierro, Centro Nacional de Investigaciones Médico-Quirúrgicas de la Seguridad Social, Univ. Autónoma, S. Martín de Porres 4, Madrid-35, España]

Phaseolus vulgaris. Carbohydrate content. Snap beans. Sucrose. Glucose. Fructose. Maltose. Cooking.

The soluble sugar contents of 17 raw and cooked vegetables, including green bean, were determined by TLC and high performance liquid chromatography. In general, the soluble carbohydrate content of vegetables is low. For raw materials the highest content was found in carrot, red cabbage, eggplant, green bean, and leek. Upon cooking, the glucose, fructose, and total sugar contents decrease and this diminution is more drastic in the case of frying. The amount of sucrose, except in the case of carrot, eggplant, and green bean, increases with cooking. The maltose content of the broad bean increases in the culinary process. (Author's summary) C03

0130

13547 MEREDITH, F. and DULL, G. **Amino acid levels in canned sweet potatoes and snap beans.** Food Technology 33:55-57. 1979. Engl., 10 Refs.

Phaseolus vulgaris. **Processing. Canned beans. Amino acids. Lysine. Methionine. Tryptophane. Valine. Tyrosine. Cysteine. Arginine. Alanine. Glycine.**

The effect of processing on amino acid values in sweet potatoes and snap beans was studied. Total amino acids in 100 g portions of solids was 25,946 μM for fresh, 14,344 μM for sucrose-canned and 13,352 μM for water-canned sweet potatoes. In snap beans the difference in total amino acids/100 g serving between fresh and canned was 5071 μM. For max nutrition the canning liquor should be consumed with the food. *(Summary by Nutrition Abstracts and Reviews)* C03

0131

11937 MILLS, H.A. and JONES JUNIOR, J.B. **Elemental content of frozen snap bean fruit.** HortScience 14(3):268-269. 1979. Engl., Sum. Engl., 12 Refs.

Phaseolus vulgaris. **Minerals and nutrients. Micronutrients. Nutritive value. Composition. Mineral content. Pods. Seed. Analysis. USA.**

The establishment of an av elemental composition for french beans to satisfy nutritional labeling requirements is probably not possible. Analysis of 40 frozen french bean samples at 8 locations in the USA revealed a wide range in concn for the 18 elements determined. Several causes for this wide variation are suggested. (*Author's summary*) C03

0132

23988 PIÑAGA, F.; CARBONELL, J.V.; MADARRO, A.; PENA, J.L. 1983. **Deshidratación de frutas y hortalizas con aire ambiente. 3. Ensayos comparativos con el secador solar de judías verdes.** (Dehydration of fruits and vegetables with ambient air. 3. A comparative study with solar dehydration of green beans). Revista de Agroquímica y Tecnología de Alimentos 23(2):251-261. Span., Sum. Span., Engl., 20 Refs., Illus. [Inst. de Agroquímica y Tecnología de Alimentos, Consejo Superior de Investigaciones Científicas, Jaime Roig, 11, Valencia-10, España]

Phaseolus vulgaris. Snap beans. Seed. Drying. Water content. Vitamin content. Solar drying. Spain.

The kinetics of drying of green beans by 3 different processes was studied, namely: (a) drying with ambient air (22-23°C and 40-50% RH), (b) drying with air heated by solar energy, and (c) a 2-step method initiated with ambient air and finished with solar drying. Quality of green beans dehydrated by processes (a) and (c) was analyzed and results are compared with those obtained for a check sample dried conventionally at 60°C. The use of high loading rates (40-60 kg/m²) and drying with ambient air offers interesting possibilities in relation to drying yield, although residual

product moisture is too high for stability. Solar drying, with air temp. about 50°C at noon, does not assure complete dehydration of green beans during a day's work to levels that guarantee stability. On the contrary, if drying starts at sunset, the process can be completed in a 24 h period using the 2-step method. Samples dried according to processes (a) and (c) present a stronger green color and a faster and more complete hydration than those dried with air at 66°C. No significant differences were observed in vitamin C content and shrinkage ratio among the 3 products. The final step of solar drying does not reduce the quality of green beans previously dehydrated with ambient air. (Author's summary) C03

0133

29145 RIPPLE, W.J. 1986. Spectral reflectance relationships to leaf water stress. Photogrammetric Engineering and Remote Sensing 52(10):1669-1675. En., Sum. En., 25 Ref., Il.

Phaseolus vulgaris. Snap beans. Radiation. Leaves. Canopy. Water content. Water stress. Analysis. Laboratory experiments. USA

Spectral reflectance data were collected from detached snap bean leaves in the lab. with a multiband radiometer. Four expt. were designed to study the spectral response resulting from changes in leaf cover, relative water content of leaves, and leaf water potential. Spectral regions included in the analysis were red (band 3, 0.63-0.69 microns), near infrared (band 4, 0.76-0.90 microns), and middle infrared (band 7, 2.08-2.35 microns). Results indicated that the red and middle infrared bands showed sensitivity to changes in both leaf cover and relative water content of leaves. The near infrared was only highly sensitive to changes in leaf cover. Results provided evidence that middle infrared reflectance was governed primarily by leaf MC, although soil reflectance was an important factor when leaf cover was less than 100 percent. High correlations between leaf water potentials and reflectance were attributed to covariances with relative water content of leaves and leaf cover. (AS)

0134

26502. ROSINGER, C.H.; WILSON, J.M.; KERR, M.W. 1984. CHANGES IN THE SOLUBLE PROTEIN AND FREE AMINO ACID CONTENT OF CHILL-SENSITIVE AND CHILL-RESISTANT PLANTS DURING CHILLING AND HARDENING TREATMENTS. JOURNAL OF EXPERIMENTAL BOTANY 35(159):1460-1471. ENGL., SUM. ENGL., 33 REFS., ILLUS. [SCHOOL OF PLANT BIOLOGY, UNIV. COLLEGE OF NORTH WALES, BANGOR, GWYNEDD LL57 2UW, ENGLAND]

THE EFFECTS OF LOW TEMP. [5 AND 12 DEGREES CELSIUS] AND DROUGHT TREATMENTS ON LEAF SOLUBLE PROTEIN CONTENT AND FREE AMINO ACID CONTENT WERE INVESTIGATED IN 4 SPECIES, WHICH WERE RANKED ACCORDING TO CHILLING SENSITIVITY: PEA [CHILL-RESISTANT], MUNG BEAN [HIGHLY CHILL-SENSITIVE], AND TOMATO AND FRENCH BEAN [INTERMEDIATE CHILLING SENSITIVITY]. DROUGHT TREATMENT CAUSED A 30-40 PERCENT DECREASE IN PROTEIN LEVELS, AND IN ALL BUT MUNG BEAN A 100-200 PERCENT INCREASE IN FREE AMINO ACID CONCN. FOUR DAYS CHILLING AT 5 DEGREES CELSIUS, 85 PERCENT RH, CAUSED LEAF WATER CONTENT TO DECREASE BY ALMOST 50 PERCENT IN MUNG BEAN, BUT BY ONLY APPROX. 6-7 PERCENT IN THE OTHER 3 SPECIES. DURING THIS TREATMENT THE LEAF SOLUBLE PROTEIN CONTENT

DECREASED IN ALL 4 SPECIES, ALTHOUGH THE DECREASE WAS GREATEST AND MOST RAPID IN MUNG BEAN. IN THE CHILL-SENSITIVE SPECIES THE DECREASE IN PROTEIN CONTENT WAS ACCOMPANIED BY AN INCREASE IN FREE AMINO ACID CONTENT. WHEN PLANTS OF EACH SPECIES WERE CHILLED AT 5 DEGREES CELSIUS, 100 PERCENT RH, WATER LOSS WAS GREATLY REDUCED OR PREVENTED AND THERE WAS NO SIGNIFICANT DECREASE IN LEAF SOLUBLE PROTEIN. IT IS CONCLUDED THAT THE PROTEIN DECREASE WHICH OCCURRED AT 5 DEGREES CELSIUS, 85 PERCENT RH, WAS A RESPONSE TO WATER LOSS AND NOT THE DIRECT RESULT OF LOW TEMP. HOWEVER, CHILLING AT 100 PERCENT RH DID CAUSE AN INCREASE IN FREE AMINO ACID CONTENT OF THE CHILL-SENSITIVE SPECIES, SUGGESTING THAT THIS WAS A DIRECT RESPONSE TO LOW TEMP. ALTHOUGH DROUGHT TREATMENT CAUSED A 6-20 FOLD INCREASE IN FREE PROLINE CONTENT IN THE LEAVES OF THE 4 SPECIES EXAMINED, CHILLING (5 DEGREES CELSIUS) AND CHILL-HARDENING (12 DEGREES CELSIUS) CAUSED LITTLE CHANGE IN FREE PROLINE CONTENT, INDICATING THAT THE ACCUMULATION OF THIS PROTECTIVE AMIND ACID IS UNLIKELY TO CONTRIBUTE TO THE EFFECTIVENESS OF THE CHILL-HARDENING TREATMENT. (AS).

0135

18737 SISTRUNK, W.A.; REDDY, K.B.; GONZALEZ, A.R. 1982. Relationship of cultivar and maturity to protein, fiber, and seed of canned green beans. Arkansas Farm Research 31(3):6. Engl.

Phaseolus vulgaris. Cultivars. Maturation. Protein content. Fibre content. Harvesting. Timing. Snap beans. Canned beans. Seed.

The effect of 7 green bean cv. (BBL-94, BBL-47, Tidalwave, Early Gallatin, BBL-92, E-6207, and Exp. 611), 3 harvests at 3-day intervals, and 3 sieve sizes (4, 5, and 6) on the quality of graded, snipped, and cut beans canned by standard commercial procedures was studied. Fiber, seed, DM, and shearpress values were higher in cv. BBL-94 (0.253%, 13.7%, 7.93%, and 123.4 lb/150 g, resp.), Early Gallatin (0.149%, 11.0%, 7.62%, and 106.5 lb/150 g, resp.), and Exp. 611 (0.179%, 10.2%, 7.39%, and 101.6 lb/150 g, resp.). Protein content was significantly higher in BBL-94 (1.35%) and Exp. 611 (1.27%). All quality parameters increased with a delay in harvest (fiber content increasing more) and an increase in sieve size. The mean max. protein content of 1.3% was attained in the 3rd harvest and in sieve size 6. Significant interaction was observed between cv. and harvest on fiber, seed, and protein contents. Quality parameters also differed among cv. depending on the sieve size. There was a highly significant correlation between the % seed and % fiber (r = 0.869), the % seed and shearpress (r = 0.859), the % seed and % protein (r = 0.887), and the % seed and the % DM (r = 0.929). Protein content of canned green beans can be increased significantly by delaying the harvest date without causing the beans to exceed the limits of fiber. Cv. with higher seed % reached higher levels of protein. (Summary by EDITEC. Trans. by L.M.F.) C03

0136

23923 TWOGOOD, M.C. 1981. HPLC method for determining organic acids and evaluation of selected organic acids, total acidity, pH, copper, iron and added salt (NaCL) in four snap bean varieties as they relate to internal can corrosion. Ph.D. Thesis. Fayetteville, University of Arkansas. 72p. Engl., Sum. Engl., 118 Refs.

Phaseolus vulgaris. Cultivars. Snap beans. Canned beans. Mineral content. pH. Cu. Fe. Storage. Analysis. Temperature. USA.

A high pressure liquid chromatography method was developed to determine the organic acid profiles of green beans. The method requires further refinement to separate acetic, lactic, fumaric, and succinic acids. Four green bean var. were analyzed for organic acids, total acidity, pH, Cu, and Fe. The effects of these variables plus the effect of added NaCl were evaluated in terms of their relationships to internal corrosion of laquered tin plate cans. Raw, blanched, and processed bean samples were analyzed as was the canned product at 8 and 12 mo. of storage at both room temp. and 38°C. Acids identified in green beans were: acetic, ascorbic, citric, fumaric, lactic, malic, succinic, and trans-aconitic. Titratable acidity increased significantly with each treatment interval except between 8-12 mo. at room temp. The pH of the slurry decreased significantly after processing and continued to decrease significantly during storage except between processing and 8 mo. at room temp. The changes in organic acids did not account for the changes in pH and acidity, although there was a possible relationship between 1 unknown peak and internal can corrosion. Cu was not related to internal corrosion. Fe concn. (a corrosion indicator) increased during storage and corrosion occurred at an accelerated rate at 38°C storage. Slimgreen was the most corrosive var. studied. There was no significant difference in pH of the slurry between the salt and the nonsalt treatments of var. Early Gallatin; however, there was a significant negative correlation between the pH of the slurry of the nonsalt treatment and the Fe level which indicated that there was a relationship between added salt content and increased corrosion activity in this var. (Summary by Food Science and Technology Abstracts) C03

0137

20096 VAN BUREN, J.P.; LEE, C.Y.; MASSEY JUNIOR, L.M. 1982. Variation of vitamin concentration and retention in canned snap beans from three processing plants during two years. Journal of Food Science 47(5):1545-1548. Engl., Sum. Engl., 16 Refs. [New York State Agricultural Experiment Station, Cornell Univ., Geneva, NY 14456, USA]

Phaseolus vulgaris. Snap beans. Canned beans. Processing. Vitamin content. Amino acids. USA.

A statistical evaluation of vitamin status during canning was obtained by sampling raw, blanched, and canned snap beans. With the exception of folic acid retention, it was not possible to distinguish the separate plants. This leads to the expectation that the seasonal av. of vitamins from processing plants obtaining material from the same area would be similar. Retention % were lower for thiamin, folic acid, and vitamin B_6 than for ascorbic acid which was lower than for carotene. Raw material was a source of variation. Av. concn. in drained canned beans (dry wt. basis) were: 116 mg ascorbic acid/100 g and 22, 3.4, 5.3, and 7.3 micrograms/g of carotene, thiamin, B_6, and folic acid/g, resp. (Author's summary) C03

0138

20613 VAN BUREN, J.P. 1980. Calcium binding to snap bean water-insoluble solids. Calcium and sodium concentrations. Journal of Food Science 45(3):752-753. Engl., Sum. Engl., 11 Refs., Illus.

Phaseolus vulgaris. Snap beans. Ca. Pods. Mineral content. Canned beans. Na. USA.

The degree of Ca binding to bean pod constituents under various conditions of Ca and sodium salt concn. was determined using snap bean pods of var. Tendercrop. A limit of Ca binding on insoluble solids of canned beans was

approx. 10,000 mg/kg. This amount was increased in snap beans that underwent a low temp. blanch. Sodium chloride decreased the binding of Ca and the firmness of the canned beans. (Author's summary) C03

0139

3089 VEERABHADRAPPA, P.S.S. **Multiple forms of carboxylesterases in the green bean (*Phaseolus vulgaris* L.) and pea (*Pisum sativum* L.).** Ph.D. Thesis. Corvallis, Oregon State University, 1969. 106p. Engl., Sum. Engl., 88 Refs., Illus.

Phaseolus vulgaris. **Inhibitors. Hydrolysis. Enzymes. Analysis. Laboratory experiments.**

Aqueous extracts of peas and beans were subjected to zone electrophoresis on polyacrylamide gel. By the zymogram technique at least 14 bands of esterase activity in beans and 7 in peas were seperated. α-Naphthyl acetate, propionate and butyrate and AS naphthol acetate were used as substrates to identify the esterases. Absence of activity with β-naphthyl laurate indicated the absence of lipase-type activity in both aqueous extracts. All heterogeneous esterases were classified as aliesterases or carboxylesterases (EC 3.1.1.1.) based on their inhibition characteristics with certain organophosphorus compounds. Carboxylesterases active toward phenyl propionate in protamine sulfate-treated aqueous extract of the bean were separated into 3 fractions (S_I, S_{II} and S_{III}) by gel filtration on Sephadex G-100, indicating that they are not of similar mol size. Subsequent analysis of each fraction by polyacrylamide gel electrophoresis showed that fraction S_I contained the 1st group of esterase activity; fraction S_{II}, the 1st and 2nd groups; and S_{III}, the fast moving 3rd group. Each fraction was further separated by ion-exchange chromatography on DEAE- or CM-cellulose. Preliminary studies revealed that the 1st group was cationic while the 2nd and 3rd groups were anionic at the pH used. Chromatography of the 1st group on CM-cellulose with NaCl elution resulted in 3 fractions CM_I, CM_{II} and CM_{III}. Esterase activity was separated into 3 fractions (DE_I, DE_{II} and DE_{III}) when S_{II} was chromatographed on DEAE-cellulose. Fraction DE_{III} was shown to contain only the 2nd group of esterase activity. NaCl linear gradient elution of fraction S_{III} on DEAE-cellulose resulted in 2 fractions (DE_{IV} and DE_V), each of which contained 2 esterase bands. Inhibitor sensitivity determined with DFP, parathion and PCMB and substrate specificity towards 9 substrates indicated that there were similarities and variations among each of the fractions. The applicability of the term "isozyme" to bean esterases was discussed; a hypothetical model accounting for the majority of the properties of these esterases was proposed. Although results indicate that these complex forms of esterases were probably isozymes, conclusive evidence as to their isozymic nature is still to be established. (*Author's summary*) C03

0140

25662. WAKARCHUK, D.A.; HAMILTON, R.I. 1985. CELLULAR DOUBLE-STRANDED RNA IN PHASEOLUS VULGARIS. PLANT MOLECULAR BIOLOGY 5(1):55-63. ENGL. SUM. ENGL., 22 REFS., ILLUS. (AGRICULTURE CANADA, RESEARCH STATION, 6660 N.W. MARINE DRIVE, VANCOUVER, BRITISH COLUMBIA, CANADA V6T 1X2)

HIGH MOL. WT. DOUBLE-STRANDED (DS) RNAS HAVE BEEN DETECTED IN APPARENTLY VIRUS-FREE FRENCH BEAN CV. BLACK TURTLE SOUP. SEVERAL OTHER BEAN CV. WERE FREE OF DETECTABLE HIGH MOL. WT. DSRNAS. THE DSRNAS HAVE BEEN PARTIALLY CHARACTERIZED AND HAVE HOMOLOGY TO THE BLACK TURTLE SOUP GENOME AS WELL AS TO THE GENOMES OF OTHER BEAN CV. THE TM OF HYBRIDS FORMED BETWEEN BLACK TURTLE SOUP DNA AND DENATURED DSRNA HAVE BEEN ESTIMATED. (AS).

0141

5481 WHITLEY, E.J. **The isolation and characterization of a proteinase inhibitor from the navy bean.** Ph.D. Thesis. Bloomington, Indiana University. Department of Biochemistry, 1973. 160p. Engl., 101 Refs., Illus.

Phaseolus vulgaris. **Enzymes. Proteins. Amino acids. Analysis. Inhibitors. USA.**

Two proteins were isolated from the navy bean (*Phaseolus vulgaris*) that had the ability to inhibit the activity of trypsin and chymotrypsin. Each inhibitor was demonstrated to be homogeneous by ion-exchange chromatography, gel filtration, acrylamide gel electrophoresis, and by the possession of a single amino-terminal residue. Amino acid analysis showed that the inhibitors are distinct proteins, yet have similarities in their compositions. A convenient technique, giving both qualitative and quantitative information, was developed to show that the inhibitors form enzyme-inhibitor complexes in reacting with trypsin at neutral pH, while at a lower pH, a complex did not form. The k_i, at pH 8, was calculated to be 2.0 x 10^{-9}M. The specific activity of the inhibitor was measured by quantitating its effect on tryptic hydrolysis after determining the concentration of active trypsin by active site titration. This overcame the problem faced by many researchers whose inhibitor assays were inaccurate due to a lack of knowledge about their enzyme; i.e., it is impossible to know how much enzyme is inhibited unless the starting enzyme concentration is known. Experiments were also carried out to show that each assay employed first-order kinetics for enzyme and inhibitors. A preincubation period with trypsin, in the absence of substrate, was required to allow the inhibitor to exert its maximum inhibition. The choice of substrate for the assay was demonstrated to affect the degree of inhibition, suggesting that inhibitor and substrate compete for the enzyme. The specific activity of the inhibitor ranged from 1.54 ± .06 to 2.98 ± .07 for the 7 substratres of trypsin tested. The assay for inhibition after preincubation at pH 3 yielded a lower specific activity than after pH 8 preincubation for all substrates. The phenomenon corresponded with the ability of inhibitor to complex with trypsin at pH 8 but not at pH 3. However, the degree of the pH effect was not identical for all substrates; those for which the lowest specific activity was obtained were most affected by the change in the pH of preincubation. A model based on the affect of the various conditions on the equilibrium between the enzyme-inhibitor complex with free enzyme and inhibitor was developed to explain this differential effect of preincubation pH. Acrylamide gel electrophoresis indicated that treatment of navy bean inhibitor with trypsin induced a structural modification in the inhibitor. The alteration was more pronounced after treatment at pH 4 than after pH 8 and was dependent upon the length of exposure to trypsin and the enzyme concentration. The degree of modification was inversely related to the effect of preincubation pH on specific activity; i.e., inhibition was minimal and modification was maximal after treatment at low pH. Modification thus provided a chemical basis for the effect on equilibrium discussed above. (*Summary by Dissertation Abstracts*) C03

0142

29130 ZONNEVELD, H. ; KLOP, W.; GORIN, N. 1984. Analysis of unboiled and boiled beans for chlorophylls and pheophytins by thin-layer chromatography and fluorimetry comparison with spectrometry. Zeitschrift fur Lebensmittel-Untersuchung und-Forschung 178(1):20-23. En., Sum. De., En., 11 Ref. [Sprenger Inst., P.O. Box 17, 6700 AA Wageningen, The Netherlands]

Phaseolus vulgaris. Snap beans. Chlorophyll. Analysis. Netherlands.

A method is described that permits estimation of chlorophylls a and b and pheophytins a and b in green beans. Pigments were extracted with acetone and subjected to TLC on commercially prepared plates. The separated

pigments were measured by irradiation at wavelength 360 nm and fluorescence above 630 nm on the plate. Data were compared with those obtained by a spectrophotometric method of pigment extract without purification. Concn. of pheophytin b obtained by 2 equations with the spectrophotometric method conflicted with one another and with the new method. Extrapolation of retained chlorophyll b to zero time of boiling gave a more appropriate result with the results from this new method. [AS]

D00 AGRONOMY

0143

14252 DENNY, S. **Homestead snap beans—top management beats weather and disease.** Florida Grower and Rancher 71(1):4-6. 1978. Engl., Illus.

Phaseolus vulgaris. Productivity. Yields. USA.

The good results obtained in a 600-ac snap bean cultivation in Dade County, Florida (USA) are reported, where a total of 3000 ac of snap beans are produced in 7 mo. A yield of 132 bushels/ac was obtained by a complicated spray program applied by airplane in close collaboration with commercial firms and during tough weather and disease conditions. *(Summary by I.B. Trans. by L.M.F.)* D00

0144

23360 HADDAD, N.I. 1985. Bean production in Jordan. In Regional Workshop in Potential for Field Beans (Phaseolus vulgaris L.) in West Asia and North Africa, Aleppo, Syria, 1983. Proceedings. Cali, Colombia, Centro Internacional de Agricultura Tropical. pp.44-47. Engl., 3 Refs., Illus. [Univ. of Jordan, Faculty of Agriculture, Amman, Jordan]

Phaseolus vulgaris. Snap beans. Production. Cultivars. Yields. Cultivation systems. Diseases and pathogens. Fusarium solani phaseoli. Rhizoctonia solani. Colletotrichum lindemuthianum. Uromyces phaseoli. Development. Jordan.

Beans are widely consumed as fresh (green) pods in Jordan. The crop, as dry beans, is not produced in the country and is entirely imported. Fresh-pod beans are grown in the Jordan Valley under irrigation; cv. Astro and Wade are widely grown. Major diseases affecting this crop are Fusarium solani, Rhizoctonia solani, Colletotrichum lindemuthianum, and Uromyces phaseoli. Little research has been conducted on this crop because of the small area it occupies. Research should be initiated to determine the feasibility of dry bean production in this country. (Summary by T.F.) D00

0145

23364 MORENO, M.-T.; MARTIN[illegible]; CUBERO, J.I. 1985. Bean production in Spain. In Regional Workshop in Potential for Field Beans (Phaseolus vulgaris L.) in West Asia and North Africa, Aleppo, Syria, 1983. Proceedings. Cali, Colombia, Centro Internacional de Agricultura Tropical. pp.70-85. Engl., 6 Refs., Illus. [Inst. Nacional de Investigaciones Agrarias, Apartado 240, Córdoba, España]

Phaseolus vulgaris. Plant geography. Development. Consumption. Snap beans. Production. Yields. Seed characters. Cultivars. Cultivation systems. Cultivation. Rotational crops. Spain.

For the last 50 yr common bean (both dry and green) has been the most

important legume in Spain. Although the area planted to dry beans as well as that planted to most other legumes has decreased, the demand for some of those used for human consumption has increased and market prices have risen greatly. Insects and diseases, production costs, and environmental and institutional factors have been identified as the major production constraints in this country. Economic importance, yield trends, consumption patterns, bean types used in the different regions, and cropping systems are indicated. Research activities on common beans to date have been left in the hands of private firms and to the farmers' initiative. More progress has been made with the green product than with dry seeds, even though farmers have been able to produce dry products of outstanding quality. Systematic work on breeding and agronomy is urgently required, mainly for dry bean production. (Summary by T.F.) D00

0146

17471 OHLANDER, L.J.R. 1980. Research on haricot bean (*Phaseolus vulgaris* L.) production in Ethiopia 1972-1976. Uppsala, Sweden, Swedish University of Agricultural Sciences. Department of Plant Husbandry. Report no. 82. 288p. Engl., Sum. Engl., 131 Refs., Illus.

Phaseolus vulgaris. Snap bean. Developmental research. Cultivation. Planting. Timing. Weeding. Water requirements. Climatic requirements. Cultivars. Adaptation. Yields. Selection. Seed. Protein content. *Ophiomyia phaseoli*. Seed treatment. Ethiopia.

Research on haricot (*Phaseolus vulgaris*) in Ethiopia from 1972-76 is summarized. In field trials, yields 3 times the present av. agronomic yield of 0.7 t/ha were obtained using suitable cv. and cultural practices. The doubling of agronomic yield by modifying traditional technology was envisaged. Variation in disease resistance and disease attack were responsible for the differences in yield shown by the cv. tested. Variation in rainfall affected yield in arid areas. The reduction of runoff by soil management to improve soil infiltration is suggested. A suitable environment for growing *P. vulgaris* was 1400-2000 m alt.; av. max. temp. 30-32°C; av. min. temp. 10-12°C; and 350-500 mm rainfall in the 1st 70-100 days of growth, followed by dry weather. Hand weeding 25-35 days after sowing was usually sufficient. The application of 40-70 kg P_2O_5 and 20 kg N/ha in the humid areas was adequate. *Rhizobium* inoculation gave no positive effects unless *Phaseolus* beans had not been grown in the soil previously. The optimum crop density was 300,000 plants/ha. Harvesting was successful after 70% of the pods had yellowed until 10 days after all the seeds had hardened. The no. of hard-shelled beans which did not readily imbibe water was increased by early harvesting. Early sowing of *P. vulgaris* in the main rainy season gave the highest yield. *(Summary by Field Crop Abstracts)* D00 101

0147

7212 ROOS, E.E. and MANALO, J. R. **Effect of initial seed moisture on snap bean emergence from cold soil.** Journal of the American Society for Horticultural Science 101(3):321-324. 1976. Engl., Sum. Engl., 20 Refs.

Phaseolus vulgaris. **Germination. Emergence. Seed. Seed characters. Water requirements. Temperature. USA.**

The moisture content of french bean (*Phaseolus vulgaris* L.) seeds used in commercial plantings ranged from 7.7-13.7% on a fresh weight basis. Bean seeds having initial seed moisture contents above 12% had higher field emergence than lower moisture seeds, particularly at soil temperatures below 10°C. The high-moisture seeds quickly lost moisture when planted in very dry soil. Laboratory germination was improved a lesser amount by raising initial seed moisture content. *(Author's summary)* D00

0148

23368 SAKAR, D. 1985. Bean production in Turkey. In Regional Workshop in Potential for Field Beans (Phaseolus vulgaris L.) in West Asia and North Africa, Aleppo, Syria, 1983. Proceedings. Cali, Colombia, Centro Internacional de Agricultura Tropical. pp.116-123. Engl., Illus. [National Food Legume, Middle Anatolian Regional Agricultural Research Inst., P.K. 226 Ulusu, Ankara, Turkey]

Phaseolus vulgaris. Plant geography. Cultivation systems. Snap beans. Seed characters. Production. Diseases and pathogens. Injurious insects. Development. Turkey.

Dry beans rank 3rd in area and production among food legumes grown in Turkey. Beans often are grown under irrigation, except in the rainfed area of the Black Sea coast. So far, there are no registered cv. and all existing types are local mixtures often grown with agronomic neglect. Agroecological zones, cropping systems, irrigated and rainfed bean regions, and production constraints are described. Research activities on food legumes in Turkey started in 1965 at the Eskisehir Institute followed by the Agean Region Agricultural Research Institute at Izmir. Both of them have collected some local bean germplasm (less than 1000 accessions). Because of severe halo blight incidence in the nurseries, a crossing program has been started to transfer resistance from Phaseolus coccineus and P. vulgaris lines to the adapted local lines. Attempts will be made with regional and international centers such as CIAT to obtain the necessary collaboration for improved germplasm, training, and information exchange. (Summary by T.F.) D00

0149

14276 WRIGHT, R.M. **Seed size studies in dwarf french beans.** Australian Seed Science Newsletter 5:120-125. 1979. Engl.

Phaseolus vulgaris. **Fertilizers. Seed characters. Climatic requirements. Spacing. Cultivation. Australia.**

The effect of N fertilization (0-200 kg/N/ha applied 10 days after emergence and a side-dressing of 0-90 kg N/ha), plant density, and environment on seed size of dwarf french beans in Bowen, Queensland (Australia). Only the environment affected seed size. Early plantings, as soon as possible after the rainy season (Dic.-March), are recommended. *(Summary by I.B. Trans. by L.M.F.)* D00 D04

D01 Soil, Water, Climate and Fertilization

0150

4977 ABRUÑA, F. *et al.* **Response of green beans to acidity factors in six tropical soils.** Journal of Agriculture of the University of Puerto Rico 58(1):44-58. 1974. Engl., Sum. Engl., Span., 5 Refs.

Phaseolus vulgaris. **pH. Soil analysis. Ca. Productivity. Leaves. Mn. Al. Yields.**

The effect of soil acidity factors on yields and foliar composition of intensively managed green beans was determined in ultisols and an oxisol typical of the humid tropics. Beans responded very strongly to liming on all 6 soils. Leaf Ca content increased and Mn content decreased with increasing lime rates and with yields. Bean yields increased with increasing soil pH to about 5.2, at which level these soils contained essentially no exchangeable Al. Bean yields increased with increasing exchangeables soil base content to about 70% saturation based on cation exchange capacities as determined with ammonium acetate at pH 7. Bean yields increased with decreasing

exchangeable soil Al to essentially O. Soil pH and exchangeable base and Al contents were effective criteria for liming these soils. (*Author's summary*) D01

0151

7814 ASIF, M.I. and GREIG, J.K. **Effects of seasonal interaction of nitrogen, phosphorus, and potassium fertilizers on yield and nutrient content of snap beans (*Phaseolus vulgaris* L.)** Journal of American Society for Horticultural Sciences 97(1/2):44-47. 1972. Engl., Sum. Engl., 20 Refs., Illus.

Phaseolus vulgaris. **N. P. K. Ca. Mg. Zn. Pods. Fertilizers. Yields. Plant nutrition. Field experiments. Experiment design.**

In field trials in 1968-69 *Phaseolus vulgaris* was given 0, 60, 120 or 180 lb N/acre, with or without 43 lb P and 83 lb K/acre, Increased N applications resulted in increased pod yields, higher contents of K, Ca, Mg and Zn in the plants and accumulation of nitrate N in the pods. Applied PK reduced pod yields and increased Fe content of plants, but antagonized the uptake of Mg and Zn. Pods showed the highest accumulation of N, P and Zn; leaves the most K, Ca, Mg, Fe and Mn; and stems the most Cu. In general, beans had a higher nutrient content in the spring than in the autumn. (*Summary by Field Crop Abstracts*) D01 C01

0152

25302 BIUK, A.A. 1983. Physiological and yield responses of snap beans (Phaseolus vulgaris) to water availability. Ph.D. Thesis. Corvallis, Oregon State University. 238p. Engl., Sum. Engl., 199 Refs., Illus.

Phaseolus vulgaris. Water stress. Irrigation. Growth. Leaves. Photosynthesis. Yields. Yield components. Snap beans. USA.

In field trials in Oregon, USA, in 1980 and 1981 with Phaseolus vulgaris cv. Oregon 1604 grown on a silty clay loam, plant water balance was monitored throughout the growing season in severely, moderately, and unstressed water treatments. While the plants were able to adjust osmotically to maintain turgor under severe water stress, pod no./plant was reduced by 50% and yields were reduced from 13.58 (unstressed) to 8.28 t pods/ha (severely stressed). [Horticultural Abstracts]

0153

22919 BONANNO, A.R. 1983. Effects of irrigation scheduling, using remotely sensed canopy-air temperature differentials, on water relations yield, and quality of snap beans (Phaseolus vulgaris L.). Ph.D. Thesis. Corvallis, Oregon State University. 175p. Engl., Sum. Engl., 191 Refs., Illus.

Phaseolus vulgaris. Irrigation. Timing. Water stress. Snap beans. Canopy. Temperature. Cultivars. Soil moisture. Yields. Yield components. Plant development. USA.

Field expt. were conducted in Oregon (USA) in 1981 and 1982 to develop a method for using remotely measured leaf canopy-air temp. differences, stress-degree-days (SDD), to schedule irrigations and to evaluate the effects of differential irrigation on snap bean cv. Oregon 1604 and Galamor. Effects on soil water potential, leaf water potential, leaf osmotic potential, leaf turgor potential, leaf transpiration, leaf diffusive resistance, plant growth and development, yield components, and pod quality factors were measured. To schedule irrigations, various levels of positive SDDs, measured daily at midday, were allowed to accumulate between irrigations. When air VPD were small, water-stressed plants had positive SDDs and well-watered plants had negative SDDs. When VPD were large, SDDs were always negative (canopy temp. were cooler than air temp.).

At these high VPD, temp. differences between leaves of well-watered and stressed plants were as much as 5-7°C. A model is presented in which SDDs can be adjusted based on the expected SDD of well-watered plants at a given VPD. With this modification, irrigations can be adequately scheduled using only canopy temp., air temp., and RH measurements. In both seasons, yield was strongly related to av. soil water potential at 0-45 cm depth. In 1981, evaporative demand on the crop was much higher than in 1982. As a result, yields in 1982 were at least 5 t/ha greater at a given soil water potential than in 1981. Under water stress, total leaf area/plant was reduced more by a decrease in area/leaf than by a reduction in leaf no. Leaf water potential was not consistent with level of plant water stress. Although some osmotic adjustment occurred in stressed plants, leaf turgor potential was still generally lower than in well-watered plants throughout the day. As leaf water potential decreased from early morning through midday, transpiration rates increased due to increasing evaporative demand. Leaf diffusive resistance also increased with decreasing leaf water potential, but a threshold value for stomatal closure was not demonstrated. (Summary by Dissertation Abstracts International) DOI

0154

20078 BONANNO, A.R.; MACK, H.J. 1983. Use of canopy-air temperature differentials as a method for scheduling irrigations in snap beans. Journal of the American Society for Horticultural Science 108(5): 826-831. Engl., Sum. Engl., 23 Refs., Illus. [Dept. of Horticultural Science, North Carolina State Univ., Raleigh, NC 27650, USA]

Phaseolus vulgaris. Irrigation. Temperature. Canopy. Snap beans. Rainfall. Yields. USA.

Two field expt. were conducted at the Oregon State U. Vegetable Research Farm (USA) during 1981-82 to determine the feasibility of using midday canopy temp., measured with an infrared radiation thermometer, for irrigation scheduling in Oregon 1604 and Galamor snap beans. Treatments which allowed various levels of positive canopy minus air temp. differences [stress-degree-days (SDD)] to accumulate between irrigations were evaluated along with a treatment irrigated at 4 growth stages, a dry treatment, and a control treatment which was irrigated at -0.06 MPa soil water potential (SWP). Diurnal measurement of canopy and air temp. indicated that the greatest differences between canopy and air temp. occurred near noon. In 1981, all treatments irrigated by an accumulation of positive SDD had reduced yields compared with the control SWP treatment. In 1982, under higher rainfall and lower air saturation vapor pressure deficits (VPD) than in 1981, yields of the SDD irrigated treatments were comparable with those obtained with the SWP treatment. Accumulation of positive SDD values to schedule irrigations was adequate when midday VPD values were low. However, when high VPD occurred, SDD values were always negative. A model is presented in which SDD values can be adjusted for environmental variability to more accurately schedule irrigations. Measurements of air temp. within the canopy were made and compared with surface canopy temp. measured with an infrared thermometer. Regression analysis showed that canopy temp. could be predicted using the air temp. within the canopy (R^2 = 0.89). The sum of SDD values for the season was used to estimate canning maturity pod yield (R^2 = 0.65). (Author's summary) DOI

0155

20080 BONANNO, A.R.; MACK, H.J. 1983. Water relations and growth of snap beans as influenced by differential irrigation. Journal of the American Society for Horticultural Science 108(5):837-844. Engl., Sum. Engl., 31 Refs., Illus. [Dept. of Horticultural Science, North Carolina State Univ., Raleigh, NC 27650, USA]

Phaseolus vulgaris. Cultivars. Irrigation. Growth. Plant development. Water content. Leaf area. Osmotic potential. Stomata. Transpiration. Water stress. USA.

Two field expt. were conducted to evaluate the effects of differential irrigation on plant growth, development, and water status of 2 snap bean cv., Oregon 1604 and Galamor. Plants were grown at various irrigation levels ranging from a well-watered control to a dry treatment which received only one irrigation to establish plants. Measurements on plants sampled weekly at 6 times during the growing season showed that total plant dry wt., total leaf dry wt., total leaf area, av. area/leaf, and no. of leaves/plant were reduced by water deficits in both cv. Also, for both cv., total leaf area/plant was reduced more by a decrease in area/leaf than by a reduction in leaf no. Specific dry leaf wt. was higher in the drier treatments. During each year, a significant difference between treatments occurred earlier in the season for total leaf area/plant than for total plant wt. At predawn, leaf water potential was always more negative in the dry treatment than in the control. Early in the season, there was no significant difference in midday leaf water potential between the control and dry treatment. Later, as soil water became limiting, the dry treatment had a more negative leaf water potential than the control. Near the end of the season, after the dry treatment had been subjected to a long period of water stress, midday leaf water potential was more negative in the control than in the dry treatment. Although some osmotic adjustment occurred in the dry treatment, leaf turgor potential was generally lower than in the control throughout the day. As leaf water potential decreased from early morning through midday, transpiration rates increased due to an increase in evaporative demand on the leaves. Leaf diffusive resistance also increased with decreasing leaf water potential but a threshold value for stomatal closure was not demonstrated. (Author's summary) D01

0156

20079 BONANNO, A.R.; MACK, H.J. 1983. Yield components and pod quality of snap beans grown under differential irrigation. Journal of the American Society for Horticultural Science 108(5):832-836. Engl., Sum. Engl., 22 Refs., Illus. [Dept. of Horticultural Science, North Carolina State Univ., Raleigh, NC 27650, USA]

Phaseolus vulgaris. Snap beans. Irrigation. Yields. Yield components. Cultivars. Soil moisture. Water requirements. Water stress. USA.

Field expt. were conducted to evaluate the effects of differential irrigation treatments on the yield and pod quality of Oregon 1604 and Galamor snap beans in 1981 and 1982 at the Oregon State U. Vegetable Research Farm (USA). Treatments in which various levels of positive canopy minus air temp. differences [stress-degree-days (SDD)] accumulated between irrigations were evaluated along with irrigation at 4 growth stages, a dry treatment which received only one irrigation to establish plants, and a control treatment irrigated at -0.06 MPa soil water potential (SWP). In both seasons, yield was related strongly to the av. soil water potential from planting to harvest. Yields in 1982 were at least 5 MT/ha greater at a given av. soil water potential than in 1981. Yields of Oregon 1604 and Galamor were similar under adequate irrigation, but under greatest water stress, yield of Oregon 1604 was higher than for Galamor. Pod no. was reduced only in the dry treatment. Percentage of set pods, pod length, and no. of seeds/pod were all reduced by low irrigation, while fiber content of pods and wt./seed were increased by low irrigation. (Author's summary) D01

0157

19951 BROUWER, H.M.; STEVENS, G.R.; FLETCHER, J.G. 1981. Differential varietal response to zinc foliar sprays in navy beans (Phaseolus vulgaris). Queensland Journal of Agricultural and Animal Sciences 38(2):179-185. Engl., Sum. Engl., 12 Refs., Illus.

Phaseolus vulgaris. Fertilizers. Leaves. Zn. Cultivars. Mineral content. Yields. Snap beans. Australia.

Rain-grown trials were conducted from 1973 to 1975 on the southern Darling Downs (Australia) to assess the effects of foliar applications of zinc sulphate heptahydrate on yield of 5 navy bean cv. (Selection 51, Selection 46, Selection 39, Gallaroy, and Kerman). Yield increases of up to 86% were obtained, though var. responses to Zn application varied markedly. Dry seed beans harvested from Zn-sprayed treatments accumulated significantly higher Zn levels than beans from control plots. Severity of Zn deficiency symptoms early in the season correlated significantly with yields obtained at the end of the season. Appropriate early treatment of plants showing deficiency symptoms could reduce the effects of Zn deficiency and enhance yields. (Author's summary) D01

0158

8597 BUBENZER, G.D. and WEIS, G.G. **Effect of wind erosion on production of snap beans and peas.** Journal of American Society for Horticultural Science 99(6):527-529. 1974. Engl., Sum. Engl., 9 Refs., Illus.

Phaseolus vulgaris. **Climatic requirements. Erosion. Yields. Seedlings. Irrigation. Growth. Mechanical damage. Plant physiological disorders.**

Yields of *Phaseolus vulgaris* plants were reduced 8% by exposure to winds of 15.5 m/sec for 20 min during the seedling stage and by 14% when flowering plants were treated. Pea yields were reduced 16%, but losses were not significantly affected by growth stage. Bean losses from plots treated during early growth were attributed to mechanical mage to the plant caused by the abrasive action of suspended sand particles and to wind desiccation. Losses from plants treated at later stages were attributed to loss of buds and blossoms. Physical damage wa not as apparent in peas as in beans. Yields of beans and of peas were inversely related to soil loss when plants were exposed to wind at the seedling stage. *(Summary by Field Crop Abstracts)* D01 E06

0159

23387 BUSADA, C.J.; MILLS, H.A.; JONES JUNIOR, J.B. 1984. Influence of foliar-applied NO_3 and NH_4 on dry matter and nitrogen accumulation in snap beans. HortScience 19(1):79-80. Engl., Sum. Engl., 6 Refs. [Dept. of Horticulture, Univ. of Georgia, Athens, GA 30602, USA]

Phaseolus vulgaris. Snap beans. Fertilizers. N. Dry matter. Translocation. USA.

Expt. were conducted to evaluate the effect of weekly foliar applications of N fertilizer solutions containing NO_3 or NO_4 ions applied at a rate of 22.4 kg/ha (10 ppm) on DM and N accumulation in snap bean. These applications significantly reduced DM, N accumulation, and yield of Blue Lake 2/4 snap bean grown in solution culture. The reductions in DM and N accumulation were greatest with the NH_4-N vs. the NO_3-N foliar treatment. Data obtained indicate that the cultural practice of applying NH_4 or NO_3 fertilizer through an overhead irrigation system may reduce snap bean yield. (Author's summary) D01

0160

8331 CHIPMAN, E.W. and MacEACHERN, C.R. **Effect of nitrogen, phosphorus and potassium on yields and nutrient levels in snap beans.** Communications in Soil Science and Plant Analysis 8(3):183-194. 1977. Engl., Sum. Engl., 10 Refs.

Phaseolus vulgaris. **N. P. K. Ca. Mg. Leaves. Fertilizers. Yields. Pods. Analysis. Plant nutrition. Experiment design. Field experiments.**

French beans (*Phaseolus vulgaris*) were grown on 4 commercial fields with fertilizer treatments consisting of three rates of NPK in all combinations. Yields and levels of N, P, K, Ca and Mg in leaf tissue were measured. There was a reduction of foliar Ca from the addition of N fertilizer. No other consistent response pattern emerged. *(Author's summary)* D01

0161

11185 COERTZE, A.F. **Irrigation of green beans.** Farming in South Africa. Vegetable Series II. Green Beans and Green Peas F.1/1978. 2p. Engl., Illus.

Phaseolus vulgaris. **Water requirements. Irrigation. Cultivation. South Africa.**

Some considerations are given on the importance, the amount and method of irrigation that should be used in green bean cultivation. An adequate irrigation increases yields and the no. of pods and produces more vigorous plants; however, it can also contribute favorably to the development of weeds. The effective root depth of green beans is 450 mm. The amount of water needed for germination depends on the type of soil and can vary from 25 mm on a sandy soil to 60 mm on a clayey soil. After emergence, an irrigation of 35 mm is sufficient for a period of 10 days; after flowering, 35 mm/wk. should be provided until the moment of harvest. The total amount of water required for the crop is 355 mm; if the efficiency of the irrigation is taken into account, 450 mm should be provided, this without taking into consideration rainfall. The advantages and disadvantages of sprinkler and flood irrigation are presented. *(Summary by C.P.G. Trans. by L.M.F.)* D01

0162

11641 COERTZE, A.F. Climate and soil requirements for green beans. Farming in South Africa. Series: Vegetable Cultivation in South Africa. Green Beans and Green Peas no. B.1/1977. 2p. Engl., Illus.

Phaseolus vulgaris. **Climatic requirements. Soil requirements. Diseases and pathogens. South Africa.**

Edaphoclimatic requirements for snap bean cultivation are described. Optimum daily temp. for growth, quality and yield varies between 16-21°C. Temp. > 35°C cause flowers to abort and yield decreases. Night temp. < 5°C cause damage to the seed production in pods. Halo blight, pod rotting caused by *Botrytis* and anthracnose can occur in wet conditions, which also cause difficulties during harvesting. Dry winds adversely affect pollination. Snap beans require deep, well-drained but water-retaining soils. Optimum pH of the soil varies between 6.0-6.5. The crop presents toxicity in soils with high Bo content. The best results have been found in medium loamy soils and adequate fertilization is important for an excellent production. *(Summary by C.P.G. Trans. by L.M.F.)* D01

0163

11189 COERTZE, A.F. and JACKSON, D.C. **Fertilization of green beans.** Farming in South Africa. Vegetable Series II. Green Beans and Green Peas E.1/1977. 3p. Engl., Illus.

Phaseolus vulgaris. **Planting. Fertilizers. N. P. K. Zn. Mn. B. Mineral deficiencies. South Africa.**

Recommendations are given on the date and rates of NPK application in green bean crops

and Zn, Mn and B deficiencies are described including the rates and ways of applying trace elements for correction. Foliar nutrition and the inoculation of seed with N-fixing bacteria have not given positive results. The crop should not be planted more than once in 3 yr and green peas (*Pisum sativum*) should not precede or follow green beans to avoid the incidence of pathogens in the soil. *(Summary by C.P.G. Trans. by L.M.F.)* D01

2972 0164

DALE, J. E. Some effects of alternating temperature on the growth of French bean plants. Annals of Botany (N.S.) 28(109):127-135. 1964. Engl. Sum. Engl. 15 Refs. Illus.

Phaseolus vulgaris. Plant physiology. Temperature. Growth. Plant development. Leaves. Leaf area. Plan assimilation.

In the main experiment described plant dry weight and leaf area, relative growth-rate, net assimilation rate (on an area basis), leaf-weight ratio and leaf-area ratio were studied for plants grown under a range of temperature régimes and in 12-hour days. Comparisons under conditions where the mean temperature was the same showed that final dry weight and leaf area were greatest at constant temperature and least where the temperature fluctuated about the mean value. These findings are discussed in relation to the concept of thermoperiodism, and in relation to the significant effects of day and night temperature upon the development of leaf area. (Author's summary).

0165

*DOBRZANSKI, A.; FAJKOWSKA, H. 1974. Influence of organic and mineral fertilization and crop rotation on weed infestation in vegetables. In Antoszewski, R.; Harrison, L.; Zych, C.C., eds. International Horticultural Congress, 19th. Warsaw, 1974. Abstracts of Contributed Papers, Proceedings. Skierniewice, Poland, Research Institute Vegetable Crops. p.234.

0166

9056 DOSS, B.D., EVANS, C.E. and TURNER, J.L. **Irrigation and applied nitrogen effects on snap beans and pickling cucumbers.** Journal of the American Society for Horticultural Science 102(5):654-657. 1977. Engl., Sum. Engl., 14 Refs., Illus.

Phaseolus vulgaris. **Irrigation. N. Growth. Rainfall data. Yields. USA.**

Field studies were conducted to determine the response of french beans (*Phaseolus vulgaris*) and cucumbers (*Cucumis sativus*) to no, intermediate and high irrigation with 0, 65, 100 and 135 kg N/ha on beans and 56 and 112 kg N/ha on cucumbers. Intermediate irrigation increased marketable yields, but high irrigation did not. Average french bean yields for the 3-yr period by soil water regimes were 5800, 7000 and 6800 kg/ha for no, intermediate and high irrigation, respectively. Applied N increased yields, with the 3-yr av bean yields being 4600, 6600, 7200 and 7700 kg/ha for 0, 65, 100 and 135 kg N/ha, respectively. There was a greater response to N fertilizer on the spring crop than on the fall crop. (*Author's summary*) D01

0167

25891. DRAKE, S.R.; SILBERNAGEL, M.J.; DYCK, R.L. 1984. THE INFLUENCE OF IRRIGATION, SOIL PREPARATION AND ROW SPACING ON THE QUALITY OF SNAP BEANS, PHASEOLUS VULGARIS. JOURNAL OF FOOD QUALITY 7(1):59-66. ENGL. SUM. ENGL., 15 REFS. [UNITED

STATES DEPT. OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, P.O. BOX 30, PROSSER, WA 99350, USA]

IRRIGATION FREQUENCY INFLUENCED QUALITY OF FRESH, CANNED, AND FROZEN SNAP BEANS; SUBSOILING INFLUENCED QUALITY OF FRESH SNAP BEANS. THE SEED INDEX OF FRESH SNAP BEANS WAS REDUCED WITH OPTIMAL IRRIGATION AND SUBSOILING AS AGAINST DEFICIT IRRIGATION AND NO SUBSOILING. OPTIMAL IRRIGATION RESULTED IN A DARKER FRESH SNAP BEAN WITH A HIGH MOISTURE AND ASCORBIC ACID CONTENT AND LOWER SHEAR VALUES. SUBSOILING RESULTED IN FRESH SNAP BEANS HIGH IN MOISTURE AND LOW IN SHEAR VALUES. CANNED AND FROZEN SNAP BEANS THAT WERE OPTIMALLY IRRIGATED WERE LOW IN SHEAR VALUES, DRAINED WT., AND DRIP LOSSES. CULTURAL PRACTICES INFLUENCED FRESH, CANNED, AND FROZEN SNAP BEAN POD QUALITY. STRESS CONDITIONS, WATER STRESS, AND SOIL COMPACTION TENDED TO HASTEN MATURITY, WHICH WAS REFLECTED IN THE QUALITY PARAMETERS MEASURED. [AS].

0168

17488 DRAKE, S.R.; SILBERNAGEL, M.J. 1982. The influence of irrigation and row spacing on the quality of processed snap beans. Journal of the American Society for Horticultural Science 107(2):239-242. Engl., Sum. Engl., 17 Refs.

Phaseolus vulgaris. Snap bean. Canned beans. Irrigation. Spacing. Nutritive value. Nutrient loss. Water stress. Water content. Vitamin content. Pods.

Irrigation method and row spacing had a significant influence on the quality of fresh, canned, and frozen snap beans. Sprinkle irrigated fresh and canned snap beans contained more ascorbic acid than rill irrigated snap beans. Rill irrigated snap beans had more intense color, lower shear values, less turbid brine, and less drained wt. loss. Canned snap beans grown in narrow rows had less drained wt. loss than snap beans from wide rows. Frozen snap beans from narrow rows had more drip loss, less moisture, increased soluble solids and ascorbic acid content than those from wide rows. Under the conditions of this study, rill irrigated snap beans and snap beans grown in narrow rows did have quality advantages over sprinkle irrigated snap beans and snap beans grown in wide rows. *(Author's summary)* D01 C03

0169

20866 EL-LEBOUDI, A.; MAKSOUD, A.; MIDAN, A.; MITKEES, A. 1974. Response of snap bean plants to fertilization with phosphorus, potassium and manganese. Agricultural Research Review (Egypt) 52(5):149-159. Engl., Sum. Engl., 12 Refs.

Phaseolus vulgaris. Snap beans. Fertilizers. P. K. Mn. N. Dry matter. Leaves. Stems. Roots. Pods. Seeds. Yields. Yield components. Egypt.

Research was carried out on snap bean plants at the Soil and Water Research Institute (Egypt) to study the fertilization requirements of K and Mn under conditions of phosphate presence in a clay loam alluvial soil. Besides the control treatment (no phosphate added), 200 kg superphosphate/feddan (1 feddan = 0.42 ha) was applied once or twice; potassium sulphate was added at a rate of 0 or 100 kg/feddan and Mn was applied either as a spray of manganese sulphate or as a preplanting soaking solution for seeds. Results indicated a favorable significant effect of K on growth and yield; nutri-

tional status was not significantly affected. Data also revealed that P and Mn were not significant regarding their effects on snap bean behavior when grown under conditions of the tested alluvial soils. (Author's summary) D01

4891 0170

EL NADI, A.H. Water relations of beans. III. Pod and seed yield of haricot bea under different irrigation in the Sudan. Experimental Agriculture 11(2):155 158. 1975. Engl. Sum. Engl. 5 Refs.

Phaseolus vulgaris. Water requirements (Plant). Pods. Seed. Productivity. I gation. Fertilizers. Sudan.

Equal volumes of irrigation water, applied in different ways to a crop of harico beans in two seasons, showed that the best practice was 60 mm. irrigation every days. (Author's summary).

0171

15971 FARLOW, P.J. Effect of low temperature on number and location developed seed in two cultivars of French beans (*Phaseolus vulgaris* L.) Australi Journal of Agricultural Research 32:325-330. 1981. Engl., Sum. Engl., 3 Ref Illus.

Phaseolus vulgaris. Snap bean. Plant development. Seeds. Pods. Temperature. Maturatio Ovules. Pollen.

Seed and pod development for the French bean cv. Redlands Pioneer were both reduced temp. treatments below 21°C. At temp. greater than 13.9°C undeveloped seeds we distributed uniformly within pods, and this was attributed to failure of the female gamet At 13.9°C restriction of developed seed to the stigmatic end of the pod was apparent, ar below this temp. the no. of undeveloped seeds increased significantly, with no see developing at 10°C. This cessation appeared to be due to both random failure of the fema gamete and inadequate pollen tube growth. Seed development within pods of the cv. Re lands Pioneer and Tweed Wonder was compared at 12°C. Tweed Wonder performed signi cantly better, and this was attributed to greater cold tolerance of both male and fema gametes. *(Author's summary)* D01 C02

0172

2631 FOY, C. D. *et al.* Differential tolerance of dry bean, snapbean, and lima bea varieties to an acid soil high in exchangeable aluminum. Agronomy Journal 59 (6):56 563. 1967. Engl., Sum. Engl., 10 Refs., Illus.

Phaseolus vulgaris. Phaseolus lunatus. pH. Al. Soil requirements. Host-plant resistanc Toxicity. Fertilizers. N. P. K. Statistical analysis. Cultivars. Productivity. Yields. USA.

Varieties of dry beans, french beans and lima beans differed widely in their top and root growt on acid Bladen soil (pH 4.4) and in their yield response to lime. Previous evidence that Al toxicit is the primary growth-limiting factor in this soil led to the conclusion that certain bean varietic differ in their specific tolerance to Al. With few exceptions, varieties that originated in the Sout (Florida, South Carolina, Tennessee) or East (New York) showed greatest tolerance to the aci soil. Varieties developed in the Midwest (Michigan) or West (Idaho, California) showed lea tolerance. Results suggest the possibility of breeding bean varieties with greater tolerance to A Such varieties would root more deeply in acid, Al-toxic subsoils and make better use of subso water and nutrients. (*Author's summary*) D01 C01

0173

10684 GOULDEN, D.S. and MALONE, M.T. **The New Zealand green and dry bean industries.** Christchurch, New Zealand, Department of Scientific and Industrial Research, 1978. 5p. Engl., 8 Refs.

Paper presented at Bean Improvement Workshop, Sydney, Australia, 1978.

Phaseolus vulgaris. **Seed.** *Whetzelinia sclerotiorum. Pseudomonas phaseolicola.* **Cultivars. Host-plant resistance. Diseases and pathogens. Seed production. Marketing. Industrialization. New Zealand.**

The main diseases of dry and french beans are *Whetzelinia (Sclerotinia) sclerotiorum*, halo blight (*Pseudomonas phaseolicola*) and the top yellows virus complex caused by pea leaf roll virus and/or subterranean clover red leaf virus. A description is given of the main cv., the producing areas, marketing, industrialization and breeding programs, which place emphasis on disease-resistant var. The fresh market production of french beans is static, but that for dry bean processing has increased steadily. There is a large domestic market for dry beans and good prospects of export markets. (*Summary by F.G. Trans. by T.B.*) D01

0174

13140 HARDWICK, R.C. **The emergence and early growth of french and runner beans (*Phaseolus vulgaris* L. and *Phaseolus coccineus* L.) sown on different dates.** Journal of Horticultural Science 47:395-410. 1972. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. **Planting. Growth. Cultivars. Emergence. Seedlings. Timing.**

Results are reported of an investigation into the effects of sowing on different dates on the emergence and growth of various *Phaseolus vulgaris* and *P. coccineus* cv. under field conditions. In 1969 five french bean and 3 runner bean cv. were sown at 2-wk intervals from April onwards. The expt was repeated with the addition of 2 cv. in 1970. Consistent differences were found between and within species for a no. of growth parameters. Especially in the early sowings, seedlings of runner beans emerged before those of french beans, and small-seeded french bean cv. (in particular Comtesse de Chambord) before larger-seeded cv. The mean RGRs measured after emergence were greater in french beans than in runner beans, but differences within species were not significant. Very early sowing appeared to have a lasting depressive effect on the growth rates of seedlings of both species. The estimated wt of seedlings at emergence (estimated from regressions of seedling wt on time since emergence and on seed wt) were lower in the early sowings than in later sowings, especially in Comtesse de Chambord. The main results in each yr were similar, but some differences in detail were found. In particular there were differences between yr in the emergence of cv. as affected by soil temp. The discrepancies were attributed to a difference in the temp regimes of the 2 sites. *(Author's summary)* D01

0175

21305 HESSE, N.; LENZ, F. 1982. Einflub der Wasserversorgung auf Transpirations- und Netto-Photosyntheseraten bei Stangenbohnen (Phaseolus vulgaris L. var. vulgaris). (Influence of water supply on transpiration and net photosynthetic rates of climbing French bean). Gartembauwissenschaft 47(4):145-152. Germ., Sum. Engl., Germ., Fr., Russ. [Inst. für Obstbau und Gemüsebau der Universität Bonn, Auf dem Hügel 6, 5300 Bonn, Germany]

Phaseolus vulgaris. Snap beans. Water stress. Irrigation. Transpiration. Photosynthesis. Light. Temperature. CO_2. Relative humidity.

Effects of light, temp., humidity, and CO_2 levels on transpiration and net photosynthetic rates were measured on well-watered and water-stressed

climbing French beans. Plants showed highest net photosynthetic rates when leaf water potential was not lower than -2 bar. Plants with water potentials between -2.0 and -5.5 bar in most treatments had 30-50% lower transpiration and about 50% lower net photosynthetic rates than well-watered plants. With increasing light intensities, transpiration and photosynthetic rates increased. RH had little effects on net photosynthetic rates. However, transpiration rates were reduced considerably with increasing humidity. Transpiration was also strongly decreased by higher CO_2 levels. (Extracted from author's summary) D01

0176

22174 HILEMAN, L.H.; MORELOCK, T.E. 1982. In row application of compost evaluated in greenbean field tests. Arkansas Farm Research 31(6):5. Engl. [Dept. of Agronomy, Arkansas Univ., Fayetteville, AR 72701, USA]

Phaseolus vulgaris. Snap beans. Fertilizers. Soil amendments. Analysis. Composition. Yields. USA.

Cotton gin trash was applied in the row to green beans cv. Early Bird, at 0.0, 7.4, 22.2, 29.6, or 37.0 t/ha, at the Main Expt. Station at Fayetteville (Arkansas, USA). Yield ranged from 8.6 t/ha with no compost to 12.8 t for the highest rate although yield differences from the 4 highest rates were not significant. (Summary by Field Crop Abstracts) D01

0177

7950 HOEFT, R.G., WALSH, L.M. and LIEGEL, E.A. **Effect of seed-placed fertilizer on the emergence (germination) of soybeans (*Glycine Max* L.) and snapbeans (*Phaseolus vulgaris* L.).** Soil Science and Plant Analysis 6(6):655-664. 1975. Engl., Sum. Engl., 9 Refs.

Phaseolus vulgaris. **Emergence. N. P. K. Statistical analysis. Germination. Field experiments. Plant nutrition. Fertilizers.**

Field trials were established on a sandy loam and a silt loam using french beans and soybeans as test crops. Row fertilizer was placed with the seed. Treatments were arranged in a 3 x 3 x 3 factorial design; and N, P and K were applied in all combinations at 3 rates (0, 3.4 and 6.8 kg/ha). Ammonium nitrate (AN), monoammonium phosphate (MAP), concentrated superphosphate (CSP) and potassium chloride (KCl) were used as sources of N, P and K. Additional treatments compared MAP with diammonium phosphate (DAP) and KCl with potassium nitrate (KNO). The salt index of each treatment was inversely related to emergence; i.e., as the salt index increased, emergence decreased. Level of N was more important than level of P or K in regard to reduction in emergence. French beans grown on a sandy loam were extremely sensitive to damage from seed-placed fertilizer even at rates as low as 3.4 kg/ha of N, P or K. Soybeans planted on a silt loam soil were less sensitive than french beans on a sandy loam. The soybeans were able to tolerate up to 10.2 kg/ha of seed-placed P plus K or 6.8 kg/ha of seed-placed N plus P, or N plus K without causing a significant delay in emergence. (*Author's summary*) D01 C01

0178

13144 INNES, N.L.; HARDWICK, R.C. 1975. Horses for courses in the bean field. Commercial Grower 19:447-448. Engl., Illus.

Phaseolus vulgaris. Snap beans. P. coccineus. Genotypes. Climatic requirements. Selection. Cultivars. Mechanization. Harvesting. Herbicides. Botrytis cinerea. Colletotrichum lindemuthianum. Pseudomonas phaseolicola. Bean common mosaic virus. Bean yellow mosaic virus. Delia platura. Disease control. England.

The adaptation of French bean plants to particular growing conditions (genotype-environment interaction) is considered as well as other aspects

related to bean growing in Wellesbourne, England. Information from trials conducted by different governmental institutions and other seed firms indicate the different performance of materials over diverse locations. A var. like Bush Blue Lake 274 does well in north Norfolk and Lincolnshire but not in Essex or Suffolk. Improvement of the French bean has included the selection for agronomic characteristics for mechanical harvesting. Several herbicides that can be used in weed control and are selective or not to the crop are indicated. Disease problems caused by the fungal pathogens Botrytis cinerea, Fusarium spp., Colletotrichum lindemuthianum, bacteria such as Pseudomonas phaseolicola, and BCMV and BYMV are discussed. Reference is made to the bean seed fly, Delia platura, and control measures are given. (Summary by EDITEC. Trans. by L.M.F.) DOL

0179

27332. ISHIMURA, I.; FEITOSA, C.T.; LISBAO, R.S.; PASSOS, F.A.; FORNASIER, J.B.; NODA, M. 1985. DIFERENTES COMBINACOES DE NPK NA PRODUCAO DO FEIJAO-VAGEM EM SOLO ORGANICO ALICO DO VALE DO RIBEIRA (SP). (DIFFERENT NPK COMBINATIONS IN SNAP BEAN PRODUCTION IN ORGANIC SOIL OF HIGH ACIDITY OF VALE OO RIBEIRA (SAO PAULO). BRAGANTIA 44(1):429-436. PT. SUM. PT., EN., 7 REF. (ESTACAO EXPERIMENTAL DE PARIQUERA-ACU, INST. AGRONOMICO, CAIXA POSTAL 28, 13.100 CAMPINAS-SP, BRASIL)

A TRIAL WAS CARRIED OUT AT THE PARIQUERA-ACU EXPTL. STATION (SAO PAULO, BRAZIL) ON ORGANIC SOIL OF HIGH ACIDITY (PH = 4.9) TO DETERMINE THE INFLUENCE OF 4 LEVELS OF FERTILIZERS (0, 118-192-186, 236-384-372, AND 354-576-558 KG N-P-K/HA ON THE YIELD OF SNAP BEAN CV. TERESOPOLIS. THE RESULTS SHOWED THAT POD YIELD INCREASED WITH INCREASING FERTILIZER LEVELS (LINEAR EFFECT). THE HIGHEST POD YIELD WAS OBTAINED WITH 354-576-558 KG N-P-K/HA, RESP. THE RESULTS ALSO SHOWED THAT AV. POD WT. REMAINED CONSTANT. (AS).

0180

29684 JAYANTHAMMA, B.P.N. ; MADALAGERI, B.B. 1985. Response of French bean genotypes to phosphorus levels. Current Research 14(7-9):55-57. En., 2 Ref. [Horticultural Research Station, G.K.V.K. Bangalore-560 065, India]

Phaseolus vulgaris. Snap beans. Cultivars. Fertilizers. P. Adaptation. Yields. India.

During 1983-84, 23 French bean var. were grown at 3 P levels (50, 100, and 150 kg/ha) at the Horticultural Research Station, Bangalore, India. Data on genotype x environment interaction for pod yield are presented. In general, var. Wade could be considered as of good adaptation. Var. Prevato, VL-1, Fran Tocato, and VL-2 had higher regression values (over 8), and a high mean value greater than the general mean and therefore are better adapted to favorable environments. (CIAT)

2963 0181

JONES, L.H. Adaptive responses to temperature in dwarf french beans, Phaseolus vulgaris L. Annals of Botany 35(141):581-596. 1971. Engl. Sum. Engl. 7 Refs. Illus.

Phaseolus vulgaris. Plant physiology. Plant physiological processes. Temperature. Leaves. Leaf area. Growth. Harvesting. Photosynthesis. Plant assimilation.

The effects of temperature on the growth parameters Net Assimilation Rate (E), Relative Leaf Growth Rate (RLGR), Relative Growth Rate (RGR), Specific Leaf Area (SLA), and Leaf Weight Ratio (LWR) in Phaseolus vulgaris L. beans were examined. Rapid changes in SLA invalidate the conventional two-harvest method of estimating RGR, and make comparisons between varieties difficult. The changes in SLA are seen to be due to independent effects of temperature on RLGR and E, LWR being unaffected. A simple model is described which allows the time-course of SLA and RGR to be followed by iterative integration on a computer. The results of the simulation suggest that the observed effects of temperature on RLGR and E are sufficient to predict the changes in SLA and RGR. This should permit more useful comparisons of growth parameters of varieties grown in differing conditions to be made. (Author's summary)

3952 0182

KEMP, G. A., KROGMAN, K. K. and HOBBS, E. H. Effect of sprinkler irrigation and cooling on yield and quality of snap beans. Canadian Journal of Plant Science 54(3):521-528. 1974. Engl. Sum. Engl., Fr. 14 Refs. Illus.

Phaseolus vulgaris. Cultivation. Water requirements. Soil requirements. Pods. Plant development. Pods. Soil water. Productivity. Irrigation.

High temperatures and dry soil conditions that frequently occur in southern Alberta during July and August may cause objectionably high fiber content of snap beans (Phaseolus vulgaris L.). During the period 1968-71, the response of bean yield and quality to cooling by low-volume sprinkler irrigation during hot weather at the time of pod development was studied. Low-volume sprinkling for cooling prevented undesirable fiber formation and alleviated, to some extent, soil moisture stress. Where soil moisture was returned to field capacity by irrigation at 7- to 10-day intervals, yield and quality also remained high without low-volume sprinkler cooling. Thus, under Alberta conditions, excess fiber formation appears to be closely related to the amount of available soil moisture and can be avoided by proper irrigation with conventional methods. (Author's summary).

5546 0183

LUNIN, J., GALLATIN, M.H. and BATCHELDER, A.R. Effect of saline water on the growth and chemical composition of beans: II. Influence of soil acidity. Proceedings of the Soil Science Society of America 25(5):372-376. 1961. Engl., Sum. Engl., 11 Refs., Illus.

Phaseolus vulgaris. pH. Salinity. Biochemestry. Composition. Productivity. Growth. Water content. Laboratory experiments. Mn. Agricultural lime.

Two greenhouse experiments were conducted to determine the relationship between soil acidity and salinity on the growth and chemical composition of snap beans. One experiment was carried out on a Sassafras soil limed to give three pH levels. During the growth of the crop, four 1-inch irrigations of dilute synthetic sea water having EC values of 2, 4, and 8 mmhos /cm were applied as well as demineralized water. Growth depression with increasing salinity was greatest on the most acid soil. Increasing salinity depressed pH values and increased the availability of manganese in the soil and its uptake by the plant. Liming had the

reverse effect. The second experiment was conducted on the Portsmouth soil limed to give four levels of base saturation. Increasing salinity decreased soil pH but did not increase the availability of Fe, Al, or Mn to a level which might depress plant growth. Liming increased the yield of beans but no significant interaction between base saturation and salinity on yields was obtained. The chemical composition of the plant was more closely associated with the composition of the soil solution than the exchangeable cation composition. In some instances the interaction between salinity and base saturation treatment on plant composition was significant. (Author's summary)

0184

20077 MACK, H.J. 1983. Fertilizer and plant density effects on yield performance and leaf nutrient concentration of bush snap beans. Journal of the American Society for Horticultural Science 108(4):574-578. Engl., Sum. Engl., 18 Refs. [Dept. of Horticulture, Oregon State Univ., Corvallis, OR 97331, USA]

Phaseolus vulgaris. Fertilizers. Spacing. Snap beans. N. P. K. Cultivars. Yields. Leaves. Mineral content. Ca. Mg. Dwarf beans. USA.

There were no significant fertilizer x plant density interactions affecting yields or leaf nutrient concn. of snap beans in 5 field expt. Higher rates of fertilizer application produced significantly higher yields of pods than did lower rates in 2 expt. At higher plant densities (15.2 to 30.5 cm rows, 43-65 plants/m^2) yields were 20-38% higher than at lower plant densities (91.4-cm rows, 22-29 plants/m^2). Av. yield increase at higher densities was 29%. Crop economic values followed similar trends. At higher plant densities, av. N, K, Ca, and Mg concn. in leaves at early bloom were lower than at lower densities. Higher fertilizer rates tended to increase N concn. in leaves but had no consistent effects on P, K, Ca, and Mg. (Author's summary) DOI

0185

17484 MACK, H.J.; VARSEVELD, G.W. 1982. Response of bush snap beans (*Phaseolus vulgaris* L.) to irrigation and plant density. Journal of the American Society for Horticultural Science 107(2):286-290. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. Snap bean. Irrigation. Soil water. Water requirements. Spacing. Fibre content. Pods. Seeds. Yields. Cultivars. Bush bean. USA.

Yields of snap bean pods were increased by irrigation and plant density in 4 field expt. at the Oregon State U. Vegetable Research F. n (USA). Highest yields were obtained with the -0.6 bar soil water potential regime which represented removal of 40-45% of the available soil water at 30 cm depth. Yields were lowest with the -2.5 bars soil water potential which represented 65-70% water removal. An av. of 60% more water applied to the -0.6 bar than the -2.5 bars treatment increased yields approx. 54%. Yields were usually intermediate with the -1.0 bar soil water potential representing 50-55% available soil water removal. Two cv. were used in 2 of the expt. and responded differently to irrigation. Yield of Oregon 1604 was higher than that of Galamor with -0.6 bar soil water potential but was lower than Galamor with -2.5 bars. Yield of Oregon 1604 averaged 27% higher in square arrangement than in 91 cm rows and the increase was greater for the high than for the low population density when compared in 1 expt. Yield was 20% higher for high density of 43 plants/m^2 than for low density of 21.5 plants/m^2. Yields of 2 cv. in 2 expt. averaged 67% higher in high density (40-57 plants/m^2) than in low density (20-33 plants/m^2) plantings. There were no consistent irrigation x density interactions. Usually there was a more rapid depletion of soil water for high density than for low density. Fiber in canned sieve size 5 pods was higher in Oregon 1604 at -2.5 bars soil water potential than for Galamor, but at the -0.6 bar soil water potential regime, the amount of fiber was similar in the 2 cv. Percent of pod wt.

attributed to seed and % fiber were usually highest at -2.5 soil water potential. *(Author's summary)* D01 D02

4870 - 0186

MACK, H. J. and SINGH, J. N. Effects of high temperature on yield and carbohydrate composition of bush snap beans. Journal of the American Society of Horticultural Science 94:60-62. 1969. Engl. Sum. Engl. 25 Refs.

Phaseolus vulgaris. Temperature. Flowering. Pods. Field experiments. Productivity. Soil fertility. Experiment design. Leaves. Canopy. Sugars. Carbohydrate content.

The percentage set of blossoms and number and weight of pods of bush snap beans, Phaseolus vulgaris L. were reduced when plants were subjected to high maximum temperatures during bloom. Yields were reduced 0 to 65% in greenhouse and field tests. Perforated plastic-covered cages in the field produced maximum temperatures of 83 to 101°F while maximum temperatures for checks averaged 74 to 89°. High temperatures decreased carbohydrates in leaves, starch more than sugars, when compared to checks. (Author's summary).

0187

0366-2778 MACK, H. J., FANG, S.C. and APPLE JUNIOR, S. B. Response of snap beans (*Phaseolus vulgaris* L.) to soil temperature and phosphorus fertilization on five western Oregon soils. Soil Science Society of America. Proceedings 30(2):236-239. 1966. Engl., Sum. Engl., 11 Refs., Illus.

Phaseolus vulgaris. Plant physiology. Soil requirements. Temperature. Climatic requirements. Minerals and nutrients. Plant fertility. Laboratory experiments. P. Fertilizers. Analysis. Soil temperature. Mineral content.

Dry weight and P content of french bean plants were determined for 2 levels of P fertilizers on 5 western Oregon soils at soil temperatures of 54, 62, 70 and 78°F. "A" values for P were also calculated. Significant differences in dry weights and P content were found when means of soil temperature (T), P levels (P) and soil (S) were compared. The interactions of S x P, S x T, P x T, and S x P x T were also significant. Dry weights and P content were increased significantly as soil temperatures increased from 54 to 78°F. Generally, the greatest increase in dry weights occurred when soil temperature was increased from 54 to 62°F, while the greater percentage increase in P content of plants was found when soil temperature was increased from 62 to 70°F. Smallest increases in dry weights and P conten. associated with P fertilization were at 54°F and on soils highest in available P. Percentage of P in plants on the 5 soils (temperatures and P levels combined) ranked in the same order as initial soil analysis values for P and was as follows: Labish Peat, Willamette, Chehalis, Olympic and Quillayute. "A" values were affected by soil temperatures and were usually highest at 78°F. (*Author's summary*) D01

2700 0188

MACKAY, D. C. and LEEFE, J. S. Optimum leaf levels of nitrogen, phosphorus and potassium in sweet corn and snap beans. Canadian Journal of Plant Science 42:233-246. 1962. Engl. Sum. Engl. 26 Refs. Illus.

Phaseolus vulgaris. Minerals. Mineral content. Composition. N. P. K. Analysis. Climatic requirements. Plant physiological processes. Zea mays. Canada.

Optimum nutrient levels were derived by comparing the polynomial regression curves relating leaf analyses and crop yields with rates of applied nitrogen,

phosphorus and potassium. Uppermost mature leaves were used for analysis, and samples were collected at specific physiological stages of development. In two seasons the optimum levels in sweet corn differed by 7, 25 and 9 per cent, and in snap beans by 12, 29 and 11 per cent for nitrogen, phosphorus and potassium respectively. A low moisture supply was generally associated with lower optimum levels for all three nutrients, but "excess" moisture had only slight effects on these levels for any nutrient. Optimum nutrient levels which were calculated from ample moisture conditions were, for the tassel-emerging stage of sweet corn, 3.5, 0.33 and 2.5 per cent, and at the early flower stage of snap beans 5.1, 0.40 and 2.0 per cent for nitrogen, phosphorus and potassium, respectively. At the sixth to seventh leaf stage of sweet corn optimum levels were higher for nitrogen and potassium but lower for phosphorus (3.8, 3.1 and 0.34 per cent respectively), and at the pollen-shedding stage the levels were only slightly different than at tassel-emergence. (Author's summary).

0189

23039 MAUK, C.S.; BREEN, P.J.; MACK, H.J. 1983. Yield response of major pod-bearing nodes in bush snap beans to irrigation and plant population. Journal of the American Society for Horticultural Science 108(6): 935-939. Engl., Sum. Engl., 22 Refs., Illus. [Oregon State Univ., Dept. of Horticulture, Corvallis, OR 97331, USA]

Phaseolus vulgaris. Snap beans. Planting. Spacing. Irrigation. Flowering. Podding. Stems. Water stress. Yields. USA.

Yield variables of main stem nodes 6 (terminal) and 2 (that of the 1st trifoliate leaf) of bush snap bean cv. Oregon 1064 were evaluated at 2 irrigation regimes x 2 plant populations in a warm (1978) and a moderate (1979) season. A single inflorescence formed at node 6, whereas up to 4 inflorescences were borne on branches at node 2. After emergence, crops were irrigated either when the soil water potential reached -0.06 MPa (high) or -0.25 MPa (low). High and low plant populations were, resp., 45 vs. 18 plants/m^2 in 1978 and 54 vs. 33 plants/m^2 in 1979. Yield/unit area was increased significantly from 38 to 54% by high plant population and from 40 to 120% by high irrigation. On a per plant basis, plant population failed to have a significant effect on total yield or yield variables at node 6. At node 2, however, high plant population reduced the no. of inflorescences in 1978 and decreased the no. of flowers, no. of pods formed and harvested, and % set, and reduced pod yield by about 50% in both years. Per unit area yields of node 2 at high and low plant population differed by less than 13-18%. Since the productivity of node 6 was not influenced by density, per unit area yields at this node more directly reflected plant population. Nodes 2 and 6 responded similarly to the low irrigation regime, which in 1978 significantly decreased the no. of pods formed, % set, and pod yield at both nodes. Irrigation effects on individual yield parameters at each node generally were less in the cooler 1979 season. No significant irrigation x plant population interactions occurred for any measured yield variable in either season. (Author's summary) D01

0190

18597 MAUK, C.S. 1982. Influence of irrigation and plant population on yield parameters, flower and pod abscission, and photosynthate distribution in snap beans, Phaseolus vulgaris L. Ph.D. Thesis. Corvallis, Oregon State University. 149p. Engl., Sum. Engl., 249 Refs., Illus.

Phaseolus vulgaris. Irrigation. Spacing. Yields. Abscission. Flowers. Pods. Snap beans. Photosynthesis.

During 2 seasons effects of high and low irrigation (water applied at -0.6 and -2.5 bars soil water potential, resp.) and density were evaluated on

yield parameters and flower/pod development at mainstem nodes 2 and 6 (terminal) of Oregon 1604, a determinate snap bean. High and low plant densities were 45 vs. 18 and 54 vs. 33 plants/m^2 in 1978 and 1979, resp. Yield/unit area was increased under high irrigation and/or high density. Yield/plant was increased 121% by high irrigation, and was 67% greater under low than high density in the more stressful year of 1978, (no density effect in 1979). High irrigation increased no. of pods formed (1978, 1979), and % set and total pod fresh wt. (1978) at node 6, as well as, % set (1978, 1979) and pods formed (1978) at node 2. Density had no effect at node 6, however, low density increased no. of flowers and all other yield parameters at node 2. Nodes 2 and 6 combined were responsible for over 80% of the total yield/plant. The flowering period was prolonged for organs at more distal raceme nodes (RN) within an inflorescence. There was an acropetal decline in yield parameters, which was reduced by high irrigation at both the terminal (6-T) and main lateral (2-A) inflorescences at nodes 6 and 2, resp., whereas, low density only limited the decrease at 2-A (1978). The most proximal raceme node (RN-1) accounted for 65-80% of the total yield/inflorescence. High irrigation reduced flower/pod abscission at both nodes, but low density only decreased abscission at node 2. A large fraction of abscised organs were shed the day after anthesis, and this proportion increased under low irrigation (6-T, 2-A), and high density (2-A). Abscission increased acropetally within both 6-T and 2-A. Organs at RN-1 and RN-2 of 6-T received a larger % of translocated ^{14}C-assimilate (12-19%) from 7-8 days after their anthesis than those at RN-3 (2-3%). Flowers/pods at 2-A showed a similar acropetal decline in ^{14}C-activity, but less pronounced. Low density increased % ^{14}C-activity recovered in RN-1 and RN-2 pods of 2-A at 7-8 days after their anthesis, however, irrigation (6-T, 2-A) and density (6-T) effects were slight. (Summary by Dissertation Abstracts International) D01

0191

27239. M'RIBU, E. 1985. THE EFFECTS OF DIFFERENTIAL WATERING AT VARIOUS DEVELOPMENT STAGES ON THE PRODUCTION OF FRENCH BEANS [PHASEOLUS VULGARIS L.]. ACTA HORTICULTURAE NO.153:145-149. EN. SUM. EN., 10 REF. [DEPT. OF CROP SCIENCE, EGERTON COLLEGE, NJORO, KENYA]

PLANTS OF FRENCH BEAN CV. MONEL WERE GROWN IN POLYETHYLENE BAGS IN THE GREENHOUSE. FROM THE 2-LEAF STAGE THE PLANTS WERE WATERED AT INTERVALS OF 2-6 DAYS IN VARIOUS COMBINATIONS DURING THE VEGETATIVE, FLOWERING, AND POD DEVELOPMENT STAGES. SHORT WATERING INTERVALS DURING THE VEGETATIVE STAGE INCREASED THE TOTAL AND MARKETABLE YIELD BUT HAD NO EFFECT ON POD LENGTH. WATERING AT SHORT INTERVALS DURING POD DEVELOPMENT INCREASED TOTAL AND MARKETABLE YIELDS AND POD LENGTH. THE WATERING INTERVAL DURING THE MAIN FLOWERING STAGE HAD NO EFFECT ON YIELD OR QUALITY. [AS].

0192

18057 MUIRHEAD, W.A.; WHITE, R.J.G. 1981. The influence of soil water potential on the flowering pattern, pod set and yield of snap beans (*Phaseolus vulgaris* L.). Irrigation Science 3(1).45-56. Engl., Sum. Engl., 19 Refs., Illus.

Phaseolus vulgaris. Flowering. Irrigation. Podding. Yields.

The effect of the soil water potential on pod yield of snap beans grown with a series of irrigation frequencies was studied over 2 seasons. The treatments were to furrow-irrigate either weekly or fortnightly during the preflowering period and each treatment then received weekly or fornightly irrigations to harvest. These treatments were compared with trickle irrigation applied daily in the 1st and every 2nd day in the 2nd season. Irrigation frequencies during preflowering did not influence pod yield; this was determined by irrigation treatments applied after flowering. The highest yield was similar in each season (16.7 t/ha) and was produced under trickle irrigation. Pod yield was reduced by 0.5 t/ha each day the soil water potential at 30 cm depth was less than -50 kPa. This relationship accounted for approx. 77% of the variation in pod yield. *(Author's summary)* D01 C02

0193

22514. MULLINS, C.A.; COFFEY, D.L. 1983. EFFECTS OF MOLYBDENUM, GRANULAR INOCULANTS, AND NITROGEN FERTILIZATION ON SNAP BEAN PRODUCTION AND LEAF NUTRIENT CONTENT. TENNESSEE FARM AND HOME SCIENCE NO.126:2-5. ENGL. 9 REFS. [SOIL SCIENCE DEPT., UNIV. OF TENNESSEE, KNOXVILLE, TN 37901, USA]

TESTS WERE CONDUCTED IN 1979 AND 1980 AT THE U. OF TENNESSEE PLATEAU EXPT. STATION IN CROSSVILLE [USA] TO EVALUATE THE EFFECTS OF MO SEED TREATMENT, GRANULAR INOCULANT APPLICATION, AND N FERTILIZATION ON SNAP BEAN YIELD AND LEAF PETIOLE CONTENT OF SELECTED NUTRIENTS. WITH THE EXCEPTION OF AN INCREASE IN LEAF PETIOLE P CONTENT, MO-TREATED SEED HAD LITTLE INFLUENCE ON MOST OTHER FACTORS EVALUATED IN THIS STUDY. INOCULATION WITH THE 2 RHIZOBIUM STRAINS DID NOT COMPENSATE FOR THE NEED OF N FERTILIZATION OF SNAP BEANS. [MICROBIOLOGY ABSTRACTS].

0194

14361 MULLINS, C.A., TOMPKINS, F.D. and PARKS, W.L. **Effects of tillage methods on soil nutrient distribution, plant nutrient absorption, stand, and yields of snap beans and lima beans.** Journal of the American Society for Horticultural Science 105(4):591-593. 1980. Engl., Sum. Engl., 24 Refs.

Phaseolus vulgaris. Land preparation. Soil requirements. Nutritional requirements. Spacing. Nutrient absorption. N. P. K. Mg. Ca. Leaves. Pods. Cultivation. Herbicides. USA.

A 3 yr (1976-78) tillage study was conducted with snap beans and lima beans. Treatments included 2 no-till systems where furrows were opened with a fluted coulter or a vibratory unit, 2 reduced tillage methods with seedbeds prepared with a disk or a powered harrow, and conventional tillage. Tillage method did not affect soil pH at sampled depths. Soil P levels were higher at the 10-15 cm depth with conventional compared to tillage with vibratory unit. Soil K levels were higher at the 5-10 and 10-15 cm depths with conventional tillage. Tillage method did not affect petiole N, K, and Ca concn. Petiole P concn. were lowest with conventional tillage. Petiole Mg concn. were lowest with the no-till treatments using fluted coulter for snap beans and the vibratory unit for lima beans. Snap bean stand was highest with no-till the vibratory unit. Tillage method did not affect mean snap bean yield or lima bean stand. Mean lima bean yield was highest with conventional tillage. *(Author's summary)* D01 D02

0195

21523 NEHRI, A. 1980. Essai de fertilisation de la culture du haricot-vert. Comparaison de quelques techniques de fumure organique. (Fertilization trials of haricot bean crops. Comparison of organic fertilization techniques). These Ing.Agr. Rabat, Morocco. Institut Agronomique et Veterinaire Hassan 2. 49p. Fr., 25 Refs., Illus.

Phaseolus vulgaris. Fertilizers. N. P. K. Dung. Timing. Harvesting. Germination. Growth. Nodulation. Mineral content. Yields. Snap beans. Morocco.

Local bean var. Royal nel was fertilized with NPK and 6 different rates of horse manure (from 10 to 60 t/ha) at the Institut Agronomique et Veterinaire Hassan 2, Rabat, Morocco. The land had not been cultivated for 10 yr. There were 3 fertilization dates and 4 harvests (at 4-day intervals). Exptl. operations are detailed. Results of soil and manure analyses are given as well as data on germination, growth, plant height, nodule no., petioles and leaf stems N contents, and yields. Yields increased with higher manure doses. Best yields varied between 10.9-12.5 t/ha. Higher profits were given by 16 t manure/ha, applied on the 3rd date (Jan. 21). The application of 40 t manure/ha (25 days before sowing) was similar to the application of 50-60 t manure/ha (70 or 50 days before sowing). (Summary by I.B.) D01

0196

27335. NICHOLAIDES III, J.J.; CHANCY, H.R.; NELSON, L.A.; SHELTON, J.E. 1985. SNAP BEAN GRADE AND YIELD RESPONSE TO N RATE AND TIME OF APPLICATION AND P AND K RATE. COMMUNICATIONS IN SOIL SCIENCE AND PLANT ANALYSIS 16(7):741-757. EN. SUM. EN., 12 REF., IL. (NORTH CAROLINA AGRICULTURAL RESEARCH SERVICE, RALEIGH, NC 27695-7619, USA)

A FIELD EXPT. WAS CONDUCTED ON A GRAVELLY LOAM IN NORTH CAROLINA, USA, TO DETERMINE THE EFFECT OF TIMING AND RATE OF N AND RATE OF P AND K FERTILIZATION ON SNAP BEAN YIELD AND GRADE, PLANT TISSUE NUTRIENT CONCN., AND RESIDUAL SOIL TEST LEVELS. INITIAL SOIL TEST LEVELS BY THE MEHLICH-I EXTRACTANT WERE 4 MICROGRAMS P/CC (VERY LOW) AND 0.09 MEQ K/100 CC (LOW). TOTAL SNAP BEAN FRESH WT. YIELD RESPONSE TO N FERTILIZATION WAS QUADRATIC WITH MAX. YIELD AT 168 KG N/HA. THE 112 KG N/HA RATE PRODUCED GREATER YIELD WHEN 66 PERCENT RATHER THAN 50 OR 100 PERCENT OF THE N WAS APPLIED PREPLANT. P HAD A SIGNIFICANT QUADRATIC EFFECT ON TOTAL BEAN YIELD WITH MAX. BEING PREDICTED BY THE RESPONSE EQUATION TO OCCUR AT 145 KG P/HA, WHICH GAVE A RESIDUAL SOIL TEST LEVEL OF 20 MICROGRAMS P/100 CC. NO SIGNIFICANT INCREASE IN TOTAL YIELD OCCURRED ABOVE 68 KG K/HA, WHICH GAVE A RESIDUAL SOIL TEST LEVEL OF 0.124 MEQ K/100 CC. (AS).

0197

27218. PAL, R.K.; PHOGAT, K.P.S. 1984. EFFECT OF FOLIAR APPLICATION OF UREA ON THE GREEN POD YIELD OF FRENCH BEAN (PHASEOLUS VULGARIS L.) VAR. CONTENDER. PROGRESSIVE HORTICULTURE 16(1-2):95-96. EN. 5 REF. (GOVERNMENT VALLEY

FRUIT RESEARCH STATION, JEOLIKOTE, NAINITAL, UTTAR PRADESH, INDIA)

IN 2-YR TRIALS WITH FRENCH BEAN IN JEOLIKOTE (UTTAR PRADESH, INDIA), UREA AT 5.0-2.5 PERCENT WAS APPLIED IN LATE APRIL BEFORE FLOWERING. THE GREEN POD YIELD (24.5/PLANT) WAS GREATEST WITH UREA AT 2 PERCENT. DATA ARE TABULATED ON PLANT HEIGHT, NO. OF BRANCHES AND LEAVES, PLANT SPREAD, POD LENGTH AND NO./PLANT. (CIAT).

D198

11927 PALANIYANDI, R. and SMITH, C.B. **Effects of nitrogen sources on growth responses and magnesium and manganese leaf concentrations of snap beans.** Communications in Soil Science and Plant Analysis 10(5):869-881. 1979. Engl., Sum. Engl., 15 Refs.

Phaseolus vulgaris. **Ammonium sulphate. Nitrate. P. K. Ca. Mg. Mn. N. Laboratory experiments. Foliage. Dwarf beans. Soil fertility. pH. Leaves. USA.**

The effects of 3 N sources (ammonium sulfate, ammonium nitrate and sodium nitrate) in combination with P, K, Ca and Mg on vine wt, leaf Mg and Mn concn in Bush Blue Lake 274 french beans were studied in 3 greenhouse expt using a Hagerstown silt loam soil. In NP treatments, regardless of N source, plants were ≥ 29% more vigorous than the control or N treatment. Sodium nitrate resulted in slightly less vigorous plants with > Mg and < Mn concn, compared to those of ammonium sulfate. Ammonium nitrate treatments had intermediate effects. Addition of K resulted in increased vine wt and decreased leaf Mg concn. Adding both K and Mg to the NP treatment did not affect leaf Mg concn. (*Summary by Fertilizer Abstracts*) D01

D199

4192 PALANIYANDI, R. and SMITH, C.B. **Growth and nutrient interrelationships in snap beans as affected by several sources of potassium and magnesium.** Journal of the American Society for Horticultural Science 103(1):109-113. 1978. Engl., Sum. Engl., 12 Refs.

Phaseolus vulgaris. **N. P. K. Mg. Mn. Fe. Cu. B. Zn. Al. Na. Micronutrients. Fertilizers. Growth. Leaves. Stems. Roots. Soil analysis. Laboratory experiments.**

In 2 glasshouse trials, 8 different treatments consisting of a basic NP fertilizer combined with various sources of K and Mg were applied to *Phaseolus vulgaris* seedlings growing on silt loam soils. NP significantly increased the top wt and leaf and total plant contents of N, P, Ca, Mg, Mn and Na. Regardless of K source, application of NPK significantly increased leaf K content and decreased the P content and, to a greater extent, the Mg content while only KCl increased the leaf Mn content. Irrespective of Mg source, NP + Mg increased leaf Mg content but caused no reduction in K content. Addition of both K and Mg to the NP treatment did not affect leaf Mg content. Treatments caused a redistribution of elements in plant parts. (*Summary by Field Crop Abstracts*) D01 C01

0200

28629. PAPADOPOULOS, I. 1986. NITROGEN FERTIGATION OF GREENHOUSE-GROWN FRENCH BEAN. COMMUNICATIONS IN SOIL SCIENCE AND PLANT ANALYSIS 17(9):893-903. EN. SUM. EN., 21 REF., IL.

WATER CONTAINING 3.6, 7.2, OR 10.8 MMOL N/LITER AND UNIFORMLY SUPPLIED WITH 2.0 AND 5.0 MMOL P AND K/LITER, RESP., WAS USED FOR IRRIGATING GREENHOUSE-GROWN FRENCH BEAN CV. BLUE LAKE. THE FERTILIZERS WERE APPLIED WITHEVERY IRRIGATION VIA THE IRRIGATION STREAM. THE PLANTS WERE GROWN IN POTS, EACH FILLED WITH 12 KG OF SOIL. IN ALL TREATMENTS A 0.3 LEACHING FRACTION WASALLOWED. THE TOTAL AMOUNTS OF N APPLIED IN A TOTAL AMOUNT OF 100 LITERS WATER/POT WERE 9, 18, AND 27 G/POT FOR THE 3 N LEVELS, RESP. THE N LEVEL INDUCED CONSIDERABLE DIFFERENCES IN SOIL SALINITY AMONG TREATMENTS. IN THE ROOT VOL. OF THE TREATMENT FED WITH THE LOWEST N LEVEL THE RESIDUAL NO3-N CONCN. IN THE SOIL SOLUTION WAS NEGLIGIBLE, WHEREAS WITH THE HIGHEST N LEVEL IT RANGED THROUGHOUT THE GROWING PERIOD BETWEEN 15-20 MMOL/LITER. WITH THE N-TREATMENT 7.2 MMOL/LITER, WHICH GAVE AS HIGH YIELD (1.8 KG/POT) AS THE HIGHEST N LEVEL, NO3-N WAS MOSTLY AROUND 3 MMOL/LITER. IT WAS CONCLUDED THAT 7.2 MMOL N/LITER APPLIED WITH EVERY IRRIGATION VIA THE IRRIGATION STREAM IS ADEQUATE FOR HIGH YIELD WITHOUT UNDULY INCREASING SOIL SALINITY OR WASTING N.(AS).

0201

27703. PECK, N.H.; MACDONALD, G.E. 1984. SNAP BEAN PLANT RESPONSES TO NITROGEN FERTILIZATION. AGRONOMY JOURNAL 76(2):247-253. EN. SUM. EN., 21 REF., IL.

A STUDY WAS CONDUCTED TO DETERMINE THE EFFECT OF N FERTILIZATION ON VEGETATIVE GROWTH, N PARTITIONING IN THE PLANTS, AND POD PRODUCTION IN SNAP BEAN PLANTS. PLANTS OF CV. BUSH BLUE LAKE-47 WERE GROWN UNDER FIELD CONDITIONS (GENEVA, NEW YORK, USA) WITH N FROM AMMONIUM NITRATE AT RATES OF 0, 4, 8, AND 12 G/SQUARE METER PLACED IN A BAND 5 CM TO THE SIDE AND 5 CM BELOW THE DEPTH OF THE SEEDS AT PLANTING TIME (10 JUNE 1981) IN A LIMA SILT LOAM (FINE-LOAMY, MIXED, MESIC GLOSOBORIC HAPLUDALF), A PRODUCTIVE SOIL DERIVED FROM CALCAREOUS GLACIAL TILL. ROWS WERE 50 CM APART WITH 22 PRODUCTIVE PLANTS/METER OF ROW (44 PLANTS/SQUARE METER). THE FRESH WT., DRY WT., TOTAL N, AND NITRATE N WERE DETERMINED IN DIFFERENT PARTS OF THE PLANTS AT THE SEEDLING, BLOOM, AND POD STAGES. YIELD AND QUALITY DETERMINATIONS WEREMADE ON THE PODS AT 10 AND 13 AUG. HARVESTS. FERTILIZER N DECREASED GROWTH OFTHE PLANTS IN THE SEEDLING STAGE BUT NOT IN THE POD STAGE. FERTILIZER N REDUCED THE NO. OF RHIZOBIUM NODULES ON THE ROOTS. AT THE POD STAGE, TOTAL N WAS 15.7 G/SQUARE METER IN PLANTS GROWN WITH RESIDUAL AVAILABLE SOIL N BUT WITHOUT FERTILIZER N, WHILE TOTAL N WAS 19.5 G/SQUARE METER IN PLANTS GROWN WITH RESIDUAL SOIL N + FERTILIZER N AT 12

G/SQUARE METER. FERTILIZER N AT 4-8G/SQUARE METER PRODUCED THE OPTIMUM QUALITY AND YIELD OF SNAP BEAN PODS FOR PROCESSING. [AS].

0202

20092 PECK, N.H. 1978. Plant and soil analyses: efficient use of energy in agriculture through improved vegetable fertilization. New York Food and Life Sciences 11(3):4-7. Engl., Illus.

Phaseolus vulgaris. Analysis. Fertilizers. Snap beans. P. K. Mineral content. Developmental stages. Soil fertility. N. Yields. Plant assimilation.

The use of soil and plant analyses in the development of efficient fertilizer systems during the growth of a no. of crops including Phaseolus vulgaris is described. Although P promotes seedling growth, it has been shown that an extremely high concn. of P without adequate K will reduce seedling growth and yields of snap bean. (Summary by Field Crop Abstracts) D01

0203

9992 PECK, N.H. and VAN BUREN, J.P. **Plant response to concentrated superphosphate and potassium chloride fertilizers V. Snap bean (*Phaseolus vulgaris* var. *humilis*).** Search Agriculture 5(2):1-32. 1975. Engl., Sum. Engl., 6 Refs., Illus.

Phaseolus vulgaris. **K. Cl. P. Fertilizers. Petioles. Yields. Field experiments. Pods. Nutrient solution. Laboratory experiments. Nutrient absorption. USA.**

French beans cv. Slimgreen was grown during 1970 on fine sandy loam soil that had received 0-1200 lb concn superphosphate (CSP) and 0-960 lb KCl/ac annually since 1963. Preceding crops included sweet corn, pea and lucerne. By 1970 the soil contained 2-86 lb available P and 54-390 lb available K/2,000,000 lb soil. In 15 tables comprehensive analytical data are presented on plant parts sampled on 8 and 21 July and 3 Aug., and on pod and seed yields. Pod yield and fresh and dry wt were highest at 300 lb CSP and 240 lb KCl/ac. These moderate rates produced compact plants and concentrated sets of pods. Cv. Slenderwhite, Early Gallatin and Earliwax responded in the same manner as Slimgreen. (*Summary by Field Crop Abstracts*) D01 C01

0204

0340-5149 PECK, N.H. *et al.* **Phosphorus fertilization of snap beans.** Farm Research 29(4):10-11. 1964. Engl., Sum. Engl., Illus.

Phaseolus vulgaris. **P. Fertilizers. K. N. Pods. Productivity. Soil. Fertility. Seedlings. Soil temperature. Growth.**

Trials carried out with common beans showed that fertilizer P, applied in a band at planting, usually increases seedling and vegetative growth, thereby increasing the percentage of large pods. Nevertheless, in cold soils it may result in a higher percentage of small pods. Fertilizer P may induce or accentuate another limiting factor (i.e., K deficiency), reducing pod yields. (*Summary by T.M.*) D01

0205

28294. POMBO, G.I.; SMITH, C.B. 1986. GROWTH AND NUTRIENT INTERRELATIONSHIPS OF THREE VEGETABLE CROPS WITH DIFFERENT SENSITIVITIES TO SOIL PH AS AFFECTED BY LIME AND FERTILIZER TREATMENTS. COMMUNICATIONS IN SOIL SCIENCE AND PLANT ANALYSIS 17(3):353-368. EN; SUM. EN., 19 REF. [DEPT. OF

HORTICULTURE, THE PENNSYLVANIA STATE UNIV., UNIV. PARK, PA 16802, USA]

THE ROLE OF LIME AND FERTILIZERS IN SENSITIVITY TO LOW SOIL PH OF SNAP BEANS, TOMATOES, AND RED BEETS WAS STUDIED. TREATMENTS OF NO LIME, CALCITIC AND DOLOMITIC LIME RESULTED IN SOIL PH LEVELS OF 5.5, 6.9, AND 6.7, RESP., ATTHE TIME OF PLANTING. A VAR. OF BANDED FERTILIZER TREATMENTS WAS APPLIED TO EACH PLOT. LEAF SAMPLES WERE ANALYZED FOR 11 ELEMENTS. GROWTH RESPONSES OF THE 3 CROPS WERE RELATED TO THE PLANT SENSITIVITY TO ACID SOILS. WHEN GROWN ON SOIL WITH PH 5.5, SNAP BEAN VINE WT. AND POD YIELDS WERE NOT AFFECTED. LEAF MN LEVELS INCREASED WITH THE GREATER SENSITIVITY TO ACID SOILS. BOTH CALCITIC AND DOLOMITIC LIMES HAD LITTLE EFFECT ON SNAP BEAN YIELDS. LIME TYPES AFFECTED PRIMARILY LEAF CA AND MG. THE NPK FERTILIZER TREATMENT INCREASED ONLY VINE WT. OF SNAP BEANS. LEAF MN WAS INCREASED SUBSTANTIALLY INTHE NPK TREATMENT. WHEN GYPSUM OR EPSOM SALTS WAS ADDED, YIELDS WERE NOT AFFECTED. [AS [EXTRACT]].

0206

5043 PRASHAR, P. **Pea beans, alternate crop for eastern South Dakota.** South Dakota Farm and Home Research 23(1):38-39. 1974. Engl.

Phaseolus vulgaris. **pH. Leaves. Water content. Laboratory experiments. Na. Cl. Light. Nutrient solution. Yields. Irrigation. Cultivars.**

In field trials in 1972-73, cultivars of navy beans (*Phaseolus vulgaris*) were compared. In 1972, yields without irrigation ranged from 1027 lb./acre in cv. SW 69-6207-2 to 3771 lb in cv Atlas; at 2 sites with irrigation yields ranged from 2588 lb in cv. Processor 10 to 4161 lb in cv. Processor 6 and from 1360 lb in cv. Processor 5 to 4854 lb in cv. Processor 6, respectively. (*Summary by Field Crops Abstracts*) D01

0207

19932 RUIZ-SIFRE, G.V.; RIES, S.K. 1983. Response of crops to sorghum residues. Journal of the American Society for Horticultural Science 108(2):262-266. Engl., Sum. Engl., 17 Refs., Illus. [Dept. of Horticulture, Pesticide Research Center, Michigan State Univ., East Lansing, MI 48824, USA]

Phaseolus vulgaris. Green manures. Growth. Yields. Snap beans. USA.

Vegetable and field crops were grown on young residues of several cv. of sorghum in the greenhouse and field. The growth and yield of snap bean in the field was increased or decreased by sorghum residues depending on the sorghum plant part, quantity, cv., and soil environment. Residues from Bird-a-Boo and Milkmaker sorghum stimulated field-grown snap beans more than those from Haygrazer. The optimum amount of young sorghum shoot residues needed to stimulate snap bean growth and yield was about 2500 kg/ha. Although sorghum residues may stimulate crop growth in some instances, this stimulation was not easily controlled because the optimal range of sorghum residues and soil environment is too narrow and unpredictable. (Author's summary) D01

0208

21085 SALADIN G., F. 1981. El cultivo de la habichuela. 2. parte. (Snap bean cultivation. Part 2). Agro (República Dominicana) 10(86):7-9. Span., Illus.

Phaseolus vulgaris. Snap beans. Soil requirements. Land preparation. Fertilizers. Dominican Republic.

General aspects on snap bean cultivation are presented regarding adequate soils, soil preparation, and fertilization (N, N fixation, P, and K). Recommended fertilizer formulations and time of application are given and the use of foliar fertilizers is mentioned. [CIAT]

0209

21064 SARKAR, A.N.; WYN JONES, R.G. 1982. Effect of rhizosphere pH on the availability and uptake of Fe, Mn and Zn. Plant and Soil 66(3):361-372. Engl., Sum. Engl., 15 Refs., Illus. [Dept. of Biochemistry & Soil Science, Univ. College of North Wales, Bangor, Gwynedd LL57 2UW, Wales]

Phaseolus vulgaris. Snap beans. Rhizosphere. Roots. Fe. Mn. Zn. Fertilizers. N. K. P. pH. Nutrient uptake. Wales.

Dwarf French bean plants were grown in pots for 21 days in brown earth soil (Denbigh series) adjusted initially to pH 7 or 8. Variations in rhizosphere pH were induced by 3 N treatments at 500 or 1000 ppm: choline phosphate, ammonium phosphate, and calcium nitrate. The rhizosphere pH was found to be significantly lower following the application of either ammonium or choline phosphates and to be increased by calcium nitrate. Fe and Zn contents of shoot and root were inversely proportional to rhizosphere pH. Mn content also increased with decreasing pH, but increased sharply at pH 5.5. Shoot Fe, Zn and Mn were significantly correlated with extractable levels in rhizosphere and non-rhizosphere soil. (Author's summary) D01

0210

17413 SARKAR, A.N.; WYN JONES, R.G. 1982. Influence of rhizosphere on the nutrient status of dwarf French beans. Plant and Soil 64:369-380. Engl., Sum. Engl., 28 Refs., Illus.

Phaseolus vulgaris. Snap beans. Seedlings. Rhizosphere. Growth-chamber experiments. pH. Nutrient absorption. N. P. Shoots.

French bean seedlings grown on choline, ammoniacal, and nitrate forms of N together with equivalent basal application of P as KH_2PO_4 were tested for nutrient uptake from the rhizosphere under standard growth chamber conditions. Statistical tests on soil (rhizosphere and non-rhizosphere) and plant (root and shoot) revealed that with the exception of P, levels of all other estimated macro-(Na^+, K^+, Ca^{2+}, Mg^{2+}) and micronutrients (Fe^{2+}, Mn^{2+}, Zn^{2+}) were significantly changed after 42 days growth as compared with 21 day growth period. The higher uptake into shoots of Na^+, K^+, Fe^{2+}, Mn^{2+}, Zn^{2+}, and $H_2PO_4^-$ and higher biomass accumulation in the rhizosphere were associated with lower rhizosphere pH. The uptake of Ca^{2+} and Mg^{2+} increased with higher rhizosphere pH. While ammoniacal and choline forms decreased rhizosphere pH and increased the P uptake, nitrate form reversed the trend showing significant inverse relationship between shoot phosphate and rhizosphere pH. Ca and Fe were associated with an inhibition of the translocation of P from root to shoot. However, no causal relationships could be established. Both shoot wt. and shoot P content were closely associated with a no. of rhizosphere soil parameters. *(Author's summary)* D01 C01

0211

0347-5256 SAXENA, G. J. and LOCASCIO, S. J. Effect of fertilizer and fritted trace element (FTE 503) levels and placement on snap beans grown on a Tiwiwid sand. Agronomy Journal 67(4):459-462. 1975. Engl., Sum. Engl., 11 Refs.

Phaseolus vulgaris. **Fertilizers. Tracers. Roots. N. P. K. Soil fertility. Experiment design. Productivity.**

Since nutritional requirements had not been established for vegetables grown in noncoastal regions of Guyana, a study was conducted on a major soil type in these areas, a Tiwiwid sand (Typic Quartzipsamments) to evaluate the effect of fertilizer rate and placement and the rate of a fritted trace element (FTE 503) on nutrient uptake, root distribution and yield of common beans (*Phaseolus vulgaris* L.). Fertilizer levels were 79-67-112 and 158-67-224 kg/ha, applied to 1/3, 2/3 and the full bed. FTE 503 levels were 0 and 44.8 kg/ha. Yields ranged from 1,008 kg/ha for the lower fertilizer rate to 727 kg/ha for the higher rate. With the application of FTE 503 and the lower fertilizer rate, yields increased as the fertilizer band increased, whereas yields were reduced at the higher rate. Application of FTE 503 increased the average dry weight of bean plants from 0.55 to 1.07 and from 1.94 to 5.17 g/plant at the flowering and pod setting stages, respectively. FTE 503 applications increased yields from 216 to 1,800 kg/ha and to 1,428 kg/ha, respectively, for the lower and higher rates of fertilizer application. Mean root concentration in the top 30 cm of soil increased from 1.39 to 1.82 cm of root/cc of soil with FTE 503. Application of FTE 503 also corrected micronutrient deficiencies and improved the availability of soil water and nutrients. (*Author's summary*) D01

0212

1130 SCHULTEIS, D.T. and KATTAN, A.A. **Response of snap beans to root microclimate.** Arkansas Farm Research 20(1):9. 1971. Engl., Illus.

Phaseolus vulgaris. **Roots. Climatic requirements. Soil water. Cultivation. Growth. Yields. Water stress.**

In glasshouse experiments, *Phaseolus vulgaris* plants were grown in Hoagland solution with addition of carbowax to give a moisture stress of 0.3 or 3 atm, with or without root aeration. Root and shoot wt were higher at the lower moisture stress and increased with increase in root aeration. (*Summary by Field Crop Abstracts*) D01

0213

26584. SHUKLA, P.D.; ADHIKARI, K.S.; DIVAKAR, B.L. 1984. EFFECT OF LIME ON GROWTH, YIELD AND QUALITY OF FRENCH BEAN (PHASEOLUS VULGARIS). PROGRESSIVE HORTICULTURE 16(1-2):48-51. ENGL., SUM. ENGL., 6 REFS. (HORTICULTURAL EXPERIMENTS & TRAINING CENTRE, CHAUBATTIA, UTTAR PRADESH, ALMORA, INDIA)

IN AN INVESTIGATION CARRIED OUT IN 1977-79 AT HORTICULTURAL EXPT. AND TRAINING CENTRE (CHAUBATTIA, INDIA) DURING 3 SUCCESSIVE GROWING SEASONS OF THE FRENCH BEAN CROP, THE APPLICATION OF LIME AT 12 T/HA IMPROVED PLANT HEIGHT, POD LENGTH, SEED YIELD, AND 100-SEED WT. THE INCREASE IN LIME LEVEL UP TO 8 T/HA RAISED SOIL PH TO A HIGH LEVEL. (AS).

0214

19491 SINGH, K.N.; PRASAD, R.D.; TOMAR, V.P.S. 1981. Response of French bean to different levels of nitrogen and phosphorus in Nilgiri-Hills under rainfed condition. Indian Journal of Agronomy 26(1):101-102. Engl., 3 Refs. (Central Soil Salinity Research Inst., Karnal 132001, India)

Phaseolus vulgaris. Snap beans. Fertilizers. N. P. Yields. India.

The response of French bean to 3 levels of N (0, 10, and 20 kg/ha) and 4 levels of P (0, 30, 60, and 90 kg/ha) was studied in Mannavanur Kadaikanal, Tamil Nadu (India) under rainfed conditions in a randomized block design with 3 replications. Yields increased with increasing rates of N and the difference due to any 2 levels of N was significant. P applied at 60 and 90 kg/ha significantly increased yields in comparison with 30 kg. (Summary by L.M.F.) DOI

0215

26579. SINGH, R.; SINGH, D.V. 1984. EFFECTIVENESS OF LIMING MATERIALS, THEIR DOSES AND FINENESS ON YIELD AND NUTRIENT UPTAKE BY FRENCH-BEAN IN ACIDIC SOILS OF THE KUMAON HILLS. INDIAN JOURNAL OF AGRICULTURAL SCIENCES 54(6):491-495. ENGL., SUM. ENGL., 10 REFS., ILLUS. [GOVERNMENT VALLEY FRUIT RESEARCH STATION, SRINAGAR-GARHWAL, UTTAR PRADESH 246 174, INDIA]

IN FIELD TRIALS IN THE KUMAON HILLS OF ALMORA, INDIA, IN 1977-78, PHASEOLUS VULGARIS CV. BLACK QUEEN WAS SOWN ON ACID SOIL TREATED WITH SUFFICIENT (A) BURNT LIME, (B) CALCITIC LIMESTONE, (C) BASIC SLAG, OR (D) DOLOMITIC LIMESTONE TO GIVE A PH OF 6.8 OR 25, 50, OR 75 PERCENT OF THIS VALUE. LIME WAS APPLIED IN 3 DEGREES OF FINENESS WITH A MESH SIZE OF -30+60 BEING MOST EFFECTIVE. LIMING INCREASED THE YIELD OF GREEN PODS AND DM BY 15.3-52.2 AND 39.7-84.6 PERCENT, RESP., (B) GIVING THE HIGHEST GREEN POD YIELD OF 8.73 T/HA. APPLICATION OF 75 PERCENT OF REQUIREMENT OF (B) WAS EQUIVALENT TO 100 PERCENT REQUIREMENT OF (A), (C), AND (D) IN YIELD INCREASE AND UPTAKE OF N, P, CA, AND MG. (SOILS AND FERTILIZERS).

0216

23895 SINGH, R.; SINGH, D.V. 1983. Effect of lime applied as calcitic limestone in acid soils of Kumaon Hills in Uttar Pradesh. Journal of the Indian Society of Soil Science 31(1):148-151. Engl., 8 Refs. [Horticultural Experiment & Training Centre, Chaubattia, Almora, Uttar Pradesh, India]

Phaseolus vulgaris. Agricultural lime. Soils. Snap beans. Yields. Dry matter. N. P. K. Ca. Mg. Mineral content. India.

In a pot expt. the effect of varying doses of lime as calcitic limestone (0, 25, 50, 75, and 100% of the lime requirement) on properties of 4 acid soils of Kumaon Hills in Uttar Pradesh, India, was studied, and the optimum lime level for French beans was determined. In the clayey soil from Reoni there was a significant increase in DM yield and % of N, P, K, Ca, and Mg with 75% lime requirement dose, and the highest benefit was obtained with the 100% dose. In Kalakhet soil, the DM yield was significantly enhanced with all the doses of lime, but the highest yield was obtained with 75% required dose. In Genthia soil, lime applied at the rate of 50% lime requirement proved to be the optimum, increasing DM yield 37.4% over the control. In Kanalichhina soil, 75% lime requirement dose produced the max. DM to the extent of 46.8% over the control. Liming in increasing doses progressively improved all the soils regarding pH, Ca and base saturation

%, exchange acidity, and exchangeable Al. The rate of lime requirement for improving the soil as well as snap bean production was the highest for Reoni followed by soils of Kanalichhina, Kalakhet, and Genthia. Lime requirement of these soils largely depends upon the Ca saturation, exchange acidity, and clay content. [CIAT]

0217

28626. SMITH, C.B.; DEMCHAK, K.T.; FERRETTI, P.A. 1986. EFFECTS OF LIME TYPE ON YIELDS AND LEAF CONCENTRATIONS OF SEVERAL VEGETABLE CROPS AS RELATED TO SOIL TEST LEVELS. JOURNAL OF THE AMERICAN SOCIETY FOR HORTICULTURAL SCIENCE 111(6):837-840. EN. SUM. EN., 14 REF. [DEPT. OF HORTICULTURE, THE PENNSYLVANIA STATE UNIV., UNIV. PARK, PA 16802, USA]

THE EFFECTS OF LIMING WITH AND WITHOUT FERTILIZER ON TOMATOES, SWEET CORN, SNAP BEANS, AND CABBAGE WERE EVALUATED IN EXPT. IN 11 PRODUCTION AREAS OF PENNSYLVANIA, USA, IN 1981-83. CALCITIC, CALCITIC WITH 3 PERCENT MG, AND DOLOMITIC LIME TYPES (FINENESS-95 PERCENT THROUGH A 100-MESH SIEVE) AT RATES OF 4.5-15.7 T/HA WERE COMPARED WITH UNLIMED CHECKS. HIGH LIME RATES INCREASEDYIELDS AND HAD NO DELETERIOUS EFFECTS. SUBSTANTIAL CHANGES IN SOIL PH AND CA AND MG SATURATION TOOK PLACE WITHIN A YEAR OF APPLICATION. LEAF MN CONCN. AND, TO A LESSER EXTENT, LEAF ZN AND B WERE DECREASED BY LIMING. CALCITIC LIME INCREASED LEAF CA BUT DEPRESSED LEAF MG, RESP., AT RATES OF 13.4-15.7 T/HA. COMPARABLE DOLOMITIC LIME TREATMENTS ENHANCED LEAF MG SUBSTANTIALLY BUTDID NOT INCREASE LEAF CA. WITHIN 2-3 MO. OF LIME APPLICATION, LEAF ANALYSES SHOWED THAT THE CALCITIC TYPE USUALLY SUPPLIED REASONABLE AMOUNTS OF CA, THE DOLOMITIC TYPE CONSISTENTLY SUPPLIED SUBSTANTIAL QUANTITIES OF MG, AND BOTH TYPES REDUCED LEAF MN. [AS].

0218

8008 SMITH, C.B. **Growth responses, nutrient leaf concentrations and interelement relationships of snap beaf as affected by fertilizer treatment.** Journal of the American Society for Horticultural Science 102(1):61-64. 1977. Engl., Sum. Engl., 11 Refs.

Phaseolus vulgaris. Growth. N. P. K. Mg. Fertilizers. Urea. Leaves. Field experiments. Analysis. Mineral content. Yields.

Bush Blue Lake 283 beans (*Phaseolus vulgaris* L.) were grown with 16 fertilizer treatments at 16 commercial sites in Pennsylvania in 1973-74. No treatment gave significantly higher combined yield at one harvest than the NP treatment (28 kg/ha of each). This treatment resulted in increases of 27% in vine weight and 9% in yield while leaf concentration of Ca and Mg were enhanced by 19 and 36%, respectively, and K concentration was decreased by 17%. Added K, which further increased vine weight but not yield, depressed Mg leaf concentration but this was more than compensated by the NP enhancement. Although added Mg did not affect growth responses, it increased Mg leaf concentration, decreased Mn concentration and tended to decrease P and Ca

concentration but did not lower K leaf concentration. When both K and Mg were added. Mg leaf concentration was no higher. Diammonium phosphate had no injurious effects. (*Author's summary*) D01 C02

0219

16084 SMITTLE, D.A.; STANSELL, J.R.; WILLIAMSON, R.E. 1978. **Cultural studies with snap beans.** Athens, University of Georgia. College of Agriculture. Experiment Stations. Research Bulletin no. 226. 22p. Engl., Sum. Engl., 30 Refs.

Phaseolus vulgaris. **Snap bean. Cultivation. Spacing. Fertilizers. Irrigation. Water requirements. Harvesting. Agricultural equipment. Cultivars. Agronomic characters. Pods. Yields. Field experiments. USA.**

Results of studies on snap beans conducted during 1973-76 in SE Coastal Plain, Georgia, USA to adapt cultural practices established in other areas and develop new cultural methods according to regional requirements are summarized. Recommendations are given on aspects of production and management such as seed quality, soil preparation, var. selection, plant population and arrangement, irrigation, fertilization, and harvesting. Desirable characteristics of these var. include: (1) high pod production; (2) erect plant growth; (3) low resistance to pod detachment; and (4) disease resistance. The efficiency of mechanical harvest is determined by the type of plant growth along with the frequent check and adjustment of mechanical harvesters. Tables are included on the results of the expt. *(Summary by C.P. G. Trans. by L.M.F.)* D01 D02

0220

6228 SMITTLE, D. A. **Response of snap bean to irrigation, nitrogen fertilization, and plant population.** Journal of the American Society for Horticultural Science 101(1):37-40. 1976. Engl., Sum. Engl., 14 Refs.

Phaseolus vulgaris. **Irrigation. N. Fertilizers. Spacing. Yields. Foliage. Growth.**

French bean (*Phaseolus vulgaris* L.) yield was increased by higher plant populations, more frequent irrigation and additional N applied as a topdress. Highest yields were obtained with an irrigation-fertilization program that included applications of 8 mm of water at 23 mm of pan evaporation until 1/3 foliage cover, at 15 mm of pan evaporation until 2/3 foliage cover, then at 8 mm of pan evaporation until harvest with N applications to maintain petiole NO_3-N level above 1500 ppm preblossom and 1000 ppm during fruit development. Response of 30 x 8 cm and 91 x 3 cm plant spacings to irrigation and N fertilization were similar. Pan evaporation data can be used to schedule irrigation under varied climatic conditions and maintain a low soil water tension throughout french bean growth. The relationship of water use by french beans to pan evaporation changes with crop development. An adjustment must be made to compensate for the changing relationship; and frequent irrigation and N fertilization must be made to french beans produced on sandy soil under humid conditions. *(Author's summary)* D01

0221

28015. SRINIVAS, K.; RAO, J.V. 1984. RESPONSE OF FRENCH BEAN TO NITROGEN AND PHOSPHORUS. INDIAN JOURNAL OF AGRONOMY 29(2):146-149. EN. SUM. EN., 5 REF. (INDIAN COUNCIL OF AGRICULTURAL RESEARCH, KRISHI BHAWAN, NEW DELHI 110001,INDIA)

THE RESPONSE OF FRENCH BEANS TO N (0, 30, 60, AND 90 KG/HA) AND P (0, 50,100, AND 150 KG/HA) WAS STUDIED AT THE INDIAN INSTITUTE OF HORTICULTURAL RESEARCH IN HESSARAGHATTA (BANGALORE, INDIA) DURING

THE KHARIF SEASONS OF 1978 AND 1979. SIGNIFICANT YIELD RESPONSES WERE OBTAINED WITH THE APPLICATIONOF N AND P. POD YIELDS WERE HIGHEST WITH 90 KG N AND 150 KG P/HA; HOWEVER, THE OPTIMUM LEVELS WERE FOUND TO BE 80 KG N AND 123 KG P/HA. [AS].

0222

16958 STANSELL, J.R.; SMITTLE, D.A. 1980. **Effects of irrigation regimes on yield and water use of snap bean (*Phaseolus vulgaris* L.).** Journal of the American Society for Horticultural Science 105(6):869-873. Engl., Sum. Engl., 12 Refs., Illus.

Phaseolus vulgaris. **Green bean. Irrigation. Osmotic potential. Evapotranspiration. Pods. Yields. Developmental stages. Water requirements. Income.**

Pod yield of Galagreen and Eagle snap bean cv. irrigated when the soil water tension reached 0.25 bar averaged 11.9 t/ha, and irrigation at tensions of 0.5 and 0.75 bar reduced this yield by 41 and 48%, resp. The reduction in water use was proportionately less than yield decreases, resulting in water use efficiencies of 0.62, 0.45, and 0.4 t of pods/cm of water with irrigation at 0.25, 0.5, and 0.75 bar, resp. Pod yield and water use efficiency were generally greater in Eagl· than in Galagreen snap beans. A 0.75-bar stress applied preblossom, at flowering, or a. pod development reduced pod yield by 25% in both cv. *(Summary by Horticultural Ab tracts)* D01

0223

25310. STRYDOM, E. 1971. THE PRODUCTION OF GREEN BEANS. PRETORIA, SOUTH AFRICA, DEPARTMENT OF AGRICULTURAL AND TECHNICAL SERVICES. LEAFLET NO.64. VEGETABLE SERIES NO.7. GREEN BEAN SERIES NO.1. 9P. ENGL.

GENERAL INFORMATION ON DIFFERENT ASPECTS OF GREEN BEAN PRODUCTION, WITH EMPHASIS ON SOUTH AFRICA, IS PRESENTED. BRIEF DISCUSSIONS ARE PRESENTED ON ECONOMIC IMPORTANCE, PRODUCTION AREAS, CLIMATIC AND SOIL REQUIREMENTS, FERTILIZATION, PLANTING TIME, AND SEED TREATMENT, CROP ROTATIONS, SOIL PREPARATION AND CULTIVATION, CHEMICAL WEED CONTRO, IRRIGATION HARVESTING, MARKETING, AND YIELDS. A BRIEF DESCRIPTION OF AVAILABLE BUSH AND CLIMBING BEAN VAR. IS ALSO GIVE. THE MAIN BEAN INSECT PESTS, DISEASES, AND OTHER MINOR DISORDERS ARE LISTED; A BRIEF NOTE ON SYMPTOMS AND CONTROL IN INCLUDED FOR EACH ONE. [CIAT].

0224

27459. TROIANO, J.; JACOBSON, J.S.; HELLER, L. 1984. EFFECTS OF SIMULATED ACIDIC RAIN APPLIED ALONE AND IN COMBINATION WITH AMBIENT RAIN ON GROWTH AND YIELD OF FIELD-GROWN SNAP BEAN. AGRICULTURE, ECOSYSTEMS AND ENVIRONMENT 11(2):'61-172. EN. SUM. EN., 20 REF. [BOYCE THOMPSON INST., CORNELL UNIV., TOWER ROAD, ITHACA, NY 14853, USA]

FIELD-GROWN SNAP BEAN CV. PROVIDER PLANTS WERE TREATED WITH

SIMULATED ACIDIC RAIN APPLIED EITHER ALONE OR IN COMBINATION WITH AMBIENT RAIN, AND THEEFFECTS ON GROWTH AND YIELD WERE DETERMINED. IN PLOTS WHERE AMBIENT RAIN WAS EXCLUDED, A RETRACTABLE CANOPY WAS ACTIVATED TO SHIELD THE CROP. FOUR LEVELS OF ACIDITY AT PH VALUES OF 5.0, 4.2, 3.4, AND 2.6 WERE APPLIED IN 4 REPLICATETREATMENTS AND THE EXPT. WAS CONDUCTED IN 2 SUCCESSIVE YEARS (1981 AND 1982).IN PLOTS THAT RECEIVED ONLY SIMULATED RAIN, YIELD WAS NOT ADVERSELY AFFECTED BY ACIDIC RAIN; IN 1981, A POSITIVE LINEAR RELATIONSHIP WAS PRESENT BETWEEN ACIDITY OF SIMULATED RAIN AND YIELD, BUT IN 1982, NO EFFECT WAS FOUND. IN CONTRAST, IN PLOTS THAT RECEIVED BOTH SIMULATED AND AMBIENT RAIN, A NEGATIVE LINEAR RELATIONSHIP BETWEEN ACIDITY IN SIMULATED RAIN AND YIELD WAS OBSERVED IN BOTH YEARS. VEGETATIVE MASS AND SIZE OF PODS WERE UNAFFECTED BY ACIDITY INSIMULATED RAIN IN EITHER EXPTL. CONDITION. (AS).

0225

18564 VAN BUREN, J.P.; PECK, N.H. 1981. Effect of K fertilization and addition of salts on the texture of canned snap bean pods. Journal of Food Science 47(1):311-313. Engl., Sum. Engl., 11 Refs., Illus.

Phaseolus vulgaris. Fertilizers. K. Pods. Snap beans. Canned beans.

Snap bean cv. Wax Bonanza and Early Gallatin were grown in sand culture with 2 levels of K (0.3 and 6 meq/l) and outdoors with 4 levels of K (0, 100, 500, and 1700 kg/ha) to determine the effects of K fertilization on the texture of canned pods and to compare the effects of additions of salts and removal of soluble pod components with the effects of fertilization. Increases in pod K, obtained either by fertilization or direct addition to the can, resulted in less firm canned pods. Removal of soluble solids from pods prior to canning resulted in firmer pods. Pod K and texture were highly correlated, with the greatest changes in texture with changing K occurring below 2% K in pods on a dry wt. basis. The effects of K and Na appeared due to a combination of Ca displacement and an enhancement of pectin degradation. (Author's summary) DOI

0226

19748 WAGENET, R.J.; RODRIGUEZ, R.R.; CAMPBELL, W.F.; TURNER, D.L. 1983. Fertilizer and salty water effects on Phaseolus. Agronomy Journal 75(2):161-166. Engl., Sum. Engl., 23 Refs. [Dept. of Agronomy, Cornell Univ., Ithaca, NY 14853, USA]

haseolus vulgaris. Snap beans. Salinity. Irrigation. Fertilizers. N. Water stress. Dry matter. Yields. Mineral content. P. Yield components. USA.

Greenhouse studies, involving interactive effects on snap bean yield of 3 levels of irrigation water salinity, 3 frequencies of irrigation water application, 2 levels of N applied in the irrigation water, and 7 levels of P and K fertilization, were conducted to determine if the adverse effects of saline conditions or water stress on Phaseolus could be overcome by enhanced fertility status and/or improved saline water management on an Argixeroll. DM and bean yields were reduced with decreasing irrigation frequency (2 to 8 days) and increasing salinity of irrigation water (0.5 to 8.0 mmho/cm). Percentage yield decrements were measured for both salt and irrigation regimes. Yield increases were noted for all fertilizer treatments so long as salinity did not become too high (8 mmho/cm). Plant N content and root wt. were shown to be responsive to irrigation frequency

and salinity, but not to fertilizer form. N applied in the irrigation water produced increased yield across all treatments in one set of expt. where greenhouse conditions were hot, dry, and of high potential evapotranspirational demand. No N effect was measured in a 2nd series of expt. with low potential evapotranspiration. (Author's summary) D01

0227

20876 WELLS, P.D. 1982. Green bean. Zimbabwe Agricultural Journal 79(3): 91-95. Engl., 7 Refs.

Phaseolus vulgaris. Snap beans. Climatic requirements. Soil requirements. Nutritional requirements. Cultivars. Planting. Irrigation. Harvesting. Yields. Marketing. Storage. Diseases and pathogens. Resistance. Zimbabwe.

General aspects of the cultivation and storage of snap beans are presented, with specific recommendations for Zimbabwe. These include climate, soils, fertilizer requirements, cv., planting, management, irrigation, harvest, yields, marketing, and storage. A list of 17 cv. with information on yield, quality, harvest period, seed color, pods, use, and diseases is given. [CIAT]

D02 Cultivation Practices: Planting, Weed Control and Harvesting

0228

*AGAMALIAN, H. 1972. Herbicide development in green and dry beans. In Annual California Weed Conference, 24th, USA, 1972. Proceedings. Salinas, USA, Univ. of California Agric. Ext. Serv. pp.76-80.

0229

8094 AITKEN, J.B. **Weed control in snap beans with dinotroaniline herbicides.** *In* Annual Meeting Southern Weed Science Society, 28th., 1975. Memphis, Tennessee, 1975. pp.175-178. Engl., Sum. Engl., 6 Refs.

Phaseolus vulgaris. **Weeds. Herbicides. Weeding. Field experiments. USA.**

Dinitroaniline herbicides were evaluated in replicated field plots during both the spring and fall of 1972. Excellent control of Texas panicum and goosegrass was obtained with treatments of fluchloralin and butralin. Trifluralin and dinitramine gave excellent control of Texas panicum but only fair control of goosegrass. No significant difference was measured among treatments regarding sicklepod control. Control of pigweed species was best achieved with butralin, with nitralin, fluchloralin and dinitramine providing fair to good control. The effect of the herbicide treatment was generally a noticeable increase in french bean yield when compared to the cultivated check, the one exception being the spring treatment of 0.50 lb. A dinitramine. (*Author's summary*) D02

0230

7679 AITKEN, J. B. and ANDREWS JUNIOR, O. N. **Performance of alachlor and alachlor combinations in snap beans.** *In* Annual Meeting Southern Weed Science Society, 26 th., Raleigh, North Carolina, 1973. pp. 215-224. Engl., Sum. Engl., 2 Refs.

Phaseolus vulgaris. **Weeds. Herbicides. Weeding. Field experiments. Plant injuries. Yields. USA.**

Herbicide combinations with alachlor, applied preemergence on french beans, were evaluated on sandy to sandy loam soils at 7 locations in Florida from 1971-72. It was found that (1) alachlor (2

lb a.i./acre) controlled annual grasses (large crabgrass and goosegrass), except Texas panicum, over a wide range of rainfall conditions. (2) There was no consistent difference in control between alachlor, trifluralin and EPTC on annual grasses except Texas panicum. (3) Linuron, CDEC or dinoseb added to alachlor did not improve annual grass or broadleaf (Florida pusley, sickledpod and pigweed) weed control of alachlor alone. (4) Alachlor and trifluralin provided better pigweed control than EPTC. Alachlor and EPTC provided good (above 80%) control of sicklepod at 2 locations. (5) Bean injury from alachlor occurred at 2 of 4 locations in 1972, with no injury at any location in 1971. (6) In 1972 bean injury occurred on sandy and sandy loam soils and was more severe where subirrigation or overhead irrigation was employed and where the cultivars Sprite or Provider were planted. (7) Where weeds were controlled and beans were not injured by alachlor treatments, yields were higher than untreated checks or herbicide treatments providing insufficient weed control. Yield reductions occurred only where injury symptoms were observed. *(Author's summary)* D02

0231

* AITKEN, J.B. 1972. Performance of substituted dinitroaniline herbicides on snap beans (Phaseolus vulgaris L.). In Annual Meeting Southern Weed Science Society, 25, 1972. Proceedings. pp.57-61.

0232

* ALVAREZ, G. 1981. NC 20484, herbicide para el control de coquito (Cyperus rotundus L.). In Seminario de la Sociedad Colombiana de Control de Malezas y Fisiologia Vegetal, 13, Reunion Asociacion Latinoamericana de Fisiologia Vegetal, 8, Cali, Colombia, 1981. Resumenes. Cali, Estacion Experimental La Tupia, Quimica Schering Colombiana S.A. pp.12-13.

0233

15851 ALVES, A.; BERNARDI, J.B. 1968. Contrôle de ervas daninhas em cultura de feijão-vagem pelo uso de herbicidas. *(Control of weeds in snap beans with herbicides)*. Bragantia 27(16):187-192. Port., Sum. Port., Engl., 2 Refs.

Phaseolus vulgaris. Snap bean. Weeds. Weeding. Herbicides. Cultivation. Yields.

Four herbicides for controlling weeds in snap bean crops were tested in preemergent conditions. EPTC and trifluralin were incorporated before planting whereas chloroxuron and DNBP were applied after planting without incorporation in the soil. A plot cultivated by usual practices was used as check. Under these exptl. conditions there was no appreciable increase on bean yields, but all the herbicides tested were efficient in controlling the weed. Those applied after planting showed better residual effects. Some toxicity of chloroxuron was noted on snap beans. *(Author's summary)* D02

0234

* ANDERSON, R.F. 1974. Velsicol new generation herbicides. In International Velsicol Symposium, 8, Brighton, UK, 1974. Proceedings. Chicago, USA. Velsicol Chem. Corp. 10p.

0235

* ARSSI RURAL DEVELOPMENT UNIT, CROP AND PASTURE SECTION. ETHIOPIA. 1978. Report on crop protection surveys and experiments, 1977/78. Addis Ababa, Ethiopia. 52p.

0236

19461 ASHLEY, R.A. 1982. Timing applications of diclofop for control of large crabgrass. Proceedings Northeastern Weed Science Society 36:199-202. Engl. [Univ. of Connecticut, Storrs, CT 06268, USA]

Phaseolus vulgaris. Snap beans. Weeding. Herbicides. Timing. USA.

Field expt.. were conducted at the U. of Connecticut Agronomy Research Farm (Storrs, USA) to determine the feasibility of timing diclofop treatments for control of Digitaria sanguinalis in snap beans in terms of days after sowing rather than leaf count. D. sanguinalis was controlled with diclofop at 1.1 kg/ha either preemergence or up to 14 days after sowing. Applications in the early morning or in the evening were significantly more effective than those at midday. (Summary by Herbage Abstracts) D02

0237

*ASHLEY, R.A. 1974. Effect of delayed incorporation on performance of trifluralin. Proceedings of the Northeastern Weed Science Society 28:172-174.

0238

*ASHLEY, R.A. 1973. Two-year study of weed control in snap beans. Proceedings of the Northeastern Weed Science Society 27:178-183.

0239

*ASHLEY, R.A. 1972. Effect of competition and control of Galinsoga ciliata [Ref.] Blake in snap beans. Proceedings of the Northeastern Weed Science Society 26:338-341.

0240

21056 ASHWORTH, S.; HARRISON, H. 1983. Evaluation of mulches for use in the home garden. HortScience 18(2):180-182. Engl., Sum. Engl., 7 Refs., Illus. [Dept. of Horticulture, Univ. of Wisconsin, Madison, WI 53706, USA]

Phaseolus vulgaris. Mulching. Soil temperature. Growth. Snap beans. Yields. Weeding. USA.

Nine mulch treatments—2 organic (bark, straw), 6 synthetic (polypropylene and polyethylene products), and a control—were evaluated for use around 5 vegetable crops (lettuce, cabbage, tomato, cucumber, snap bean cv. Tendergreen) and 2 woody ornamental species (privet and American arborvitae). Distinct diurnal soil-temp. regimes developed under the mulches resulting in differences in plant growth and yield. No single mulch performed best for all species. Bark mulch produced the highest snap bean yield; this mulch followed the opaque synthetic mulches in remaining intact throughout the summer and thus provided effective weed control. Bark mulch provided the most satisfactory appearance since it blended in with the surrounding soil. (Author's summary) D02

0241

29176 BADILLO-FELICIANO, J. ; REYES-SOTO, I.; BEAVER, J.S. 1985. A comparison of yields of common beans at physiological and harvest maturity. Journal of Agriculture of the University of Puerto Rico 69(1):19-24. En., Sum. En., Es., 7 Ref., Il. [Agricultural Experiment Station, Univ. of Puerto Rico, RÑo Piedras, Puerto Rico]

Phaseolus vulgaris. Snap beans. Harvesting. Cultivars. Timing. Yields. Yield components. Puerto Rico.

Results of field expt. carried out at the research and development centers of Isabela and Fortuna, in Puerto Rico, are given. Two harvesting stages of snap bean cv. Bonita and Naranjito, white- and striped-seeded, resp., were compared. Both cv. were harvested (1) when physiologically mature and (2) when dry. Results showed that the yields of cv. Bonita were higher and this cv. had more pods/plant and more seeds/pod. Furthermore, the yield of physiologically mature snap beans was 70 percent higher than when harvested dry. When unhulled snap beans are sold, the yield is about 75 percent over that of dry beans. (AS-CIAT)

0242

*BAGLEY, P.C.; BESTE, C.E. 1981. Herbicides for narrow-row snap beans. Proceedings of the Northeastern Weed Science Society 35:179.

0243

*BAGLEY, P.C.; BESTE, C.E. 1980. New herbicides for narrow-row snap beans. Proceedings of the Northeastern Weed Science Society 34:176-186.

0244

*BAKER, R.S.; BARRENTINE, W.L.; BOWMAN, D.H.; HAWTHORNE, W.L.; PETTIET, J.V. 1976. Crop response and arsenic uptake following soil incorporation of MSMA. Weed Science 24:322-326.

0245

*BASF UNITED KINGDOM LTD. 1971. BAS 2900H. St. Francis Tower, Greyfriars, Technical Data Sheet, Agricultural Division. 3p.

0246

*BAUR, J.R. 1972. Degradation of 14C-picloram by bean plants. In Meeting of the Weed Science Society of America, St. Louis, 1972. Abstracts, USA. US Dep. Agric., Dep. Range Sci. pp.68-69.

0247

*BAYER, G.H. 1977. Herbicide combinations for soy, snap and kidney beans in New York. Proceedings of the Northeastern Weed Science Society 31:34-38.

0248

*BENSON, G.L.; BAGLEY, R.W.; MUR, A.R. DE 1981. Ro 13-8895, a selective postemergence herbicide for grass control. Proceedings of the Northeastern Weed Science Society 35:80.

0249

* BERAUD, J.M.; DANIAU, P.; LE SIOURD, J. 1979. Le banfluraline, herbicide de base pour un programme de desherbage des cultures

de haricot. In Compte Rendu de le 10e Conference du COLUMA. pp.1079-1088.

0250

*BESTE, C.E. 1974. Evaluation of no-tillage vegetables in a rye cover-crop mulch. In Meeting Weed Science Society of America, 1974. Abstracts, USA. Univ. Maryland, College Park. pp.105-106.

0251

*BIANCO, V.V.; MAGNIFICO, V. 1974. Weed control in snap beans for processing. Rivista di Agronomie 8(2-3):317-326.

0252

23191 BINNING, L.K.; WYMAN, J.A.; STEVENSON, W.R. 1981. Pest control in commercial snap bean production. Madison, University of Wisconsin. Cooperative Extension Programs. Publication no.A2329. 8p. Engl., Illus.

Phaseolus vulgaris. Snap beans. Weeding. Herbicides. Injurious insects. Insect control. Diseases and pathogens. Disease control. Chemical control. USA.

Two aspects of pest control are described. The 1st deals with weed control which can be effectively achieved by good cultivation practices and the use of herbicides. Several herbicides are listed along with the weed types for which they were intended. The 2nd aspect includes chemical and cultural control of the major insects and diseases in bean crops. Insect pests include European corn borers, seed corn maggot, corn ear worm, plant bugs, potato leafhopper, bean aphids, cutworms, loopers, wireworms, and white grubs. Diseases include root rots (caused by Rhizoctonia, Pythium, and Fusarium), bacterial blights, white mold, Botrytis gray mold, rust, common mosaic, and yellow bean mosaic. [CIAT]

0253

*BINNING, L.K.; FAWCETT, R.S.; HARVEY, R.G. 1976. Quackgrass control in vegetable crops. Proceedings of the North Central Weed Control Conference 31:155.

0254

*BINNING, L.K.; HARVEY, R.G.; WEIS, G. 1972. Application of EPTC through irrigation water to snapbeans. Proceedings of the North Central Weed Control Conference 27:68.

0255

*BOLDT, P.F.; SWEET, R.D. 1975. Snap bean response to fluorodifen. Proceedings of the Northeastern Weed Science Society 29:199-202.

0256

*BOLDT, P.F.; SWEET, R.D. 1974. Evaluation of herbicides on dry and snap beans (Phaseolus vulgaris). Proceedings of the Northeastern Weed Science Society 28:155-160.

0257

*BRATHWAITE, R.A.I. 1979. Weed control in grain legumes. In Regional Workshop on Tropical Grain Legumes, West Indies,

Trinidad, 1979. Paper presented. Trinidad and Tobago, Dep. Crop Sci., Univ. W. Indies, St. Augustine. 23p.

0258

*BRECKE, B.J.; DUKE, W.B. 1978. Effect of glyphosate on intact bean plants, leaf discs, and isolated cells. In Meeting of the Weed Science Society of America, 1977. Abstracts, Jay, USA, Univ. of Florida. pp.87-88.

0259

*BRUNS, V.F.; DEMINT, R.J.; FRANK, P.A.; KELLY, A.D.; PRINGLE JUNIOR, J.C. 1974. Responses and residues in six crops irrigated with water containing 2,4-D. Prosser, US Dep. Agric., Irrig. Agric. Res. Ext. Center. Bulletin, College of Agriculture Research Center. 10p.

0260

*CANADA. AGRICULTURE CANADA RESEARCH STATION. 1981. Report. In_____. Research Branch Report, 1980. Kentville. pp.105-119.

0261

*CANADA, AGRICULTURE CANADA RESEARCH STATION. 1979. Report. In_____. Research Branch Report 1976-78. Harrow. pp.91-105.

0262

*CANADA, DEPARTMENT OF AGRICULTURE. 1975. Report, Research Station, Lethbridge, Alberta. In_____. Research Branch Report 1974. pp.305-325.

0263

* CASSIDY, J.C. 1972. Herbicide evaluation in peas and French beans 1971-72. In British Weed Control Conference, 11th, 1972. Proceedings. London, UK, British Crop Protection Council. pp.1088-1095.

0264

* CHYKALIUK, P.B. 1982. Interactions of plant growth regulators or additives on absorption and translocation of herbicides. Thesis. Stillwater, Oklahoma State Univ. 88p.

0265

*CHILALO AGRICULTURAL DEVELOPMENT UNIT, CROP PRODUCTION DEPARTMENT. ETHIOPIA. 1973. Weed control in haricot beans. In_____. Report on surveys and experiments 1972. Asella, Ethiopia. pp.202-209.

0266

*CHILALO AGRICULTURAL DEVELOPMENT UNIT. ETHIOPIA. 1975. Crop protection activities, 1974. Parts from report on surveys and experiments carried out in 1974 by Crop and Pasture Section. Asella, Ethiopia. pp.147-195.

0267

*COBB, W.T. 1981. Sonalan efficacy and crop tolerance when applied preplant incorporated to edible beans in the Pacific Northwest - EUP research. Proceedings of the Western Society of Weed Science 34:123-125.

0268

21923 COERTZE, A.F.; VAN DEN BERG, A.A. 1981. Planting density in bush beans. Bean Improvement Cooperative. Annual Report 24:1. Engl.

Phaseolus vulgaris. Planting. Spacing. Snap beans. Yields. Yield components. South Africa.

A trial was conducted in 1980 at the Horticultural Research Institute (Pretoria, South Africa) to evaluate the effect of 10 plant densities (from 59,492 to 555,327 plants/ha) on seed yield of snap bean cv. Rolito. No significant difference in yield was found at densities of 136,827 plants/ha and above. The no. of pods/plant and the mass of plants increased at low density planting. The no. of pods/plant varied from 44 at the lowest to 8 at the highest density planting. Plant height, height at which the pods were borne, and the effect on weeds were better at high than at low density plantings. (Summary by T.F.) D02

0269

11186 COERTZE, A.F. Cultivation practices in green bean production. Farming in South Africa. Vegetable Series II. Green Beans and Green Peas G.1/1978. 2p. Engl., Illus.

Phaseolus vulgaris. Cultivation. Land preparation. Planting. Spacing. Weeds. Herbicides. South Africa.

Some cultural practices of snap bean cultivation are briefly described and recommendations are given to improve cultural operations and increase yields. Among the recommendations given, the following were emphasized: avoid an excessive pulverised condition of the soil that weakens its structure; apply a pesticide against nematodes to the soil; plant at a depth ≤ 50 mm; avoid seed damage and cultivating under wet conditions or with dew to prevent disease incidence, and preferably use chemical weed control instead of mechanical. *(Summary by C.P.G. Trans. by L.M.F.)* D02

0270

11187 COERTZE, A.F. The picking stage, harvesting, yield and post-harvest handling of green beans. Farming in South Africa. Vegetable Series II. Green Beans and Green Peas I.1/1978. 4p. Engl., Illus.

Phaseolus vulgaris. Maturation. Harvesting. Yields. Cultivation. South Africa.

Recommendations are given on the collection, handling and storage of green beans, requirements for mechanically reaped cv. and the ideal stage for harvesting. The process of pod formation can be divided into 3 stages: (1) pod development and the initiation of seed development; (2) enlargement of the pods and a rapid enlargement of the seed and (3) thickening of the cell wall, maturing and drying of the pod; drying and hardening of the seed. The 2nd stage is the most acceptable for harvesting since green beans reach their max. yield. Crop yields vary between 6000-10,000 kg/ha under commercial conditions, depending on the technology and control given to the crop. Optimum temp. for storage varies between 7-10°C. *(Summary by C.P.G. Trans. by L.M.F.)* D02

0271

CORREA, R. T. and STEPHENS, T. S. The effect of row spacing on green bean varieties. Journal of the Rio Grande Valley Horticultural Society 14:140-148. 1960. Engl., Sum. Engl., 7 Refs.

Phaseolus vulgaris. Productivity. Spacing. Experiment design. Cultivars. Pods. USA.

The yields of beans used in these experiments were increased from 31% to as much as 130% by paired rows spaced 12 or 14 inches apart on 38-inch beds as compared to production from rows spaced 38 inches apart. The results of spacing beans in paired rows 6 inches apart on 38-inch beds were inconsistent with variabilities between varieties and seasons. These results indicate 12-inch spacing between rows is the minimum distance on which to obtain the highest production from Topmost, Pearlgreen and Tenderwhite. An intermediate spacing between 12 and 6 inches between rows is the most desirable for Topcrop, Harvester and Earligreen. Planting the rows of beans close together did not influence the sieve sizes of pods of Topcrop, Topmost, Pearlgreen or Tenderwhite. Neither did closer row spacing influence the percentage seed development nor fiber percentage of canned pods of sieve size 5 of Topcrop, Topmost, Pearlgreen or Tenderwhite. Harvester and Earligreen decreased in small sieve sizes, increased in large sieve sizes, and increased in percentage seed and fiber content of canned sieve size 5 pods from rows spaced 38 inches apart as compared to rows spaced 6 inches apart. A sensory evaluation of the canned pods by a panel of trained judges could not detect differences due to row spacing of Topcrop, Topmost, Pearlgreen or Tenderwhite. (Author's summary)

0272

CRANE, S.; SOLLAZZO, P.J.; ILNICKI, R.D. 1981. Weed control in double crop no-till soybeans. Proceedings of the Northeastern Weed Science Society 35:48-50.

0273

CROSBIE, S.H.; BINNING, L.K.; HARVEY, R.G. 1977. The interaction of dinitroaniline herbicides on various crops species. Proceedings of the North Central Weed Control Conference 32:92.

0274

*DALY, P. 1981. Efficacite des herbicides en cultures maraicheres intensives tropicales. In Compte Rendu de la 11e Conference du COLUMA. v.3,pp.966-973.

0275

19741 DANIELLS, J.W.; WILSON, G.L. 1983. Plant spacing in French beans. 1. Yield. Australian Journal of Experimental Agriculture and Animal Husbandry 23(120):54-57. Engl., Sum. Engl., 6 Refs., Illus. [Dept. of Primary Industries, South Johnstone Research Station, P.O. Box 20, South Johnstone, Qld. 4859, Australia]

Phaseolus vulgaris Planting Spacing. Cultivars. Snap beans. Dry matter. Yields. Australia.

Four French bean cv. (Providor, Gallatin 50, Slenderette, and Redlands New Pioneer) were grown at a range of plant population densities and rectangularities for 2 seasons in SE Queensland, Australia. Plant population densities 2-3 times those used commercially increased yields by 25-30%. This increase resulted from a greater no. of pods/unit area with only a small reduction in pod size. Rectangularity in the range 1-8 had no effect on yield. These responses are discussed in terms of time courses of LAI development, light interception by canopies, crop growth rates, and DM

distribution between vegetative and reproductive growth after flowering. (Author's summary) D02

0276

*DEFRANK, J.; PUTNAM, A.R. 1978. Weed and crop response to allelopathic crop residues. Proceedings of the North Central Weed Control Conference 33:44.

0277

*DEMINT, R.J.; PRINGLE, J.C.; HATTRUP, A.; BRUNS, V.F.; FRANK, P.A. 1975. Residues in crops irrigated with water containing trichloroacetic acid. Journal of Agricultural and Food Chemistry 23(1):81-84.

0278

*DEYTON, D.E.; CAROLUS, R.L. 1973. Some side effects of pesticides on vegetables. HortScience 8(3):29.

0279

7606 DURAN, L. *et al.* **Calidad industrial de variedades de judías verdes. II. Estudios de variedades seleccionadas. Influencia de la pauta de recolección sobre el rendimiento y la calidad.** *(Industrial quality of green bean varieties. II. Studies of selected varieties. Influence of harvesting method on yield and quality).* Revista de Agronomia y Tecnologia de los Alimentos 6:327-334. 1966. Span., Sum. Span., 7 Refs.

Phaseolus vulgaris. **Cultivars. Soil analysis. Harvesting. Yields. Pods. Costs. Seed characters.**

A study was conducted to evaluate the influence of harvesting method on yield, distribution of sizes and quality parameters for 5 bean varieties: Perfection, Fineta, Saint Fiacre, Phenomene and Blue Lake 231. A decrease in frequency of harvest increased total production and reduced harvesting costs. On the other hand, the proportion of fine beans (<8mm) decreased considerably. The characteristics of the raw material and canning quality remained practically invariable. Perfection and Blue Lake were outstanding for their high percentage of fine beans and the excellent quality of the canned product. Their fruits are almost rounded, meaty and stringless. (*Author's summary. Trans. by T.M.*) D02

0280

22263 DURANTI, A.; CARONE, F. 1981. Rapporti di competitivita tra fagiolino nano da industria ed infestanti. (Competitive interrelationships between snap beans and weeds). Informatore Fitopatologico 31(7-8):13-19. Ital., Sum. Ital., Engl., 1 Ref., Illus. [Istituto di Agronomia Generale e Coltivazioni Erbacee dell'Universita degli Studi di Napoli, Portici, Italy]

Phaseolus vulgaris. Weeds. Snap beans. Planting. Timing. Yields. Italy.

Results are reported of a test carried out during 1979 in the Sele river plain (Salerno, Italy) to estimate the yearlong competitive relationships between weeds and snap beans for processing (cv. Cascade). Fourteen sowings were conducted every 2 wk. from March 7th to Sept. 9th. For each sowing weed infestation was evaluated at 4 different biological stages of the crop (development of the 1st true leaf, appearance of the 1st flower bud, full flowering, pod ripening) and correlated to pod yield. By delaying hand weeding an increase of the weed infestation was found for almost all the sowing times while yield decrease was not proportional; negligible differences were found between the yields in unweeded plots and

those where weeds were eliminated at full flowering. Furthermore, in the summer-autumn plantings the time of hand weeding had no influence. (Author's summary) D02

0281

25221 DURANTI, A.; LANZA, M.R. 1979. La raccolta meccanica del fagiolo nano mangiatutto, 6. Diserbo chimico e tolleranze varietale. (Mechanical harvesting of edible bush beans. 6. Chemical weed control and varietal tolerance). Annali della Facolta di Scienze Agrarie della Universita degli Studi di Napoli 13(1):39-48. Ital., Sum. Ital., Engl., 33 Refs.

Phaseolus vulgaris. Snap beans. Cultivars. Weeding. Herbicides. Toxicity. Italy.

Results are reported and examined of a field trial carried out during 1978 in the Sele river plain (Salerno, Italy) to study the behavior of 3 snap bean var. (Bush Blue Lake 274, Cascade, Stretch) with respect to 6 selective herbicides (benfluralin, bentazon, dinitramine, diphenamid, EPTC, isopropalin). Benfluralin, diphenamid, and isopropalin exhibited both excellent effectiveness if evaluated on the basis of phytotoxicity and yield of green beans. Dinitramine was slightly less effective in weed control. EPTC gave lower control of weeds and caused some crop injury resulting in yield reduction. Bentazon was the most phytotoxic. Var. showed differential tolerance to herbicides; in particular, the yield of cv. Cascade was greatly affected by bentazon. [AS]

0282

16462 EGYPT. MINISTRY OF AGRICULTURE. 1932. French beans (Fasoolia). Phaseolus vulgaris, L. Cairo, New Series Leaflet no.7. 4p. Engl.

Phaseolus vulgaris. Snap beans. Agronomic characters. Planting. Timing. Spacing. Fertilizers. Irrigation. Maturation. Egypt.

Plant characteristics and cultivation of snap bean in Egypt are described. The most cultivated var. in Cairo is Baladi. Planting takes place in Jan. and harvesting in early April; however, successive sowings are made throughout the summer until the beginning of Oct. Aspects related to planting, quantity of seed, planting distances, fertilizers, and irrigation are given. Pods are ready for harvest in 45 days in summer and in 70-80 days in spring. In the northern part of Delta the 1st planting is made 10-15 days later than in the southern district. (Summary by EDITEC. Trans. by L.M.F.) D02

0283

20033 ELLAL, G.; BRYAN, E.H.; McMILLAN JUNIOR, R.T. 1982. Influence of plant spacing on snap bean yield and disease incidence. Proceedings of the Florida State Horticultural Society 95:325-328. Engl., Sum. Engl., 4 Refs., Illus. [IFAS, Univ. of Florida, Agricultural Research & Education Center, 18905 SW 280 Street, Homestead, FL 33031, USA]

Phaseolus vulgaris. Spacing. Planting. Yields. Snap beans. Rhizoctonia solani. Fusarium solani phaseoli. Yield components. USA.

Five in-row spacings (0.75, 1.3, 2.5, 5.1, and 7.6 cm) between plants were evaluated for yield and disease incidence in snap bean at the Agricultural Research and Education Center, Homestead, Florida, USA. Yields were significantly higher at 5.1, 2.5, and 1.3 cm spacings than at the 0.75 and 7.6 cm spacings. Stem diameter was correlated ($P = 0.01$) to space between plants. Yield components (pods, foliage, and roots) were correlated ($P = 0.01$) to stem diameter. No correlation was found between yield and stem lesions caused by either Rhizoctonia or Fusarium. In a factorial plant population expt. with plant populations ranging from 140 to 600 thousand plants/ha, bean yield was highly correlated with plant population

(P = 0.01). Av. plant wt. and pod wt./plant were inversely correlated to plant population (P = 0.01). (Author's summary) D02

0284

*ENGSTROM, E. 1974. Crop protection trials 1967-1972. Crop and pasture section, Asella, April 1974. Ethiopia, Chilalo Agricultural Development Unit. 57p.

0285

*ESHEL, Y.; RUBIN, B. 1972. Differential tolerance of six leguminous crops to terbutryne. Israel Journal of Agricultural Research 22(4):11-15.

0286

*FADAYOMI, O.; WARREN, G.F. 1977. Differential activity of three diphenyl ether herbicides. Weed Science 25(5):465-468.

0287

*FARRANT, D.M.; BRYANT, J.H. 1975. New uses of trifluralin in vegetable crops. In British Weed Control Conference, 12th, Brighton, 1974. Proceedings. London, UK. pp.1089-1099.

0288

*FEUNG, C.S.; HAMILTON, R.H.; MUMMA, R.D. 1977. Metabolism of 2,4-dichlorophenoxyacetic acid. 2. Herbicidal properties of amino acid conjugates. Journal of Agricultural and Food Chemistry 25(4):898-900.

0289

*FIERLINGER, P.S.; ITO, P.J.; MONTFORO, L.C. 1972. Herbicide control of nutsedge (Cyperus rotundus). In Annual Meeting, National Weed Committe for Ghana, 5th, 1972. Proceedings. Kumasi, Ghana, Univ. Sci. and Technology. pp.16-18.

0290

*FISHER, A.; TASISTRO, A. 1981. Effect of certain herbicides upon the Rhizobium phaseoli-Phaseolus vulgaris symbiosis. In Symposium on Theory and Practice of the Use of Soil Applied Herbicides, Versailles, 1981. Corvallis, OR, Crop Sci. Dep., Oregon State Univ. pp.120-128.

0291

*FISHER, A.; MICHIMANI, J.; TASISTRO, A. 1980. Un enfoque de sistemas para el control de malezas en frijol. Mexico, Universidad Autonoma de Chepingo. Circular Tecnica, Departamento de Parasitologia, no.10. 1p.

0292

*FISHER, A.; TASISTRO, A. 1979. Efecto de diversos herbicidas sobre la simbiosis Rhizobium phaseoli - Phaseolus vulgaris.

[Abstract]. Mexico, Univ. Autonoma de Chapingo. Catedra de Control de Malezas, Depto de Parastiologia, no.1. 2p.

0293

17350 FLETCHER, R.F.; TETRAULT, R.; MACNAB, A.A. 1976?. Growing snap beans for processing. Pennsylvania, Pennsylvania State University. College of Agriculture Extension Service. Circular no. 564. 11p. Engl.

Phaseolus vulgaris. Snap beans. Cultivation. Diseases and pathogens. Injurious insects.

General recommendations for growing snap beans for processing are given. Aspects include crop rotation, temp. requirements, soils and soil preparation, var., handling of seed, planting, soil pH, fertilizers and method of application, weed control, irrigation, and harvesting. Symptoms of major diseases (Fusarium root rot, Rhizoctonia root rot, Pythium root rot, Pseudomonas phaseolicola, P. syringae, Xanthomonas phaseoli, X. phaseoli var. fuscans, Colletotrichum lindemuthianum, Erysiphe polygoni, BCMV, BYMV, Botrytis cinerea, Sclerotinia sclerotiorum, and Uromyces phaseoli) as well as the damage caused by major pests (Epilachna varivestis, Aphis spp., Empoasca spp., Hylemya cilicrura, and Lygus spp.) are briefly described with references on their control. High-density planting is mentioned. (Summary by EDITEC. Trans. by L.M.F.) D02

0294

12336 FORSTER, R. and ALVES, A. **Eliminação correta das ervas daninhas.** (*Weed control*). Granja 33(351):16, 40-41. 1977. Port.

Phaseolus vulgaris. **Weeds. Herbicides. Weeding. Brazil.**

Chemical weed control in various crops in Brazil is discussed, among them dry beans and french beans. Herbicide rates, time of application and weeds controlled are given in table form. (*Summary by J.E.Z. Trans. by L.M.F.*) D02

0295

*French beans and minimum tillage: weed control. 1977. Noticias Agricolas 8(5):19-20.

0296

*FRIESEN, G.H. 1979. Protection of snapbeans from substituted urea injury by prior treatment with dinitroaniline herbicides. Canadian Journal of Plant Science 59(2):535-537.

0297

21100 FUENTES P., J.R. 1983. Las malezas en el cultivo de fréjol de vaina (Phaseolus vulgaris L.). 1. Relación maleza cultivo. (Weeds in green beans. 1. Weed-crop relationship). In Heredia, M. do C.V. de; Casali, V.W.D., coord. Seminarios de Olericultura. Vicosa-MG, Brasil, Universidade Federal de Vicosa. v.7,pp.20-40. Span., 39 Refs. [Univ. Austral de Chile, Casilla 567, Valdivia, Chile]

Phaseolus vulgaris. Snap beans. Weeds. Empoasca. Diabrotica balteata. Tetranychus. Apion. Heliothis. Sterogyra. Vaginula. Ascochyta phaseolorum. Pythium. Cercospora. Uromyces. Sclerotinia sclerotiorum. Pseudomonas syringae. Meloidogyne. Pratylenchus.

A literature review on weed/green beans interaction is presented as a basis

for future research work on weed control. A list of damaging weeds found in bean crops is included. The concept of competition is discussed with special reference to competition for water, light, and nutrients, their effects on bean, and critical periods. Weeds are considered alternate host plants of bean pests (Empoasca sp., Diabrotica balteata, Tetranychus spp., Apion, Heliothis sp., Sterogyra sp., Vaginula sp.), diseases (Ascochyta phaseolorum, Pythium sp., Cercospora sp., Uromyces sp., Sclerotinia sclerotiorum, Pseudomonas syringae), and nematodes (Meloidogyne sp. and Pratylenchus sp.). Other problems associated with weeds include those occurring at bean harvest, and seed contamination. Allelopathy effects are discussed as well as the bean-weed-insect interaction. Weeds reduce green bean production between 20-41%. (Summary by EDITEC) DO2

0298

21099 FUENTES P., J.R. 1983. Las malezas en el cultivo de fréjol de vaina (Phaseolus vulgaris L.). 2. Métodos de control de malezas. (Weeds in green beans. 2. Weed control methods). In Heredia, M. do C.V. de; Casali, V.W.D., coord. Seminarios de Olericultura. Vicosa-MG, Brasil, Universidade Federal de Vicosa. v.7,pp.41-57. Span., 35 Refs. [Univ. Austral de Chile, Casilla 567, Valdivia, Chile]

Phaseolus vulgaris. Snap beans. Weeds. Weeding. Cultural control. Chemical control. Biological control. Socioeconomic aspects. Planting. Spacing. Rotational crops. Cover crops.

A literature review was made on the different weed control methods in green bean crops. The following control methods are discussed: cultural (plant density, earthing up, mulching, and crop rotations); mechanical; chemical (preplant incorporated, preemergence, and postemergence herbicides; herbicide mixtures); and biological (e.g., Hymenia recurvalia in Amaranthus dubius). Socioeconomic aspects of weed control in beans are analyzed. The weed control system to be used will be specific for each region and will be determined by both socioeconomic and agroecologic characteristics. (Summary by EDITEC) DO2

0299

*GALVEZ, V.M.; CRIOLLO E., H. 1981. Competencia entre el frijol [Phaseolus vulgaris] var. Diacol Andino y las malezas. In Seminario de la Sociedad Colombiana de Control de Malezas y Fisiologia Vegetal, 13, Reunion Asociacion Latinoamericana de Fisiologia Vegetal, 8, Cali, Colombia, 1981. Resumenes. Pasto, Colombia, Univ. de Narino. Fac. Ciencias Agricolas. p.14.

0300

22155 GLAZE, N.C.; PHATAK, S.C. 1982. Weed control in snapbeans. Proceedings of the Southern Weed Science Society no.35:118-128. Engl., Sum. Engl., 14 Refs.

Phaseolus vulgaris. Snap beans. Cultivars. Weeds. Weeding. Herbicides. Yields. USA.

Eighteen herbicides were evaluated alone or in combination between 1970-76 in Georgia (USA) to determine crop tolerance, weed control potential, and effect of treatments on yield of snap bean cv. GV-50. Three treatments had yields equal to the hand-weeded check: nitralin at 0.6 kg/ha, the methyl ester of chloramben at 2.2 kg/ha applied preplant incorporated, and trifluralin applied preplant incorporated at 0.6 kg/ha, followed by dinoseb at 1.7 kg/ha applied at ground cracking. Yields from EPTC treatments were

highest in those years when yellow nutsedge (Cyperus esculentus) was a significant weed. Fluorodifen and the methyl ester of chloramben were compared as preplant incorporated and preemergence applications. In all but 1 test for each herbicide, the yields of the preemergence treatments increased as the rate increased while the yields decreased when both were applied preplant incorporated in all tests. Several dinitroaniline herbicides were tested and were comparable in weed control and yields. (Author's summary) D02

0301

*GLAZE, N.C. 1975. Weed control in snapbeans. HortScience 10(3):332-333.

0302

13569 GONZALEZ A., J. Control químico de malezas en el cultivo de la habichuela (*Phaseolus vulgaris* L.) en la zona de Santágueda. *(Chemical weed control of snap bean crops in the Santágueda area).* Tesis Ing. Agr. Manizales, Colombia, Universidad de Caldas. Facultad de Agronomía, 1975. 64p. Span., Sum. Span., 25 Refs., Illus.

Phaseolus vulgaris. Weeding. Herbicides. Plant injuries. Experiment design. Colombia.

With the objective of finding a herbicide that helps solve the problem of weed control in snap beans, a trial was conducted with 7 herbicides on the "Montelindo" farm, located in the Santágueda zone, state of Caldas (Colombia). Bean var. used was "Raleo" with a direct planting system without thinning. The exptl. design used was random block with 23 treatments and 4 replications. The herbicides tested were: linuron, alachlor, methabenzthiazuron and dinitro as preemergents; trifluralin as P.P.I.; and AC 553-dinoseb acetate as postemergent. Each one of the herbicides was used at 3 different rates. The effects of the herbicides were evaluated according to the following parameters: (a) germination expressed as a %; (b) crop phytotoxicity using the conventional scale utilized by the ICA; (c) wt. of the weeds present in two 0.25 x 0.50 m areas in each plot; (d) determination of the species with the common and scientific names of the weeds tested, and (e) the yields, by weighing the production of each plot. The predominant weeds in the snap bean crop were broadleaf weeds among which *Eleusine indica, Digitaria sanguinalis* and *Cynodon dactylon* were found. The broadleaf weeds found in the lot where the trial was conducted were, mainly, *Borreira* sp., *Commelina difusa* and *Emilia sonchifolia.* The herbicide that showed the highest effectiveness in weed control was dinitro at a rate of 16.01 l/ha. A very high phytotoxicity occurred with herbicides methabenzthiazuron (10 kg/ha) and dinuron (4 kg/ha). These products caused the total death of the plants. Methabenzthiazuron (2.5 kg/ha) and alachlor (4 kg/ha) were considered as promissory treatments. No significant differences were found among treatments for broadleaf weed control. *(Author's summary. Trans. by L.M.F.)* D02 K00

0303

24886. GONZALEZ, A.R.; GAVIN, J.C.; MARX, D.B. 1984. EFFECT OF PLANTING DATE, SIEVE SIZE AND CULTIVAR ON COLOR OF SNAP BEANS. ARKANSAS FARM RESEARCH 33(2):8. EN. IL.

THE EFFECT OF PLANTING DATE, CV., AND SIEVE SIZE ON THE COLOR OF SNAP BEAN CV. GALLATIN VALLEY 50, EARLY BIRD, BLUE MOUNTAIN, EPOCH, AND THE BREEDING LINE USDA-711 WAS EVALUATED AT THE MAIN EXPT. STATION IN FAYETTEVILLE [ARKANSAS, USA]. THE CUT BEAN PODS WERE BLANCHED FOR 3 MIN IN BOILING WATER, COOLED IN RUNNING TAP WATER, AND THEN FROZEN AND STORED AT -20 DEGREES CELSIUS. THE DATA WERE

STATISTICALLY ANALYZED IN SPLIT-SPLIT PLOT DESIGN. THE RESULTS INDICATED THAT CV. AND SIEVE SIZE HAVE A STRONG EFFECT ON THE COLOR OF SNAP BEANS, AND THAT THE PLANTING DATE IS NOT CRITICAL. BREEDING LINE USDA-711 SHOWED THE DARKEST GREEN COLOR AND THE HIGHEST CHLOROPHYLL CONTENT AS COMPARED WITH THE OTHER CV. GALLATIN VALLEY 50 AND EARLY BIRD SHOWED THE LIGHTEST GREEN COLOR AND THE MOST VARIABILITY IN COLOR BETWEEN SIEVE SIZES. [CIAT].

0304

24288 GONZALEZ, A.R.; SISTRUNK, W.A.; MARX, D.B.; MORELOCK, T.E. 1983. Comparative study of three snap bean mechanical harvesters. Arkansas Farm Research 32(4):4. Engl.

Phaseolus vulgaris. Harvesting. Mechanization. Snap beans. Agricultural equipment. USA.

Three harvesters (FMC model GB-110, Chisholm-Ryder Multi-Density, and 2-row Chisholm-Ryder Hi-Boy) were compared in 2 expt. as to their efficiency in harvesting snap bean cv. Gallatin Valley 50 at 472,000 and 212,503 plants/ha. The 3 harvesters provided similar harvest efficiency (75.0, 81.9, and 63.3%, resp.) and quality of snap beans. The stage of pod maturity may significantly affect the performance of the harvesters and the quality of raw product. An important advantage of the 1st 2 harvesters is that under the same field conditions they could harvest 2.6 times faster than the latter harvester. [CIAT]

0305

21583 GONZALEZ, A.R.; SISTRUNK, W.A.; MARX, D.B.; MORELOCK, T.E. 1983. Efficiency of three harvesters and their effect on quality of raw and processed snap beans. HortScience 18(5):742-745. Engl., Sum. Engl., 21 Refs., Illus. [Dept. of Food Science, Univ. of Arkansas, Fayetteville, AR 72701, USA]

Phaseolus vulgaris. Harvesting. Mechanization. Agricultural equipment. Snap beans. Yields. USA.

The efficiency of 3 mechanical harvesters (FMC Model GB-110, Chisholm-Ryder Multi Density, and Chisholm-Ryder Hi-Boy) in 2 snap bean production systems is compared. The 3 harvesters tested provided about the same harvest efficiency. Harvesters did not show significant differences in sound, broken, and bruised pods harvested from 2 fields. More pod clusters and less trash were obtained in the field with more mature pods. Under the same field conditions, 2.6 times more snap beans could be harvested with the FMC model GB-110 and Chisholm-Ryder Multi-Density than with the Chisholm-Ryder Hi-Boy. Quality differences of canned beans harvested with the machines were too small to differentiate by the USDA standards for grades of canned snap beans. (Author's summary) D02

0306

*HARRIS, G.K.; STONE, J.D. 1974. Cobex - a new herbicide in beans. Proceedings of the Western Society of Weed Science 27:47.

0307

*HARVEY, R.G.; JANSEN, G.E. 1978. Differential susceptibility of various vegetable and field crops to EPTC. Proceedings of the North Central Weed Control Conference 33:172.

0308

*HATFIELD, H.K.; WARHOLIC, D.T.; SWEET, R.D. 1978. Dinitroaniline toxicity to gelinsoga, ragweed, and several crops. Proceedings of the Northeastern Weed Science Society 32:141-150.

0309

*HEMPHILL JUNIOR, D.D.; MONTGOMERY, M.L. 1981. Response of vegetable crops to sublethal application of 2,4-D. Weed Science 29(6):632-635.

0310

1738 HENDERSON, J.R., BUESCHER, R.W. and MORELOCK, T.E. **Broken-end discoloration in snap bean varieties.** Arkansas Farm Research 26(4):12. 1977. Engl.

Phaseolus vulgaris. **Pods. Temperature. Cultivars. Plant injuries. Water requirements. Harvesting.**

Of 48 *Phaseolus vulgaris* var. grown in at least 2 yr, NCX8005 and Regal were the least prone to discoloration after damage during handling. A comparison of Blue Crop and NCX8005, which discolor slightly, with Provider and GP72-122, which are prone to discoloration, showed that discoloration is positively related to capacity for the rapid synthesis of simple phenols. *(Summary by Plant Breeding Abstracts)* D02

0311

*HIGGINS, E.R.; PRUSS, S.W. 1978. Metolachlor tolerance in snapbeans and kidney beans. Proceedings of the Northeastern Weed Science Society 32:151.

0312

26064. HILLS, W.A.; DARBY, J.F.; THAMES JUNIOR, W.H.; FORSEE JUNIOR, W.T. 1953. BUSH SNAP BEAN PRODUCTION ON THE SANDY SOILS OF FLORIDA. GAINESVILLE, UNIVERSITY OF FLORIDA. AGRICULTURAL EXPERIMENT STATIONS. BULLETIN NO.530. 23P. ENGL., 8 REFS.

VARIOUS ASPECTS OF BUSH SNAP BEAN PRODUCTION ON THE SANDY SOILS OF FLORIDA [USA] ARE REVIEWED, NAMELY SOIL AND CLIMATIC REQUIREMENTS AND CULTURAL PRACTICES [LIMING, FERTILIZATION, NUTRITIONAL SPRAYS AND DUSTS, SOIL PREPARATION, PLANTING, CULTIVATION, HARVESTING, AND PACKING]. VAR. TENDERGREEN, WADE'S BUSH, STRINGLESS BLACK VALENTINE, CONTENDER, PLENTIFUL, BOUNTIFUL, CHEROKEE WAX, LOGAN, TOPCROP, AND RIVAL ARE BRIEFLY DESCRIBED. THE MAIN DISEASES [COLLETOTRICHUM LINDEMUTHIANUM, UROMYCES PHASEOLI, ERYSIPHE POLYGONI, SCLEROTINIA SCLEROTIORUM, PELLICULARIA FILAMENTOSA, PSEUDOMONAS PHASEOLICOLA, XANTHOMONAS PHASEOLI, AND BCMV] AND INSECT PESTS [CUTWORMS, ARMYWORMS, URBANUS PROTEUS, EMPOASCA FABAE, TETRANYCHUS SPP., LIRIOMYZA PUSILLA, THRIPS, NEZARA VIRIDULA, HALTICUS BRACTEATUS, AND ELASMOPALPUS LIGNOSELLUS] ARE MENTIONED AS WELL AS THEIR CONTROL MEASURES. [CIAT].

0313

HOFFMAN, J. C. Injury of snap bean pods associated with machine harvesting and handling. Journal of the American Society for Horticultural Science 96(1): 21-24. 1971. Engl. Sum. Engl. 7 Refs. Illus.

Phaseolus vulgaris. Plant injuries. Pods. Harvesting. Crop loss causes.

The harvesting of snap beans by machine caused obvious as well as unnoticed injury to the pods. All pods were injured, but injury varied in severity. Machine-harvested pods lost a significantly greater amount of weight than did corresponding samples of hand-picked pods. Cultivars differed in response to injury as well as ease with which they abscissed from the plant. The cv. Provider was easy to harvest by machine and received less injury than other cultivars studied. Snap bean cultivars with greater hair concentration per unit area lost weight more rapidly, and to a greater extent than those with sparse hairs. A small but significant amount of weight was lost through the pedicel and possibly the calyx. Pods with broken pedicel ends were similar in weight lost to pods having the pedicel removed. Broken shanks near the pedicel healed rapidly and did not contribute to a large amount of weight loss. Rubbing snap bean pods lightly caused a very significant amount of injury. The hairs on the pods were broken, split or pulled from the base, and these injured areas were the site of significant weight loss. Broken or split hairs did not heal, but continued to be a source of water loss. (Author's summary).

0314

* HOPEN, H.J. 1974. Performance of bentazon in combination with preplant and preemergence herbicides for snap beans. Proceedings of the North Central Weed Control Conference 29:73.

0315

* ILNICKI, R.D.; MICHIEKA, R.W.; SOMODY, J. 1977. The effects of some preemergence herbicides and herbicide combinations on snapbeans and lima beans. Proceedings of the Northeastern Weed Science Society 31:268-269.

0316

*ILNICKI, R.D.; MICHIEKA, R.W. 1977. The response of snapbeans and lima beans to some dinitroaniline herbicides. Proceedings of the Northeastern Weed Science Society 31:266-267.

0317

*ILNICKI, R.D.; HERMAN, D.J.; SOMODY, J. 1975. Effects of some preplant incorporated herbicides on weed control in snapbeans and lima beans. Proceedings of the Northeastern Weed Science Society 29:197-198.

0318

* INSTITUTE OF AGRICULTURAL RESEARCH. ETHIOPIA. 1976. Rapport 1973-4. Addis Ababa, Ethiopia. Inst. Agric. Res. 174p.

0319

*JEANPLONG, J. 1973. Investigation of the weed flora of North Vietnam. Botanikai Kozlemenyek 60(3):167-175.

0320

*JENSEN, K.I.N. 1978. Weed control in snap beans. In Canada Department of Agriculture Research Station. Annual Report 1978. Kentville, Nova Scotia. pp.87-90.

0321

23996 KEULS, M.; MARIAKIS, G.F.P.; MAGID, A.H.A. 1984. The relationship between pod yield and specific leaf area in snapbeans: an example of stepwise multivariate analysis of variance. Scientia Horticulturae 23(3):231-246. Engl., Sum. Engl., 13 Refs., Illus. [Dept. of Mathematics, Agricultural Univ., P.O. Box 30, Wageningen, Netherlands]

Phaseolus vulgaris. Snap beans. Statistical analysis. Leaf area. Yields. Netherlands.

After a detailed (univariate) analysis of variance, stepwise multivariate analysis of variance (stepwise MANOVA) was used on the exptl. data obtained from an investigation with snap beans carried out in the arid regions of Shambat (Sudan). The relationship between pod yield and specific leaf area (SLA) for 3 snap bean cv. (Giza 3, Daria, and Slankette) and 4 sowing dates was examined. Four variables over plots were considered, namely, yield earliness, total yield, SLA earliness, and av. SLA. From a stepwise MANOVA, it appeared that the cv. effect was primarily expressed by yield earliness and total yield. SLA earliness and av. SLA provided no additional cv. effect. Furthermore, the sowing date effect could be expressed mainly by SLA earliness and yield earliness. Finally, the interaction effect played a minor part compared with the sowing date and cv. effect. [AS]

0322

14347 KISH, A.J. and OGLE, W.L. Improving the heat unit system in predicting maturity date of snap beans. HortScience 15(2):140-141. 1980. Engl., Sum. Engl., 20 Refs., Illus.

Phaseolus vulgaris. Water requirements. Water content. Agricultural equipment. Maturation. Harvesting. Cultivars.

Field expt. were conducted at Clemson U. (USA) every yr from 1975-78 to study the accuracy of the heat unit system in predicting maturity date of snap beans. The growing-degree day method was found to be unreliable. Indications were that other environmental factors, in addition to temp., affected the maturity of this crop. The available soil moisture for each of 10 plantings grown under natural rainfall varied greatly. Because of the unreliability of the heat unit method, it was decided to integrate the available soil moisture parameter into the degree day method. The formula that gave the smallest C.V. was one using the daily heat unit multiplied by a ratio of the available soil moisture to a constant soil moisture value. Predicting the maturity of snap beans was improved by integrating available soil moisture into the heat unit system. *(Author's summary)* D02

0323

17704 KOSTEWICZ, S.R.; TYSON, R.V.; STALL, W.M. 1981. Bush snap bean yields as influenced by row spacing and weed population. Proceedings of the Florida State Horticultural Society 94:127-129. Engl., Sum. Engl., 8 Refs., Illus.

Phaseolus vulgaris. Snap beans. Dwarf beans. Spacing. Planting. Weeding. Yields. USA.

Bush snap bean cv. Sprite was planted in the fall of 1980 at 12, 18, 24, and 36-in. rows with 1.5-in.-row spacings on a St. John's fine sand near Gainesville, Florida (USA). Beans were either cultivated once or left uncultivated. Total and marketable pod yields increased as plant density increased. A single between-row cultivation 21 days after planting resulted in a doubling of yield, however, yields in general were low due to heavy in-row weed pressures. In the spring 1981 season, 12, 18, and 36-in rows and 1.5-in. in-row spacings were used in combination with 4 weed control treatments (weed-free, DCPA broadcasted preemergence, DCPA 8-in banded preemergence over the row, and weedy check) and 3 cultivation levels (0, 1, and 2). Highest yields of marketable and total pods were associated with closer spaced rows (high plant population) and lowest weed densities (weed-free growing area). Cultivation was effective in reducing weed levels and increased yields at wide row spacings, but decreased yield at 12-in. row spacing. *(Author's summary)* D02

0324

7503 LAY, M. M., HERMAN, D. and ILNICKI, R. D. Response of snapbeans and lima beans to trifularin, alone and in combination with several herbicides. Northwestern Weed Science Society. Proceedings 27:184-191. 1973. Engl., Sum. Engl.

Phaseolus vulgaris. Phaseolus lunatus. Weeding. Weeds. Herbicides. USA.

An evaluation was made of the effectiveness of herbicides for broad spectrum weed control in french beans var. Tendercrop and lima beans var. Fordhook Alachlor produced better broadleaf weed control with preemergence than with preplant-incorporated (PPI) applications. The reverse was true for CGA 10832. Combinations of alachlor with metobromuron gave excellent weed control when applied preemergence. Other good combinations included trifluralin and alachlor applied PPI or trifluralin applied prior to planting followed by fluorodifen and metobromuron, applied to the surface after planting. The combination of applying herbicides prior to planting, then followed by preemergence applications of herbicides, also proved effective for CGA 10832 and EPTC, applied PPI, followed by fluorodifen. Some new formulations of chloramben appeared to be more effective than the older formulation. *(Author's summary)* D02

0325

*LEEFE, J.S. 1973. Herbicides for snap beans. In Canada Department of Agriculture Research Station. Annual Report 1978. Kentville, Nova Scotia. pp.52-53.

0326

*LEEFE, J.S. 1973. Weed control [in vegetables]. In Canada Department of Agriculture Research Station. Annual Report 1978. Kentville, Nova Scotia. pp.37-38.

0327

*LEELA, D. 1981. Bioassays for detection of soil residues. Pesticides 15(5):24-26.

0328

*LEHMAN, S.K.; HANSEN, J.R. 1976. Hercules 26905 - a new herbicide for field crops and horticultural uses. Proceedings of the North Central Weed Control Conference 30:77.

0329

*LEHMAN, S.K.; DICKSON, T.K. 1976. Hercules 26905, a phosphate herbicide (Abstract). In Annual Meeting Southern Weed Science Society, 29, 1976. Proceedings. Delaware, USA. Hercules Inc., Wilmington. p.438.

0330

*LICHTNER, F.T. 1982. Amitrole absorption by Phaseolus roots. Plant Physiology 69(4):45.

0331

27242. LOCASCIO, S.J.; STALL, W.M. 1983. WEED CONTROL IN SNAP BEANS. PROCEEDINGS OF THE FLORIDA STATE HORTICULTURAL SOCIETY 96:90-92. EN. SUM. EN., 3 REF. (VEGETABLE CROPS DEPT., INST. OF FOOD AND AGRICULTURAL SCIENCES, UNIV. OF FLORIDA, GAINESVILLE, FL 32611, USA)

SNAP BEANS WERE GROWN TO EVALUATE 12 HERBICIDES IN 1982-83. PRINCIPAL WEEDS WERE EUPHORBIA HIRTA IN 1982 AND BRASSICA KABER IN 1983. ADEQUATE BROAD-LEAVED WEED CONTROL WITHOUT REDUCTION IN VIGOR WAS PROVIDED BY 0.85 KG ETHALFLURALIN + 3.30 KG EPTC/HA, AND 2.20 KG METOLACHLOR/HA. TRIFLURALIN AT 0.85 KG/HA PROVIDED ADEQUATE CONTROL IN 1983, BUT NOT IN 1982. PREEMERGENCE TREATMENTS THAT PROVIDED CONTROL OF BRACHIARIA PLATYPHYLLA IN 1982 AND DIGITARIA SANGUINALIS AND ELEUSINE INDICA IN 1983 INCLUDED ETHALFLURALIN + EPTC, 0.85 KG PENDIMETHALIN/HA, AND 2.20 KG METOLACHLOR/HA. POSTEMERGENCE GRASS CONTROL WAS EXCELLENT WITH 0.22 KG SETHOXYDIM/HA, 0.28 KG FLUAZIFOP- BUTYL, AND 0.28 KG CGA 82725 (CHLORAZIFOP). MODERATE TO GOOD SEDGE CONTROL WAS OBTAINED WITH EPTC AND METOLACHLOR TREATMENTS. (AS).

0332

*LOPEZ, M.J.; LEIHNER, D.E. 1981. Control quimico de malezas en policultivos con yuca (Manihot esculenta, Crantz). In Seminario de la Sociedad Colombiana de Control de Malezas y Fisiologia Vegetal, 13, Reunion Asociacion Latinoamericana de Fisiologia Vegetal, 8, Cali, Colombia, 1981. Resumenes. Cali, Centro Internacional de Agricultura Tropical. p.9.

0333

*LUIB, M.; HIEPKO, G.; WEERD, J.C. VAN DE 1974. Basagran, a new selective post-emergence herbicide. In East African Weed Control, 5, Conference, Nairobi, 1974. Proceedings. 11p.

0334

*LUMKES, L.M.; VELDE, H.A. TE Protection of wind erosion: minimum cultivation techniques on soils susceptible to blowing when growing sugarbeet, potato, etc. in rye as a cover crop. In

British Weed Control Conference, 12, Brighton, 1974. Proceedings. pp.1073-1079 .

0335

17964 MACARTNEY, J.C. 1960. The history of the canning bean industry in Tanganyika. Tengeru, Tanzania, Northern Regional Research Centre. 11p. Engl.

Phaseolus vulgaris. Canned beans. History. Snap beans. Seed characters. Cultivation. Uromyces phaseoli. Symptomatology. Etiology. Disease control. Stored grain pests. Tanzania.

A historial review on the canning bean industry in Tanganyika, Tanzania, is given along with prospects for growing white haricot beans in the Northern Province. The problem of hard seed is discussed in detail and the following recommendations are given to eliminate this problem: (1) seed from hard-seeded parents should not be planted or soft seed should be selected through a breeding program; (2) planting should take place under adequate conditions in order to ensure good early germination; and (3) information as to optimum temp. and RH for storing should be obtained. The symptomatology, etiology, and control methods of rust (Uromyces appendiculatus), the major bean disease in Tanganyika, are described. Damage caused to the seed under field and storage conditions and recommended control measures for major pests in the Northern Province [bruchids (Acanthoscelides obtectus), Callosobruchus chinensis, and C. maculatus] are listed. Standard specifications of the white canning haricot and aspects of its cultivation are given. (Summary by F.G. Trans. by L.M.F.) D02

0336

*McLAUGHLIN, M.F.; SWEET, R.D.; SHANNON, S. 1976. Weeds and crop growth. Proceedings of the Northeastern Weed Science Society 30:105-117.

0337

14115 MANGUAL C., G. 1981. Effect of two planting systems on density and yield of snap beans (*Phaseolus vulgaris* L.). Journal of Agriculture of the University of Puerto Rico 65(4):313-316. Engl., Sum. Engl., Span., 5 Refs.

Phaseolus vulgaris. Planting. Spacing. Yields. Field experiments. Puerto Rico.

The double row planting system was compared with the single row planting system, currently used in Puerto Rico, in a trial conducted with snap bean commercial var. Blue Lake 47 at the Isabela Agricultural Expt. Substation. A Latin square design was used with 7 treatments and 7 replications. Planting in double rows increased plant stand in all treatments, registering a 48% increment over the conventional single row planting. Optimum planting distance in the double row system was 0.30 m between double rows and 0.60 m between pairs of double rows. With this system, yields of 6464 kg/ha are obtained in a simulated once-over harvest. *(Author's summary)* D02

0338

16969 MANGUAL-CRESPO, G.; GONZALEZ, A.L. 1981. Preliminary evaluation of a snap bean harvester in southern Puerto Rico. Journal of Agriculture of the University of Puerto Rico 65(2):138-141. Engl., Sum. Engl., Span., 7 Refs.

Phaseolus vulgaris. Agricultural equipment. Harvesting. Pods. Labour. Crop losses. Field experiments. Puerto Rico.

This study showed that there were no significant differences between yields of manually harvested and mechanically harvested snap bean. The time required to harvest 1 ha differed significantly being 395 and 100.7 man hours for manual and mechanical harvesting, resp. Although the % of trash harvested (mechanically) was high (32.8%) it could be reduced with adequate blower and reel calibration. *(Summary by Abstracts on Tropical Agriculture)* D02

0339

13557 MANGUAL C., G. and TORRES, C.J. Response of pole beans (*Phaseolus vulgaris* L.) to various plant densities. Journal of Agriculture of the University of Puerto Rico 63(4):465-468. 1979. Engl., Sum. Engl., Span., 9 Refs., Illus.

Phaseolus vulgaris. Cultivars. Spacing. Planting. Field experiments. Yields. Puerto Rico.

The effect of 4 spacings within the row (8, 15, 23 and 30 cm) on the marketable yield of 4 commercial pole bean var. (McCaslan 42, Romano, Kentucky 191 and Blue Lake S-7 Stringless), was evaluated on a winter planting at the Adjuntas Experiment Substation. At the 8 cm spacing, var. Romano was the highest yielder (12,523 kg/ha) while Kentucky 191 had the lowest (9,542 kg/ha). At 15 cm, Kentucky 191 yielded 10,004 kg/ha; and McCaslan 42 only 8,297 kg/ha. At 23 cm, Blue Lake S-7 was highest in yield (11,587 kg/ha) while Romano had the lowest (5,928 kg/ha). At 30 cm, Kentucky 191 was the highest yielder (9,442 kg/ha) while McCaslan 42 was the lowest (4,659 kg/ha). *(Author's summary)* D02

0340

9913 MANGUAL-CRESPO, G. and TORRES, C.J. Response of snapbeans to increasing plant density. Journal of Agriculture of the University of Puerto Rico 62(4):399-403. 1978. Engl., Sum. Engl., Span., 8 Refs., Illus.

Phaseolus vulgaris. Spacing. Cultivars. Yields. Puerto Rico.

The effect of 5 row spacings (30, 45, 60, 75 and 90 cm) on the marketable yield of 3 commercial french bean var. (Blue Lake 47, Astro, and Harvester) was evaluated in a spring planting at the Isabela and Adjuntas substations. At Isabela, the highest yields of Blue Lake 47 (17,084 kg/ha) were obtained at 45 cm between rows; the lowest (8406 kg/ha) at 90 cm. Max yields of Harvester (12,353 kg/ha) were obtained at 30 cm, followed closely by 11,927 kg/ha at 45 cm. At Adjuntas, the highest yields of Astro (8497 kg/ha) were obtained with 30 cm between rows; the lowest (5000 kg/ha) with 75 cm. Max yields of Harvester (8564 kg/ha) were obtained with 45 cm, followed by 8161 kg/ha with 30 cm. The low[illegible] yield (3856 kg/ha) was obtained with 90 cm. In both localities, plants spaced 30 and 45 cm between rows were significantly taller than those at wider spacings due to competition for light. *(Author's summary)* D02 D05

0341

9544 MANGUAL c., G. Effect of two harvesting systems on the yield and seed percentage of snap beans, *Phaseolus vulgaris*, in the Isabela area. Journal of Agriculture of the University of Puerto Rico 61(3):275-278. 1977. Engl., Sum. Engl., Span., 3 Refs., Illus.

Phaseolus vulgaris. Harvesting. Seed. Yields. Cultivars. Marketing. Production. Agricultural equipment. Puerto Rico.

Optimum marketable yields of 5560, 3991 and 5672 kg/ha were obtained on a Coto clay oxisol in Puerto Rico when french bean var. Wade was harvested using the once-over system at 55 days; Tendergreen at 49 days and Contender at 47 days, respectively. In the multiple harvesting system, marketable yields of Wade, Tendergreen and Contender were of the order of 5381, 3632 and 6995 kg/ha in 2, 3 and 2 pickings, respectively. Mean differences were not significant. The once-over

harvesting system should be preferred because production costs are lower. (*Author's summary*) D02

0342

11141 MANGUAL C., G. **Edad óptima para la recolección de habichuelas tiernas en la zona de Isabela.** (*Optimum age for once-over harvesting of french beans in Isabela*). Rio Piedras, Universidad de Puerto Rico. Estación Experimental Agrícola. Boletin no. 244. 1976. 12p. Span., Sum. Engl., Span., 10 Refs.

Phaseolus vulgaris. **Cultivars. Age. Harvesting. Yields. Production. Fibre content. Temperature. Puerto Rico.**

Four french bean planting dates were compared (Jan., Apr., Jul., Oct.) including 3 var. (Wade, Tendergreen, Contender) to determine the best date for once-over harvesting at Isabela, Puerto Rico. The highest marketable yield (4.5 t/ha) was obtained from the Oct. planting of Contender 45 days after planting. The shortest period to harvest was 43 days for the Apr. planting of Tendergreen and Contender; the longest period 57 days for the Jan. planting of Wade. None of the var. tended to be determinate. Flowering was uniform and progressive in Wade and Tendergreen, but irregular in Contender. In general pods of the Apr. planting were the most fibrous; those of the Jul. planting, the least. Contender had the highest fiber content. (*Summary by Abstracts on Tropical Agriculture*) D02

0343

5807 MANGUAL C., G. Effect of time of planting on the marketable yield of two snap bean varieties at Isabela, Puerto Rico. Journal of Agriculture of the University of Puerto Rico 59(3):219-221. 1975. Engl., Sum. Engl., Span., 5 Refs.

Phaseolus vulgaris. **Planting. Yields. Cultivars. Experiment design. Field experiments. Harvesting. Puerto Rico.**

Experimental plantings of french beans at Isabela, Puerto Rico demonstrated that the optimal planting season extends from Dec. to March. The variety contender outyielded Wade in all plantings and showed a tendency to flower twice. This characteristic is not detrimental if the harvest is to be made in several pickings but could be unfavorable if the once-over harvest system is to be adopted. (*Author's summary*) D02

0344

28615. MASCIANICA, M.P.; WILSON, H.P.; WALDEN, R.F.; HINES, T.E.; BELLINDER, R.R. 1986. NO-TILLAGE SNAP BEAN GROWTH IN WHEAT STUBBLE OF VARIED HEIGHT. JOURNAL OF THE AMERICAN SOCIETY FOR HORTICULTURAL SCIENCE 111(6):853-857. EN. SUM. EN., 18 REF., IL. (BASF CORPORATION, CHEMICAL DIVISION, PARSIPPANY, NJ 07054, USA)

BUSH-TYPE SNAP BEANS WERE SEEDED BY A NO-TILLAGE METHOD INTO STANDING WHEAT STUBBLE OF 8, 15, 23, 30, AND 38 CM IN HEIGHT TO EVALUATE THE EFFECTS OF STUBBLE HEIGHT ON POD MECHANICAL HARVEST EFFICIENCY, PLANT MORPHOLOGY, ANDSHOOT COMPONENT YIELD. BASAL INTERNODE ELONGATION, STEM PLUS LEAF YIELDS, PODYIELDS, EFFICIENCY OF MECHANICAL POD HARVEST, AND HEIGHT OF BASAL POD SET WERE RELATED IN A POSITIVE LINEAR OR CURVILINEAR FASHION TO WHEAT STUBBLE

HEIGHT. QUANTITY OF PODS MISSED DURING MECHANICAL POD HARVEST WAS RELATED NEGATIVELY TO HEIGHT OF BASAL POD SET. HARVEST EFFICIENCY WAS MAXIMIZED WITH STUBBLE HEIGHTS OF 15-30 CM, AND THESE NO-TILLAGE SYSTEMS YIELDED MECHANICALLY HARVESTED PODS LEVELS THAT EQUALED OR EXCEEDED THOSE OF A CONVENTIONAL TILLAGE (PLOW, DISK 2 TIMES) SYSTEM. SUPERIOR MECHANICAL POD HARVEST EFFICIENCY WAS ATTRIBUTED TO INCREASED BASAL INTERNODE LENGTH AND MECHANICAL SUPPORT OF THE SHOOTS BY THE WHEAT STUBBLE. (AS).

0345

*MAY, C. 1974. Peas and green beans - post-emergence weed control with bentazone. Agricultural News from BASF no.9:15-16.

0346

*MAURITIUS SUGAR INDUSTRY RESEARCH INSTITUTE. 1976. Annual Report 1975. Reduit, Mauritius. 68p.

0347

10676 MEAKINS, L. **Recent technological developments in the New South Wales green bean industry.** Sydney, New South Wales, Department of Agriculture, 1978. 1p. Engl.

Paper presented at Bean Improvement Workshop, Sydney, Australia, 1978.

Phaseolus vulgaris. **Harvesting. Seed. Mechanization. Agricultural equipment. Planting. Australia.**

Due to the high cost of harvesting, an analysis is made of the development of a new technology in the bean industry. Reference is made to different imported machinery: the single-row mechanical picker; the open front harvester, which permits a more efficient spatial arrangement of the plants and higher crop yields; the pneumatic precision seed drill, which eliminates seed injury and reduces the quantity of seed required up to 40%. Planting systems have changed a lot due to the introduction of this machinery, but there has been relatively little change in commercial bean var. (*Summary by F.G. Trans. by L.M.F.*) D02

0348

*MEDINA, L.; FISCHER, A.; TASISTRO, A. 1980. Determinacion del periodo critico de competencia entre las malezas y un cultivo de asociacion mais-frijol bajo dos niveles de fertilizacion. Mexico, Universidad Autonoma de Chapingo. Circular Tecnica, Departamento de Parasitologia, no.6. 1p.

0349

*MEISSNER, R. 1974. The effect of some herbicides on the germinating seeds of some bean varieties. Crop Production 3:81-87.

0350

*MONACO, T.J.; SANDERS, D.C. 1976. Promising new herbicides for vegetable crops. In Annual Meeting Southern Weed Science Society, 29, 1976. Proceedings. Raleigh, USA, N. Carolina State Univ. pp.210-218.

0351

*MONACO, T.J.; WEBER, J.B. 1973. Alachlor - a herbicide for selected vegetable crops. In Annual Meeting Southern Weed Science Society, 26, New Orleans, Louisiana, 1973. Proceedings. pp.205-214.

0352

*MORRIS, R.O. 1974. The control of weeds in green beans [Phaseolus vulgaris]. In British Weed Control Conference, 12, London, 1974. Proceedings. London, UK; British Crop Protection Council. pp.419-426.

0353

21018 MOSS, G.I.; MUIRHEAD, W.A. 1983. Agronomic assessment of snap beans (Phaseolus vulgaris) in a warm-temperature semi-arid environment. Journal of Agricultural Science 101:657-667. Engl., Sum. Engl., 10 Refs., Illus. [Commonwealth Scientific & Industrial Research Organization, Centre for Irrigation Research, Griffith, N.S.W. 2680, Australia]

Phaseolus vulgaris. Snap beans. Planting. Timing. Temperature. Flowering. Podding. Dry matter. Rainfall. Rainfall data. Water requirements. Yields. Yield components. Australia.

The production of green beans was studied in sowings made from Dec.-Feb., Sept.-Feb., and from Oct.-Feb. in 3 seasons, and over 6 consecutive seasons for a midseason sowing. With Sept.-Oct. sowing the rate of emergence was slow and establishment sometimes poor. A possible viral disease and the lack of continuity of pod set, resulting from cool weather, were problems. Good yields, up to 19.6 t/ha, were obtained from midseason sowings (31 Oct.- 18 Dec.) with good yields for late sowings up to 13.9 t/ha in the 1st 3 seasons. In another 3 seasons, midseason sowings (late Nov.-early Dec.) resulted in poor yield due to periods of hot weather (over 35°C max.) prior to and during flowering. Quality and yield were related. The highest yield and best quality green pods were obtained when conditions favored rapid growth and rapid pod setting, and when there was a high rate of pod maturation. For dry seed yield early sowings were best, 3.6 and 2.8 t/ha in 2 seasons. A total of 460 mm of water was required for the 1st 6 sowings, but fell to 360 mm for the mid-Feb. sowing (rainfall + irrigation). Although it was possible to grow beans over a 9-mo. period, the Jan. and early Feb. sowings appeared to be the least risk prone with the present cv. (Author's summary) D02

0354

*MUCCI, F.; BASSO, F. 1979. Weed control in second crops of snap beans. Investigation into the effectiveness of EPTC and into its residual effects. Informatore Fitopatologico 29(7):15-23.

0355

*MULDER, C.E.G.; WORTMANN, G.B. 1979. Selective weed control with bendioxide (bentazone). In National Weeds Conference of South Africa, 3, 1979. Proceedings. Nelspruit, S. Africa. BASF Agric. Res. Sta. pp.159-166.

0356

*NAISH, R.W.; UPRITCHARD, E.A. 1974. Dinitramine: a new incorporated herbicide for pees, beans and field bressicas. In New Zealand Weed and Pest Control Conference, 27, Nelson, 1974. Proceedings. pp.109-112.

0357

*NOLL, C.J. 1976. Chemical weed control on snapbeans. Proceedings of the Northeastern Weed Science Society 30:202-204.

0358

*NOLL, C.J. 1972. Evaluation of herbicides for weed control in snap beans. Proceedings of the Northeastern Weed Science Society 28:342-345.

0359

*OGG, A.G. 1980. A sprinkler system for research on applying herbicides in irrigation water. Weed Science 28(2):201-203.

0360

22650 OKAFOR, L.I.; SAGAR, G.R.; SHORROCKS, V.M. 1983. Biological activity of dinitramine in soils. 1. Dose, depth of incorporation, placement and depth of sowing. Weed Research 23(4):191-197. Engl., Sum. Engl., Fr., Germ., 16 Refs., Illus. [School of Plant Biology, Univ. College of North Wales, Bangor, Gwynedd LL57 2UW, England]

Phaseolus vulgaris. Snap beans. Herbicides. Toxicity. United Kingdom.

In pot studies with dinitramine, the susceptibility of French bean seedlings to the herbicide was influenced by the depth of sowing and the dose and depth of incorporation of the herbicide. Max. phytotoxicity occurred when French bean seeds were sown into a zone in which dinitramine had been incorporated. Where the seeds were separated from the herbicide-treated zone by a layer of untreated soil, the susceptibility of the French bean seedlings increased with increased depth of sowing. With increasing distance between the point of contact with the herbicide and the soil surface, injury was greater. (Author's summary) D02

0361

22651 OKAFOR, L.I.; SAGAR, G.R.; SHORROCKS, V.M. 1983. Biological activity of dinitramine in soils. 2. Soil organic matter and soil moisture content. Weed Research 23(4):199-206. Engl., Sum. Engl., Fr., Germ., 26 Refs., Illus. [School of Plant Biology, Univ. College of North Wales, Bangor, Gwynedd LL57 2UW, England]

Phaseolus vulgaris. Snap beans. Herbicides. Soils. Soil moisture. Toxicity. United Kingdom.

The influence of soil OM and soil MC on the bioactivity of dinitramine was studied in lab. and greenhouse expt. The effect of soil MC on the phytotoxicity of dinitramine to French bean cv. Masterpiece in compost and in quarry sand was also studied. The total dry wt. of bean seedlings

planted in compost decreased in soils with low soil MC and by dinitramine action, and there was an interaction between dose of herbicide and moisture level of the soil. (Summary by T.F.) D02

0362

*OLUNGA, B.A. 1970. Studies on the penetration and movement of herbicides. Ph.D Thesis. Bangor, UK. University College of North Wales. 128p.

0363

*OLYMPIOS, C.M.; PAPACHRISTODOULOU, S. 1978. Production and economics of French beans grown in plastic greenhouses. Cyprus, Ministry of Agriculture and Natural Resources. Technical Bulletin no.24. 12p.

0364

*PARDO, D. 1978. Use of dinitramine in vegetable crops. In Mediterranean Herbicide Symposium, Madrid, 1978. Weeds and herbicides in the Mediterranean Basin: Proceedings. v.1,pp.374-381.

0365

23194 PERALOZA C., J. 1983. Efecto de la variedad, densidad, forma y fecha de siembra en el cultivo de poroto verde (Phaseolus vulgaris L.) bajo invernaderos fríos en época de verano a otoño. (Effect of variety and planting, density, form and date on snap beans grown in cold greenhouses during the winter to autumn season). Tesis Ing.Agr. Quillota, Chile, Universidad Católica de Valparaiso. 99p. Span., Sum. Span., 38 Refs., Illus.

Phaseolus vulgaris. Cultivars. Spacing. Planting. Timing. Fertilizers. N. Snap beans. Chile.

The agronomic and economic feasibility of cultivating snap bean var. Apolo (bush) and Enriqueta (climbing) was studied under cold greenhouse conditions during the summer-autumn season at the La Palma Expt. Station of the Agronomy College, U. Católica de Valparaiso, Chile. The study included 2 planting dates (Feb. 24 and March 24), 2 fertilization levels (medium and high), and the following densities and planting systems: 312,000 and 110,000 plants/ha in double rows, and 156,000 and 55,000 plants/ha in single rows. Snap beans would be a feasible and profitable alternative under cold greenhouse conditions in the summer-autumn season to obtain 2 harvests/yr. Rotation of snap beans/tomato has the best expectations. Var. Enriqueta presented better pod quality, size, and wt., and also produced the best yields. Regardless of N levels, best yields of both var. were obtained at higher planting densities in double rows. [AS (extract)-CIAT]

0366

25602. PORIAZOV, I.; KOSTOV, D.; CASANOVA, A.; IORDANOV, D.; SAVON, R. 1984. EVALUACION AGROECONOMICA DE LA COSECHA MECANIZADA DE LA HABICHUELA CON LA COSECHADORA FZB. [AGROECONOMICAL EVALUATION OF MECHANIZED HARVESTING OF SNAP BEANS WITH THE FZB HARVESTER]. CIENCIA Y TECNICA EN LA AGRICULTURA. HORTALIZAS, PAPA, GRANOS Y FIBRAS 3[2]:31-39. SPAN. SUM. SPAN., ENGL., 9 REFS.

DURING THE 1982-83 CROP YEAR, A MECHANIZED HARVESTING EXTENSION TRIAL WAS CARRIED OUT WITH SNAP BEAN VAR. HARVESTER (IMPORTED), USING THE FZB HARVESTER. THE TRIAL WAS CONDUCTED AT THE EMPRESA DE CULTIVOS VARIOS 19 DE ABRIL (LA HABANA, CUBA) ON RED FERRALITIC SOIL IN PLOTS OF 16 SQUARE METERS. FIVE REPLICATIONS WERE MADE AND THE AMOUNT OF ACTUAL PRODUCTION, LOSSES, AND FIELD YIELD WERE DETERMINED. RESULTS INDICATE A HIGH EFFICACY RESULTING FROM MECHANIZED LABOR AS COMPARED WITH HAND HARVESTING. THE DIRECT COSTS OF HARVESTING DECREASED 15 TIMES AND THAT OF LABOR, 75 TIMES; PRODUCTIVITY INCREASED APPROX. 8-FOLD AND THE LOSS OF NONHARVESTED PODS RANGED BETWEEN 24-28 PERCENT OF THE FIELD YIELD. IT WAS VERIFIED THAT THE HARVESTER REPLACES THE WORK OF 75-80 DAY-LABORERS/DAY AND THUS IS ECONOMICALLY PROFITABLE, WHEREAS HAND HARVESTING WAS FOUND TO BE NOT ECONOMICALLY EFFECTIVE. (AS).

0367

*PRECHEUR, R.J.; MILLER, R.A.; MARINI, D.; HOWELL JUNIOR, J.C. 1979. Evaluation of incorporation equipment on trifluralin in snap beans. Proceedings of the Northeastern Weed Science Society 33:132.

0368

*PRENDEVILLE, G.N.; WARREN, G.F. 1975. Spreading and penetration of herbicides dissolved in oil carriers. Weed Research 15(4):233-241.

0369

*PRITCHARD, M.K.; WARREN, G.F. 1979. Site of action of oxyfluorfen. In Meeting of the Weed Science Society of America. Abstracts of 1979. p.98.

0370

*PROCESSORS' AND GROWERS' RESEARCH ORGANISATION. 1975. Annual report 1973. Thornhaugh, Peterborough, UK. 81p.

0371

11960 **PROTECTION OF snapbeans from substituted urea injury by prior treatment with dinitroaniline herbicides.** Canadian Journal of Plant Science 59:535-537. 1979. Engl., Sum. Engl., 6 Refs.

Phaseolus vulgaris. **Herbicides. Plant injuries. Urea. Weeds. USA.**

Under weedfree conditions, french beans (Bush Blue Lake), grown in soil treated with trifluralin, fluchloralin or profluralin as preplant-incorporated treatments, were protected from injury resulting from preemergence treatments of metobromuron and, to some extent, linuron. Dinitramine, however, did not offer such protection. (*Author's summary*) D02

0372

14212 PUTNAM, A.R. and RICE JUNIOR, R.P. **Environmental and edaphic influences on the selectivity of alachlor on snap beans** *(Phaseolus vulgaris).* Weed Science 27(5):570-574. 1979. Engl., Sum. Engl., 17 Refs., Illus.

Phaseolus vulgaris. Herbicides. Soil requirements. Climatic requirements. Planting. Cultivation. Soil water. Temperature. Organic matter. Ecology.

The influence of several environmental and edaphic factors on alachlor selectivity in snap bean was examined. Crop safety was consistently improved when alachlor was applied preplant incorporated as compared to surface preemergence treatment. Under field conditions, max. injury occurred either when temp. during germination were cool and rainfall was min., or when temp. approached or exceeded 27°C and the soil was saturated. In the growth chamber, more damage occurred under low temp. regimes, although volatilization of alachlor from moist soil also produced injury under higher temp. Injury was less severe in soils high in OM content. Alachlor injury decreased after 5 cm of simulated rainfall were applied on a loamy sand. *(Author's summary)* D02

0373

*PUTNAM, A.R.; LOVE, A.P.; LOCKERMAN, R.H. 1974. Efficacy of activated charcoal as an herbicide antidote of seeded vegetable crops. Proceedings of the North Central Weed Control Conference 29:69.

0374

*PUTNAM, A.R.; LOVE, A.P. 1971. Preplant and pre-emergence herbicides for effective weed control in snap beans. Proceedings of the North Central Weed Control Conference 26:99.

0375

*RAAFAT, A.; ABDEL-HALIM, M.A.; AMER, M.A.; EL-HADIDY, M.F. 1977. Growth and physiological responses of (French) bean plants to some herbicides, insecticides and their combinations. Annals of Agricultural Science, University of Ain Shams 20(2):141-150.

0376

*RAHN, E.M.; SMITH, T.S.; MERRICK, J.E. 1972. Evaluation of several herbicides and herbicide combinations on lima beans and snap beans. Proceedings of the Northeastern Weed Science Society 26:346-350.

0377

16703 RAMASWAMY, H.S.; RANGANNA, S.; GOVINDARAJAN, V.S. 1980. A nondestructive test for determination of optimum maturity of French (green) beans (*Phaseolus vulgaris*). Journal of Food Quality 3(1):11-23. Engl., Sum. Engl., 11 Refs., Illus.

Phaseolus vulgaris. Snap bean. Developmental stages. Maturation. Pods. Harvesting. Composition. Agricultural equipment.

Beans harvested at intervals of growth until over-maturity were examined by a trained sensory panel and sensory characteristics were related to the physicochemical features at each stage. The wt./length ratio was closely related to sensory character and could provide a simple test for optimal maturity. *(Summary by Horticultural Abstracts)* D02

0378

*RAMIREZ DE VALLEJO, A.; MENESES S., L. 1977. Frejoles. Ensayo demostrativo en var. Negro Argel. In Control de Malezas: Resultados de la Investigacion y Nuevos Herbicidas, 1976-77.

Santiago, Chile, Sociedad Chilena de Control de Malezas. pp.82-83.

0379

*RICE JUNIOR, R.P. 1978. Environmental and edaphic influences on the sensitivity of diphenamid and alachlor in tomatoes and snapbeans. Thesis. East Lansing, Michigan State Univ. 112p.

0380

*RICE JUNIOR, R.P.; PUTNAM, A.R. 1978. Environmental effects on alachlor activity in snap beans. In Meeting of the Weed Science Society of America. Abstracts, 1977. East Lansing, Michigan State Univ. p.5.

0381

*RICHARDSON, W.G.; WEST, T.M.; PARKER, C. 1982. The activity and pre-emergence selectivity of some recently developed herbicides: chlomethoxynil, NC 20484 and MBR 18337. UK., Agricultural Research Council, Weed Research Organization. Technical Report no.64. 50p.

0382

24244 RIPOLL N., E.A. 1985. Efectos del uso de túnel y mulch plástico sobre rendimiento y calidad de melón (Cucumis melo) y poroto verde (Phaseolus vulgaris L.) en cultivo temprano. (Effects of the use of plastic tunnels and mulch on yield and quality of melon and green beans in early plantings). Tesis Ing.Agr. Santiago, Chile, Pontificia Universidad Católica de Chile. 83p. Span., Sum. Span., Engl., 18 Refs.

Phaseolus vulgaris. Snap beans. Cultivars. Cultivation. Planting. Temperature. Yields. Chile.

The effect and use of plastic tunnels for early growing of snap bean var. Apolo and Green Crop were evaluated in the Curacaví zone (Chile) in 1982. Bean var. were compared under plastic tunnel conditions and in the open. Beans grown under the plastic tunnels yielded 50% more than those grown in the open. Var. Apolo yielded 23.5 and 13.3 t/ha under plastic tunnels and in the open, resp. Var. Green Crop yielded 21.3 and 14.6 t/ha, resp. [CIAT]

0383

*ROBERTS, H.A.; BOND, W. 1982. Evaluation of dimethachlor and metolachlor for weed control in drilled vegetable crops. Annals of Applied Biology 3:74-75.

0384

*ROBERTS, H.A.; BOND, W.; POTTER, M.E.; DUDLEY, J.M. 1981. 31st Annual report, 1980. Wellesbourne, Warwick, UK. National Vegetable Research Station. 198p.

0385

*ROBERTS, H.A. 1977. Evaluation of VEL-5052 for weed control in some drilled vegetable crops. In International Velsicol Symposium, 11, Brighton, UK, 1977. Wellesbourne, Warwick, UK. National Vegetable Research Station 5p.

0386

*ROJAS G., M.; ROSALES, E. 1981. Experimentacion de nuevos productos y tecnicas de control en zacate Johnson [Sorghum halepense] . In Informe de Investigacion 1979-80, 17, Division de Ciencias Agropecuarias y Maritimas, Instituto Tecnologico de Monterrey. pp.75-76.

0387

18762 ROUANET, G. 1972. Avantages et inconvénients de l'utilisation d'un herbicide prélevée (métobromuron) dans la culture du haricot a Awassa (Ethiopie). [Advantages and disadvantages of using a preemergence herbicide (metobromuron) in snap bean crops at Awassa, Ethiopia]. L'Agronomie Tropicale 2:239-248. Fr., Sum. Fr., Engl., Span., 5 Refs.

Phaseolus vulgaris. Weeding. Herbicides. Snap beans. Ethiopia.

Proliferation of weeds is a prioritary problem in Phaseolus vulgaris crops in Awassa in southern Ethiopia. A crop of cv. Canallini grown in the wet season of 1967 and given 3, 4, or 5 kg metobromuron/ha yielded 0.87, 0.82, and 0.89 t dry beans/ha, resp., compared with 0.49 t/ha for the unweeded control. In an expt. in the dry season, 1.25 kg metobromuron/ha caused slight phytotoxicity and higher rates killed some plants; the crop was destroyed by frost, a recurrent risk in this area. It was found possible to resow the sprayed areas without further tillage. In a var. trial, the Michigan-type cv. MPBT showed 50% survival with 1.25 kg metobromuron/ha and 5% survival with 2.5 kg; plants of cv. Canallini, SATINP, and HLK all survived the high rate of herbicide but with slight yellowing of the 1st leaves. In the wet season of 1969, cv. SATINP yielded 1.03 t/ha unweeded, 1.1 t/ha when hand-weeded once, 1.25 t/ha when hoed once, and 1.44 and 1.61 t/ha with 1 and 2 kg metobromuron/ha, resp. It was concluded that the cost of the metobromuron treatment can successfully compete with the cost of hand weeding. Chemical weeding is therefore technically and economically feasible. Consequential effects of labor employment, however, should be taken into account. (Summary by Field Crop Abstracts) D02

0388

*ROVALO, M.; MACIAS, C. 1979. Bioensayos con Larrea divaricata como posible planta alelopatica y/o herbicida. In Informe de Investigacion 1977-1978, 16, Division de Ciencias Agropecuarias y Maritimas, Instituto Tecnologico de Monterrey. pp.69-70.

0389

2336 RUBIN, B. and ESHEL, Y. Absorption and distribution of terbutryn and fluometuron by germinating seeds of cotton (*Gossypium hirsutum*) and snapbean (*Phaseolus vulgaris*). Weed Science 26(4):378-381. 1978. Engl., Sum. Engl., 10 Refs., Illus.

Phaseolus vulgaris. Herbicides. Seed. Plant assimilation. Germination. Seed coat. Hypocotyls. Cotyledons. Roots. Translocation. Leaves. C. Laboratory experiments. USA.

The absorption and distribution of ^{14}C-terbutryn and ^{14}C-fluometuron during germination of cotton (SJ-1) and french bean (Tenderette) seeds was studied. Seeds of the susceptible french bean absorbed larger amounts of both herbicides from soil than the resistant cotton seeds. The herbicides accumulated mainly in the seed coat of cotton which shed following emergence, with no translocation to the seedling leaves. In french bean seeds the herbicides accumulated in the cotyledons, which served as a source for acropetal flow to the developing foliage of the young seedling. (*Author's summary*) D02 C00

0390

*RUBIN, B.; ESHEL, Y. 1977. Absorption and translocation of terbutryn and fluometuron in cotton (Gossypium hirsutum) and snapbeans (Phaseolus vulgaris). Weed Science 25(6):499-505.

0391

5822 RUTLEDGE, A. D., SWINGLE, H.D. and HILTY, J.W. **Root rot and weed control studies with snapbeans.** Tennessee Farm and Home Science Progess Report no.68:5-7. 1969. Engl., Sum. Engl., Illus.

Phaseolus vulgaris. **Bean root rots.** *Rhizoctonia solani.* **Weeds. Weeding. Herbicides. Chemical control.**

Weed and *Rhizoctonia solani* control and yields of french beans were studied by applying various combinations of Eptam and fungicide. Eptam applied as a preplant incorporated (PPI) treatment at 3 lb/acre was more effective in controlling weeds than was a subsurface application of 2 lb/acre. However, the PPI treatment of Eptam did not differ in weed control from the cultivated plots. There did not appear to be any difference between methods of fungicide application in controlling *R. solani;* however, both methods showed greater *R. solani* control than did the nontreated cultivated check. Yields were reduced during both years in plots that had received either a seed or furrow application of fungicides in combination with either a PPI or subsurface application of Eptam. (*Author's summary*) D02 E03

0392

21086 SALADIN G., F. 1981. El cultivo de la habichuela. 3. parte. (Snap bean cultivation. Part 3). Agro(República Dominicana) 10(89):22-26. Span., 16 Refs., Illus.

Phaseolus vulgaris. Snap beans. Planting. Spacing. Mechanization. Intercropping. Weeding. Herbicides. Dominican Republic.

General information on snap bean cultivation practices is presented. It includes recommended planting densities, cultivation systems, mechanized planting, and weed control. A list of the major weed species in Dominican Republic is presented. [CIAT]

0393

*SARPE, N.; IONESCU, F.; POPESCU, A. 1981. Studies concerning the residual effect of atrazine, alachlor, metolachlor, EPTC + R-25 788, trifluralin, EPTC, metobromuron and vernolate applied to maize or beans on succeeding crops such as wheat, flax, beans and sunflower. In Symposium on Theory and Practice of the Use of Soil Applied Herbicides, Versailles, 1981. Proceedings EWRS. pp.318-324.

0394

*SCHEPPS, A.L.; ASHLEY, R.A. 1982. The effects of various weed-free periods on snap bean yields. Proceedings of the Northeastern Weed Science Society 36:104-107.

0395

*SCUDDER, W.T. 1975. Chemical weed control for commercial vegetable production. In Institute of Food and Agricultural Sciences. Annual Research Report 1973. Sandford, University of Florida. pp.248-249.

0396

*SCUDDER, W.T. 1972. Annual research report 1970. Sandford, Institute of Food and Agricultural Sciences. University of Florida. p.150.

0397

*SENESAC, A.F.; WARHOLIC, D.T.; SWEET, R.D. 1979. Tolerance of snap and dry bean varieties to bentazon, metolachlor and pendimethalin. Proceedings of the Northeastern Weed Science Society 33:178-182.

0398

*SINGH, K. 1975. Herbicidal control of weeds in vegetable crops. In Third All India Weed Control Seminar, Hissar, 1973. Proceedings. Hissar, India, Haryana Agric. Univ. Dept. Vegetable Crops. pp.53-54.

0399

SMITH JUNIOR, L.L.; GERONIMO, J. 1978. Response of seven crops to six hormone-like herbicides. In Meeting of the Weed Science Society of America. Abstracts, 1977. p.32.

0400

1353 STANG, J.R. **Responses of bush snap bean cultivars (*Phaseolus vulgaris* L.) to plant population densities.** Ph.D. Thesis. Corvallis, Oregon State University, 1976. 141p. Engl., Sum. Engl., 122 Refs., Illus.

Phaseolus vulgaris. **Dwarf beans. Spacing. Cultivars. Yield components. Translocation. Statistical analysis. Pods. Yields. Leaf area. Growth.**

The effects of plant population densities on the growth and development of 6 bush french bean cv. (selected for differences in leaf size) were studied in 2 field experiments. A systematic planting design was used to achieve a range of densities from 21-110 plants/m^2 and a rectangularity of approx 1. For most of the important parameters analyzed including pod yield, cv. x density interactions were not statistically significant. The cv. differed with respect to optimum density for high yield. High pod yield was found to be mainly a function of an early, concentrated development and growth of reproductive organs and a concurrent reduction in vegetative growth. Those with higher leaf areas during the reproductive period had lower pod yields because these high leaf areas had developed as a compensatory reaction to poor initial reproductive development. The cv. did not differ in the rate of decline of NARs/unit increase in LAIs; however, at any given LAI the highest yielding cv. had the highest NAR, which was associated with low specific leaf areas. (*Summary by T.B.*) D02 D05

0401

*STEVENSON, M.R. 1975. Weed control in snap beans. In New Zealand Weed and Pest Control Conference, 28, 1975. Proceedings. pp.75-79.

0402

*STOLAREK, J.; PAZURKIEWICZ-KOCOT, K.; KROL, H. 1980. Electric potential changes in Phaseolus vulgaris L. induced by the herbicide Treflan. Prace Naukowe Uniwersytetu Slaskiego no.375:29-37.

0403

16071 STOLK, J.H. Stamslabonen onder glas. *(Dwarf French beans under glass).* Groenten en Fruit 35(38):55. 1980. Dutch.

Phaseolus vulgaris. Dwarf bean. Snap bean. Pods. Agronomic characters. Yields.

Data are presented on the yields/m² and pod characteristics of 11 dwarf *Phaseolus vulgaris* cv. with once-over or multiple harvesting, assessed from trials in several places. For either harvesting method Preresco, Kap-Prevabel, and Rubio were the most suitable; Lotus was also satisfactory for once-over harvesting and Centrum-Resulta, Prelude, and Piter for multiple harvesting. *(Summary by Horticultural Abstracts)* D02

0404

*SUMNER, D.R. 1974. Interactions of herbicides and nematicides with root diseases of snapbean and southern pea. Phytopathology 64(10):1353-1358.

0405

*SWEET, R.D. 1976. When it comes to competing with weeds some are more equal than others. Crops and Soils 28(6):7-9.

0406

*SWEET, R.D.; YIP, C.P.; SIECZKA, J.B. 1974. Crop varieties: can they suppress weeds?. New York's Food and Life Sciences Quarterly 7(3):3-5.

0407

*TAKABAYASHI, M. 1975. Evaluation of candidate pesticides. (0-2). Herbicides: upland crops. Japan Pesticide Information no.25:10-12.

0408

*TALBERT, R.E.; WALLINDER, C.J.; FREELAND, T.R. 1981. Field evaluation of herbicides in vegetable crops, 1980. Fayetteville, Univ. Arkansas Agricultural Experiment Station. Mimeograph Series no.289. 15p .

0409

*TALBERT, R.E.; WALLINDER, C.J.; SAUNDERS, P.A. 1980. Field evaluation of herbicides in vegetable crops, 1979. Fayetteville, Univ. Arkansas Agricultural Experiment Station. Mimeograph Series no.281. 17p.

0410

*TALBERT, R.E.; SAUNDERS, P.A.; HODGES, L. 1979. Field evaluation of herbicides in vegetable crops, 1978. Fayetteville, Dep. Agron. Univ. Arkansas Agricultural Experiment Station. Mimeograph Series no.267. 14p.

0411

*TALBERT, R.E.; HODGES, L. 1978. Field evaluation of herbicides in vegetable crops, 1977. Fayetteville, Dep. Agron. Univ. Arkansas Mimeograph Series no.258. 15p.

0412

*TALBERT, R.E.; KENNEDY, J.M.; KENNEDY, M.R.; RAMTHUM, L.E. 1974. Snap beans (Phaseolus vulgaris) and southern pea (Vigna unguiculata). In _____. Field evaluation of herbicides in vegetable crops. Fayetteville, University of Arkansas Agricultural Experiment Station. Mimeograph Series. p.9.

0413

*TALBERT, R.E.; KENNEDY, J.M. 1974. Snap beans (Phaseolus vulgaris). In _____. Field evaluation of herbicides in vegetable crops, 1973. Fayetteville, University of Arkansas Agricultural Experiment Station. Mimeograph Series. pp.2,4.

0414

*TALBERT, R.E. 1971. Field evaluation of herbicides in vegetable crops, 1971. Fayetteville, University of Arkansas Agricultural Experiment Station. Mimeograph Series. no.197. 19p.

0415

*TASISTRO, A.; FISCHER, A.; ORRANTIA, M. 1979?. Comparacion de herbicidas para el control de malezas en frijol (Phaseolus vulgaris). Chapingo, Mexico, Univ. Autonoma de Chapingo. Departamento de Parasitologia. Circular Tecnica no.2. 2p.

0416

*TASMANIAN DEPARTMENT OF AGRICULTURE. AUSTRALIA. 1975. Annual report 1974/75. Tasmania. Government Printer no.46. 113p.

0417

*TASMANIAN DEPARTMENT OF AGRICULTURE. AUSTRALIA. 1974. Annual Report 1973-74. Tasmania, Government Printer no.49. 109p.

0418

19934 TEASDALE, J.R.; FRANK, J.R. 1983. Effect of row spacing on weed competition with snap beans (Phaseolus vulgaris). Weed Science 31(1):81-85. Engl., Sum. Engl., 21 Refs., Illus. [Dept. of Agriculture, Beltsville Agricultural Research Center, Beltsville, MD 20705, USA]

Phaseolus vulgaris. Snap beans. Spacing. Weeding. Yields. Canopy. USA.

In field trials in 1979 and 1980, Phaseolus vulgaris was grown in rows 15, 25, 36, 46, and 91 cm apart, but with intrarow spacing increasing as the distance between rows decreased, to give a constant density of 43 plants/m^2. Compared with the conventional spacing of 91 cm, there was an increase in weed suppression of 18% with row spacings of 15-36 cm when weeds were allowed to emerge with the crop, and of 82% when weeds were controlled by hoeing and hand weeding for the 1st half of the season. The effect of the 46 cm spacing on weed growth was variable. The rate of canopy closure, measured as the % of soil surface covered by P. vulgaris vegetation, was greater in the less wider rows. Seed yields were similar at spacings of 15-46 cm and were, on av., 23% higher than yields produced at 91 cm spacing. (Summary by Horticultural Abstracts) D02

0419

17455 TEASDALE, J.R.; FRANK, J.R. 1982. Weed control systems for narrow and wide row snap bean production. Journal of the American Society for Horticultural Science 107(6):1164-1167. Engl., Sum. Engl., 12 Refs., Illus.

Phaseolus vulgaris. Weeding. Snap beans. Herbicides. Yields. Planting. USA.

Five field expt. conducted in Maryland (USA) compared weed control systems for snap bean cv. Checkmate production in 25-cm rows including herbicides, but no cultivation, with systems for conventional 91-cm rows including both herbicides and cultivation. Herbicide combinations of EPTC + dinoseb each at 3.4 kg/ha, EPTC at 3.4 kg/ha + bentazon at 0.8 kg/ha, and trifluralin at 0.6 kg/ha + bentazon at 0.8 kg/ha provided excellent control of annual weeds and yellow nutsedge (Cyperus esculentus) in most expt. With the most effective herbicide treatments, weed control was similar in 25-cm and 91-cm rows. However, when herbicide treatments failed to control all weed species, weed control in 91-cm rows was better than that in 25-cm rows, because 91-cm rows were cultivated. Snap beans in 25-cm rows yielded an av. of 25% higher than snap beans in 91-cm rows (plant density was equivalent at both row spacings). As weed control improved, the magnitude of the yield difference between 25-cm and 91-cm row spacings increased. (Author's summary) D02

0420

*TERRY, P.J. 1975. Sixth Progress Report of the East African Herbicide Research Project R. 2557/R. 2995 July-December 1974. Arusha, Tanzania, East African Community Tropical Pesticides Research Institute. 10p.

0421

*TERRY, P.J. 1974. Fifth Progress Report of the East African Herbicide Research Project R.2557, January-June 1974. Arusha, Tanzania, East African Community Tropical Pesticides Research Institute. 8p.

0422

*TERRY, P.J. 1973. Third Progress Report of the East African Herbicide Research Project R. 2557, January-June 1973. Arusha, Tanzania, East African Community Tropical Pesticides Research Institute. 12p.

0423

*THIBODEAUX, S.D.; HERNANDEZ, T.; SCHILLING, P. 1977. Results of vegetable herbicide screening experiments 1974-1976 on sweet corn, field peas, snap beans, okra and peanuts. In Annual Meeting of the Southern Weed Science Society, 30, 1977. Proceedings. p.155.

0424

*THOMPSON, A.; RAHMAN, A.; COX, T.I. 1981?. Annual report 1979-80. New Zealand, Ministry of Agriculture and Fisheries, Agricultural Research Division. 390p.

0425

17407 TOMPKINS, F.D.; MULLINS, C.A.; MERRYMAN, D.M.; JEFFERY, L.S. 1979. Effects of seedbed preparation and herbicides on weed control in snap beans. Tennessee Farm and Home Science 111:21-23. Engl., 4 Refs., Illus.

Phaseolus vulgaris. Snap bean. Soil requirements. Soil conservation practices. Herbicides. Weeds. Weeding. Yields. USA.

In 1978, trials were conducted at the Plateau Expt. Station of the U. of Tennessee, Crossville (USA) to evaluate the effectiveness of selected herbicides and herbicide combinations for controlling weeds in snap bean var. Early Gallatin, planted with 4 different methods of seedbed preparation. Plantings were made on June 21 and 29, and July 7 on a Hartsells sandy loam soil. A split plot expt. design replicated 3 times at each planting date was used. Conventional preparation consisted of moldboard plowing to a depth of 15.25 cm in the spring and 2 trips with a powered harrow before planting. Treatment 2 used a powered harrow to stir the top 12.7 cm of soil twice. The other 2 treatments were seeded in sod using a non-till unit equiped with fluted coulters. These were clipped 10 days before planting with a rotary mower and 0.678 kg paraquat/ha was applied to one group and 3.24 kg glyphosate/ha to the other. Seven herbicide treatments were also broadcast applied after planting including paraquat, glyphosate, dinoseb, metolachlor, pendimethalin, and bentazon, alone or combined at different rates. Predominant weeds among 4 grass species and 16 broadleaf species were *Digitaria sanguinalis, Setaria viriois, Panicum dicholomiflorum, Ambrosia artemisifolia,* and *Amaranthus retroflexus.* The method of seedbed preparation did not affect the chemical control of the 5 predominant weed species; however, it was a significant factor in controlling some other species as compared with no-till plots. Chemical control for the predominant species varied from 77-98%. Combining dinoseb with either metolachlor or pendimethalin increased weed control to 96 and 92%, resp. Yield was significantly less in no-till plots. However, herbicide treatment did not significantly affect yields. Tables are given on the treatments and different results obtained. *(Summary by C.P.G. Trans. by L.M.F.)* D02

0426

14273 TOMPKINS, F.D., GUINN, R.S. and MULLINS, C.A. Optimizing plant spacing for commercial snap bean production. Tennessee Farm and Home Science Progress Report 110:41-44. 1979. Engl., 3 Refs., Illus.

Phaseolus vulgaris. Cultivation. Spacing. Yields. Yield components. USA.

In trials with the bean cv. Early Gallatin between row spacings were 12, 24, and 36 in. and within-row spacings 6, 9, or 12 plants/ft. Av. pod yield/ac from 12-in. rows was 29% greater than from 36-in. rows. Pods were higher off the ground on plants in narrow rows. Increasing plant density from 6 to 9 plants/ft augmented pod yield by about 15% and a further increase to 12 plants/ft augmented the yield by a further 2.5%. The highest av. pod yield (6.2 t/ac) was obtained from plots with 12 in. rows and 12 plants/ft of row. *(Summary by Horticultural Abstracts)* D02

0427

*TOZER, W.E.; STERRETT, J.P. 1973/1974. Responses of bean and woody plants to atrazine or prometone/ethephon and prometone/endothal/ethephon. Non-herbicidal defoliants. Edgewood Arsenal. Technical Reports no. EO-TR-73063. 16p.

0428

28816. TRIPATHI, S.S.; SINGH, P.P. 1986. THE ASSOCIATION OF PLANTING DENSITY AND PLANT TYPE IN FRENCH BEAN (PHASEOLUS VULGARIS). EXPERIMENTAL AGRICULTURE 22(4):427-429. EN. SUM. EN., ES., 4 REF. (DEPT. OF AGRONOMY, G.B. PANT UNIV. OF AGRICULTURE & TECHNOLOGY, PANTNAGAR, 263 145, UP, INDIA)

THE INTERACTION BETWEEN PLANTING DENSITIES (10, 20, 30, 40, AND 50 PLANTS/SQUARE METER) AND TYPE OF PLANT IN 5 FRENCH BEAN VAR. OF CONTRASTING GROWTH HABITS WAS STUDIED IN EXPT. CONDUCTED IN PANTNAGAR, INDIA, DURING THE WINTER SEASONS OF 1980-81. FRENCH BEAN

VAR. RUFUS (SEMI-SPREADING) OUTYIELDEDTHE OTHER GENOTYPES AT ALL THE DENSITIES IN BOTH YEARS, FOLLOWED BY VAR. CONTENDER (BUSH). THE BETTER PERFORMANCE OF RUFUS RESULTED FROM ITS GREATER NO. OF PODS/PLANT AND WT. OF SEEDS/POD. MOST VAR. YIELDED BEST AT 30 PLANTS/SQUARE METER; HOWEVER, VAR. CONTENDER YIELDED BEST AT 50 PLANTS/SQUAREMETER. (CIAT).

0429

*TRUNKENBOLTZ, M.; PRIN, M. 1979. Contribution a l'etude de la lutte contre les mauvaises herbes dans les culture de haricots. In Compte Rendu de la 10e Conference du COLUMA. pp.1101-1115.

0430

*UNIVERSITY OF THE WEST INDIES. 1978. Annual research report 1976-1977. St. Augustine, Trinidad and Tobago. Departmental Paper no.12. 24p.

0431

*VELSICOL CHEMICAL CORPORATION. 1973. Technical information, experimental herbicide HCS 3510. Chicago, Illinois. Velsicol Agricultural Chemicals. Development Bulletin. 4p.

0432

*VENGRIS, J.; DUNN, S.; STACEWICZ-SAPUNCAKIS, M. 1972. Life history studies as related to weed control in the Northeast. 7. Common purslane. Amherst, University of Massachusetts. Agricultural Experiment Station. Research Bulletin no.598. 46p.

0433

16465 VERHAY, E.W.M. 1973. A herbicide trial in green beans. Ethiopia, Horticultural Project H.V.A. Research Report no.6. 4p. Engl., Sum. Engl.

Phaseolus vulgaris. Snap beans. Weeding. Herbicides. Yields. Cultivars. Plant injuries. Ethiopia.

Trifluralin (1 and 2 l/ha) and nitralin (1 and 2 kg/ha) incorporated before growing, and fluorodifen (7 and 10.1 l/ha), metobromuron (3 and 4.5 kg/ha), methabenzthiazuron (2 and 4 kg/ha) and monolinuron + dinoseb-acetate (4 and 6 kg/ha), applied before germination, were tried on bean var. Sprite, Gardol, Harvester, and Slimgreen in comparison with a hand-weeded control. Trifluralin, nitralin, fluorodifen, and metobromuron all checked weed growth notably, although most plots badly needed a weeding by the time the trial was completed (approx. 70 days after treatment). Differences among these products and between varying application rates of each product were rather erratic presumably due to an unfavorable grouping of the replications. Weed control by methabenzthiazuron and monolinuron + dinosebacetate was inadequate. None of the products caused clear symptoms of crop damage on any of the 4 cv. Yields were in the order of 10 t/ha; the control lagged behind with a yield of 8.5 t/ha, suggesting that the single hand weeding had been performed too late to safeguard yield. It is concluded that chemical weed control is currently uneconomical. (Author's summary) D02

0434

*VILLIERS, O.T. DE; MARAIS, H.J. 1979. Comparative effects of diuron and prometryne on biochemical processes in isolated leaf cells. In National Weeds Conference of South Africa, 3, 1979. Proceedings. pp.199-204.

0435

28061. WAHAB, M.N.J.; DABBS, D.H.; BAKER, R.J. 1986. EFFECTS OF PLANTING DENSITY AND DESIGN ON POD YIELD OF BUSH SNAP BEAN (PHASEOLUS VULGARIS L.). CANADIAN JOURNAL OF PLANT SCIENCE 66(3):669-675. EN. SUM. EN., FR., 14 REF. (REGIONAL AGRICULTURAL RESEARCH CENTER, BANDARAWELA, SRI LANKA)

BECAUSE OF INTEREST IN MAXIMIZING PRODUCTION/UNIT AREA IN REGIONS WHERE THE LAND BASE IS LIMITED, THE EFFECTS OF PLANTING DENSITY (16-116 PLANTS/SQUARE METER) AND PLANTING DESIGN ON POD YIELD OF BUSH SNAP BEAN WERE MEASURED IN REPLICATED FIELD TRIALS AT THE U. OF SASKATCHEWAN (CANADA) WITH CV. HARVESTER IN 1980 AND 1981. THREE PLANTING DESIGNS WERE USED: (A) CONVENTIONAL ROW DESIGNS WITH INTERPLANT SPACING OF 5 CM AND INTERROW SPACINGS OF 20, 45, 80, AND 125 CM; (B) SQUARE DESIGNS WITH INTERPLANT AND INTERROW SPACINGS BOTH AT 10, 15, 20, AND 25 CM; AND (C) TRIANGLE DESIGNS (HONEYCOMB) WITH PLANTS ARRANGED AT EQUAL DISTANCES OF 10, 15, 20, AND 25 CM FROM EACH OF THEIR 6 NEAREST NEIGHBORS. IN ALL 3 PLANTING DESIGNS, HIGHER PLANTING DENSITIES (UP TO 116 PLANTS/SQUARE METER) GAVE HIGHER POD YIELDS/UNIT AREA. EXCEPT FOR THE LOWER RESPONSE IN THE SQUARE DESIGN IN 1981, INCREASES IN YIELD WITH INCREASING DENSITY WERE SIMILAR FOR ALL DESIGNS IN BOTH YEARS. POD YIELDS DID NOT DIFFER FROM ONE DESIGN TO THE OTHER IN 1980. IN 1981, THE TRIANGLE DESIGN GAVE THE HIGHEST AV. YIELD AND THE ROW DESIGN GAVE THE LOWEST AV. YIELD. THE RESULTS CONFIRM OBSERVATIONS OF YIELD ADVANTAGES IN PLANTING DESIGNS THAT USE EQUAL SPACING IN ALL DIRECTIONS. (AS).

0436

13177 WALKER, M.R. Developments in the Tasmanian green bean industry. Journal of Agriculture 50(1):26-28. 1979. Engl., Illus.

Phaseolus vulgaris. Spacing. Planting. Harvesting. Weeding. Mechanization. Australia.

Developments in the Tasmanian green bean cultivation are outlined with emphasis on improved spacing, harvesting and sowing methods and weed control. *(Summary by Field Crop Abstracts)* D02

0437

27791. WESTON, L.A.; PUTNAM, A.R. 1985. INHIBITION OF GROWTH, NODULATION, AND NITROGEN FIXATION OF LEGUMES BY

QUACKGRASS. CROP SCIENCE 25(3):561-565. EN. SUM. EN., 25 REF. (DEPT. OF HORTICULTURE, MICHIGAN STATE UNIV., EAST LANSING, MI 48824, USA)

THE POSSIBILITY OF INHIBITION OF NODULATION, N2 FIXATION, AND LEGUME GROWTH IN THE PRESENCE OF LIVING OR HERBICIDALLY TREATED AGROPHYRON REPENS WAS DETERMINED. SOYBEANS, NAVY BEANS, AND SNAP BEANS WERE GROWN BOTH IN GREENHOUSE AND FIELD EXPT. IN LIVING OR KILLED A. REPENS. INOCULATED LEGUMES WERE SEEDED IN THE FOLLOWING REGIMES: (1) LIVING A. REPENS SOD, WHICH WAS REGULARLY MOWED; (2) GLYPHOSATE-TREATED A. REPENS SOD; (3) SOIL FROM A. REPENS SOD FROM WHICH PLANT MATERIAL WAS REMOVED BY SIEVING OR RAKING; (4) A CONTROL SOIL OF SIMILAR TYPE AND PHYSICAL STRUCTURE FREE FROM A. REPENS INFESTATION. LEGUMES GROWN IN TREATMENT 1 IN THE GREENHOUSE AND IN THE FIELD EXHIBITED DECREASED NODULE NO., NODULE FRESH WT., AND N2 FIXATION WHEN COMPARED WITH LEGUMES GROWN UNDER SIMILAR CONDITIONS IN TREATMENTS 3 AND 4. SHOOT AND ROOT WT. WERE ALSO SIGNIFICANTLY DECREASED IN FIELD AND GREENHOUSE EXPT. WHEN LEGUMES WERE GROWN IN TREATMENT 1. IN MANY CASES, LEGUME NODULATION AND GROWTH WERE DECREASED IN TREATMENT 2 AS COMPARED WITH TREATMENTS 3 OR 4. DECREASES IN LEGUME GROWTH AND NODULATION IN THE PRESENCE OF A. REPENS MAY BE ATTRIBUTED TO ALLELOCHEMICAL EFFECTS. (AS (EXTRACT)).

0438

*WHITEHEAD, R. 1977. Developments with Nortron in crops other than sugar beet. AgTec, Fisons Agricultural Technical Information Spring:10-15.

0439

*WILLIAM, R.D.; WARREN, G.F. 1975. Competition between purple nutsedge and vegetables. Weed Science 23(4):317-323.

0440

0381-4973 WILLIAMS, C. F. *et al.* Effect of spacing on weed competition in sweet corn, snap beans, and onions. Journal of the American Society for Horticultural Science 98(6):526-529. 1973. Engl., Sum. Engl., 8 Refs., Illus.

Phaseolus vulgaris. Weeds. *Zea mays*. Spacing. Field experiments. Weeding. Productivity. Pods. Yields.

Interactions of row spacings of the crop and weed competition were studied in bush french beans (*Phaseolus vulgaris* L.), sweet maize (*Zea mays* L.) and onions (*Allium cepa* L.). Close plant spacing resulted in less weed competition (as measured by crop plant reproductive parts) than wider row spacings. Early weed competition was important in all crops, but weed competition at any time reduced onion yields significantly. Maize required 2 wk and beans 3 wk of growth after emergence to eliminate losses due to weed competition. Fresh weights of weeds at harvest time were significantly less (0.8 kg) in plots of beans with narrow row spacing than in plots with the medium and wide spacings (2.8 and 2.4 kg) in an 0.81 m^2 area. *(Author's summary)* D02

0441

*WILLIAMS, C.F. 1971. Interaction of crop plant population with weed competition in corn (Zea mays L.), bush snap beans (Phaseolus vulgaris L.) and onion (Allium cepa L.) at differing stages of development. Corvallis, Oregon State Univ. 69p.

0442

9473 WILLIAMSON, R.E. and SMITTLE, D.A. **High density snap bean harvester trials.** Transactions of the American Society of Agricultural Engineers 19(5):844-848. 1976. Engl., Sum. Engl., 7 Refs., Illus.

Phaseolus vulgaris. **Harvesting. Pods. Yields. Mechanical damage. Cultivars. Plant injuries. Agricultural equipment.**

Six bean varieties with different growth characteristics, av pod detachment forces and av pod breaking forces were used to determine the effect of harvester reel speed, pod detachment force, plant erectness and pod breaking force on harvester efficiency and % of damaged pods. Multiple regression techniques were used to relate the variables. All data are tabulated. (*Summary by Horticultural Abstracts*) D02

0443

*WILSON, H.P.; BELOTE III, J.N. 1974. Activities of alachlor and fluorodifen in snap beans. Proceedings of the Northeastern Weed Science Society 28:161-166.

0444

*WILSON, H.P.; HINES, T.E.; BELOTTE, J.N. 1974. Relationship between activated carbon and atrazine on cucumber and snap beans. Proceedings of the Northeastern Weed Science Society 28:235-241.

0445

*WILSON, H.P.; DAVIS, H.J.; BELOTE, J. 1971. Activities of several herbicides and herbicide combinations in snap beans (Phaseolus vulgaris). Proceedings of the Northeastern Weed Science Society 25:249-254.

0446

*WOOLSON, E.A. 1973. Arsenic phytotoxicity and uptake in vegetable crops. In Meeting of the Weed Science Society of America, Atlanta, Georgia, 1973. Abstracts, 1973. p.77.

D03 Cultivation Systems: Intercropping, Rotational Crops

0447

27402. BROWN, J.E.; SPLITTSTOESSER, W.E.; GERBER, J.M. 1985. PRODUCTION AND ECONOMIC RETURNS OF THREE VEGETABLE DOUBLE-CROPPING SYSTEMS. JOURNAL OF THE AMERICAN SOCIETY FOR HORTICULTURAL SCIENCE 110(3):414-417. EN. SUM. EN., 16 REF. (101 FUNCHES HALL, DEPT. OF HORT., AUBURN UNIV., AUBURN, AL 36848, USA)

SNAP BEANS BUSH BLUE LAKE, SWEET CORN SUNDANCE, CAULIFLOWER SNOW CROWN, SUMMER SQUASH ZUCCHINI ELITE, AND BROCCOLI GREEN COMET WERE USED TO COMPARE DOUBLE CROPPING SYSTEMS WITH MONOCROPPED SYSTEMS. THE DOUBLE CROPPING SYSTEMS USED WERE SPRING SNAP BEAN AND FALL CAULIFLOWER, SUMMER SQUASH AND FALL BROCCOLI, AND SPRING SWEET CORN AND FALL SNAP BEANS. THE MONOCROP SYSTEM WAS USED AS A CONTROL FOR THE DOUBLE CROPPING SYSTEMS. THE GREATEST NET RETURNS WERE (1) SQUASH MONOCROPPED OR SQUASH/BROCCOLI DOUBLE-CROPPED, (2) SQUASH DOUBLE-CROPPED, (3) CAULIFLOWER OR CAULIFLOWER/SNAP BEAN DOUBLE-CROPPED, AND (4) BROCCOLI OR CAULIFLOWER OR SNAP BEANS MONOCROPPED. FALL SNAP BEANS PROVIDED THE LEAST ECONOMIC RETURN. THE DOUBLE CROPPING SYSTEM ALLOWS AN OPTION OF CROP PRODUCTION WITH A POTENCIAL INCREASE IN YIELD AND ECONOMIC RETURNS USING HALF THE AMOUNT OF LAND/YR REQUIRED FOR EITHER CROP GROWN IN MONOCULTURE. IN ADDITION, THESE SYSTEMS REDUCE THE RISK OF ECONOMIC FAILURE DURING A YEAR OF LOW MARKET DEMAND FOR EITHER CROP GROWN ALONE. (AS).

0448

20004 GUNASENA, H.P.M. 1982. Performance of a maize-legume intercrop system in Sri Lanka: summary. In Keswani, C.L.; Ndunguru, B.J., eds.

Symposium on Intercropping in Semi-Arid Areas, 2nd., Morogoro, Tanzania, 1980. Proceedings. Ottawa, Canada, International Development Research Centre. pp.72-73. Engl. [Dept. of Crop Science, Faculty of Agriculture, Univ. of Peradeniya, Peradeniya, Sri Lanka]

Phaseolus vulgaris. Snap beans. Intercropping. Zea mays. Fertilizers. N. Yields. Sri Lanka.

Six expt. were conducted during 1977-78 to evaluate N utilization in some locally important maize-legume (mainly soybean) intercropping systems and to compare their nutritive value and economics with corresponding monocrop systems, located at the university farm, Kundasale, and Peradeniya (Sri Lanka). An augmented exptl. design was used to include several systems of local importance, in 6 treatments replicated 3 times. In maize-French bean cv. Wade intercropping, maize yield was higher in the intercropping system while legume yield decreased. (Summary by EDITEC. Trans. by L.M.F.) D03

0449

*HINTON, A.C.; MINOTTI, P.L. 1982. Living mulch, initial investigations in a grass sod-dry bean system. Proceedings of the Northeastern Weed Science Society 36:110-111.

0450

21945 INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1982. Cultures associees. (Intercropping). In _____. Compte rendu des travaux du Departement des Productions Vegetales. Exercice 1981. Rubona. pp.137-140. Fr.

Phaseolus vulgaris. Dwarf beans. Climbing beans. Intercropping. Yields. Snap beans. Rwanda.

Data are presented on cultural trials carried out with different crop

associations at Rubona and Karama, Rwanda, in 1981. Results of intercropping trials at Karama (colluvium soils) and Burenge (transition soils) are given in table form. At Karama and Burenge, resp., av. yields of 1909 and 708 kg/ha (climbing bean) and of 1333 and 600 kg/ha (dwarf beans) were obtained. (Summary by I.B.) D03

0451

23921 McLEAN, I.B. 1981. Intercropped tomato and snap bean: a computer model. Ph.D. Thesis. East Lansing, Michigan State University. 203p. Engl., Sum. Engl., 135 Refs., Illus.

Phaseolus vulgaris. Snap beans. Intercropping. Lycopersicon esculentum. Carbon fixation. Plant respiration. Yields. Spacing. Timing. Planting. USA.

A dynamic simulation model of intercropped tomato cv. PikRed and snap bean cv. Bush Blue Lake is presented. By repeated simulations the model predicts the combinations of 3 variables (C fixation, respiration rates, and photosynthate partitioning) which optimize individual and combined species yields. Field validation trials confirmed the predicted optimum combinations of 0.80 and 0.05 m spacing between tomato plants and between snap bean plants, resp., together with the earliest sowing of snap beans for max. total yield. (Extracted from author's summary) D03

0452

21913 MANSFIELD, J.E. 1982. Mixed cropping in Tabora region. Summary. In Keswani, C.L.; Ndunguru, E.J., eds. Symposium on Intercropping in Semi-Arid Areas, 2nd., Morogoro, Tanzania, 1980. Proceedings. Ottawa, Canada, International Development Research Centre. pp.158-159. Engl.

Phaseolus vulgaris. Snap beans. Intercropping. Yields. Tanzania.

Upland annual rainfed crops grown within Tabora region (Tanzania) are mentioned. French beans and other legumes are found in mixed croppings which vary in combination from year to year. It is a highly flexible system that has developed over the years and it is highly resistant to changing to monocropping as far as family food crop production is concerned. Yields show a high C.V. (Summary by I.B.) D03

0453

27367. MULLINS, C.A. 1985. EFFECT OF CROP ROTATION ON SNAP BEAN PRODUCTION. BEAN IMPROVEMENT COOPERATIVE. ANNUAL REPORT 28:107-109. EN. 3 REF. [DEPT. OF PLANT & SOIL SCIENCE, UNIV. OF TENNESSEE PLATEAU EXPERIMENT STATION, RT. 9, BOX 363, CROSSVILLE, TN 38555, USA]

A 5-YR TRIAL WAS INITIATED IN 1982 AT THE U. OF TENNESSEE PLATEAU EXPT. STATION [USA] TO OBTAIN INFORMATION ON CROP ROTATION FOR SNAP BEANS IN THIS AREA. A PLOT ROTATED OUT OF SNAP BEANS IN 1979 AND 1980 AND PLANTED TO SNAP BEANS IN 1981 WAS SELECTED FOR THE STUDY. ROTATION CROPS WERE SNAP BEANS, FIELD MAIZE, WHEAT, AND GRASS. ROTATION SEQUENCE HAD LITTLE EFFECT ON THE FALL BEAN YIELD IN 1983. ROTATION EFFECTS WERE MOST EVIDENT IN THE SPRING OF 1984 WHEN YIELDS WERE HIGHEST IN PLOTS IN SOD THE PREVIOUS 2 YR. PLOTS THAT HAD 2 CROPS OF SNAP BEANS IN 1982 AND FIELD MAIZE IN 1983 HAD A

MODERATE BEAN YIELD. IT IS EVIDENT THAT 2 YR OUT OF SNAP BEANS IS BEST, BUT DOUBLE CROPPING DID NOT APPEAR AS DETRIMENTAL AS WAS EXPECTED. [CIAT].

0454

19300 THOMAS, P.K.; MOHAN KUMAR, C.R.; PRABHAKAR, M. 1982. Intercropping cassava with French beans. Indian Farming 32(4):5. Engl. [Central Tuber Crops Research Inst., Sreekariyam, Trivandrum, 17 Kerala, India]

Phaseolus vulgaris. Snap beans. Intercropping. Manihot esculenta. Planting. Spacing. Timing. Fertilizers. Harvesting. India.

Some of the intercropping studies with cassava at the Central Tuber Crops Research Institute, Trivandrum, India, have shown that the French bean var. Contender can be taken as a successful intercrop with cassava. Management practices for this association are given. Cassava cuttings should be planted in the 1st half of June and immediately after cassava planting, been seeds should be dribbled at a spacing of 30 cm interrow and 20 cm within the rows. Fertilizers are applied 3 wk. after seed germination and chemical products are sprayed to control insects. The 1st harvest of green pods can be done 45-50 days after planting, and 2 more pickings can be done within 10-15 days time. Cassava will be ready for harvest 10 mo. after planting. (Summary by F.G. Trans. by L.M.F.) D03

0455

17859 WILL, A.G.K. 1971. Notes on a small vegetable market garden trial in Uganda. In East African Horticultural Symposium, 1st., Kampala, Uganda, 1970. Papers. The Hague, Netherlands, International Society for Horticultural Science. Technical communications no.21. pp.66-72. Engl., 2 Refs.

Phaseolus vulgaris. Rotational crops. Marketing. Snap beans. Income. Irrigation. Uganda.

Five years of monitoring an intensively cultivated vegetable garden with crop rotation at the Kawanda Research Station, Uganda, showed the most successful crop sequence to be: for the 1st year, cabbage, broccoli, cauliflower, leeks; the 2nd yr, tomato, French bean; the 3rd year, Swiss chard, lettuce, cucumber and with the following catch crops: carrots, spring onions, beet, spinach, Amaranthus sp., Solanum sp., and French bean. With supplementary irrigation, all year round vegetable production can be achieved in Uganda. A min. size of 2 ha is recommended to allow an adequate profit margin. (Summary by ENITEC. Trans. by L.M.F.) D03

0456

21953 WILSON, G.F.; ADENIRAN, M.O. 1976. Intercropping of cassava with vegetables. In Monyo, J.H.; Ker, A.D.R.; Campbell, M., eds. Symposium on Intercropping in Semi-Arid Areas, Morogoro, Tanzania, 1976. Report. Ottawa, Canada, International Development Research Centre. p.24. Engl.

Phaseolus vulgaris. Snap beans. Intercropping. Manihot esculenta. Yields. Nigeria.

The results of a series of expt. on vegetables in a cassava-based cropping system for the humid tropics, carried out by the farming systems program of the International Institute of Tropical Agriculture, Ibadan, Nigeria, are briefly discussed. With the aid of irrigation 1 crop of cassava was intercropped with 3 of vegetables (tomato-okra-French bean); the highest yield was obtained when cassava rows were 2 m apart. Cassava suppressed the yields of okra and French bean. The poor performance of French bean could have been due to the zero tillage method used. (Summary by F.G. Trans. by L.M.F.) D03

0457

10683 ALLEN, A.G. **Processing requirements of green beans.** Hobart, Tasmania, Australia, s.e., 1978. 2p. Engl.

Paper presented at Bean Improvement Workshop, Sydney, Australia. 1978.

Phaseolus vulgaris. **Seed. Harvesting. Processing. Marketing. Production. Australia.**

The following aspects of french bean industry are discussed briefly: purchase and supply of seed, on-farm production, harvesting and processing of the crop. *(Summary by T.B.)* D04 J00

0458

10681 BARKE, R.E. **The influence of nutrition and irrigation on yield and quality of french bean seed.** Bowen, Queensland Department of Primary Industries, 1978. 16p. Engl., Sum. Engl., 43 Refs.

Paper presented at Bean Improvement Workshop, [illegible], Australia, 1978.

Phaseolus vulgaris. **Seed. Irrigation. Plant nutrition. Nutritional requirements. N. P. K. Fertilizers. Toxicity. Yields. Pods. Soil water.**

Correct nutrition in the parent plant is essential for healthy growth, good yields and high-quality french bean seed. All essential nutrients need to be present in sufficient quantity for healthy growth and maturation processes for the production of good yields of high-quality seed. Elements present in toxic quantities in the parent plants may also result in impaired seed quality. All essential nutrients other than N should be present in luxury quantities, and soil and leaf analysis techniques should be used to ensure that these requirements are being met. These techniques can also be used to prevent toxicities developing. Generally where the soil pH is between 6-6.5 and good-quality water is used, then toxicities are unlikely. Deficiencies of N, Ca, Mg, K and B have been reported to be especially likely to result in poor-quality seed. N is an especially difficult element to use in french bean crops whether grown for pods or for seed. This element is required in much greater quantities than any other essential mineral nutrient for good yields and seed quality. The heaviest demands for the element occur during the pod and seed development stages. A shortage at this stage results in pod abortion, lower yields and poorer quality seed; however, too much N can lead to excessive vegetative growth and proneness to lodging and diseases. Excessive N may also delay harvesting, especially where pod set is unsatisfactory. The element should be applied at rates depending on the available soil level of this element at planting and also ideally depending on the amount of pod set that occurs. Rapid soil and plant field-diagnostic techniques hold promise for a more controlled use of this element. The effects of moisture stress and supply on french bean performance show many similarities to the effects of N supply. Stress during the flowering period is especially detrimental to final yield of pods or seed, and adequate supplies are necessary during pod filling to ensure adequate nutrient absorption and seed protein content. However, high available water late in the crop can lead to larger seed, which may result in seed-quality problems. A controlled use of water and N are necessary during the vegetative growth phase to minimize the risks of excessively vegetative plants. *(Author's summary)* D04

0459

10679 BEAL, P. **The french bean seed industry in the dry tropics of Queensland.** Bowen, Queensland, Department of Primary Industries, 1978. 4p. Engl.

Paper presented at Bean Improvement Workshop, Sydney, Australia, 1978.

Phaseolus vulgaris. **Seed production. Seed. Germination. Seed characters. Storage. Industrialization. Cultivation. Australia.**

An analysis is made of the present situation of bean seed production, that of french beans decreasing (1138 ha in 1974 vs. 437 in 1977) and that of navy beans increasing (0 in 1974 vs. ca. 460 in 1977). Criticisms are given of Queensland seed as compared to seed of US origin. Observations of commercial plantations showed that low %s of germination were due to harvesting and storing seeds with high moisture content. Recommendations are given to seed growers and merchants on the optimum treatment from seeding to harvesting and in subsequent storage. Future prospects of the french bean seed industry are analyzed. *(Summary by F.G. Trans. by T.B.)* D04

0460

11635 CLARK, B.E. and PECK, N.H. **Relationship between the size and performance of snap bean seeds.** Geneva, N.Y. Cornell University. New York State Agricultural Experiment Station. Bulletin no. 819. 1968. 30p. Engl., Sum. Engl., 6 Refs., Illus.

Phaseolus vulgaris. **Seed. Cotyledon cracking. Seedlings. Seed characters. Laboratory experiments. Field experiments. Cultivars. Germination. Yields. USA.**

Various lots of french bean seeds, most of which represented var. subject to transverse cracking of the cotyledon, were separated into different size grades and then subjected to lab germination tests and planted in field trials. In lots showing an appreciable amount of transverse cracking, small seeds generally produced more seedlings with intact cotyledons and a higher total % germination in the lab tests than the large seeds. In field plantings where seeds of the different sizes were planted in separate rows and where the same no. of seeds was planted in each row, rows planted from large seeds generally outyielded those planted from small seeds. The same was true when planting rates were adjusted in accordance with lab germination tests to provide approx the same no. of plants in each row. When the same wt of seed was planted in each row, however, rows from small seeds generally outyielded those from large seeds. When 2 different seed sizes were alternated in the same row, the yields obtained were generally equivalent to the average of the yields from the 2 seed sizes planted in separate rows. In single harvests made on the same date for plants from small and large seeds, a higher proportion of small pods was usually obtained from small seeds than from large seeds. (*Author's summary*) D04 D00

0461

1374 DEAN, L.L. **Progress with persistent-green color and green seed-coat in snap bean (*Phaseolus vulgaris* L.) for commercial processing.** HortScience 3(3):177-178. 1968. Engl., Sum. Engl., 5 Refs.

Phaseolus vulgaris. **Seed color. Seed coat. Pods. Processing. Fibre content. Seed. Maturation. Chlorophyll. Crossbreeding. Curly top virus. Bean common mosaic virus. Host-plant resistance.**

Persistent-green color was incorporated into curly top- and bean common mosaic virus-resistant french beans. Cooperative observation and processing trials throughout the US indicated wide adaptability and good commercial potential for several lines. Release of one or more of these french beans to commercial seedmen for multiplying was anticipated for 1968. (*Author's summary*) D04 G00 E04

0462

10891 DHINGRA, O.D. and MAFFIA, L.A. **Acetone as a fungicide carrier in dormant snap bean seeds.** Fitopatologia Brasileira 3:267-270. 1978. Engl., Sum. Engl., Port., 7 Refs.

Phaseolus vulgaris. **Pesticides. Seed treatment. Cotyledons. Seed coat.**

French bean seeds were soaked for 30, 60 or 90 min in 0.25, 0.5, 1.0 or 1.5% solution of benomyl, methyl thiophanate, carboxin, thiram, captafol or PCNB in acetone. Fungicide activity was detected in all the treated seeds; all fungicides penetrated into the seeds in the absence of water. Benomyl, methyl thiophanate and carboxin penetrated the cotyledons, whereas thiram, captafol and PCNB penetrated through seed coat up to the cotyledon surface. Fungicidal activity of benomyl and methyl thiophanate was detected in cotyledons, hypocotyl and primary leaves of seedlings from treated seeds, whereas activity of carboxin was detected only in the cotyledons. Methyl thiophanate activity was detected in the roots of seedlings from seeds treated with 1.5% solution. Acetone did not harm the seeds, which were soaked for up to 2 hr. (*Author's summary*) D04

0463

7089 FARKAS, D.F. **Use of seed size for controlling snap bean quality for processing.** Food Technology 21(5):105-107. 1957. Engl., Sum. Engl., 8 Refs., Illus

Phaseolus vulgaris. **Seed Pods. Seed characters. Processing. Maturation. Irrigation. Yields. Cultivars.**

A method for measuring and controlling the maturity of french beans for processing is described. Incoming loads of beans were continuously sampled, and the length of 10 seeds in cm, in ten 4-sieve ($^{24}/_{64}$ in., 0.953 cm) or 5-sieve ($^{27}/_{64}$ in., 1.071 cm) diameter pods, was determined. Seed length was continuously compared with pod diameter distributions and processed product quality on a standard quality control chart. The use of this chart in process optimization is discussed. (*Author's summary*) D04

0464

14277 GAGE, J.F. and BAIN, J.M. **Seasonal variation in french bean seed weight.** Australian Seed Science Newsletter 5:72-75. 1979. Engl., Illus.

Phaseolus vulgaris. **Climatic requirements. Seed characters. Temperature. Photoperiod. Flowering. Plant development. Australia.**

A no. of french bean cv. was planted at Redland Bay, in SE Queensland (Australia) every mo. during a 12-mo. period (1977-78) with uniform cultural conditions, to determine the influence of environmental factors on bean seed size. Seed was harvested when mature and mean seed dry wt. was determined. An inverse relationship between temp. and seed wt. was found. The apparent relationship between seed wt. and photoperiod probably results from the correlation between photoperiod and temp. The possibility of using early or late plantings as a means of reducing seed size is indicated. *(Summary by I.B. Trans. by L.M. F.)* D04

0465

17811 KERR, W.E. 1962. Bean seed production. Rhodesia Agricultural Journal 59(3):159-164. Engl., Sum. Engl., 6 Refs., Illus.

Phaseolus vulgaris. Seed production. Snap beans. Climatic requirements. Fertilizers. Soil requirements. Planting. Timing. Irrigation. Harvesting. Threshing. Yields. Melanagromyza phaseoli. Uromyces phaseoli. Colletotrichum lindemuthianum. Meloidogyne javanica. Xanthomonas phaseoli. Pseudomonas phaseolicola. Rhizoctonia solani. Isariopsis griseola. Rhodesia.

Bean cultivation in Rhodesia is confined to irrigable land. Climatic and soil conditions for growing, and cultivation practices are described; special attention must be paid to irrigation. The potential yield is about 1500 kg/ha. Various pests and diseases and their control are reviewed. (Summary by Abstracts on Tropical Agriculture) D04

0466

19444 SANCHEZ, A. 1983. Normativas para la certificación de semillas de fríjol, categorías de semillas, muestreo y almacenaje. (Norms for certifying bean seed, seed categories, sampling, and storage). In Curso Intensivo de Postgrado en la Producción de Fríjol, 4o., Matanzas, Cuba, 1983. Conferencias. Cuba, Ministerio de Agricultura. pp.47-61. Span., 10 Refs., Illus.

Phaseolus vulgaris. Snap beans. Seed production. Legal aspects. Seed. Cuba.

The different norms regulating common bean and snap bean production in Cuba are reported. The following aspects are analyzed: land requirements and separation or isolation of lots to prevent var. mixture, removal of undesirable plants, field inspection to verify isolation, monitoring of pests and diseases and var. characteristics. Max. tolerance under field conditions or threshold levels of (a) plant types not corresponding to the var. and (b) presence of viruses, fungal pathogens (Colletotrichum lindemuthianum and Sclerotium sp.), and bacteria (Xanthomonas phaseoli) are important. Harvesting should take place when beans have a MC between 12.5-18%. Among the different types of seed (basic, registered 1, registered 2, certified 1, and certified 2), differences were established regarding field tolerance and quality specifications such as % pure seed, inert material, seeds of other crops, of other var. and weeds, spotted seed, germination, and moisture. Concepts related to seed sampling are defined, among which are classes (elemental, global, and lab. sampling), sampling intensity according to the no. of sacks or amount of seed, and fundamental data to allow identification. (Summary by EDITEC. Trans. by L.M.F.) D04

0467

1284 SILBERNAGEL, M.J. and DRAKE, S.R. **Seed index, an estimate of snap bean quality.** Journal of the American Society for Horticultural Science 103(2):257-260. 1978. Engl., Sum. Engl., 11 Refs.

Phaseolus vulgaris. **Seed. Seed characters. Pods. Yields. Processing. Fibre content. Harvesting.**

A "seed index" based on the product of seed wt by length was positively correlated with the fiber development of large- and medium-sieved french beans, whether fresh or canned. Fresh seed index values, which are easier to measure than fiber, can be used to estimate canned product quality rapidly and inexpensively. It is suggested that var. be compared for yield, days and/or heat units to harvest maturity, sieve size distribution and quality, when at least 95% of the harvested pods are within Fancy Grade (max 8% of the french bean wt corresponds to seeds). (*Author's summary*) D04

0468

9646 SMITTLE, D.A., WILLIAMSON, R.E. and STANSELL, J.R. **Response of snap bean to seed separation by aerodynamic properties.** HortScience 11(5):469-471. 1976. Engl., Sum. Engl., 6 Refs., Illus.

Phaseolus vulgaris. **Seed. Cultivars. Germination. Seedlings. Seed characters. Yields. Bean root rots.**

Seed of 11 french bean cv. were separated by aerodynamic properties in a vertical air column into 2 equal (heavy and light) volumes. The separation technique did not affect seed germination, seedling emergence or plant survival at full expansion of the 1st trifoliate leaf. However, seed remaining in the air column after aspiration (heavy seed) produced fewer weak plants and fewer plants with root rot (*Rhizoctonia solani*) at the 1st trifoliate leaf stage. These seed produced a higher plant stand, increased pod wt/plant and a more uniform pod size distribution. Heavy-and

light-seeded population yielded 15 and 11 t/ha, respectively. Yield of heavy seed was 21% more than nongraded seed while that of light seed was 11.3% less. (*Summary by Field Crop Abstracts*) D04

0469

10685 WHATMORE, A.W. **Present and future situation in the Australian green bean industry.** Crows Nest, New South Wales, Edgell Division of Petersville Pty, 1978. 3p. Engl., Sum. Engl.

Paper presented at the Improvement Workshop, Sydney, Australia, 1978.

Phaseolus vulgaris. **Processing. Marketing. Industrialization. Consumption. Australia.**

Because of high production costs, the processed frozen and canned french bean market in Australia is mainly domestic. Perspectives for the industry are not very good as the market will probably remain virtually static, or at best, increase at a rate of 1-2%/yr, equivalent to population increase. On the other hand, the Australian consumer is becoming more sophisticated, and the rapid growth of the fast-food business and meals prepared away from home may contribute to a decline in per capita bean consumption. (*Summary by T.B.*) D04

0470

10678 WRIGHT, R.M. **Field research on french bean seed production problems in the dry tropics of Queensland.** Bowen, Queensland Department of Primary Industries, 1978. 6p. Engl., Illus.

Paper presented at Bean Improvement Workshop, Sydney, Australia, 1978.

Phaseolus vulgaris. **Seed production. Plant nutrition. Seed characters. Weeding. Harvesting. Water content. Germination.**

Results of field research on nutrition, weed control, harvesting procedures, and field germination and performance are discussed with reference to their effects on seed quality. Applications of 200 kg N/ha as a side-dressing increased yields 30%, mainly due to increased seed size (large seeds are desirable for cooking but not for the processing bean seed market). Mn levels are high (200-400 ppm in the leaves); Zn applications have had no effect on yield or seed germination. Recommended herbicides are EPTC (Eptam) and trifluralin (Treflan); almost 80% of the bean seed area is treated annually. Threshing and cleaning seed affects germination up to 29 and 17%, respectively, moreso in the white-seeded var. than the french beans. All harvesting procedures are conducted at seed moisture levels far below those recommended in the USA. For both green bean and seed production, better results were obtained by sowing high-germinating lines than lower germinating lines at higher planting rates. (*Summary by F.G. Trans. by T.B.*) D04

0471

9010 WYATT, J.E. **Seed coat and water absorption properties of seed of near-isogenic snap bean lines differing in seed coat color.** Journal of the American Society for Horticultural Science 102(4):478-480. 1977. Engl., Sum. Engl., 12 Refs., Illus.

Phaseolus vulgaris. **Seed coat. Seed color. Water absorption. Cultivars. Seed. Cotyledons. USA.**

Differences in water absorption by intact seeds and in osmotic properties of excised seed coats were measured in 4 near-isogenic breeding lines of french beans, *Phaseolus vulgaris.* White seeds absorbed water more rapidly than colored ones. Excised white seed coats were more permeable to water than colored seed coats in response to an osmotic gradient. Seed coat thickness and seed

coat dry wt were negatively correlated with rate of osmosis through the seed coats. Colored seeds had greater seed coat dry wt and thickness than white seeded isolines. (*Author's summary*) D04

0472

11191 ZAEHRINGER, M.V., DAVIS, K.R. and DEAN, L.L. **Quality attributes of persistent-green color snap beans (*Phaseolus vulgaris* L.) in relation to sieve size, growing area, freezing, and canning.** Moscow. University of Idaho. Agricultural Experiment Station. Research Bulletin no.93. 1976. 11p. Engl., Sum. Engl., 16 Refs.

Phaseolus vulgaris. **Seed characters. Seed color. Chlorophyll. Cooking. Cultivars. Processing.**

Sieve-size distribution, % seed and blendor fiber determinations, and a combination of alcohol-insoluble solids (AIS) and DM give a general idea of maturity of french beans; but these tests do not yield a complete characterization of quality since no information on color or color-related constituents is obtained. This is of particular importance in evaluating the quality of persistent-green color (PC) french beans. In this study detailed results are given of > 20 physical, chemical and sensory measurements related to quality made on PC cv. Custer and Xlda 267-4. (*Summary by T.B.*) D04

D05 Varietal Trials

0473

22670 BAGGETT, J.R.; VARSEVELD, G.W. 1982. Green beans tested for yield and quality. Oregon Vegetable Digest 31(2):1-6. Engl.

Phaseolus vulgaris. Snap beans. Germplasm. Yields. Seed characters. Cultivars. Canned beans. USA.

The results of the evaluations of new breeding lines of snap beans for processing in Oregon, USA, during 1981 are presented. Two lines, Oregon 43 and Oregon 55, were released officially. The yields of 38 lines of 2 plantings and the canned green bean quality scores (color, appearance, texture, flavor, and flesh) are presented in table form. [CIAT]

0474

10839 BASCUR B., G. and CAFATI K., C. **Variedades de frejoles recomendadas por el INIA para la zona Centro Norte.** (*Bean varieties recommended by INIA for the North-Central zone of Chile*). Investigación y Progreso Agrícola 9(1):54-55. 1977. Span., Illus.

Phaseolus vulgaris. **Cultivars. Adaptation. Host-plant resistance. Viroses. Spacing. Chile.**

The characteristics are given in table form of 8 dry and french bean var., resistant or tolerant to seed-transmitted virus diseases, as well as recommended planting distances, densities and dates. The vegetative cycles range from 60-120 days. (*Summary by T.B.*) D05

0475

8158 BEDFORD, L. V. **Variety performance trials of dwarf french beans (*Phaseolus vulgaris* L.).** Journal of National Institute of Agricultural Botany 14:86-92. 1976. Engl., Sum. Engl., Illus.

Phaseolus vulgaris. **Cultivars. Dwarf beans. Pods. Field experiments. Experiments design. Yields.**

The results are presented of variety performance trials of dwarf french beans at the National Institute of Agricultural Botany and Processors and Growers Research Organization from 1968-

74. The 20 varieties were classified as long, short, flat or wax podded. Maturities ranged from 6 days earlier than the control variety Bush Blue Lake 274 to 1 day later. Differences in pod characters and plant habit are described. *(Author's summary)* D05

0476

23376 CASTRO A., M. 1957. Fríjol variedades ejoteras y variedades comunes. (Evaluación del rendimiento en grano). [Snap bean and dry bean varieties. (Evaluation of grain yield)]. Tesis Ing.Agr. Chapingo, México, Escuela Nacional de Agricultura. 49p. Span., Sum. Span., 27 Refs., Illus.

Phaseolus vulgaris. Cultivars. Yields. Adaptation. Snap beans. Apion godmani. Epilachna varivestis. Empoasca fabae. Colletotrichum lindemuthianum. Uromyces phaseoli. Pseudomonas phaseolicola. Xanthomonas phaseoli. Erysiphe polygoni. Bean common mosaic virus. Mexico.

The yield of 14 snap bean var. was assessed in El Horno exptl. field, Chapingo, Mexico. Highly significant differences were found for var. and significant differences for replications. Var. Tendergreen and Ferry's Plentiful are recommended when snap bean prices are low; these can be left to mature to be sold as dry grain. The major bean pests and diseases are briefly described as well as their control measures in the Chapingo region. [AS (extract)-CIAT]

0477

1072 CHIRIBOGA V., C.E. Adaptabilidad y estabilidad de ocho variedades de frejol (*Phaseolus vulgaris* L.), en cinco localidades de la Sierra Ecuatoriana. (*Adaptability and stability of eight french bean varieties in five locations of the Ecuadorian Sierra*). Tesis Ing. Agr. Quito, Universidad Central del Ecuador. Facultad de Ingeniería Agronómica y Medicina Veterinaria, 1977. 86p. Span., Sum. Span., Engl., 52 Refs., Illus.

Phaseolus vulgaris. Cultivars. Adaptation. Yield components. Soil analysis. Agronomic characters. Cultivation. Statistical analysis. Field experiments. Harvesting. Ecuador.

A study was conducted at 5 locations in the Ecuadorian Sierra (highlands) for 1 yr to determine the range of adaptation and to evaluate the main agronomic characteristics of 8 french bean var. A randomized complete block with 4 replications was used, and analyses of simple correlations were made between yield and the rest of the characteristics; harvest index and yield components as well as biological yield. The Finlay & Wilkinson method was used to estimate yield stability, based on the following paramaters: regression coefficients and av yield of each var. at each site. Panamito was the latest to reach maturity and Linea-32 to bloom at all locations. Both var. had more pods/plant and more seeds/pod. The correlation between yield and its components was not constant at the different sites, but there was a good correlation between yield and HI. Best yields were obtained with Linea-32, for its better adaptation to poor environments (1577 kg/ha); Nima, for its specific adaptation to favorable environments (1410 kg/ha); and Uribe for its av adaptation (1317 kg/ha). (*Author's summary*) D05

0478

6075 CHUNG, J.H. and GOULDEN, D.S. Yield components of haricot beans (*Phaseolus vulgaris* L.) grown at different plant densities. New Zealand Journal of Agricultural Research 14:227-234. 1971. Engl., Sum. Engl., 12 Refs.

Phaseolus vulgaris. Spacing. Yields. Cultivars. Statistical analysis. Flowering. Growth. Agronomic characters. Field experiments.

At Lincoln 8 dry bean cultivars were grown at 2 and 4 in. spacing in 18 in.-rows in 1969-70. The

cultivars Small White Commercial, White Navy, Sanilac and Seaway were superior in yield and seed size for processing. On average, plots with 2 in. spacing yielded 9.8% more than plots with 4 in. Cultivars did not differ significantly in their yield response to different plant spacings. The cultivars differed in flowering date, growth habit, pod clearance from the ground and seed size. The plot-to-plot correlation of yield with no. of pods/plant was positive and significant at the wider spacing. Yield was not associated with no. of seeds/pod and showed a significant negative correlation with 100-seed wt. Inverse relationships among components of yield were observed, but no. of pods/plant and 100-seed wt were not significantly correlated. Standardized partial regression coefficient analysis indicated that no. of pods was the main component determining yield. Selection for high yield can be based on no. of pods/plant when grown at wider plant spacing. Heritability estimates for components of yield were very high. (*Author's summary*) D05

5012

0479

COELHO, R.G. et al. Productividade de alguns cultivares de feijão-de-vagem (Phaseolus vulgaris L.) de porte baixo. (Productivity of some snap bean (Phaseolus vulgaris L.) cultivars). Revista Ceres (Brazil) 31(118):518-521. 1974. Port., Sum. Engl., 5 Refs.

Phaseolus vulgaris. Cultivars. Productivity. Experiment design. Temperature. Water requirements (plant). Brazil.

This study was carried out at two experimental stations of IPEACS, at Itaguí and at Avelar, Vassouras, Rio de Janeiro in 1972 and 1973 to test the behavior of 8 snap bean cultivars in the regions Serrana and Baixada Fluminense. Results indicated that greater use should be made of bush-type beans in that region. 'Contender' was the best variety tested, yielding 17,930 kg/ha. (Author's summary)

0480

10335 FOUILLOUX, G. **Classification et évolution des variétés de haricot.** (*Classification and evolution of french bean varieties*). *In* Réunion EUCARPIA Haricot. Versailles, France, Centre National de Recherches Agronomiques, Station de Génétique et d'Amélioration des Plantes. 1975. pp.5-16. Fr.

Phaseolus vulgaris. **Cultivars. Agronomic characters. Host-plant resistance. Diseases and pathogens. Seed color. Adaptation. Pods. Cultivation. France.**

A summary is presented of the different types and var. of green beans, as well as their cultivation in France. Among classification criteria figure growth habit (bush or climbing var.); pod structure (fibrous, oblique fiber structure or without fiber) which will determine their utilization; color and seed shape. Breeding work is mainly focused on pods and not sufficiently on the seed. The principal objetive of breeders is to produce var. resistant to diseases and herbicide toxicity. Regarding var. aspects, taller var. are being sought, adaptable to different technological operations, resistant to lodging and showing a balance between length, straightness and the presence of fibrous structure, as well as being adaptable to only one mechanical harvest. There are a great many var., legal and illegal, but their yields are too low and seed cost too high. To lower consequent imports, breeding studies, white bean (particularly Flageolet) production and new high-yielding var. that can be planted on a large scale, should increase. (*Summary by M.R.T. Trans. by L.M.F.*) D05

0481

13128 GOMEZ C., O., DIAZ F., T.M.R. and DEPESTRE M., T. **Evaluación de variedades de habichuela (*Phaseolus vulgaris*).** (*Evaluation of french bean varieties*). Ciencia y Técnica en la Agricultura (Viandas, Hortalizas y Granos) 1(2):75-83. 1978. Span., Sum. Span., Engl., 8 Refs.

Phaseolus vulgaris. **Cultivars. Introduction. Yields. Adaptation. Cuba.**

An evaluation was made of 14 french bean var. introduced in Cuba as compared to the improved var. Tendergreen and the commercial var. Harvester. Emphasis was placed on the best var. characteristics for mechanical harvesting. As for total yield (t/ha), Harvester, Calvy "R", Valja, Casstar and Prelubel were a superior homogeneous group. Among the var. which gave almost their total production in one harvest were Gazelle (99%), Lud Ludibel (97%), Simplobel (95%), Valja (94%) and Lit no. 551 (90%). Adaptation work should be continued with those var. that showed both acceptable yield and a high grouping ability for harvesting. These var. should also be included in trials carried out according to the techniques of mechanical harvesting. *(Author's summary)* D05

0482

21387 HASSAN, M.S. 1980. Drybeans variety trials. Effect of sowing date on snapbeans. In Wadi Medani, Sudan. Gezira Research Station Library. Annual Report 1973-1974. Sudan. pp.376-377. Engl.

Phaseolus vulgaris. Cultivars. Planting. Timing. Snap beans. Yields. Sudan.

Nine dry bean var. (White Beans, Baladi S.S., Baladi, Dark Red Kidney, Great Northern, White Kidney, Light Red Kidney, Michigan Red, and Perry Marrow) were sown in a var. trial in the Gezira (Sudan). White Beans and Baladi gave the highest yields, 690 kg/feddan (1 feddan = 0.42 ha), while Perry Marrow gave the lowest (190 kg/feddan). In a randomized block expt. at the same location, snap bean var. Giza-3 was sown on 15 Oct., 30 Nov., 15 Nov., and 30 Nov. to study the effect of sowing date on yield. The difference among yields was highly significant (P = 0.001). Yields decreased with later planting dates, the highest (4956 kg/feddan) being obtained by the 15 Oct. sowing. (Summary by T.F.) D05

0483

17453 HASSELBACH, O.E.; NDEGWA, A.M.M.; OKONGO, A.O. 1980. French bean seed production trials 1978/79. In Kenya. Ministry of Agriculture. Grain legume project. Thika, Kenya, National Horticultural Research Station. Interim Report no. 16. Short Rains 1979/80. pp.61-64. Engl., Sum. Engl.

Phaseolus vulgaris. Snap beans. Cultivars. Seed production. Kenya.

A cv. trial was established with locally available planting seed of French bean cv. in order to determine suitable locations in Kenya to produce high yields of good quality seed. Fourteen entries were planted in randomized block expt. with 4 (short rainy season 1978/79) or 3 (long rainy season 1979) replications. No protective measures were taken against prevalent diseases and irrigation was only applied to ascertain an acceptable yield level. It was concluded that 2 seasons are not long enough to produce reliable data on suitable locations. Trials have to be sufficiently checked by local supervisors; simpler trials that are easier to manage should hopefully receive more cooperation. (Summary by L.M.F.) D05

0484

14324 HONMA, S. and CASH, J.N. Golden Ruler - a flat wax snap bean. East Lansing, Michigan Agricultural Experiment Station, Michigan State University. Research Report no. 382. 1979. 2p. Engl., Illus.

Phaseolus vulgaris. Cultivars. Plant breeding. Pods. Harvesting. Agronomic characters. Yields.

This snap bean cv. matures a few days later than Green Ruler or Spartan Arrow. The pods are 10-14 cm long and stringless, with low fibre content, at the normal stage of harvest. The cv. yields as high as Green Ruler and is suitable for mechanical harvesting. *(Summary by Horticultural Abstracts)* D05

0485

11158 INSTITUT DE RECHERCHES AGRONOMIQUES TROPICALES ET DES CULTURES VIVRIERES. Haricots. *(French beans). In* ___. Rapport Annuel 1977. Paris, 1978. pp.106-107. Fr.

Phaseolus vulgaris. Cultivars. Yields. Adaptation. Caribbean. Africa.

In Martinique, french bean var. Vilnel and Monel were inferior in comparison with the classic control var. Fin de Villeneuve. In Upper Volta, where a trial was conducted with 6 var., no significant differences were observed. Var. Poyalnel was satisfactory (harvest beginning 2 mo after planting, lasting 30-35 days). Var. superior to Contender, in relation to pods and beans, are being looked for, thus far without success. At the same locality, the Jamaican red bean var. Diacol Aime, ICA Duva and ICA Getaki presented yields of approx 1.6 t/ha. Trials have been repeated with climbing and bush var. in Reunion during the dry and rainy seasons of 1977. *(Full text. Trans. by L.M.F.)* D05

0486

22953 ISHIMURA, I.; LISBAO, R.S.; FORNASIER, J.B. 1981. Comportamento de cultivares de feijao-vagem (Phaseolus vulgaris L.) na regiao do Vale do Ribeira, SP. (Performance of snap bean cultivars in the Vale do Ribeira region, SP). Horticultura Brasileira 1(2):35-36. Port., Sum. Port., Engl., 3 Refs. [Estacao Experimental de Pariquera-Acu, Caixa Postal 122, 11.900 Registro-SP, Brasil]

Phaseolus vulgaris. Cultivars. Snap beans. Adaptation. Yields. Brazil.

Nine pole snap bean cv. were evaluated at the Pariquera-Acu expt. station, SP, Brazil, planted on June 8 and harvested from Aug. 10 to Oct. 6, 1977. Yields of cv. Teresópolis, Senhorita, Namorada de Atibaia, and Manteiga Mairipora did not differ statistically from that of cv. Manteiga Negr das Cruzes, but were statistically superior to those of cv. Manteiga Direita, Macarrao CAC, Tupa, and Sufco, the latter presenting the lowest yield (126 pods/m^2) among the cv. tested. (Author's summary) D05

0487

25755. KENYA. MINISTRY OF AGRICULTURE. 1974. BEAN RESEARCH PROJECT. THIKA, NATIONAL HORTICULTURAL RESEARCH STATION. INTERIM REPORT. LONG-RAINS 1974. 66P. ENGL.

THE RESULTS OF BEAN RESEARCH ACTIVITIES IN KENYA DURING THE 1974 RAINY SEASON ARE REPORTED. IN YIELD TRIALS WITH 20 VAR., 2 BLACK VAR., 90-91 AND 76-79, OUTYIELDED ALL OTHER MATERIALS WITH AV. OF 3549 AND 3360 KG/HA, RESP., OVER 4 SITES. IN WHITE-SEEDED BEAN VAR. TRIALS, LINE R.M. 1-6, Y47 WAS OUTSTANDING AND SHOWED RESISTANCE TO UROMYCES PHASEOLI. IN A N/RHIZOBIUM TRIAL WITH BEAN VAR. MEXICAN 142, NO INTERACTION BETWEEN THE FACTORS WAS OBSERVED. HERBICIDE TRIALS SHOWED THAT HAND WEEDING WAS THE BEST; HOWEVER, THE MIXTURE ALACHLOR + LINURON CAN BE RECOMMENDED. NO SIGNIFICANT YIELD RESPONSES WERE FOUND DUE TO TRACE ELEMENT APPLICATIONS. PACKAGES OF GOOD AND BAD CULTURAL PRACTICES WERE COMPARED; GOOD CULTURAL PRACTICES (EARLY PLANTING, WEED CONTROL, GOOD SEED QUALITY, AND FERTILIZATION) HAD A SIGNIFICANT EFFECT ON YIELD; HOWEVER, NO SIGNIFICANT DIFFERENCES WERE OBSERVED WITH THE USE OF FERTILIZATION

AND GOOD SEED QUALITY. YIELD TRIALS WITH 10 FRENCH BEAN VAR. SHOWED THAT VAR. PREMIER WAS THE HIGHEST YIELDER (10,625 KG PODS/HA) AND SHOWED THE HIGHEST PERCENTAGE OF MARKETABLE PODS (57.8 PERCENT = 6133 KG/HA). LAB. WORK WITH WHITE-SEEDED BEANS FOR CANNING IS SUMMARIZED. (CIAT).

0488

27780. MULLINS, C.A.; COFFEY, D.L. 1982. EVALUATION OF SNAP BEAN CULTIVARS, 1980-81. TENNESSEE FARM AND HOME SCIENCE NO.121:19-21. EN. 5 REF., IL.

EIGHTEEN SNAP BEAN CV. (7 OF WHICH BELONG TO THE BUSH BLUE LAKE TYPE) WERE ASSESSED FOR THEIR YIELD POTENTIAL AT THE U. OF TENNESSEE PLATEAU EXPT. STATION NEAR CROSSVILLE, USA. CV. BUSH BLUE LAKE 274 GAVE THE HIGHEST YIELDS.THE NON-BUSH BLUE LAKE CV. DID NOT DIFFER AMONG THEMSELVES IN YIELD POTENTIAL. (CIAT).

0489

14207 MULLINS, C.A. and SWINGLE, H.D. **Evaluation of new snap beans cultivars in Tennessee.** Tennessee Farm and Home Science 110:30-32. 1979. Engl., 5 Refs.

Phaseolus vulgaris. Plant anatomy. Pods. Cultivars. Marketing. Canned beans. USA.

Five Bush Blue Lake type and 11 non-Bush Blue Lake type snap beans cv. were evaluated and compared for pod color, curvature, roughness and length. The use of the 16 var., according to their color and pod description, for freezing, canning or the fresh market is discussed. *(Summary by Food Science and Technology Abstracts)* D05

0490

8605 PALEVITCH, D. **Effects of variety, season and maturity on yield and quality of single-harvest snap beans.** Experimental Agriculture 6(3):245-253. 1970. Engl., Sum. Engl., 10 Refs., Illus.

Phaseolus vulgaris. **Maturation. Harvesting. Pods. Cultivars. Yields. Field experiments. Experiment design.**

The quality of bean pods was influenced to a large degree by the variety, season of planting and the precise time of harvesting. The varietes Tenderette,Executive and Bush Blue Lake 274 were outstanding in their concentrated yield and pod quality. The development of seeds in the pods was faster in beans planted during the spring than in the autumn. Thickenlng of the pods during ripening was more rapid in the autumn than in the spring season. Outstanding differences were found between varieties with regard to the speed of seed development during pod ripening. As opposed to the outstanding differences between varieties with regard to quality characteristics, the differences with regard to yield were generally small and without economic importance. *(Author's summary)* D05

0491

22574. PANIAGUA G., C.V.; MATEO, M. DE J. 1983. VIVERO INTERDISCIPLINARIO Y MULTILUGAR DE ADAPTACION DE LINEAS AVANZADAS DE HABICHUELAS EN REPUBLICA DOMINICANA.

[INTERDISCIPLINARY AND MULTILOCATIONAL ADAPTATION NURSERY OF ADVANCED SNAP BEAN LINES IN DOMINICAN REPUBLIC]. IN REUNION ANUAL DEL PROGRAMA COOPERATIVO CENTROAMERICANO PARA EL MEJORAMIENTO DE CULTIVOS ALIMENTICIOS, 29A., PANAMA, 1983. MEMORIA. PANAMA, V.2. 10P. SPAN. SUM. SPAN., 3 REFS. [APARTADO 213, SAN JUAN DE LA MAGUANA, REPUBLICA DOMINICANA]

TWO ADVANCED TRIALS WERE SOWN AT 2 LOCALITIES OF THE SAN JUAN DE LA MAGUANA VALLEY [DOMINICAN REPUBLIC] TO COMPARE IMPROVED SNAP BEAN LINES AND VAR. FROM PUERTO RICO, NEBRASKA AND MICHIGAN [USA], CIAT, AND LOCAL CHECKS. THE GENOTYPE WAS STUDIED FOR VARIOUS AGRONOMIC CHARACTERISTICS AND REACTION TO DISEASES. BAT-1274 AND BAT-271 SHOWED THE HIGHEST SEED WT. BEAN RUST WAS PRESENT IN ALL THE LINES, INCLUDING THE PREVIOUSLY RESISTANT B-190. THIS DISEASE DEVELOPED TO A LESSER EXTENT IN THE DOMINICAN LINES POMPADOUR AND CONSTANZA; MITA B-190, BAT-1274, A-193, AND BAT-271 SHOWED LESS THAN 5 PERCENT RUST INFECTION; PINTIO I AND VENEZUELA 44 [BOTH SUSCEPTIBLE] SHOWED LESS THAN 25 PERCENT LEAF INFECTION. ALL THE LINES PRESENTED INFECTION BY BGMV. [CIAT].

0492

25805. RAMIREZ G., D.; DESSERT, M. 1984. EVALUACION DEL POTENCIAL GENETICO EN HABICHUELA. [EVALUATION OF THE GENETIC POTENTIAL OF SNAP BEANS]. ACTA AGRONOMICA 34[1]:14-20. SPAN. SUM. SPAN., ENGL., 9 REFS.

AN EXPT. WAS CARRIED OUT IN PALMIRA, SALADITO, AND POPAYAN [COLOMBIA] TO EVALUATE THE YIELD AND ADAPTATION OF 15 SNAP BEAN ACCESSIONS AND A LOCAL CHECK [BLUE LAKE]. A RANDOMIZED COMPLETE BLOCK DESIGN WITH 3 REPLICATIONS WAS USED AT EACH LOCATION. SNAP BEAN ACCESSIONS METEOR, TIP CROP, BOUNTIFUL, AND TRUE GREEN HAD THE EARLIEST POD SET AT ALL 3 LOCATIONS. ACCESSIONS HABICHUELA 2234, BLUE LAKE, TRUE GREEN, BOUNTIFUL, AND TENDER LONG GAVE THE HIGHEST YIELDS WITH 8876, 6104, 3173, 3087, AND 3002 KG/HA. UNDER PLAMIRA CONDITIONS, THE ACCESSIONS HABICHUELA 2234, BLUE LAKE FM 1, BOUNTIFUL, AND TRUE GREEN WERE THE BEST ADAPTED; IN SALADITO, BLUE LAKE, HABICHUELA 2234, TRUE GREEN, AND WAVERO; AND AT POPAYAN, BLUE LAKE, STRINGLESS BLUE LAKE, BOUNTIFUL, AND TENDER LONG. [CIAT].

0493

12379 RODRIGUEZ, A. J., GUADALUPE, R. and CRUZ, J.R. **Quality grading of locally grown snap beans for the fresh market.** Journal of Agriculture of the University of Puerto Rico 63(2):223-228. 1979. Engl., Sum. Engl., Span., 2 Refs.

Phaseolus vulgaris. Seed characters. Planting. Harvesting. Age. Cultivars. Yields. Timing. Puerto Rico.

An evaluation was made of 6 french bean cv. (Contender, Astro, Wade, Tendergreen, Harvester and Olympia) at the Isabela Substation, Puerto Rico. Samples from fall, winter and spring plantings were of higher quality than those from the summer. Harvester, picked at 45 and 52 days in the fall and spring plantings, resp., produced the most no. 1 grade beans. The best producers of graded beans from the summer plantings were Astro and Tendergreen although their yields were only 63.8 and 63.9%, resp. *(Author's summary)* D05

0494

9647 ROGERS, I.S. **The effect of plant density on the yield of three varieties of French beans (*Phaseolus vulgaris* L.).** Journal of Horticultural Science 51:481-488. 1976. Engl., Sum. Engl., 11 Refs., Illus.

Phaseolus vulgaris. **Spacing. Cultivars. Yields. Agronomic characters. Statistical analysis. Field experiments. Australia.**

Three french bean var. were compared in a circular systematic spacing trial. For all 3 var. the inverse quadratic equation $w = \rho(\alpha+\beta\rho+\gamma\rho^2)^{-1}$ was found to describe the data better than the equation $w = (\alpha+\beta\rho)^{-1} \cdot \theta$ where w is the mean wt/plant, ρ is the density and γ, β, γ and θ are constants. Burnley Conquest was superior in yield to Jackpot and Orbit, but the mean size of Jackpot pods was significantly greater than those of the pods of Orbit and Burnley Conquest. At 47 plants/m², the approx economic optimum, Burnley Conquest yielded 33 t/ha fresh wt of pods in a square arrangement. (*Summary by Horticultural Abstracts*) D05

0495

14362 STANG, J.R., MACK, H.J. and ROWE, K.E. **Quantitative relation of bush snap bean (*Phaseolus vulgaris* L.) yields to plant population density.** Journal of the American Society for Horticultural Science 104(6):873-875. Engl., Sum. Engl., 9 Refs., Illus.

Phaseolus vulgaris. **Yields. Spacing. Statistical analysis. Experiment design. Cultivars. Fertilizers. N. Pods. Harvesting. Field experiments.**

The yield-plant density relationships of 5 bush snap bean cv. and the effect of rate of N application on the yield-density relationship of a single cv. were studied in 2 separate expt. Responses were described by the equation $W^{-\theta} = \alpha + \beta p$ where W is the pod wt/plant, p is the plant population density, and θ, α and β are constants. The θ, α and β values were tested for significant differences among the cv. and levels of N. In expt. 1, $\theta = 0.836$ was acceptable for all 5 cv. and in expt. 2, $\theta = 0.897$ was acceptable for the 3 rates of N. Values of θ were similar to those found for bush snap beans by other researchers. Significant differences existed among both α and β values of the cv. In the N expt., α was constant but values of β differed significantly and were inversely related to the level of N. Optimum plant density was dependent on the cv. and increased with the level of N. *(Author's summary)* D05 D04

0496

17733 THAMBURAJ, S.; SHANMUGAVELU, K.G.; CHOCKALINGAM, P.; PILLAI, O.A.A. 1980. **Varietal evaluation in bush beans (*Phaseolus vulgaris* L.).** South Indian Horticulture 28(4):113-115. Engl., Sum. Engl., 3 Refs., Illus.

Phaseolus vulgaris. **Cultivars. Agronomic characters. Dwarf beans. Snap beans. Pods. Yields. India.**

Of 30 French bean var. tested over 3 seasons, Premier, Masterpiece, Stringless Grey Pod, and Bountiful are recommended for growing on the plains of Tamil Nadu, India. Green-pod yields of the 4 var. ranged from 14.62-15.52 t/ha and crop duration from 81-90 days. *(Summary by Plant Breeding Abstracts)* D05

0497

1153 TOMPKINS, D.R., SISTRUNK, W.A. and HORTON, R.D. **Snap bean yields and quality as influenced by high plant populations.** Arkansas Farm Research 21(1):4. 1972. Engl.

Phaseolus vulgaris. **Yields. Pods. Yield components. Cultivars. Seed characters. Spacing.**

Three *Phaseolus vulgaris* cv. were sown in rows 9 or 40 in.apart and stands of about 6 and 12 plants/ft of row, respectively, were established. Yields were 34-68% higher from rows 9 in. apart than from rows 40 in. apart and the yield of 4-sieve and smaller pods was increased by 94-237%. Pods from rows 9 in. apart had slightly larger seeds and more fiber than those from rows 40 in. apart. (*Summary by Field Crop Abstracts*) D05

0498

1679 TOMPKINS, D.R., SISTRUNK, W.A. and FLEMING, J.W. **Yield of snap beans** (*Phaseolus vulgaris* L.) **as influenced by 5-chloro, 2-thenyl, tri-n-butyl-phosphoniumchloride.** HortScience 6(4):393-394. 1971. Engl., Sum. Engl., 5 Refs.

Phaseolus vulgaris. **Plant-growth substances. Yields. Flowering. Field experiments.**

A single foliar spray of 25 or 28 ppm of the plant growth regulator CTBP (5-chloro, 2-thenyl, tri-n-butyl-phosphoniumchloride), applied when 1st flowers opened, increased pod yields due to a greater no. of pods. In general the CTBP treatments that increased yield did not influence seed and fiber development, shear press values, color of canned pods, and Ca, Mg, P and K content of pods and seeds. (*Summary by T.B.*) D05

0499

8517 VALERIO, F. **El cultivo de la habichuela.** (*Bean growing in the Dominican Republic*). Agroconocimientos 2(18):38-43. 1977. Span., 7 Refs., Illus.

Phaseolus vulgaris. **Climatic requirements. Soil requirements. Seed. Production. Cultivars. Planting. Spacing. Irrigation. Weeding. Diseases and pathogens. Pest control. Dominican Republic.**

Beans are the main staple in the Dominican Republic; nevertheless, yields are very low, barely covering production costs. Appropriate conditions for growing the crop are discussed including climate, soils, varieties, preparation of the land, planting dates, methods and density, irrigation, weeding, fertilization, phytosanitary measures, harvesting and storage. (*Summary by I.B.Z. Trans. by T.M.*) D05

E00 PLANT PATHOLOGY

0500

8427 BOWYER, J.W. and ATHERTON, J.G. **Mycoplasma-like bodies in french bean, dodder, and the leafhopper vector of the legume little leaf agent.** Australian Journal of Biological Sciences 24:717-729. 1971. Engl., Sum. Engl., 31 Refs., Illus.

Phaseolus vulgaris. **Mycoplasmoses. Vectors.** *Orosius argentatus.* **Electron microscopy. Host range. Leaves.**

Mycoplasmalike bodies were observed in the phloem sieve tube elements of french beans (*Phaseolus vulgaris*) and dodder (*Cuscuta australis*) carrying the causative agent of the legume little-leaf disease. In dodder, they occurred in small groups of approx 5-30, in contrast to the very large numbers in beans. In beans, some of the bodies were found within the sieve plate pores.

Mycoplasmalike bodies were also found in the salivary glands and filter-chamber region of the alimentary canals of infective individuals of the cicadellid *Orosius argentatus* (Evans). In the salivary glands, they were observed in only one of the 3 types of acini. A technique involving embedding and sectioning whole insects for electron microscopy was developed. It was simple and rapid, avoided dissection of the cicadellids and permitted examination of the salivary glands in place. Following an earlier discovery of mycoplasmalike bodies in plants infected with little leaf, the presence of similar bodies in infective dodder and in cicadellic vectors and their absence from control material is interpreted as supporting evidence for mycosplasmal etiology of the disease. (*Author's summary*) E0F01

0501

21513 HUBBELING, N. 1973. Report on bean diseases in Kenya. Wageningen, Netherlands, Institute of Phytopathological Research. 27p. Engl.

Phaseolus vulgaris. Resistance. Disease control. Symptomatology. Snap beans. Colletotrichum lindemuthianum. Macrophomina phaseoli. Fusarium solani phaseoli. Sclerotium rolfsii. Rhizoctonia solani. Uromyces phaseoli. Isariopsis griseola. Erysiphe polygoni. Ascochyta phaseolorum. Ascochyta boltshauseri. Pythium. Pseudomonas phaseolicola. Xanthomonas phaseoli. Xanthomonas phaseoli var. fuscans. Pseudomonas syringae. Heliothis zea. Delia platura. Kenya.

The incidence, economic importance, source of infection, and control of main diseases and pests, and nutritional disorders, ocurring in Kenya are given. The diseases, observed during different trips, mainly occurred in local food beans and in French beans grown for the fresh market. Fungal diseases of major importance reported are caused by Colletotrichum lindemuthianum, Macrophomina phaseoli, Fusarium solani f. phaseoli, Sclerotium rolfsii, Rhizoctonia solani, Uromyces appendiculatus, Isariopsis griseola, Erysiphe polygoni. Fungal diseases of minor importance are those caused by Ascochyta phaseolorum and A. boltshauseri, and Pythium sp. Bacterial diseases of major importance discussed include those caused by Pseudomonas phaseolicola, Xanthomonas phaseoli, X. phaseoli var. fuscans and of minor importance that by Pseudomonas syringae. BCMV is important. Nutritional disorders observed due to Mn and perhaps Fe are described as well as the insect pests Heliothis armigera and Hylemia cilicrura. Recommendations on climatic conditions, soils, chemical control, and breeding for resistance are included. (Summary by I.B.) E00

0502

21707 KENYA. MINISTRY OF AGRICULTURE. 1976. Beans. Thika, National Horticultural Research Station. Horticultural Handbook no.2. 11p. Engl.

Phaseolus vulgaris. Snap beans. Cultivars. Seed treatment. Fertilizers. P. N. Planting. Spacing. Timing. Intercropping. Zea mays. Diseases and pathogens. Colletotrichum lindemuthianum. Uromyces phaseoli. Xanthomonas phaseoli. Bean common mosaic virus. Macrophomina phaseoli. Isariopsis griseola. Fusarium solani phaseoli. Whetzelinia sclerotiorum. Ophiomyia phaseoli. Aphis fabae. Heliothis zea. Plusia. Taenothrips sjostedti. Acanthoscelides obtectus. Injurious insects. Pest control. Insect control. Disease control. Yields. Stored grain pests. Harvesting. Kenya.

The National Horticultural Research Station published a handbook on bean growing in Kenya which deals briefly with the following topics: types of beans for canning (among which Mexican 142 is the most important due to its high yield) and for consumption (Rose Coco, Mwezi Moja, and Canadian Wonder); French beans (Primour, Long Tom, Saxa, Master Piece, and Monel); climatic and edaphic requirements; land preparation; seed preparation and

dressing; seed rate; fertilizers; plant density and planting time; weeding; mixed cropping; harvesting; and marketing. A section is reserved for symptomatology and control of the following main bean diseases and pests: anthracnose (Colletotrichum lindemuthianum): rust (Uromyces appendiculatus), bacterial blight (Xanthomonas phaseoli), BCMV, ashy stem blight (Macrophomina phaseoli), angular leaf spot (Isariopsis griseola), Fusarium root rot (Fusarium solani), white mold (Whetzelinia sclerotiorum), bean fly (Ophiomyia phaseoli), aphids (Aphis fabae), American bollworm (Heliothis armigera), semi-loopers (Plusia sp.), thrips (Taenothrips sjostedti), and bruchids (Acanthoscelides obtectus). Water requirements, harvesting, and marketing for French beans are also included. (Summary by F.G. Trans. by T.F.) E00

0503

21530 LEAKEY, C.L.A. 1963. French beans and their diseases in Uganda. Kampala, Uganda. Department of Agriculture. Bulletin no.4. 3p. Engl.

Phaseolus vulgaris. Symptomatology. Disease control. Colletotrichum lindemuthianum. Uromyces phaseoli. Isariopsis griseola. Xanthomonas phaseoli. Pseudomonas phaseolicola. Xanthomonas phaseoli var. fuscans. Ascochyta phaseolorum. Ramularia deusta. Whetzelinia sclerotiorum. Nematospora coryli. Leveillula taurica. Ophiomyia phaseoli. Snap beans. Uganda.

Diseases are probably the major factor limiting bean productivity in Uganda, where it is a major staple in the local diet and has export potential. Farmers are encouraged to sort out seed and reject damaged seed, planting var. in separate blocks to help reduce disease incidence and enable them to draw a distinction between resistant and susceptible var. Major diseases of beans in the country are those caused by Colletotrichum lindemuthianum, Uromyces appendiculatus, Isariopsis griseola, Xanthomonas phaseoli, Pseudomonas phaseolicola, and X. phaseoli var. fuscans. Minor diseases include those caused by Ascochyta phaseolorum, Ramularia deusta, Sclerotinia sclerotiorum, Nematospora coryli, and Leveillula taurica. Symptomatology of these diseases and of others caused by unknown fungi is briefly described. (Summary by I.B.) E00

0504

17592 MUKASA, S.K. 1962. Notes on french beans (Phaseolus vulgaris).The importance of the crop. Kawanda, Uganda. 2p. Engl.

Phaseolus vulgaris. Symptomatology. Colletotrichum lindemuthianum. Pseudomonas phaseolicola. Isariopsis griseola. Uromyces phaseoli. Viroses. Ascochyta fabae. Plant breeding. Uganda.

The importance and present state of French bean cultivation in Kawanda, Uganda, are briefly described. The quality of the crop for marketing is very low since it is a mixture of var. and very little effort is made to clean the crop which always contains foreign matter, bits of straw, broken and discolored or diseased seeds. Symptomatology of major French bean diseases is included, namely anthracnose (Colletotrichum lindemuthianum), bacterial blight (Pseudomonas medicaginis var. phaseolicola), angular leaf spot (Isariopsis griseola), and other diseases that may be important in localized areas or during particular seasons: rust (Uromyces appendiculatus), Ascochyta leaf spot (Ascochyta fabae), viruses, and white mold (Ramularia deusta). The var. collection is being assessed and crosses are being made; preliminary observations have revealed a no. of disease-resistant var. among semiclimbers and climbers. None of the bush type var. have showed resistance. Promising or disease-resistant var. are being imported from other countries. (Summary by F.G. Trans. by L.M.F.) E00

0505

4528 ZAUMEYER, W.J. and THOMAS, H.R. Bean diseases - how to control them. U.S. Department of Agriculture. Agricultural Research Service. Agriculture Handbook no. 225. 1962. 39p. Engl., Illus.

Phaseolus vulgaris. Diseases and pathogens. Disease control. Cultivation.

The symptoms, causal agent and control methods (chemical and var.) of the principal diseases affecting bean crops are described: bacterial blights, mosaics, curly top, anthracnose, rust, watery soft rot, powdery mildew, root rots, root knot, ashy stem blight, angular leaf spot, web blight, baldhead and sunscald. The use of resistant var. and pathogen-free seed is recommended along with crop rotation, field sanitation and seed treatment. *(Summary by C.P.G. Trans. by L.M.F.)* E00

E02 Bacterioses

0506

28965 BOELEMA, B.H. 1985. A glasshouse test for screening green bean cultivars for resistance to halo blight caused by Pseudomonas syringae pv. phaseolicola. Phytophylactica 17(2):99-100. En., Sum. En., Af., 5 Ref. [Horticultural Research Inst., Private Bag X293, Pretoria, 0001, South Africa]

Phaseolus vulgaris. Snep beans. Pseudomonas syringae pv. phaseolicola. Cultivars. Resistance. Laboratory experiments. South Africa.

A method was developed for testing green bean cv. for resistance to halo blight caused by Pseudomonas syringae pv. phaseolicola. The method was based on infectivity titrations. Leaves and pods were pricked with a microsyringe and at the same time a dose of low titer of the pathogen, averaging between 6-7 cells/prick, was applied. (AS)

0507

26073. BOELEMA, B.H. 1984. INFECTIVITY TITRATIONS WITH RACE 2 OF PSEUDOMONAS SYRINGAE PV. PHASEOLICOLA IN GREEN BEANS (PHASEOLUS VULGARIS). PHYTOPHYLACTICA 16(4):327-329. ENGL., SUM. ENGL., AFR., 5 REFS., ILLUS. (HORTICULTURAL RESEARCH INST., PRIVATE BAG X293, PRETORIA 0001, SOUTH AFRICA)

A STUDY WAS MADE OF THE DOSE/RESPONSE RELATIONSHIPS BETWEEN RACE 2 OF PSEUDOMONAS SYRINGAE PV. PHASEOLICOLA AND TRIFOLIATE LEAVES AND PODS OF GREEN BEAN CV. A VAR. OF RELATIONSHIPS INDICATED EITHER INDEPENDENT ACTION OF THE CELLS OF THE PATHOGEN, OR ANTAGONISM OR FACULTATIVE SYNERGISM AMONG THESE CELLS. FACULTATIVE SYNERGISM WAS FOUND ONLY IN INFECTIVITY TITRATIONS WITH PODS. IN 1 PATHOGEN/CV. COMBINATION, A STRONG INTERACTION AMONG THE CELLS OF THE PATHOGEN WAS FOUND AT THE HIGHEST INOCULUM DOSE. THE CONSEQUENCES OF THESE

FINDINGS FOR THE SIZE OF THE INOCULUM DOSE TO BE USED IN CV. RESISTANCE TRIALS IN A GLASSHOUSE ARE DISCUSSED. [AS].

6066

05C8

DICKENS, L. E. and OSHIMA, N. An evaluation of protective sprays for halo blight control in snap beans. Plant Disease Reporter 52(3):225-226. 1968. Engl., Sum. Engl. 2 Refs.

Phaseolus vulgaris. Diseases and pathogens. Pests. Disease control. Bean halo blight. Bacterioses. Pseudomonas phaseolicola. Spraying. Copper. Research.

Foliage sprays with copper compounds for the prevention of spread of halo blight gave a substantial degree of protection. One application was as effective as two applications. (Author's summary)

0509

21569 EBRAHIM-NESBAT, F.; SLUSARENKO, A.J. 1983. Ultrastructure of the interaction of cells of Pseudomonas phaseolicola with cell walls of a resistant and susceptible bean cultivar. Phytopathologische Zeitschrift 108:148-159. Engl., Sum. Engl., Germ., 16 Refs., Illus. [Inst. für Pflanzenpathologie und Pflanzenschutz, Grisebachstrabe 6, D-3400 Göttingen, Germany]

Phaseolus vulgaris. Cultivars. Pseudomonas phaseolicola. Snap beans. Cell structure. Cell walls. Electron microscopy. Hosts and pathogens. Germany Federal Republic.

Cells of Pseudomonas phaseolicola were observed entrapped against plant cell walls in both susceptible (Red Kidney) and resistant (Red Mexican) cv. of French bean. After staining samples with ruthenium red for electron microscopy, pectic polysaccharide within plant cell walls became particularly well contrasted as did fibrillar material connecting bacteria to plant cell walls. In places this fibrillar material appeared to emanate from the pectic polysaccharide in the plant cell wall, and the plant cell wall surface was eroded at such points. Ruthenium red also stains acidic, bacterial extracellular polysaccharide and some of the fibrillar material in intercellular spaces is probably from this source. It is possible that bacteria become attached through an interaction between extracellular polysaccharide and pectic polysaccharide in plant cell walls. (Author's summary) E02

0510

9024 FOUILLOUX, G. **Etude de l'hérédité de la résistance a la graisse du haricot; sélection pour ce caractère.** (*Study on the inheritance of resistance of french beans to halo blight*). *In* Reunión EUCARPIA Haricot, Versailles, France, Centre National de Recherches Agronomiques, 1975. pp.115-123. Fr., Sum. Fr., Engl.

Phaseolus vulgaris. Pseudomonas phaseolicola. **Host-plant resistance. Inheritance. Races. Cultivars. Leaves. Genetics. France.**

A study was made of the genes controlling resistance to halo blight (*Pseudomonas phaseolicola*) in 2 resistant french bean lines (PI 150414 and OSU 10183). Localized resistance to water soaking on inoculated leaves and systemic resistance to the toxin were not controlled by the same gene nor were they the same in the two lines. (*Author's summary. Trans. by T.M.*) E02 G01

0511

12660 HARRISON, D.E. and FREEMAN, H. **Bacterial brown spot** *(Pseudomonas syringae)* **of french bean.** Journal of Agriculture 63:523-526. 1965. Engl., Sum. Engl., 14 Refs., Illus.

Phaseolus vulgaris. Pseudomonas syringae. **Leaves. Pods. Host range. Disease transmission. Hosts and pathogens. Chemical control. Australia.**

Bacterial brown spot, caused by *Pseudomonas syringae*, has been recognized as a disease of french beans in Victoria since 1940. During some seasons it has caused widespread leaf infection, often leading to extensive defoliation of susceptible var., shriveling and dropping of young, recently formed pods, or twisting and distortion of others which continue to develop. This bacterium is associated with a range of diseases on other host plants in Victoria, and these could be important in its survival from one season to the next. However, in the case of beans it has been shown that an important means of dissemination is from infected seed. For production of *P. syringae*-free french bean crops, more attention should be given to the selection of seed from disease-free plants, roguing of isolated disease centers, and the adoption of general crop sanitation measures. A considerable measure of control can be obtained in the field by applications of Bordeaux mixture, commencing about 3 wk after emergence and repeating at 2-wk intervals until most of the pods have reached approx ½ their marketable size. *(Author's summary)* E02

0512

5429 HARRISON, D.E., FREEMAN, H. and SMITH, P.R. **Common and fuscous blights of french bean.** Journal of Agriculture (Australia) 62(11):508-514. 1964. Engl., Sum. Engl., 24 Refs., Illus.

Phaseolus vulgaris. Xanthomonas phaseoli, Xanthomonas phaseoli var *fuscans.* **Seed transmission. Leaves. Stems. Pods. Plant vascular system. Host range.**

Common blight, caused by *Xanthomonas phaseoli* (E.F. Smith) Dowson, has apparently been present on french beans (*Phaseolus vulgaris* L.) in Victoria since about 1936; but it was not until early in 1962 that the causal organism was definitely identified in this state . Early in 1963, another bacterium isolated from french beans in East Gippsland was shown to be a closely related strain, known as *X. phaseoli* var. *fuscans* (Burk.) Starr and Burk. Both of these organisms are responsible for a serious blighting of all the aboveground parts of the plant, the symptoms being very similar to those produced by the well-known halo blight organism, *Pseudonomas phaseolicola* (Burk.) Dowson. The bacteria are commonly seed borne and may survive in the soil from one season to the next. The most important measure for their control is the planting of disease-free seed. The production of such seed is the aim of the Victorian Government French Bean Seed Certification Scheme; other control measure including seed treatments, spraying and crop rotation are also indicated. *(Author's summary)* E02

0513

8505 JOHNSON, J. C. **"Halo-less" halo blight of french bean in Queensland.** Queensland Journal of Agricultural and Animal Science 26:293-302. 1969. Engl., Sum. Engl., 11 Refs., Illus.

Phaseolus vulgaris. Pseudomonas phaseolicola. Pseudomonas syringae. **Hosts and pathogens. Culture media. Laboratory experiments. Leaves. Pods. Seedlings. Cultivars.**

Cultural and comparative pathogenicity studies showed that the organism responsible for bacterial blight symptoms of french beans in North Queensland closely resembles *Pseudomonas phaseolicola. (Author's summary)* E02

0514

26276. LINDEMANN, J.; UPPER, C.D. 1985. AERIAL DISPERSAL OF EPIPHYTIC BACTERIA OVER BEAN PLANTS. APPLIED AND ENVIRONMENTAL MICROBIOLOGY 50(5):1229-1232. EN. SUM. EN., 24 REF., IL. ADVANCED GENETIC SCIENCES, INC., OAKLAND, CA 94608, USA)

BACTERIAL CONCN., UPWARD FLUX, AND DEPOSITION ONTO EXPOSED PETRI PLATES WERE MEASURED OVER SNAP BEANS DURING 3 GROWING SEASONS. / NET UPWARD FLUX OF BACTERIA OCCURRED ONLY DURING THE WARM PART OF SUNNY DAYS, NOT AT NIGHT WHEN LEAVES WERE WET WITH DEW OR WHEN A THERMAL INVERSION WAS PRESENT. AEROSOL SOURCE STRENGTH WAS POSITIVELY CORRELATED WITH WIND SPEED. UPWARD FLUXES WERE HIGHER ON DAYS AFTER RAIN THAN ON DAYS WHEN THE SOIL WAS DRY. OTHER UNIDENTIFIED SOURCES OF VARIABILITY IN SOURCE STRENGTH PROBABLY EXIST. CANOPY-LEVEL DEPOSITION, APPARENTLY DUE TO INTERMEDIATE-SCALE TRANSPORT OF BACTERIA IN FAIRLY CONCENTRATED CLOUDS, CAN OCCUR IN THE EARLY EVENING. (AS).

0515

22522. LINDEMANN, J.; ARNY, D.C.; UPPER, C.D. 1984. EPIPHYTIC POPULATIONS OF PSEUDOMONAS SYRINGAE PV. SYRINGAE ON SNAP BEAN AND NONHOST PLANTS AND THE INCIDENCE OF BACTERIAL BROWN SPOT DISEASE IN RELATION TO CROPPING PATTERNS. PHYTOPATHOLOGY 74(11):1329-1333. ENGL. SUM. ENGL., 23 REFS., ILLUS. (ADVANCED GENETIC SCIENCES, INC., 6701 SAN PABLO AVENUE, OAKLAND, CA 94608, USA)

PLOTS WERE ESTABLISHED AT 11 LOCATIONS ON A 64-KM E-W TRANSECT THROUGH THE MAJOR BEAN-GROWING AREA OF CENTRAL WISCONSIN, USA. BACTERIAL BROWN SPOT DISEASE EPIDEMICS OCCURRED IN 4 OF 6 PLOTS WITHIN AND IN NONE OF 5 PLOTS OUTSIDE THE BEAN-GROWING AREA EVEN THOUGH THE BEAN SEED LOT WAS NATURALLY INFESTED WITH THE PATHOGEN. EPIPHYTIC POPULATIONS OF PSEUDOMONAS SYRINGAE PV. SYRINGAE PATHOGENIC TO BEAN (PSB) WERE GREATER ON SYMPTOMLESS BEAN LEAFLETS AND MAIZE LEAVES FROM THE BEAN-GROWING AREA THAN FROM PORTIONS OF THE TRANSECT WHERE THERE WAS NO COMMERCIAL SNAP BEAN PRODUCTION. THE PATHOGEN WAS DETECTED ON HAIRY VETCH SAMPLES FROM THE BEAN-GROWING AREA ONLY. LEAVES OF OAK, BLACK LOCUST, RYE, AND SOW THISTLE NEAR COMMERCIAL SNAP BEAN FIELDS SUPPORTED EPIPHYTIC POPULATIONS OF PSB. DIFFERENCES IN DISEASE INCIDENCE ON BEANS AND DIFFERENCES IN EPIPHYTIC POPULATIONS OF PSB ON BOTH HOST AND NONHOST PLANTS IN DIFFERENT PORTIONS OF THE TRANSECT ARE PROBABLY THE RESULT OF THE INTENSIVE CROPPING OF SNAP BEANS IN THE CENTRAL PART OF THE TRANSECT. (AS).

0516

22512. LINDEMANN, J.; ARNY, D.C.; UPPER, C.D. 1984. USE OF AN APPARENT INFECTION THRESHOLD POPULATION OF PSEUDOMONAS SYRINGAE TO PREDICT INCIDENCE AND SEVERITY OF BROWN SPOT OF BEAN. PHYTOPATHOLOGY 74(11):1334-1339. ENGL. SUM. ENGL., 16 REFS., ILLUS. [ADVANCED GENETIC SCIENCES, INC., 6701 SAN PABLO AVENUE, OAKLAND, CA 94608. USA]

A SINGLE SEED LOT OF SNAP BEAN WAS PLANTED AT 11 SITES ALONG AN E-W TRANSECT IN CENTRAL WISCONSIN, USA. EPIPHYTIC POPULATION SIZES OF NATURALLY OCCURRING PSEUDOMONAS SYRINGAE PV. SYRINGAE PATHOGENIC TO BEAN [PSB] ON SYMPTOMPLESS BEAN LEAFLETS DIFFERED AMONG THESE SITES. BACTERIAL BROWN SPOT WAS NOT DETECTED AT ANY SITE AT WHICH LOG10 [EPIPHYTIC PSB POPULATION SIZE] WAS LESS THAN 4.0 ON EVERY BEAN LEAFLET SAMPLED. THUS, 10,000 COLONY-FORMING UNITS/G OF LEAFLET TISSUE MAY REPRESENT AN APPARENT INFECTION THRESHOLD POPULATION OF PSB. THE FREQUENCY WITH WHICH PSB POPULATIONS EXCEEDED THE APPARENT INFECTION THRESHOLD LEVEL WAS ESTIMATED GRAPHICALLY. A MODEL BASED ON THIS FREQUENCY ESTIMATE WAS HIGHLY PREDICTIVE OF BROWN SPOT INCIDENCE 1 WK. AFTER FULL FLOWER. THE PRESENCE OF VERY HIGH PSB POPULATIONS WAS A MORE RELIABLE PREDICTOR OF DISEASE SEVERITY THAN WAS DISEASE INCIDENCE. THE PREDICTIVE MODEL BASED ON INFECTION THRESHOLD IS PRESENTED AS PREFERABLE TO MODELS BASED ON MEAN PATHOGEN POPULATIONS BECAUSE INFECTIONS OCCUR ON INDIVIDUAL PLANT PARTS, RATHER THAN ON SOME THEORETICAL MEAN PLANT PART. [AS].

0517

15404 LINDOW, S.E.; ARNY, D.C.; UPPER, C.D.; BARCHET, W.R. 1978. The role of bacterial ice nuclei in frost injury to sensitive plants. In Li, P.H.; Sakai, A., eds. Plant cold hardiness and freezing stress. Mechanisms and crop implications. London, UK., Academic Press. pp.249-263. Engl., Sum. Engl., 17 Refs., Illus.

Phaseolus vulgaris. Leaves. Plant injuries. Temperature. Snap beans. Pseudomonas syringae.

No intrinsic ice nuclei active above about -10°C were found associated with leaves of several plant species including Phaseolus vulgaris and maize. Pseudomonas syringae and Erwinia herbicola were shown to be efficient ice nuclei between -2 and -5°C. Leaves of most plants collected from several geographically different areas and during different seasons of the yr had substantial no. of these ice nucleation active (INA) bacteria. It was concluded that epiphytic INA bacteria incite frost injury in tender plants. (Author's summary) E02

0518

28619 MORRIS, C.E. 1985. Diversity of epiphytic bacteria on snap bean leaflets based on nutrient utilization abilities: biological and

statistical considerations. Ph.D. Thesis. Madison, University of Wisconsin. 222p. En., Sum. En., 152 Ref., Il.

Phaseolus vulgaris. Snap beans. Pseudomonas syringae pv. syringae. Laboratory experiments. Isolation. Nutrient uptake. C. N. USA.

A study was conducted to (1) describe the bacteria on snap bean leaves based on their ability to use nutrients in bean leaf leachate, (2) examine the effect of nutrients on populations of these bacteria, and (3) examine statistical aspects of indices of bacterial diversity. About 2000 bacterial isolates were recovered from dilution plates of homogenates of 4 bean leaflets. Isolates were tested for ability to use 26 single C and 11 single N sources. A video camera-microcomputer system was developed to measure no. of doublings of bacteria. Isolates were categorized, with cluster analysis, into 199 groups based on their nutrient utilization patterns. The group with the largest no. of isolates had gram negative and positive aerobes and facultative anaerobes and did not grow on any nutrient. Two more versatile groups contained Pseudomonas syringae pv. syringae and Enterobacter spp., and used 16-17 C and 8-9 N sources. About 50 percent of the major groups had isolates resembling Pseudomonas mesophilica and used 2-7 C sources. Ability to use a specific nutrient is not obviously advantageous for growth on bean leaf surfaces. Several compounds were applied to field-grown bean plants based on results of nutrient utilization studies. These applications did not result in consistent changes in the population sizes of total bacteria, P. syringae pv. syringae, or bacteria using the single C source applied. Several measures of diversity of epiphytic bacteria were examined. Diversity of bacteria on single leaflets based on the Shannon index was estimated and compared statistically for 10-250 isolates/leaflet. Estimates of the total no. of groups on each leaflet or descriptions of the frequency distribution of groups with 1, 2, 3,...r isolates require much larger sample sizes. Studies of diversity and interactions of epiphytic bacteria should consider the nature of the leaf surface habitat. Methods are needed for testing resource limitation in situ. The concepts of community and diversity of epiphytic microorganisms need to be reconsidered to account for leaf to leaf variability in the organisms present. (AS)

0519

3785 OSHIMA, N. and DICKENS, L.E. Effects of copper sprays on secondary spread of common bacterial blight of beans. Plant Disease Reporter 55(7):609-612. 1971. Engl., 3 Refs.

Phaseolus vulgaris. Snap bean. *Xanthomonas phaseoli.* Disease control. Chemical control. Cu.

The effects of foliage sprays as a control of secondary spread of blight in snap bean cv. Gallatin 50 were determined; 53% basic copper sulfate (Ortho Copper 53) (O-Cu 53), 0.65 kg/200 *l* of water, and 8% metallic Cu from Cu ammonium carbonate (Oxy-Cop 8L) (O-C 8L), 3 *l*/200 *l* water were applied as full coverage sprays. Both O-C 8L and O-Cu 53 gave good blight control even after the beginning of secondary spread. O-Cu 8L was recommended since it can be used as a low vol. or full coverage spray. *(Summary by I.B. Trans. by L.M. F.)* E02

0520

*PLOPER, L.D. 1983. Enfermedades del poroto en el Noroeste Argentino y su control. Tucuman, Argentina, Estacion Experimental Agro-Industrial Obispo Colombres. Publicacion Miscelanea no.74. pp.87-103.

0521

5459 SIGEE, D.C. and EPTON, H.A.S. **Ultrastructure of *Pseudomonas phaseolicola* in resistant and susceptible leaves of french bean.** Physiological Plant Pathology 6(1):29-34. 1975. Engl., Sum. Engl., 14 Refs.

Phaseolus vulgaris. Pseudomonas phaseolicola. **Leaves. Races. Host-plant resistance. Hosts and pathogens. Electron microscopy.**

Cells of race 1 of *Pseudomonas phaseolicola* (Burk.) Dows. were infiltrated into leaves of beans (*Phaseolus vulgaris* L.) that were resistant (Red Mexican U.I. No. 3) and susceptible (Prince) to halo blight disease. When infiltrated, the bacterial cells in both cultivars had small surface protuberances that were lost within 48 h. During lesion development over 168 h, the nuclear region in bacteria within resistant leaves broke down and ribosomal aggregations developed. In susceptible leaves bacteria developed a more clearly defined nuclear region and densely ribosomal cytoplasm. Between 96 and 168 h, some bacteria in susceptible leaves produced large surface vesicles, some of which appeared to have been released. Some vesicles had ruptured liberating their contents and membrane fragments into the intercellular spaces. In addition, some bacteria had large irregular projections with dense cytoplasmic contents. (*Author's summary*) E02

0522

28817. SLUSARENKO, A.J.; LONGLAND, A. 1986. CHANGES IN GENE ACTIVITY DURING EXPRESSION OF THE HYPERSENSITIVE RESPONSEIN PHASEOLUS VULGARIS CV. RED MEXICAN TO AN AVIRULENT RACE 1 ISOLATE OF PSEUDOMONAS SYRINGAE PV. PHASEOLICOLA. PHYSIOLOGICAL AND MOLECULAR PLANT PATHOLOGY 29(1):79-94. EN. SUM. EN., 39 REF., IL. (DEPT. OF PLANT BIOLOGY & GENETICS, UNIV. OF HULL, HU' ,'U6 7RX, ENGLAND)

TOTAL CELLULAR AND POLYSOMAL RNAS WERE ISOLATED FROM LEAVES OF FRENCH BEAN CV. RED MEXICAN, WHICH HAD BEEN INOCULATED WITH VIRULENT OR AVIRULENT RACES OF PSEUDOMONAS SYRINGAE PV. PHASEOLICOLA. THE MRNAS WERE TRANSLATED IN VITRO AND THE POLYPEPTIDE FINGEPPRINTS OBTAINED FROM THE VARIOUS TREATMENTS INDICATED SPECIFIC CHANGES IN HOST MRNA ACTIVITIES IN LEAF TISSUE EXPRESSING A HYPERSENSITIVE REACTION. THE MRNAS CODED FOR SEVERAL HIGH MR POLYPEPTIDES, AND COORDINATED DECREASES AND TRANSIENT

INCREASES IN ACTIVITY WERE OBSERVED, DEFINING A CASCADE OF CHANGES IN GENE EXPRESSION IN TISSUES UNDERGOING THE HYPERSENSITIVE REACTION. SOME CHANGES WERE APPARENT AS EARLY AS 2 H AFTER INOCULATION. SOME MRNA ACTIVITIES THAT DECREASED RAPIDLY DURING THE HYPERSENSITIVE REACTION ALSO DECREASEL IN THE SUSCEPTIBLE REACTION BUT AT A SLOWER RATE. THE POSSIBLE FUNCTION OF SOME OF THE POLYPEPTIDES IS DISCUSSED. [AS].

0523

20073 SOUTH AFRICA. DEPARTMENT OF AGRICULTURAL TECHNICAL SERVICES. 1970. Beans. In _____. The Horticultural Research Institute. Pretoria. p.6. Engl.

Phaseolus vulgaris. Snap beans. Cultivars. Selection. Pseudomonas phaseolicola. Xanthomonas phaseoli. Xanthomonas phaseoli var. fuscans. Disease control. Uromyces phaseoli. South Africa.

A brief overview of different aspects related to green bean research and production in South Africa is presented. Cv. trials concentrate on evaluating the materials most suitable for the main growing areas and particular attention is given to yield, stringiness, pod color and shape, and resistance to anthracnose (Colletotrichum lindemuthianum), common blight (Xanthomonas phaseoli), and rust (Uromyces appendiculatus). Only government certified seed is recommended for planting as halo blight (Pseudomonas phaseolicola), common blight (X. phaseoli) and fuscous blight (X. phaseoli var. fuscans) are all seed-transmissible. These diseases can be prevented by planting early or late in the season; spraying with copper oxychloride is also effective. Var. Seminole and Contender are resistant to both halo and common blights. If rust symptoms appear before flowering, plants should be dusted with a mixture of dithiocarbamate and S. (Summary by EDITEC) E02

0524

21026 WEBSTER, D.M.; ATKIN, J.D.; CROSS, J.E. 1983. Bacterial blights of snap beans and their control. Plant Disease 67(9):935-940. Engl., 19 Refs., Illus. [Asgrow Seed Company, Twin Falls, ID, USA]

Phaseolus vulgaris. Snap beans. Pseudomonas phaseolicola. Pseudomonas syringae. Xanthomonas phaseoli. Disease control. Disease transmission. Seed transmission. Resistance. USA.

A review is given on bacterial blights, one of the most persistent disease problems faced by producers of snap beans in North America. Any of 3 bacterial pathogens can cause blight: Pseudomonas phaseolicola (halo blight), P. syringae (bacterial brown spot), and Xanthomonas phaseoli (common blight). Under epidemic conditions the diseases can reduce yield, but losses are usually expressed as reduction in quality owing to pod lesions, which are classified as major defects by federal grading standards. Before 1960, bacterial blights were considered relatively minor disease problems on snap beans. However, since then the occurrence of blight has increased. The high incidence of the disease from 1962 to 1967 probably resulted from a combination of genetic variability, carelessness in introducing contaminated or infected seed, and enough wind and rain to spread bacteria over a wide area. Control programs were reevaluated and although the no. of infected beans was greatly reduced the disease problem was not completely eliminated. A very reliable soak test method for

detecting blight in stock seed lots was found after the 1977 epidemic. Future success in the control of bacterial blight will depend on the development of var. with improved resistance to this disease as well as on a thorough understanding of the problem and a careful application of control strategies. Even with the current limitations, however, a practical level of control is possible, given the combined concern and attention of all parties involved in snap bean production. (Summary by J.R.) E02

0525

10834 WIMALAJEEWA, D.L.S. and NANCARROW, R.J. **The incidence of bacterial blights of french bean (*Phaseolus vulgaris*) in East Gippsland, Victoria.** Australian Journal of Experimental Agriculture and Animal Husbandry 18:318-320. 1978. Engl., Sum. Engl., 9 Refs., Illus.

Phaseolus vulgaris. Xanthomonas phaseoli. Pseudomonas phaseolicola. Pseudomonas syringae. **Field experiments. Yields. Australia.**

The incidence of common blight, halo blight and brown spot on french beans was surveyed in East Gippsland during 2 growing seasons. Common blight and halo blight were severe only during late Jan.-Mar., and occurred largely on mature crops. Common blight was the more severe disease in the Orbost area whereas halo blight was more severe in the Bairnsdale-Lindenow area. Brown spot occurred throughtout the season on crops of all ages in both areas but was more severe in the Bairnsdale-Lindenow area. The relationship of weather to the incidence of bacterial blights in the 2 areas is discussed. It is inferred that losses due to common blight and halo blight could be considerably minimized by timing the planting of crops to harvest them by mid-Feb. (*Author's summary*) E02

E03 Mycoses

0526

26026. ABAWI, G.S.; CROSIER, D.C.; COBB, A.C. 1985. ROOT ROT OF SNAP BEANS IN NEW YORK. ITHACA, NEW YORK STATE AGRICULTURAL EXPERIMENT STATION. NEW YORK'S FOOD AND LIFE SCIENCES BULLETIN, NO.110. 7P. ENGL., ILLUS.

SYMPTOMS CAUSED BY PYTHIUM ULTIMUM (AND OTHER SPECIES), RHIZOCTONIA SOLANI, THIELAVIOPSIS BASICOLA, FUSARIUM SOLANI F. SP. PHASEOLI, AND PRATYLENCHUS PENETRANS, ALL CAUSING ROOT ROTS IN SNAP BEANS IN NEW YORK (USA), ARE BRIEFLY DESCRIBED. SHORT NOTES ON CONTROL MEASURES ARE PROVIDED, INCLUDING CHEMICAL CONTROL, CULTURAL PRACTICES, AND PLANT RESISTANCE. (CIAT).

0527

1090 ABAWI, G.S., CROSIER, D.C. and COBB, A.C. **Pod-flecking of snap beans caused by *Alternaria alternata*.** Plant Disease Reporter 61(11):901-905. 1977. Engl., Sum. Engl., 8 Refs., Illus.

Phaseolus vulgaris. Alternaria alternata. **Pods. Culture media. USA.**

This is the 1st report of *Alternaria alternata* causing severe flecking of french bean pods. The disease was very severe in commercial bean fields in central and western New York State in 1974

and 76. In one field, 12% of the pods were infected, rendering them unacceptable for processing. Symptoms on pods appear initially as small, irregular, water-soaked flecks. These flecks become reddish to dark brown or black and may coalesce to produce long streaks. The infected tissues remain only a few cells deep. Plating washing or surface-sterilized pod tissues on PDA consistently yielded pure cultures of *A. alternata*. Typical pod symptoms were reproduced when plants were inoculated with a spore suspension and incubated in a mist chamber for at least 4 days. More intense and larger numbers of flecks developed on var. Roma than on Bush Blue Lake 274 or Early Gallatin. Chlorothalonil (1.2µg a.i./ml) applied before or shortly after inoculation prevented pod flecking on inoculated plants in the mist chamber. Benomyl was ineffective. (*Author's summary*) E03

0528

26539. AL-HAZMI, A.S. 1985. INTERACTION OF MELOIDOGYNE INCOGNITA AND MACROPHOMINA PHASEOLINA IN A ROOT-ROT DISEASE COMPLEX OF FRENCH BEAN. PHYTOPATHOLOGISCHE ZEITSCHRIFT 113[4]:311-316. ENGL., SUM. ENGL., GERM., 11 REFS. [[DEPT. OF PLANT PROTECTION, COLLEGE OF AGRICULTURE, P.O. BOX 2460, RIYADH, 11451, SAUDI-ARABIA]

EFFECTS OF MELOIDOGYNE INCOGNITA AND MACROPHOMINA PHASEOLINA ON ROOT ROT OF 2 FRENCH BEAN CV. WERE EXAMINED IN A GREENHOUSE EXPT. SEVERITY OF MACROPHOMINA ROOT ROT INCREASED BY 54.5, 94.6, AND 9.6 PERCENT WHEN BOTH PATHOGENS WERE INTRODUCED SIMULTANEOUSLY, THE NEMATODE 2 WK. BEFORE THE FUNGUS, AND THE FUNGUS 2 WK. BEFORE THE NEMATODE, RESP. NEMATODE INFECTION AND REPRODUCTION WERE ADVERSELY AFFECTED WHEN THE FUNGUS WAS INTRODUCED 1ST. CV. HARVESTER WAS MORE TOLERANT TO BOTH PATHOGENS AND LESS SUSCEPTIBLE TO THE NEMATODE THAN ROMANO ITALIAN. [AS].

0529

7618 BANNEROT, H., DERIEUX, M. and FOUILLOUX, G. Mise en évidence d'un second gene de résistance totale a l'anthracnose chez le haricot. *(A second gene with total resistance to bean anthracnose).* Annales de l'Amélioration des Plantes 21(1):83-85. 1971. Fr., Sum. Fr., Engl., 5 Refs.

Phaseolus vulgaris. Colletotrichum lindemuthianum. Genes. Cultivars. Host-plant resistance. Races. France.

Two bean lines (Mex 222 and 227), resistant to all races of anthracnose *(Colletotrichum lindemuthianum)* found in Versailles, were crossed with Maxidor, a variety carrying resistance from the Cornell line 49242. A study of the progeny after infection with a mixture of physiological races showed that the resistance of the Cornell and Mexican lines is due to different genes, the latter being a single dominant gene *(Author's summary. Trans. by S.S. de S.)* F03 G00

0530

7603 BANNEROT, H. and RICHTER, R. **Etude de la descendance de deux croisements de haricot pour leur résistance a différentes races physiologiques d'anthracnose.** *(Study of the resistance of progeny resulting from crosses of beans resistant to different physiological races of anthracnoses).* Annales de l'Amelioration des Plantes 18(2):171-179. 1968. Fr., Sum. Fr., Engl., 4 Refs.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Races. Crossbreeding. Host-plant resistance. Cultivars. France.**

Experiments were conducted with F_3s and F_4s of the crosses Widusa and Coco à là Creme and Widusa and Triumphe de Farcy, which were infected with different physiological races of anthracnose. Based on the relationships among the races, they were classified into 2 series, the 1st of each being the most virulent. Progeny of the 1st cross were infected with Series A(I_4, PV_6 and α_1) and of the 2nd with series B (E_8b and D_{10}). It was found that the varieties that were resistant to the most virulent race of the series were resistant to the other races of the same series. Resistance to α_1 and D_{10} was conditioned by 2 dominant duplicate genes; that of PV_6 and E_8b by a single dominant gene; and that of I_4 by 2 dominant complementary genes. A tentative explanation of these results is given on the basis of Flor's theory (1956). The mechanism of resistance is also analyzed from a biochemical point of view. *(Summary by S.S. de S. Trans. by T.M.)* E03 G01

0531

18704 BARMAN, B.; ROY, A.K. 1978. Corynespora leaf spot of French bean and tomato. Science and Culture (India) 44(9):411. Engl., 3 Refs.

Phaseolus vulgaris. Snap beans. Corynespora casiicola. Symptomatology. Isolation. Etiology. India.

The symptomatology and etiology of a leaf spot disease of French bean reported in 1976 in Nowgong, district of Assam, India, are briefly discussed. Isolations from these spots, inoculated into snap bean, were identified as Corynespora sp. (Summary by EDITEC. Trans. by L.M.F.) E03

0532

11925 BECKMAN, K.M. and PARSONS, J.E. **Fungicidal control of Sclerotinia wilt in green beans.** Plant Disease Reporter 49(4):357-358. 1965. Engl., Sum. Engl., 5 Refs., Illus.

Phaseolus vulgaris. Sclerotinia sclerotiorum. **Chemical control. Wilting. Stems. USA.**

Excellent control of Sclerotinia wilt was obtained on green beans in Washington when Botran 50W (DCNA) was sprayed (3 and 6 lb a.i./ac) on the lower portion of the vines. *(Summary by T.B.)* E03

0533

21353 BELL, D.K.; SUMNER, D.R. 1984. Ecology of a sterile white pathogenic basidiomycete in corn, peanut, soybean, and snap bean field

microplots. Plant Disease 68(1):18-22. Engl., Sum. Engl., 10 Refs., Illus. [Dept. of Plant Pathology, Univ. of Georgia, Coastal Plain Experiment Station, Tifton, GA 31793, USA]

Phaseolus vulgaris. Snap beans. Inoculation. Rhizoctonia solani. Pathogenicity. USA.

A sterile, white basidiomycete caused a slight necrosis of seedling and mature maize roots. Crop rotation of soybean and maize increased the no. of black lesions characteristic of sterile, white basidiomycete infection on maize roots. The fungus was recovered after 2. mo. from soil planted to maize, peanut, and soybean but not from snap bean or fallow soil 16 mo. after infestation. Fumigation of microplots with DD-MENCS (Vorlex) before this study began did not eliminate Rhizoctonia solani AG-4, and this fungus caused extensive root-hypocotyl necrosis of peanut, soybean, and snap bean seedlings. Fewer colonies of AG-4 were isolated from peanut seed in pods attached to the plant at harvest in soil infested with the sterile, white basidiomycete than in the control. Fewer colonies of AG-4 were recovered from soil in peanut-maize and snap bean-maize than in maize-peanut and soybean-maize cropping systems. Although the sterile, white basidiomycete can cause extensive necrosis of maize roots in localized areas where inoculum potential is high, damage over a broad area of the Georgia coastal plain (USA) is probably slight. (Author's summary) E03

0534

23049 BERA, S.C. 1983. A new leaf spot disease of beans caused by Alternaria brassicicola. Indian Phytopathology 36(4):729-730. Engl., 3 Refs. [Vegetable Research Station, Kalimpong, Darjeeling 734 101, India]

Phaseolus vulgaris. Snap beans. Alternaria brassicicola. Symptomatology. Etiology. India.

A leaf spot disease of French beans was detected during a local survey of Kalimpong and in the vicinity of Darjeeling District (India). Most of the plants were severely attacked in field conditions from March to May of 1981. The disease was characterized by brown circular spots in concentric rings on all parts of the plant. At the final stage of infection, most of the leaves dried up and dropped. The fungus was identified as Alternaria brassicicola (Schw.) Wiltshire. [CIAT]

2781 0535

BERARD, D. F., KUC, J. and WILLIAMS, E. B. A cultivar-specific protection factor from incompatible interactions of green bean with Colletotrichum lindemuthianum. Physiological Plant Pathology 2(2):123-127. 1972. Engl. Sum. Engl. 17 Refs. Illus.

Phaseolus vulgaris. Pests. Resistance. Diseases and pathogens. Mycoses. Laboratory experiments. Colletotrichum lindemuthianum. Races. Isolation.

Bean hypocotyls were protected against cultivar-pathogenic races of Colletotrichum lindemuthianum by a factor which diffused into water droplets over incompatible (resistant) interactions. The factor protected only the bean cultivar from which it

was obtained. Hypersensitive flecking did not occur in the protected areas. Conidia of a challenge inoculum germinated, formed appressoria and penetrated protected host tissue. Mycelium of the challenge was contained within the single epidermal cell penetrated. The factor from an incompatible interaction, when placed on another cultivar did not alter the susceptible or resistant response. The diffusate from compatible (susceptible) interactions also did not alter the susceptible or resistant response of the cultivar from which it was prepared or a cultivar which is a reciprocal differential to the beta and gamma race. Germination of conidia of the beta and gamma races of C. lindemuthianum in vitro was not inhibited by diffusates from compatible or incompatible interactions. (Author's summary).

0536

23140 BOEREMA, G.H.; CRUGER, G.; GERLAGH, M.; NIRENBERG, H. 1981. Phoma exigua var. diversispora and related fungi on Phaseolus beans. Zeitschrift fur Pflanzenkrankheiten und Pflanzenschutz 88(10):597-607. Engl., Sum. Engl., Ger., 10 Refs., Illus. [Plantenziektenkundige Dienst, P.O. Box 9102, 6700 HC Wageningen, The Netherlands]

Phaseolus vulgaris. Phoma. Snap beans. Symptomatology. Seed transmission. Disease transmission. Pathogenicity. Hosts and pathogens. Inoculation. Ascochyta phaseolorum. Ascochyta boltshausery. Netherlands.

In 1979 severe damage occurred in snap bean crops, caused by Phoma exigua var. diversispora, a pathogen which is not well known. The morphology of the fungus is described as well as the characteristics used in differentiating it from P. exigua var. exigua (= Ascochyta phaseolorum) and Stagonosporopsis hortensis (= Ascochyta boltshauseri). The 3 fungi cause different symptoms on beans. Under humid conditions, P. exigua var. diversispora can kill young bean plants, forming foci up to several meters in diameter in the field. Leaves, petioles, stems, and pods are attacked. Black discolorations of stems, especially at the nodes, and of petioles, and abundant formation of black pycnidia are the most conspicuous symptoms. S. hortensis is less pathogenic, but may still produce foci of plants showing stunting, and reddish-brown discolorations on stems, leaves, and pods. P. exigua var. exigua is a weak parasite; it mainly produces brown specks on mature pods, which resemble those caused by S. hortensis. P. exigua var. diversispora is seed-transmitted. No resistance has been found in Phaseolus vulgaris germplasm. The disease is at least endemic in Western Europe and in East Africa. (Author's summary) EO3

3985

0537

BORDERS, H. I. Chemical control of Rhizoctonia solani and Sclerotium rolfsii of snap beans in Boca Raton Florida, 1962. Plant disease Reporter 46(9):651-652. 1962. Engl. Sum. Engl.

Phaseolus vulgaris. Pests. Diseases and pathogens. Mycoses. Rhizoctonia solani. Sclerotium rolfsii. Disease control. Chemical control.

DAC 649 and Hercules 3944 gave statistically significant control of Rhizoctonia root rot of snap beans caused by Rhizoctonia solani and of southern blight caused by Sclerotium rolfsii. Hercules 3944 gave statistically significant control of Rhizoctonia solani at the 1% level and of Sclerotium rolfsii at the 5% level of significance. DAC 1200 was relatively ineffective. (Author's summary).

0538

28279. BUONASSISI, A.J.; COPEMAN, R.J.; PEPIN, H.S.; EATON, G.W. 1986. EFFECT OF RHIZOBIUM SPP. ON FUSARIUM SOLANI F. SP. PHASEOLI. CANADIAN JOURNAL OF PLANT PATHOLOGY 8[2]:140-146. EN. SUM. EN., FR., 17 REF., IL. [CROP PROTECTION

BRANCH, BRITISH COLUMBIA MINISTRY OF AGRICULTURE & FOOD, 17720 57TH AVENUE, SURREY, B.C. V3S 4P9, CANADA]

IN DUAL CULTURE PLATE ASSAYS INDIGENOUS RHIZOBIUM STRAINS ISOLATED FROM NODULES OBTAINED FROM COMMERCIAL SNAP BEANS IN THE LOWER FRASER VALLEY OF BRITISH COLUMBIA (CANADA) INHIBITED THE RADIAL GROWTH OF STRAINS OF FUSARIUM MONILIFORME, F. OXYSPORUM, AND F. SOLANI F. SP. PHASEOLI. GROWTH OF ALL PYTHIUM SPP. AND RHIZOCTONIA SOLANI STRAINS TESTED WAS UNAFFECTED BY RHIZOBIUM. GROWTH INHIBITION OF F. SOLANI F. SP. PHASEOLI BY 41 OF 42 INDIGENOUS STRAINS OF RHIZOBIUM WAS NOT CORRELATED WITH ABILITY TO NODULATE SNAP BEANS BUT WAS CHARACTERISTIC OF THE INTERACTION OF CERTAIN STRAIN COMBINATIONS OF THE 2 ORGANISMS. ONLY 2 OF 15 RHIZOBIUM STRAINS CAUSING GROWTH INHIBITION IN VITRO ALSO CAUSED A SIGNIFICANT REDUCTION IN ROOT ROT INGROWTH POUCH EXPT. PLANTS GROWN IN PASTEURIZED SOIL ARTIFICIALLY INFESTED WITH F. SOLANI F. SP. PHASEOLI FROM SEED RECEIVING VARYING CONCN. OF RHIZOBIUM SHOWED A SIGNIFICANT REDUCTION IN ROOT ROT. THESE DATA SUGGEST THATTHE POTENTIAL EXISTS FOR CONTROLLING FUSARIUM ROOT ROT THROUGH SEED INOCULATION WITH NODULATING RHIZOBIUM STRAINS, WHICH ARE ALSO HIGHLY ANTAGONISTIC TO F. SOLANI F. SP. PHASEOLI. (AS).

0539

16435 CAMPBELL, C.L.; PENNYPACKER, S.P. 1980. Distribution of hypocotyl rot caused in snapbean by *Rhizoctonia solani*. Phytopathology 70(6):521-525. Engl., Sum. Engl., 27 Refs.

Phaseolus vulgaris. Snap bean. *Rhizoctonia solani*. Hypocotyls. Rots. *Fusarium oxysporum*. Plant injuries. Etiology. Statistical analysis. Field experiments.

Hypocotyl rot caused by *Rhizoctonia solani* is a potentially destructive disease wherever snap beans are grown. Six snap bean fields in central Pennsylvania, USA, were selected and a 0.4 ha section of each was divided into 100 contiguous 6 x 6 m quadrats. Plants were removed from each quadrat and hypocotyls were evaluated to determine the no. of infected plants/quadrat and no. of lesions induced by *R. solani*/quadrat. The presence of *R. solani* in lesions was verified by standard isolation and identification techniques. Variance-to-mean ratios of infected plants/quadrat were not significantly greater than unity for all samples, and data for each sample were adequately fitted by the Poisson distribution function which indicated a random dispersion of infected plants. Fungal lesions were clustered, as indicated by variance-to-mean ratios greater than unity for all samples and the goodness of fit of all data sets by the negative binomial distribution function. *(Author's summary)* E03

0540

16434 CAMPBELL, C.L.; PENNYPACKER, S.P.; MADDEN, L.V. 1980. Progression dynamics of hypocotyl rot of snapbean. Phytopathology 70(6):487-494. Engl., Sum. Engl., 19 Refs., Illus.

Phaseolus vulgaris. *Rhizoctonia solani*. *Fusarium solani phaseoli*. Rots. Hypocotyls. Disease severity. Timing. Statistical analysis. Field experiments. USA.

Severity of snap bean hypocotyl rot induced primarily by *Rhizoctonia solani* and in part by *Fusarium solani* f. sp. *phaseoli*, was evaluated in 22 fields in Pennsylvania, USA, in which snap beans were grown commercially in 1977-78. The 11 fields selected each yr were planted to 6 cv. in 1977 and 5 in 1978. Disease severity was estimated at weekly intervals for each field as the proportion of hypocotyl surface covered by lesions; the assessments were made on 50 arbitrarily selected plants from each field. The "simple interest" disease model was not appropriate for describing the epidemics as indicated by the shape parameter of the Weibull distribution function. Disease progress was, however, adequately described in all cases with a quadratic 1st-difference regression model and in some cases with only a linear term in the regression model. A hierarchical cluster analysis performed by using 6 disease progress curve elements identified the presence of at least 2 epidemic types for each yr. The 2 types could be differentiated largely on the basis of rate of disease progression. *(Author's summary)* E03

0541

18785 CERVONE, F.; ANDEBRHAN, T.; COUTTS, R.H.A.; WOOD, R.K.S. 1981. Effects of French bean tissue and leaf protoplasts on Colletotrichum lindemuthianum polygalacturonase. Phytopathologische Zeitschrift 102(3/4):236-246. Engl., Sum. Engl., Germ., 21 Refs., Illus.

Phaseolus vulgaris. Colletotrichum lindemuthianum. Enzymes. Plant tissues. Rhizoctonia solani.

The activity of polygalacturonase from Colletotrichum lindemuthianum was greatly decreased following exposure to intact tissue and isolated living protoplasts from bean cv. Canadian Wonder plants but not by tissue from potato, carrot, and turnip. Polygalacturonases from Rhizoctonia fragariae, R. solani, and Trichoderma koningii were little affected by bean tissues. Decrease of enzyme activity caused by bean tissue was partially nullified by certain sugars or by treating tissue with heat, chloroform, or sodium periodate. The permeability of bean cotyledon cells was increased by polygalacturonase from C. lindemuthianum but not by polygalacturonases from R. fragariae and R. solani. (Author's summary) E03

3995

0542

CROSSMAN, D. F. et al. Control of Rhizoctonia root-rot of snapbean: low volume in-the-furrow versus high volume preplant fungicides sprays. Plant Disease Reporter 47(2):109-111. 1963. Engl. Sum. Engl. 6 Refs.

Phaseolus vulgaris. Pests. Diseases and pathogens. Mycoses. Rhizoctonia solani. Disease control. Chemical control. Field experiments. Cultivars.

The effectiveness of in-the-furrow application of fungicides for control of Rhizoctonia root-rot of snapbean was evaluated at a field site where the disease was a problem. Chemicals were applied as low-volume sprays at 40 gallons/acre delivered behind the planting shoe and wetting the seed and soil in the furrow as the seed dropped into the row. Of 18 treatments evaluated only Terraclor at 5 and 10 lb/acre were out-standing; however, thiram (6 lb), folpet (10 lb), and Miller 658 (8 lb) per acre in-the-furrow, and Terraclor (10 lb) per acre worked into the soil prior to seeding, resulted in significant reduction of root-rot. (Author's summary).

0543

7083 DEAKIN, J. R. and DUKES, P. D. Breeding snap beans for resistance to diseases caused by *Rhizoctonia solani* Kuehn. HortScience 10(3):269-271. 1975. Engl., Sum. Engl., 14 Refs., Illus.

Phaseolus vulgaris. Rhizoctonia solani. Inheritance. Host-plant resistance. Cultivars. Seed color. Productivity. Disease control.

Resistance to *Rhizoctonia solani* was highly heritable in french beans (*Phaseolus vulgaris* L.) and could be transferred easily to lines with high productivity and acceptable quality Resistance was associated with colored seed. Attempts to obtain white-seeded lines with resistance were not successful because of epistatic effects. The only barrier to the use of cultivars resistant to *R. solani* is industry's refusal of colored-seeded lines, as based on current quality standards. A selection method to obtain near-white-seeded lines is discussed. *(Author's summary)* E03 G01

0544

11963 DHINGRA, O.D. and MUCHOVEJ, J.J. **Pod rot, seed rot, and root rot of snap bean and dry bean caused by** *Fusarium semitectum*. Plant Disease Reporter 63(1):84-87. 1979. Engl., Sum. Engl., 7 Refs., Illus.

Phaseolus vulgaris. Fusarium semitectum. **Pods. Seed. Rot. Roots. Seed production. Brazil.**

A pod and seed rot of french beans caused by *Fusarium semitectum* was observed in a seed production field in Minas Gerais, Brazil, during a prolonged rainy period, resulting in total loss of the crop. Pathogenicity tests in the greenhouse on nonwound inoculated pods of french and dry beans showed that under prolonged humid conditions, a soft pod rot develops; whereas under intermittent conditions of high humidity, rusty brown circular or elongated lesions are formed. Seed infection occurs in both cases with severe infection under prolonged humid conditions. Nonwound inoculation of roots with spore suspensions of *F. semitectum* or by planting and infected seed near bean seedlings resulted in root rot, and the reddish brown lesions progressed upward. Greenhouse tests confirmed the field observation that *F. semitectum* can be a serious pathogen of beans under humid conditions and can cause considerable economic losses. (*Author's summary*) E03 D04

0545

5628 DHINGRA, O.D. **Internally seedborne** *Fusarium semitectum* **and** *Phomopsis* **sp. affecting dry and snap bean seed quality.** Plant Disease Reporter 62(6):509-512. 1978. Engl., Sum. Engl., 7 Refs., Illus.

Phaseolus vulgaris. Rhizoctonia solani. Macrophomina phaseoli. Fusarium solani phaseoli. **Seed. Laboratory experiments. Culture media. Cultivars. Brazil.**

Seeds from 7 samples of 5 dry bean cv. (Carioca, Rico Baio, Roxinho, Rico 23 and Toa) and 6 samples of 4 french bean (Blue Lake, Manteiga, Macarrão, and Companheiro Nacional), grown during the rainy season in Minas Gerais, Brazil,were assayed for seed-infecting fungi. Surface-disinfested seeds were plated on streptomycin-PDA and incubated at 24 ± 2°C under continuous light. *Fusarium semitectum* (3-85%) occurred in all samples; *Phomopsis* sp. (*Diaporthe phaseolorum*), which occurred in 9 samples, was more common in dry than in french bean seeds. Occurrence of *Rhizoctonia solani* was up to 27% in french beans and 4% in dry beans, whereas *Macrophomina phaseolina* occurred up to 8% in dry bean seeds only. Seeds with these fungi did not germinate. *Trichothecium roseum* was isolated from only dry bean cv. Rico Baio (8%) and Roxinho (70%). *Colletotrichum dematium* f. *truncata* (4-30%) occurred in 3 samples. *F. semitectum* and *C. dematium* f. *truncata* penetrated through uninjured french bean pods inoculated with 2 ml of 10^4 spores/ml spore suspension of either fungus. Seeds removed from inoculated pods were discolored and yielded the respective fungus upon isolation. This is the 1st report of the association of *F. semitectum, Phomopsis* sp. and *T. roseum* with the reduced quality of bean seeds. (*Author's summary*) E03

0546

8997 DICKSON, M.H. and BOETTGER, M.A. **Breeding for multiple root rot resistance in snap beans.** Journal of the American Society for Horticultural Science 102(4):373-377. 1977. Engl., Sum. Engl., 12 Refs.

Phaseolus vulgaris. Fusarium solani phaseoli. Pythium ultimum. Rhizoctonia solani. **Bean root rots. Inheritance. Host-plant resistance. Seed color. Plant breeding. USA.**

Inheritance of resistance to *Pythium, Fusarium* and *Rhizoctonia* in french beans (*Phaseolus vulgaris*) was studied for 3 populations involving a common resistant parent (Cornell 2114-12) and 3 different susceptible parents. *Pythium* resistance was strongly associated with colored seed but resistance was found in some white-seeded segregants and was widely influenced by degree of susceptibility of white-seeded parents. In contrast to the widely accepted theory that colored seed and resistance to *Rhizoctonia* are tightly linked, *Rhizoctonia* resistance seemed to be independent of seed color. Heritability for *Rhizoctonia* resistance was 0.75 and 0.65 for broad- and 0.32 and 0.29 for narrow-sense heritability. Resistance to all 3 diseases was independent and quantitatively inherited. Correlations for resistance to *Pythium* and *Fusarium* in F_4 with F_3 selections (r= 0.557**) were in line with heritability expectations. In the *Rhizoctonia* selections, generation-to-generation correlation was high (r = .90**) among those with the best resistance but only moderate among those with moderate resistance. In view of the low narrow-sense heritability, selection for resistance in later rather than earlier generations should be more effective. (*Author's summary*) E03 G01

0547

3783 DICKSON, M.H. **Root rot tolerance in snap beans.** New York's Food and Life Sciences Quarterly 6(2):16-17. 1973. Engl., Illus.

Phaseolus vulgaris. Pythium debaryanum. Fusarium oxysporum. Thielaviopsis basicola. **Bean root rots. Roots. Host-plant resistance. Cultivars. USA.**

Of 18 *Phaseolus vulgaris* selections derived from PI203958, which is tolerant to *Pythium, Fusarium* and *Thielaviopsis* spp., several showed tolerance to all 3 pathogens and gave higher bean yields than commercial varieties and were of comparable quality. Some selections have large, coarse roots and may be resistant to damage from wind or drought. *(Summary by Plant Breeding Abstracts)* E03

0548

16044 DIXON, R.A.; DEY, P.M.; MURPHY, D.L.; WHITEHEAD, I.M. 1981. Dose responses for *Colletotrichum lindemuthianum* elicitor-mediated enzyme induction in French bean cell suspension cultures. Planta 151:272-280. Engl., Sum. Engl., 32 Refs., Illus.

Phaseolus vulgaris. Colletotrichum lindemuthianum. Phytoalexins. Culture media. Hypocotyls. Plant tissues. Enzymes. Analysis. Plant physiological processes.

The induction of L-phenylalanine ammonia'yase (PAL, EC 4.3.1.5) and flavanone synthase in French bean cell suspension cultures in response to heat-released elicitor from cell walls of the fungus *Colletotrichum lindemuthianum* is highly dependent upon elicitor concn. The elicitor dose-response curve for PAL induction shows 2 maxima at approx. 17.5 and 50 μg elicitor carbohydrate/ml culture, whereas the flavanone synthase response shows one maximum at approx. 100 μg/ml. The PAL response is independent of the elicitor concn. present during the lag phase of enzyme induction; if the initial elicitor concn. is increased after 2 h by addition of extra elicitor, or decreased by dilution of the cultures, the dose response curves obtained reflect the concn. of elicitor present at the time of harvest. PAL induction is not prevented by addition of methyl sugar derivatives to the cultures; α-methyl-D-glucoside, itself a weak elicitor of PAL activity, elicits a multiphasic PAL response when increasing concn. are added in the presence of *Colletotrichum* elicitor. Eight fractions with different monosaccharide compositions, obtained from the crude elicitor by gel-filtration, each elicit different dose-responses for PAL induction; the response to unfractionated elicitor is not the sum of the responses to the isolated fractions. There is no correlation

between the ability of the fractions to induce PAL in the cultures and their ability to act as elicitors of isoflavonoid phytoalexin accumulation in bean hypocotyls. *(Author's summary)* E03

0549

18733 EBRAHIM-NESBAT, F.; HOPPE, H.H.; HEITEFUSS, R. 1982. Ultrastructural studies on the development of Uromyces phaseoli in bean leaves protected by elicitors of phytoalexin accumulation. Phytopathologische Zeitschrift 103:261-271. Engl., Sum. Engl., Germ., 22 Refs., Illus.

Phaseolus vulgaris. Snap beans. Uromyces phaseoli. Inoculation. Disease control. Phytoalexins. Etiology.

Glucans, which elicit phytoalexin accumulation, were infiltrated into primary leaves of susceptible French bean cv. Favorit. When leaves were inoculated with uredospores of Uromyces phaseoli, 5 days after elicitor treatment, rust development was completely inhibited. Elicitor treatment had no effect on spore germination and appressoria formation of leaf surfaces. Two days after inoculation in treated leaves many substomatal vesicles were destroyed or heavily damaged. Some apparently morphological normal vesicles were also detected. They allowed scattered intercellular growth of the rust fungus, however, no haustoria could be found in the treated tissue. The absence of haustoria was apparently related to the deposition of electron-opaque material between the plasmalemma and cell wall of plant cells at the sites of contact between host and fungal cells. These deposits were found in the treated tissue 2 days after inoculation in response to contact with disorganized substomatal vesicles and cells of intercellular hyphae. Host cells containing deposits showed sometimes disorganized membranes and cytoplasm. In elicitor-treated, noninoculated tissue as well as in water-treated, inoculated control tissue no comparable deposition of electron-opaque material was observed. (Author's summary) E03

0550

18092 GALINDO, J.J.; ABAWI, G.S.; THURSTON, H.D. 1982. Variability among isolates of *Rhizoctonia solani* associated with snap bean hypocotyls and soils in New York. Plant Disease 66(5):390-394. Engl., Sum. Engl., 18 Refs.

Phaseolus vulgaris. Leaves. Hypocotyls. *Rhizoctonia solani*. Virulence. Isolation. Snap beans.

The 33 isolates of *Rhizoctonia solani* associated with snap bean hypocotyls and soils in NY, USA and 6 from bean leaves in Colombia varied considerably in growth rate, sclerotial production, color of vegetative hyphae, and zonation in culture. A positive association was found between virulence to beans and growth rate. Disease severity generally was greater at higher soil moisture and higher RH. Isolates from NY varied from weakly to highly virulent on hypocotyls. Several caused damping-off but most only reduced plant growth. Isolates with fast to intermediate growth rates could also infect leaves. All the Colombian isolates were highly virulent to both hypocotyls and leaves. Such virulence differed widely between anastomosis groups (AG) but not within each group. Of the 33 NY isolates, 18 were in AG-4, 4 in AG-1, 5 in AG-2, and none in AG-3. All 6 Colombian isolates were in AG-1. *(Author's summary)* E03

6036

0551

GAY, J. D. Effects of temperature and moisture on snap bean damping-off caused by three isolates of Pythium myriotylum. Plant Disease Reporter 53(9):707-709. 1969. Engl., Sum. Engl. 4 Refs. Illus.

Phaseolus vulgaris. Diseases and pathogens. Pests. Pythium myriotylum. Bean

damping-off. Mycoses. Temperature. Water requirements (plant). Laboratory experiments. Stems.

Three isolates of Pythium myriotylum Drechs. differed in virulence when compared on bean (Phaseolus vulgaris). Field isolates obtained from infected plants and infested soil were more virulent than an isolate obtained from a greenhouse-grown infected bean. Damping-off reached a maximum with all isolates at 30-35°C. Moisture availability did not significantly influence the amount of damping-off. P. myriotylum could be isolated during the summer and fall months from greenhouse-maintained soil; but the fungus could not be isolated during the winter months from the same soil maintained at 30-32°. (Author's summary)

0552

28018. GOMES, J.L.L.; DHINGRA, O.D.; SILVA, R.F. DA. 1986. INFLUENCE OF FOLIAR APPLICATION OF FUNGICIDES DURING RAINY AND NON-RAINY PLANTING SEASON ON FUNGAL SEED INFECTION OF SNAPBEANS. FITOPATOLOGIA BRASILEIRA 11(1):163-169. EN. SUM. EN., PT., 15 REF. [DEPTO. DE FITOTECNIA, UNIV. FEDERAL DE VICOSA, 36.570 VICOSA-MG, BRASIL]

THE EFFICACY OF FOLIAR APPLICATION OF FUNGICIDES IN REDUCING SYMPTOMATIC AND ASYMPTOMATIC INFECTION OF SNAP BEAN SEEDS WAS STUDIED DURING THE NONRAINY AND RAINY SEASONS IN IGARAPE (MINAS GERAIS, BRAZIL). FUNGICIDES USEDWERE BENOMYL, CARBENDAZIM, AND RH2161 (EACH MIXED WITH MANCOZEB), AND THIABENDAZOLE AND THIOPHANATE-METHYL, APPLIED AT POD FORMATION, SEED FILL, AND SEED MATURATION STAGE. IN THE RAINY SEASON EXPT. 3 PLANTING DATES WERE USED. THE APPLICATION OF FUNGICIDES CONSIDERABLY INCREASED TOTAL YIELD BUT, IN GENERAL, HAD LITTE EFFECT, IF ANY, ON FUNGAL INFECTION OF SEED IN THE RAINY SEASON. FUNGICIDES OF THE BENZIMIDAZOLE GROUP CONTROLLED COLLETOTRICHUMTRUNCATUM AND FUSARIUM SPP., BUT TREMENDOUSLY INCREASED THE INCIDENCE OF ALTERNARIA ALTERNATA. IN THE NONRAINY SEASON EXPT., FUNGICIDES, IN GENERAL, SIGNIFICANTLY INCREASED TOTAL YIELD AND REDUCED THE PROPORTION OF SEEDS WITH BOTH SYMPTOMATIC AND ASYMPTOMATIC INFECTION; HOWEVER, FUNGICIDES OF THE BENZIMIDAZOLE GROUP SIGNIFICANTLY INCREASED A. ALTERNATA-INFECTED SEEDS. (AS).

0553

21568 GOMES, J.L.L.; DHINGRA, O.D. 1983. Alternaria alternata - a serious pathogen of white colored snap bean (Phaseolus vulgaris) seeds. Fitopatologia Brasileira 8(1):173-177. Engl., Sum. Engl., Port., 10 Refs., Illus. [Depto. de Fitotecnia, Univ. Federal de Vicosa, 36.570 Vicosa-MG, Brasil]

Phaseolus vulgaris. Alternaria alternata. Symptomatology. Snap beans. Brazil.

Alternaria alternata is described as a pathogen of snap bean seed. Symptomatic infection occurs when wet conditions prevail during seed fill to seed maturation stage. In relatively drier conditions seed infection may occur but symptoms are not produced. Artificial inoculation of bean

plants with the fungus produced typical symptoms of pod flecking, necrosis on stem and petiole, and discoloration of seed. Application of benzimidazole-group fungicides increases disease incidence. (Author's summary) E03

0554

4373 GOTH, R.W. A **quasi-parasite of bean pods:** *Fusarium oxyspori* Phytopathology 56(4):442-443. 1966. Engl., Sum. Engl., 4 Refs., Illus.

Phaseolus vulgaris. Fusarium oxysporium. **Hosts and pathogens. Laboratory experime Cultivars.**

When *Fusarium oxysporum* is provided with an additional food base, it is capable of causir pod decay of french beans *(Phaseolus vulgaris).* Glucose, various N sources, plant debris and sap exudates from injuries were all sufficient food bases for lesion development on bean pc *(Author's summary)* E03

0555

28257. HAMDAN, M.A.M.S.; DIXON, R.A. 1986. DIFFERENTIAL BIOCHEMICAL EFFECTS OF ELICITOR PREPARATIONS FROM COLLETOTRICHI LINDEMUTHIANUM. PHYSIOLOGICAL AND MOLECULAR PLANT PATHOLOGY 28[3]:329-344. EN. SUM. EN., 41 REF., IL. [DEPT. OF BIOCHEMISTRY, ROYAL HOLLOWAY COLLEGE, UNIV. OF LONDON, EGHAM HILL, EGHAM, SURREY TW20 OEX, ENGLAND]

POLYSACCHARIDE-CONTAINING ELICITOR PREPARATIONS FROM THE CULTURE FILTRATEAND CELL WALLS OF COLLETOTRICHUM LINDEMUTHIANUM HAD BROADI SIMILAR MONOSACCHARIDE COMPOSITIONS. BOTH PREPARATIONS INDUCED PHENYLALANINE AMMONIA-LYASE, CHALCONE SYNTHASE, AND CHALCONE ISOMERASE EXTRACTABLE ACTIVITIES IN BEAN CELL SUSPENSION CULTURES; HOWEVER, ALTHOUGH PHYTOALEXIN ACCUMULATION WASOBSERVED IN RESPONSE TO THE 2 ELICITORS IN BEAN ENDOCARP TISSUE, THE CULTURE FILTRATE ELICITOR INDUCED ONLY PHASEOLIN IN BEAN CELL SUSPENSION CULTURES WHEREAS THE CELL WALL ELICITOR INDUCED BOTH KIEVITONE AND PHASEOLIN, THE LATTER TO A CONCN. 70 TIMES GREATER THAN THAT INDUCED BY THE CULTURE FILTRATEELICITOR. ONLY THE CELL WALL ELICITOR INDUCED DEPOSITION OF WALL-BOUND PHENOLICS IN BEAN CULTURES, AND DIFFERENCES WERE ALSO OBSERVED IN THE EFFECTSOF THE ELICITOR PREPARATIONS ON LEVELS OF FREE AND ESTERIFIED HYDROXYCINNAMIC ACIDS. INDUCTION OF PROLYL HYDROXYLASE EXTRACTABLE ACTIVITY WAS OBSERVED IN RESPONSE TO BOTH ELICITORS, ALTHOUGH INCREASED ACCUMULATION OF HYDROXYPROLINE IN THE CELL WALLS OF SUSPENSION-CULTURED BEAN CELLS WAS ONLY INDUCED FOLLOWING TREATMENTS WITH CELL WALL ELICITOR. THE RESULTS ARE DISCUSSED IN TERMS OF THE COORDINATION AND REGULATION OF INDUCED RESPONSES, AN THE POSSIBLE NEED FOR MORE THAN ONE ELICITOR TO INDUCE SUCH CHANGE IS CONSIDERED. [AS].

0556

25387. HEATH, M.C. 1984. RELATIONSHIP BETWEEN HEAT-INDUCED FUNGAL DEATH AND PLANT NECROSIS IN COMPATIBLE AND INCOMPATIBLE INTERACTIONS INVOLVING THE BEAN AND COWPEA RUST FUNGI. PHYTOPATHOLOGY 74[1]:1370-1376. ENGL. SUM. ENGL., 27 REFS., ILLUS. [BOTANY DEPT., UNIV. OF TORONTO, TORONTO, ONTARIO, CANADA M5S 1A1]

POSTINOCULATION HEAT TREATMENT OF BEAN AND COWPEA LEAVES INFECTED WITH THEIR RESP. COMPATIBLE RUST FUNGI [UROMYCES PHASEOLI VAR. TYPICA AND VIGNAE, RESP.] RESULTED IN THE SEEMINGLY RAPID DEATH OF THE FUNGUS AND THE ENCASEMENT OF HAUSTORIA. BROWNING OF INVADED CELLS WAS RARE AND, ALTHOUGH DISCOLORED FLECKS DEVELOPED ON BEAN LEAVES HEATED DURING UREDIUM FORMATION, THIS WAS CAUSED BY THE BROWNING OF THE FUNGUS AND CELL WALLS OF THE PLANT, RATHER THAN THE PLANT CYTOPLASM. THE RESULTS SUGGEST THAT THESE FUNGI DO NOT RELEASE PRODUCTS DURING DEATH THAT CAUSE SIGNIFICANT NECROSIS IN SUSCEPTIBLE TISSUE. IN AN INCOMPATIBLE COMBINATION OF BEAN AND THE BEAN RUST FUNGUS, AND IN INFECTIONS OF THE SAME FUNGUS IN THE NONHOST SPECIES, COWPEA, FLUORESCENCE MICROSCOPY REVEALED NO SIGNS OF HAUSTORIUM DEATH BEFORE THAT OF THE INVADED PLANT CELL. POSTINOCULATION HEAT TREATMENT APPLIED TO THESE PLANT-FUNGUS COMBINATIONS INHIBITED THE NORMAL PLANT CELL NECROTIC REACTION IF APPLIED EARLY ENOUGH. HEAT TREATMENT APPLIED LATER HAD NO EFFECT ON THE FREQUENCY OR EXTENT OF PLANT BROWNING, INDICATING EITHER THAT THE BROWNING HAD BEEN IRREVERSIBLY TRIGGERED PRIOR TO HEATING OR THAT THE FUNGUS HAD REACHED A STAGE OF DEVELOPMENT AT WHICH RECENTLY-FORMED, CONSTITUTIVE, NECROSIS-CAUSING FACTORS WERE RELEASED DURING FUNGAL DEATH. IT IS SUGGESTED THAT THE FORMER HYPOTHESIS IS THE MORE LIKELY AND THAT THE INITIATION OF PLANT NECROSIS IN THE INCOMPATIBLE INTERACTIONS EXAMINED REQUIRES SOME ACTIVITY OF THE LIVING FUNGUS. [AS].

0557

19938 HEATH, M.C. 1983. Relationship between developmental stage of the bean rust fungus and increased susceptibility of surrounding bean tissue to the cowpea rust fungus. Physiological Plant Pathology 22(1):45-50. Engl., Sum. Engl., 11 Refs. [Dept. of Botany, Univ. of Toronto, Toronto, Ontario M5S 1A1, Canada]

Phaseolus vulgaris. Uromyces phaseoli. Etiology. Snap beans. Canada.

Primary leaves of bean cv. Pinto were inoculated with the nonpathogenic Uromyces phaseoli var. vignae (U. vignae) on one surface and with the pathogenic U. phaseoli var. typica (U. appendiculatus) on the other. The pathogenic fungus was applied so that it would be at differing stages of development at the time that the cowpea rust should have attempted (normally unsuccessfully) to form its 1st haustorium. More infection

hyphae of the cowpea rust produced haustoria at sites where the 2 fungi were in close proximity, but only where the 1st haustorium of the bean rust was probably maturing, or had already formed, at the time of initiation of the haustorium of U. vignae. The presence of an infection hypha, without a haustorium, of the pathogen did not seem to enhance frequency of haustorium production by U. vignae, even though exudates from these hyphae have been shown to have such an effect when injected into bean tissue. These results suggest that the increased susceptibility of tissue detected by double inoculation expt. involving compatible and incompatible rust fungi is most likely to be the consequence of successful haustorium formation by the pathogen; apparently such expt. cannot be relied upon to detect types of induced susceptibility which are active before the 1st haustorium is initiated and which may be responsible for allowing this haustorium to form. (Author's summary) E03

0558

16045 HEATH, M.C. 1981. The suppression of the development of silicon-containing deposits in French bean leaves by exudates of the bean rust fungus and extracts from bean rust-infected tissue. Physiological Plant Pathology 18:149-155. Engl., Sum. Engl., 9 Refs., Illus.

Phaseolus vulgaris. Uromyces phaseoli. Host-plant resistance. Inoculation methods. Leaves. Plant tissues. Cytology. Electron microscopy.

Extracts of bean rust-infected French bean leaves, when injected into uninoculated French bean tissue, increased the frequency of haustoria subsequently produced by *Uromyces phaseoli* var. *vignae* (the cowpea rust fungus); in correlation, the incidence of Si-containing, electron-opaque deposits at infection sites decreased. The effect of these extracts on haustorium formation was influenced by the age of the leaves from which the extracts were made, and the age of the leaves into which they were injected. Exudates from infection structures of *U. phaseoli* var. *typica* (the bean rust fungus) also increased haustorium production by *U. phaseoli* var. *vignae*, and in general, both extracts and exudates were less effective in older French bean leaves. Such leaves also were more resistant to bean rust infection, due at least in part to the increased no. of infection sites at which no haustoria developed; in these situations, there was a corresponding increase in the incidence of Si-containing deposits. Injection of extracts from susceptible, infected tissue increased the incidence of haustoria produced by *U. phaseoli* var. *typica* in these older leaves. These results support the previous suggestion that the ability of *U. phaseoli* var. *typica* to invade its host species successfully is initially determined by its ability to suppress the deposition of Si-containing deposits, which would otherwise prevent the development of the 1st haustorium. *(Author's summary)* E03

0559

13516 HEATH, M.C. Partial characterization of the electron-opaque deposits formed in the non-host plant, french bean, after cowpea rust infection. Physiological Plant Pathology 15:141-148. 1979. Engl., Sum. Engl., 25 Refs., Illus.

Phaseolus vulgaris. Uromyces phaseoli. Hosts and pathogens. Leaves. Electron microscopy. Cytokinins.

Phaseolus vulgaris cv. respond to *Uromyces phaseoli* var. *vignae* infection by the production of these deposits on the surrounding mesophyll cell walls. Deposition was inhibited by prior treatment of the leaves with actinomycin D, cycloheximide and blasticidin S, and was elicited by washings from fungal infection structures or, less reliably, by injection of water. Energy dispersive X-ray (EDX) analysis of the deposits revealed silicon as the only element (with an atomic number of 11 or higher) present in significant amounts. Concn were roughly proportional to the amount of electron-opaque material present and no silicon was detected in walls lacking such deposits. Cytochemical tests at the light microscope level

suggested that deposits only rarely contained high levels of phenolic compounds. Similarly EDX analysis of $FeCl_3$-treated tissue revealed only low levels of bound iron (possibly indicative of phenolic compounds) in the deposits while higher levels were found in deposit-lacking walls of cells in the immediate vicinity of the fungus. These results suggest that silicon, rather than phenolic compounds, is the primary electron-opaque component of the wall deposits formed in this non-host interaction, and that, contrary to suggestions for silicon deposition in some other situations, the formation of these deposits is controlled by metabolic activity of the protoplast. *(Author's summary)* E03

0560

26544. HEUVEL, J. VAN DEN.; WATERREUS, L.P. 1985. PECTIC ENZYMES ASSOCIATED WITH PHOSPHATE-STIMULATED INFECTION OF FRENCH BEAN LEAVES BY BOTRYTIS CINEREA. NETHERLANDS JOURNAL OF PLANT PATHOLOGY 91(6):253-264. ENGL., SUM. ENGL., GERM., 13 REFS., ILLUS. (WILLIE COMMELIN SCHOLTEN PHYTOPATHOLOGICAL LABORATORY, JAVALAAN 20, 3742 CP BAARN, THE NETHERLANDS)

A STUDY WAS CONDUCTED TO FIND A POSSIBLE CORRELATION BETWEEN PECTIC ENZYME ACTIVITY AND PHOSPHATE-STIMULATED INFECTION OF FRENCH BEAN LEAVES BY BOTRYTIS CINEREA, AND TO INDICATE WHICH PECTIC ENZYMES, IF ANY, ARE ASSOCIATED IN PARTICULAR WITH PENETRATION. B. CINEREA READILY PRODUCED POLYGALACTURONASES AND PECTIN ESTERASES IN SHAKE CULTURES OF RICHARDS' MEDIUM CONTAINING ORTHOPHOSPHATE AND NO PECTINACEOUS MATERIAL OR GALACTURONIC ACID. IN INOCULUM DROPLETS CONTAINING GLUCOSE AND KH2PO4 OR GLUCOSE AND NA-ATP, WHICH WERE USED TO EVOKE A SUSCEPTIBLE REACTION IN FRENCH BEAN LEAVES, B. CINEREA PRODUCED PECTIC ENZYMES. HOWEVER, IN INOCULUM DROPLETS CONTAINING GLUCOSE BUT LACKING PHOSPHATE, USED TO EVOKE A RESISTANT REACTION, ACTIVITIES OF PECTIC ENZYMES REMAINED LOW. AS THE ENZYME ACTIVITIES ALREADY INCREASED DURING THE PENETRATION STAGE OF THE INFECTION PROCESS, IT IS ASSUMED THAT THESE PHOSPHATE-STIMULATED ACTIVITIES OF PECTIC ENZYMES ARE, AT LEAST PARTIALLY, RESPONSIBLE FOR THE PHOSPHATE-STIMULATED SUSCEPTIBLE INTERACTION BETWEEN FRENCH BEAN LEAVES AND B. CINEREA. ELECTROPHORESIS IN PECTIN-POLYACRYLAMIDE GELS SHOWED THAT 2 POLYGALACTURONASES WITH A HIGH ISOELECTRIC POINT VALUE WERE ASSOCIATED WITH THE PENETRATION STAGE OF THE INFECTION PROCESS. (AS).

0561

20685 HEUVEL, J. VAN DEN; WATERREUS, L.P. 1983. Conidial concentration as an important factor determining the type of prepenetration structures formed by Botrytis cinerea on leaves of French bean (Phaseolus vulgaris). Plant Pathology 32(3):263-272. Engl., Sum. Engl., 18 Refs., Illus. [Willie Commelin Scholten Phytopathological Laboratory, Javalaan 20, 3742 CP Baarn, The Netherlands]

Phaseolus vulgaris. Botrytis cinerea. Snap beans. Isolation. Inoculation. Hosts and pathogens. Pathogenicity. Netherlands.

The effect of the nature and concn. of some infection-stimulating compounds

on the concn. of conidia, the isolate of Botrytis cinerea, and the species of host plant is described. Inoculations of primary leaves of French bean with conidia of B. cinerea, suspended in 0.11 or 0.28 M glucose supplemented with 0.067 M KH_2PO_4 or 1 mM Na-ATP as infection stimulants, yielded mostly spreading lesions. Light microscopy revealed that the fungus could develop 3 types of prepenetration structures from which penetration started: germ tube apices (GA) either nonswollen or appearing as an appressorium-like swelling; appressoria (HA) of different forms produced on branched germ tubes or superficial hyphae; and infection cushions (IC). These structures were also formed on leaves of cucumber and tomato. Penetration from the prepenetration structures was not markedly influenced by the glucose concn. in the inoculum or by host plant species, and varied only slightly with the isolate of B. cinerea. Penetration occurring from GA was greatly enhanced at high conidial concn., Low conidial concn., however, enhanced penetration starting from HA or IC, penetration from these structures also being dependent on the nature of the stimulant added to the glucose in the inoculum. The high proportion of GA in inocula with a high conidial concn. was associated with a rapid penetration and a rapid formation of spreading lesions. (Author's summary) E03

0562

15833 HEUVEL, J. VAN DEN Effect of inoculum composition on infection of French bean leaves by conidia of *Botrytis cinerea*. Netherlands Journal of Plant Pathology 87:55-64. 1981. Engl., Sum. Dutch., Engl., 21 Refs., Illus.

Phaseolus vulgaris. Snap bean. *Botrytis cinerea*. Inoculation. Leaves. Symptomatology. Laboratory experiments.

Inoculation of leaves of french bean with sprays or small drops of a suspension of conidia of *Botrytis cinerea* gave rise to spreading lesions, lesions remaining restricted in size or to no visible necrosis. The type of reaction depended on the composition of the inoculum. In studies with drop inoculations with buffered inocula some of the factors involved were analyzed. The formation of spreading lesions depended on pH, type and molarity of the buffer, presence of glucose, and concn. of conidia in the inoculum. If the phosphate buffer used in most of the inocula was replaced by monobasic phosphate, similar results were obtained. The reactions were not influenced by the proportion of K^+ or Na^+ ions in the phosphate buffer. Inoculations with conidia suspended in a solution of 0.067 *M* phosphate buffer (pH 5.0) or monobasic phosphate and 0.11 *M* glucose always evoked a susceptible reaction (the formation of spreading lesions). *(Author's summary)* E03

0563

13537 HEUVEL, J. VAN DEN and GROOTVELD, D. Formation of phytoalexins within and outside lesions of *Botrytis cinerea* in french bean leaves. Netherlands Journal of Plant Pathology 86:27-35. 1980. Engl., Sum. Engl., 11 Refs., Illus.

Phaseolus vulgaris. *Botrytis cinerea*. Phytoalexin. Host-plant resistance. Plant injuries. Phaseollin.

Rapidly spreading lesions and lesions restricted in size developed in primary leaves of french bean in response to infection by *Botrytis cinerea* isolates BC-1 and BC-5, resp. These isolates caused similar differential lesions in leaves of cucumber, flax, lettuce and tomato. To determine whether phytoalexin accumulation was correlated with the resistant reaction in bean leaves, accumulation of phytoalexins was examined in necrotic areas of both types of lesions and in their surrounding green tissues. Phaseollin was the predominant phytoalexin, both inside and outside lesions, whereas phaseollidin and sometimes also phaseollinisoflavan were always present in lower concn. Phaseollin accumulated earlier and to higher levels within and around lesions of isolate BC-5 than of isolate BC-1. Relatively low concn of phaseollin

were detected in the more remote green areas, including the petiole, of leaves bearing a spreading lesion. The phaseollin metabolite, 6a-hydroxyphaseollin, was found only inside lesions and in a narrow zone around lesions of both types. Differing concn of phytoalexins in the infected tissues may not be a determining factor for the differential interactions between *B. cinerea* and bean leaves, but are rather the result of it. *(Author's summary)* E03

0564

2077 HEUVEL, J. VAN DEN and GROOTVELD, D. **Phytoalexin production in french bean leaves infected by *Botrytis cinerea*.** Netherlands Journal of Plant Pathology 84(2):37-46. 1978. Engl., Sum. Dutch, Engl., 11 Refs., Illus.

Phaseolus vulgaris. *Botrytis cinerea*. **Leaves. Phytoalexins. Chlorophyll. Phaseollin. Analysis.**

French bean leaves were inoculated with 3 pathogenic and 2 nonpathogenic isolates of *Botrytis cinerea* and the infected tissues, containing either spreading lesions or lesions limited in size, were investigated for the presence of phytoalexins. In most cases phaseollin, phaseollidin, phaseollinisoflavan, the phaseollin metabolite 6a-hydroxyphaseollin and a few unidentified antifungal compounds were found; phaseollin was predominant. The concentration of phaseollin accumulating in leaves infected by the nonpathogenic isolate BC-5 was about twice as high as that in infections produced by pathogenic isolates. In contrast, leaves infected by the nonpathogenic isolate BC-6 contained only low concentrations of phaseollin. The data do not provide strong evidence that phaseollin is the principal factor limiting lesion development. *(Author's summary)* E03 C00

0565

7943 HILTY, J.W. and MULLINS, C.A. **Chemical control of snap bean rust.** Tennessee Farm and Home Science 93:4-5. 1975. Engl., Illus.

Phaseolus vulgaris. *Uromyces phaseoli*. **Disease control. Chemical control. Leaves. Yields. Foliage.**

Bravo 75 W at 3 lb/acre, Manzate D 80 W at 2 lb/acre, or 1.5 lb Bravo + 2 lb Manzate/acre gave good control of french bean rust (*Uromyces phaseoli* var. *typica*). Yields ranged from 5106 to 6659 lb/acre, cpmpared with 1311 lb/acre for the control. Spraying at 7-day intervals was superior to spraying at 14-day intervals in terms of reduced disease intensity and increase in yieldd *(Summary by Field Crops Abstracts)* E03

0566

24231 HOWLAND, A.E.; STOREY, E.H. 1964. Rust disease of beans (Phaseolus vulgaris L.). In East African Agricultural and Forestry Research Organization. Record of Research. Annual Report 1963. Kikuyo, Kenya. pp.57-58. Engl., 2 Refs.

Phaseolus vulgaris. Uromyces phaseoli. Races. Resistance. Cultivars. Snap-beans. Tanzania.

Research activities on Uromyces phaseoli in beans in 1963 are summarized. From the samples received it appeared that races P and C were the most prevalent; however, a 5th race of rust was identified. The 1st record of race E came from Morogoro, Tanzania. Snap bean var. Tengeru No. 21 was susceptible to this race. The inoculation technique now uses light oil as a suspension medium; the incubation period under a polyethylene hood was also reduced from 48 to 24 h. The scales of classification of infection used by the East African Agricultural and Forestry Research Organization and in Mexico are compared. [CIAT]

0587

25885. HUNTER, J.E.; PEARSON, R.C.; SEEM, R.C.; SMITH, C.A.; PALUMBO, D.R. 1984. RELATIONSHIP BETWEEN SOIL MOISTURE AND OCCURRENCE OF SCLEROTINIA SCLEROTIORUM AND WHITE MOLD DISEASE ON SNAP BEANS. PROTECTION ECOLOGY 7(4):269-280. ENGL. SUM. ENGL., 18 REFS. (DEPT. OF PLANT PATHOLOGY, NEW YORK STATE AGRICULTURAL EXPERIMENT STATION, CORNELL UNIV., GENEVA, NY 14456, USA)

TWELVE SNAP BEAN FIELDS IN THE STATE OF NEW YORK (USA) WERE MONITORED WEEKLY DURING THE GROWING SEASON IN 1978, 1979, AND 1980 FOR ENVIRONMENTAL AND BIOLOGICAL FACTORS ASSOCIATED WITH DEPOSITION OF INOCULUM OF SCLEROTINIA SCLEROTIORUM ON BEAN LEAVES AND INCIDENCE OF WHITE MOLD. THE SOIL MATRIC POTENTIAL IN AND AROUND BEAN FIELDS WAS MEASURED WITH A PORTABLE, QUICKLY EQUILIBRATING TENSIOMETER. CONTINGENCY TABLES AND A NONPARAMETRIC STATISTICAL TEST CALLED THE PHI COEFFICIENT WERE USED TO DETERMINE WHICH SOIL MATRIC POTENTIAL BEST PREDICTED THE OCCURRENCE OF INOCULUM AND DISEASE. THE AV. OF THE SOIL MATRIC POTENTIAL MEASUREMENTS MADE 30 AND 37 DAYS, OR 37 AND 44 DAYS, AFTER PLANTING WAS A GOOD PREDICTOR OF AVAILABILITY OF INOCULUM DURING BLOOM (THE SUSCEPTIBLE PERIOD) AND DISEASE AT HARVEST. RAINFALL WAS NOT AS GOOD A PREDICTOR. FOR SNAP BEAN GROWING AREAS WITH A HISTORY OF WHITE MOLD, A PROPOSAL IS MADE THAT DISEASE BE ANTICIPATED WHENEVER THE AV. SOIL MATRIC POTENTIAL IS EQUAL TO OR GREATER THAN -30 KPA FOR A 1- TO 2-WK. PERIOD JUST PRIOR TO OR DURING BLOOM. THE FEASIBILITY OF USING AN ASCOSPORE PRODUCTION FORECAST COMPARED WITH A DISEASE FORECAST IN A PRACTICAL PEST MANAGEMENT PROGRAM IS DISCUSSED. WAYS TO IMPROVE THESE TYPES OF FORECAST ARE ALSO CONSIDERED. (AS).

0568

18519 HUNTER, J.E. 1980. The battle against white mold disease on snap beans. American Vegetable Grower and Greenhouse Grower 28(3):8-9. Engl., Illus.

Phaseolus vulgaris. Whetzelinia sclerotiorum. Symptomatology. Epidemiology. Disease control. Chemical control.

The epidemiology and symptomatology of white mold on snap beans, caused by Sclerotinia sclerotiorum, are described as a 1st step in finding adequate control measures. Available disease control measures are explained, including an integrated approach that combines cultural practices and chemical control. Cultural practices should promote drying of soil and plant surfaces such as avoiding cultivation in small fields surrounded by dense woods; planting rows in the direction of prevailing winds; not planting var. that develop a dense canopy; using low plant populations and wide row spacing; deep plowing immediately after harvest; crop rotation with a nonsusceptible crop. Chemical control was successful with a single spray of benomyl at a rate of 1.5 lb/ac or with 2 sprays applied 1 wk. apart at a rate of 1 lb/ac/application, when 70-80% of the plants showed the 1st open

blossoms and assuring thorough coverage. Research is underway to identify sources of resistance to incorporate into cv. (Summary by EDITEC. Trans. by L.M.F.) E03

0569

9909 HUNTER, J.E., ABAWI, G.S. and CROSIER, D.C. **Effects of timing, coverage, and spray oil on control of white mold of snap bean with benomyl.** Plant Disease Reporter 62(7):633-637. 1978. Engl., Sum. Engl., 15 Refs.

Phaseolus vulgaris. Whetzelinia sclerotiorum. **Disease control. Chemical control. Laboratory experiments. Leaves. Timing. Field experiments. Cultivars. USA.**

Control of white mold of french beans with benomyl was studied in the lab, greenhouse mist chambers and in the field to determine the most efficient use of this fungicide and to explain the erratic control obtained at times by commercial growers in New York. Systemic activity of benomyl applied as a foliar spray was inadequate to protect unsprayed bean blossoms, which serve as the nutrient base for ascorporic infections. Efficacy of foliar sprays was not improved significantly by the addition of oil. Benomyl was retained on bean blossoms, even when rain occurred within a few min after spraying. Strains of *Whetzelinia sclerotiorum* tolerant to benomyl were not found in N.Y. and thus do not account for the poor control. It was concluded that effective control can be obtained with one spray of benomyl at the rate of 0.5 lb a.i./50 gal of water/ac applied 3-5 days before the full bloom stage, in a manner to ensure thorough coverage of blossoms. (*Author's summary*) E03

0570

1121 IAMAMOTO, T. *et al.* **Contrôle da "ferrugem" do feijão vagem (*Phaseolus vulgaris* L.) ocasionada pelo fungo *Uromyces phaseoli* var. *typica* Arth.** (*Control of rust in french beans, caused by Uromyces phaseoli var. typica*). Biológico 37(10):266-271. 1971. Port., Sum. Port., Engl., 13 Refs.

Phaseolus vulgaris. Uromyces phaseoli. **Disease control. Chemical control. Field experiments. Statistical analysis. Brazil.**

Two randomized block experiments were conducted with 8 treatments and 4 replications in Biritiba Mirim and Atibaia (São Paulo, Brazil) to evaluate several fungicides in the control of bean rust (*Uromyces phaseoli* var. *typica*). Plantvax (0.2%) and Plantvax (0.25%) + Vitavax (0.25%), sprayed at 14-day intervals, gave good control and max seed production. The mixture, however, was not economical. Manzate (0.3%) and Antracol (0.25%) gave moderate control when applied at weekly intervals; 2-3 applications weekly may give better control. (*Summary by T.B.*) E03

0571

20020 INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1982. Legumineuses: Essais comparatifs de fongicides contre les champignons maculicolles du haricot. (Legumes: comparative fungicide trial to control fungi in haricot beans). In _____. Compte rendu des travaux du Departement Amenagement du Milie et du Departement des Laboratoires en 1981. Rubona. pp.20-21. Fr. [B.P. 138, Butare, Rwanda]

Phaseolus vulgaris. Isariopsis griseola. Colletotrichum lindemuthianum. Ascochyta phaseolorum. Disease control. Chemical control. Snap beans. Rwanda.

Two fungicides, benomyl (WP 50%) applied at 1 kg/ha in 1000 l of water and triphenyltin acetate (WP 60%) applied at 0.5 kg/ha, were compared during

the 2nd cropping season at Rubona, Rwerere, and Karama (Rwanda) to determine their efficiency of controlling Isariopsis griseola, Colletotrichum lindemuthianum, and Ascochyta phaseolorum. Dwarf, semiclimbing, and climbing var. were used at the 3 sites. Treatments were replicated 3 times. Triphenyltin acetate was eliminated due to its phytotoxicity. Fungi were not controlled and the check var. was not outyielded. (Summary by EDITEC. Trans. by L.M.F.) EO3

0572

19705 JOHNSON, K.B.; POWELSON, M.L. 1983. Analysis of spore dispersal gradients of Botrytis cinerea and gray mold disease gradients in snap beans. Phytopathology 73(5):741-746. Engl., Sum. Engl., 21 Refs., Illus. [Dept. of Botany, Oregon State Univ., Corvallis, OR 97331, USA]

Phaseolus vulgaris. Botrytis cinerea. Snap beans. Flowering. Epidemiology. USA.

Spore dispersal, spore incidence on blossoms, and pod rot disease gradients from point inoculum sources of Botrytis cinerea were measured over time in 2 snap bean fields. Lab.-grown inoculum was placed at ground level in a 30 x 30-cm square at bloom initiation and removed at full bloom. Dispersal of inoculum, assessed by quantifying the no. of viable spores washed from bean foliage, was limited to within 3 m from the inoculum source during bloom. At harvest, the spore populations on plants were 20-30 times higher than populations at full bloom due to production of secondary inoculum. During the bloom period, incidence of B. cinerea on senescing blossoms averaged 70% at a distance of 0.9 m from the inoculum source, but less than 25% at distances greater than 4 m. In 1 expt., the incidence of pod rot at harvest averaged 7.2% at 0.9 m from the inoculum source, but only 1.3% at 4.5 m. Spore dispersal gradients (log spore no. vs. log distance) showed significant flattening at harvest compared with full bloom, whereas gradients for pod rot incidence at harvest did not flatten compared with incidence of B. cinerea on blossoms at full bloom. Because senescing blossoms are the primary infection court for infection of the pods, the nonsignificant flattening of the pod rot gradient suggests that early arrival of inoculum of B. cinerea on blossoms was important in pod rot development. (Author's summary) EO3

0573

22648 JOHNSON, K.B.; POWELSON, M.L. 1983. Influence of prebloom disease establishment by Botrytis cinerea and environmental and host factors on gray mold pod rot of snap bean. Plant Disease 67(11):1198-1202. Engl., Sum. Engl., 29 Refs., Illus. [Dept. of Botany & Plant Pathology, Oregon State Univ., Corvallis, OR 97331, USA]

Phaseolus vulgaris. Botrytis cinerea. Snap beans. Epidemiology. Flowering. Hosts and pathogens. USA.

Observations on the development of gray mold of snap beans in 5 commercial fields in the Willamette Valley of Oregon (USA) revealed that Botrytis cinerea colonized senescing cotyledons 1st. Young stem and leaf tissues also became diseased before bloom and served as within-field inoculum sources. Infected stems were the most durable prebloom inoculum source and continuously produced inoculum into the bloom period. The av. no. of sporulating prebloom infections varied among fields, ranging from 0.2 to 14.8/5-m row. Both the no. of spores/plant at bloom initiation and the incidence of B. cinerea on blossoms at full bloom were positively correlated with the no. of sporulating prebloom infections. When the no. of sporulating infections before bloom was used as a predictive variable, 50% of the variation in the incidence of pod rot among fields could be explained. A multiple regression model that included the no. of sporulating infections before bloom, interval between irrigations, cumulative duration of leaf wetness due to irrigation and rain, and canopy size, explained 82% of the variation in % pod rot among fields. (Author's summary) EO3

0574

19894 KAMINSKYJ, S.G.W.; HEATH, M.C. 1983. Histological responses of infection structures and intercellular mycelium of Uromyces phaseoli var. typica and U. phaseoli var. vignae to the HNO_3-MBTH-$FeCl_3$ and the IKI-H_2SO_4 tests. Physiological Plant Pathology 22(2):173-179. Engl., Sum. Engl., 18 Refs., Illus. [Dept. of Botany, Univ. of Toronto, Toronto, Ontario M5S 1A1, Canada]

Phaseolus vulgaris. Uromyces phaseoli. Snap beans. Etiology. Analysis. Canada.

The IKI (0.2% I dissolved in 2% aqueous KI)-H_2SO_4 and the HNO_3-MBTH (3-methyl-2-benzothiazolinone hydrazone hydrochloride, MCB)-$FeCl_3$ staining reactions for chitosan, chitin, and hexosamine were examined in the rust fungi Uromyces phaseoli var. typica and U. phaseoli var. vignae. Identical reactions were seen for both organisms. No staining was observed in any fungal structure when treated directly with IKI-H_2SO_4. However, after autoclaving in alkali to convert chitin to chitosan, this test resulted in a pink-violet coloration of the walls of germ tubes, infection structures, and intercellular mycelium. In contrast, the walls of urediospores, germ tubes, appressoria, and intercellular mycelium, but not those of the substomatal vesicles, infection hyphae, or young secondary hyphae, turned blue with HNO_3-MBTH-$FeCl_3$ in the absence of alkali treatment. A comparison of the 2 staining reactions applied to particles of partially purified chitin which had been deacetylated to different degrees, suggested that the fungal material reactive with HNO_3-MBTH-$FeCl_3$ was hexosamine which was not in the form of chitosan. Results suggest that while the walls of germ tubes, infection structures, and intercellular mycelium all contain chitin, there is a change in other wall components as the fungus enters the plant, and again as the intercellular mycelium becomes established. (Author's summary) E03

0575

17767 KHARE, M.N.; PATING, [illegible]; AGRAWAL, S.C. 1979. Influence of fungicides on the incidence of foliar diseases, phylloplane mycoflora, yield, seed-borne fungi and protein contents of French bean. Proceedings of the National Academy of Sciences 49(2):69-72. Engl., Sum. Engl., 9 Refs.

Phaseolus vulgaris. Snap beans. *Colletotrichum lindemuthianum. Alternaria alternata. Cercospora canescens.* Disease control. Yields.

Of 7 fungicide spray treatments tested (mancozeb, copper oxichloride, zineb, wettable S, ziram, wettable S + ziram, and copper oxychloride + zineb), mancozeb gave the best control of various leaf diseases of *Phaseolus vulgaris* which included anthracnose (*Colletotrichum lindemuthianum*), Alternaria leaf and pod spot (*Alternaria alternata*), and Cercospora leaf spot (*Cercospora canescens*). Max. reduction in phylloplane fungi was observed, and mancozeb had the best effect on yield. Association of fungi with harvested seed was least with mancozeb and wettable S. *(Summary by Review of Plant Pathology)* E03

0576

27765. KMIECIK, K.A.; BLISS, F.A. 1986. FIELD RESISTANCE OF SNAP BEANS TO ROOT ROT DETERMINED BY ROOT DRY MASS. BEAN IMPROVEMENT COOPERATIVE. ANNUAL REPORT 29:85-86. EN. 1 REF. [DEPT. OF HORTICULTURE, UNIV. OF WISCONSIN, MADISON, WI 53706, USA]

IN 1985, 32 SNAP BEAN CV. GROWN IN 2 FIELDS AT U. EXPTL. FARM IN HANCOCK,[WISCONSIN, USA] WERE EVALUATED FOR ROOT ROT RESISTANCE.

THE ROOTS OF PLANTS IN EACH PLOT WERE BAGGED, TAGGED, AND DRIED. DRY WT. WERE THEN TAKEN ON ROOT + HYPOCOTYL PORTIONS AND ON ROOTS ONLY FOR THE PLANTS IN EACH PLOT. ANALYSES OF VARIANCE SHOWED THAT ROOT MASS AND ROOT + HYPOCOTYL DRY MASS WERE SIGNIFICANTLY DIFFERENT FOR BOTH LOCATION AND CV. STAND COUNTS WERE NOT SIGNIFICANTLY DIFFERENT. DATA PRECISION SUGGESTS THAT ROOT MASS MAY BE A USEFUL PARAMETER IN BREEDING FOR ROOT ROT RESISTANCE. [CIAT].

0577

22160 KORE, S.S.; SOLANKE, R.B. 1982. Efficacy of fungicides on mycoflora of French bean (Phaseolus vulgaris). Indian Journal of Mycology and Plant Pathology 12(1):76-78. Engl., 9 Refs. [Dept. of Plant Pathology, Marathwada Agricultural Univ., Parbhani, India]

Phaseolus vulgaris. Snap beans. Seed treatment. Alternaria. Aspergillus. Fusarium. Macrophomina. Rhizopus. Rhizoctonia. Drechslera. Penicillium. Curvularia. Chemical control. Disease control. Germination. India.

Efficacy of 7 fungicides (thiram, carbendazim, captafol, carboxin, captan, MBC, and Agrosan GN) and their longevity in vitro were studied in French bean seeds. All the treatments reduced the mycoflora but the highest % germination was obtained with seed treated with Agrosan GN, carboxin, MBC, and carbendazim. Germination decreased and mycoflora increased with storage time after treatment. (Summary by Review of Plant Pathology) E03

0578

25337 KULIK, M.M. 1984. Symptomatology and epidemiology of several green bean diseases incited by seed-borne fungi. Seed Science and Technology 12(3):841-850. Engl., Sum. Engl., Fr., Germ., 53 Refs. [Seed Research Laboratory, Plant Genetics & Germplasm Inst., US Dept. of Agriculture, Beltsville, MD 20705, USA]

Phaseolus vulgaris. Snap beans. Symptomatology. Epidemiology. Isariopsis griseola. Colletotrichum lindemuthianum. Ascochyta phaseolorum. Macrophomina phaseoli. Fusarium oxysporum. Whetzelinia sclerotiorum. USA.

Background information, symptomatology, and epidemiology of the following diseases of Phaseolus vulgaris are presented: angular leaf spot [Isariopsis (Phaeoisariopsis) griseola], anthracnose (Colletotrichum lindemuthianum), Ascochyta leaf spots (A. boltshauseri and A. phaseolorum), ashy stem blight and charcoal rot (Macrophomina phaseoli), Fusarium yellows (F. oxysporum f. sp. phaseoli), and Sclerotinia wilt (S. sclerotiorum). [AS]

0579

22647 LEWIS, J.A.; LUMSDEN, R.D.; PAPAVIZAS, G.C.; KANTZES, J.G. 1983. Integrated control of snap bean diseases caused by Pythium spp. and Rhizoctonia solani. Plant Disease 67(11):1241-1244. Engl., Sum. Engl., 21 Refs. [Soilborne Diseases Laboratory, Plant Protection Inst., Beltsville, MD 20705, USA]

Phaseolus vulgaris. Rhizoctonia solani. Pythium myriotylum. Pythium aphanidermatum. Pythium ultimum. Snap beans. Seed treatment. Integrated control. Yields. USA.

In a 4-yr field study at Salisbury, Maryland, USA, an integrated control approach with cultural and chemical components successfully reduced snap bean diseases caused by the soil-borne plant pathogens Pythium spp. and Rhizoctonia solani. The major control component was plowing infested soil

to a depth of 20-25 cm rather than disking to 5-7 cm before planting. This procedure alone generally increased plant stand and vine wt. and always increased yield. Pod wt. was increased 43-100% in each of 4 yr in the plowed soil. Chemical seed treatment with metalaxyl or metalaxyl + chloroneb also increased plant stand and wt., but the magnitude of the increase was not as great as that achieved with plowing. In 3 of 4 yr, plowing in association with seed treatment gave a greater yield than that attained when each component was used individually. The inoculum densities of Pythium spp. and R. solani were less in plowed than in disked soils. (Author's summary) E03

0580

21029 LOCKE, J.C.; PAPAVIZAS, G.C.; LEWIS, J.A.; LUMSDEN, R.D.; KANTZES, J.B. 1983. Control of Pythium blight of snap beans by seed treatment with systemic fungicides. Plant Disease 67(9):974-977. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. Snap beans. Pythium aphanidermatum. Pythium myriotylum. Pythium ultimum. Disease control. Seed treatment. Chemical control. USA.

The systemic fungicide metalaxyl applied to snap bean seed directly or with acetone infusion significantly reduced blight in the greenhouse and field in soils naturally infested with Pythium ultimum, P. aphanidermatum, and P. myriotylum. Directly applying as little as 0.2 g a.i./kg of seed, using either a 50 WP or 2 E formulation, controlled preemergence damping-off and postemergence blight without phytotoxicity. Efficacy of metalaxyl against blight was reduced during incubation at a high temp. (35°C). Metalaxyl and propamocarb hydrochloride seed treatments generally gave better protection than ethazol against Pythium blight. In liquid culture, metalaxyl had an ED_{50} of less than 1 microgram a.i./ml in inhibiting mycelial growth of the 3 Pythium species, with P. ultimum the most sensitive. Zoospore and oosp re germination and sporangial formation were less sensitive to metalaxyl than mycelial growth. Metalaxyl did not affect membrane permeability at 50 micrograms/ml, and cholesterol had no effect on leakage. (Author's summary) E03

6064

0581

McLEAN, D. M., HOFFMAN, J. C. and BROWN, G. B. Greenhouse studies on resistance of snap beans to Rhizoctonia solani. Plant Disease Reporter 52(6):486-488. Engl., Sum. Engl. 15 Refs.

Phaseolus vulgaris. Cultivars. Diseases and pathogens. Pests. Resistance. Bean root rot. Rhizoctonia solani. Mycoses. Roots. Hypocotyls. Plant breeding. Laboratory experiments.

Twelve breeding lines and PI accessions among approximately 600 tested have shown resistance to Rhizoctonia solani in artificially-infested greenhouse soil. Some have been tested in the field with similar results based on low scores for hypocotyl and root lesions. (Author's summary)

0582

5464 MANNING, W.J. and CROSSAN, D.F. Field and greenhouse studies on the effects of plant amendments of *Rhizoctonia* hypocotyl rot of snapbean. Plant Disease Reporter 53(3):227-231. 1969. Engl., Sum. Engl., 18 Refs.

Phaseolus vulgaris. Rhizoctonia solani. Fusarium oxysporum. Hypocotyls. Field experiments. Laboratory experiments. Roots. *Zea mays.*

The effects of green and mature plant amendments on *Rhizoctonia hypocotyl* rot of french beans were assessed under field and greenhouse conditions. Under both conditions, maize amendments

significantly decreased hypocotyl rot. This effect persisted for almost a year under field conditions, but lasted less than 70 days in the greenhouse. Maize root growth alone also decreased hypocotyl rot under greenhouse conditions, but not so markedly as decreases obtained with whole plant amendments. Other amendments were ineffective in decreasing hypocotyl rot under greenhouse and field conditions. *(Author's summary)* E03

3930

0583

MANNING, W. J. CROSSMAN, D. F. and MORTON, D. J. Effects of planting depth and asphalt mulch on Rhizoctonia root and hypocotyl rot of snapbean. Plant Disease Reporter 51(3):158-160. 1967. Engl. Sum. Engl. 4 Refs.

Phaseolus vulgaris. Pests. Diseases and pathogens. Mycoses. Rhizoctonia solani. Roots. Hypocotyls. Soil temperature. Seeds. Mulching. Cultivation. Productivity. Planting.

The planting depth of snapbean seed and the presence of asphalt mulch affected plant emergence and Rhizoctonia root and hypocotyl rot incidence. Plants from seed planted 3 inches deep were shorter and had more root and hypocotyl rot than did plants from seed planted 1 inch deep. More plants emerged in the mulched rows than in the non-mulched rows. Plants in the mulched rows were slightly taller and had a higher percentage of root and hypocotyl rot. The lowest incidence of root and hypocotyl rot was obtained by planting seed 1 inch deep without mulching. At this depth, however, seed germination was reduced. (Author's summary).

0584

17837 MARSHALL, D.S. 1982. Effect of *Trichoderma harzianum* seed treatment and *Rhizoctonia solani* inoculum concentration on damping-off of snap bean in acidic soils. Plant Disease 66(9):788-789. Engl., Sum. Engl., 10 Refs.

Phaseolus vulgaris. Snap beans Seed treatment. *Trichoderma harzianum*. *Rhizoctonia solani*. pH. Inoculation. Biological control.

The efficiency of biocontrol on damping-off of snap bean induced by *Rhizoctonia solani* depends on soil reaction and inoculum concn. of the pathogen. Soil was acidified to pH 3.5 or 5.6 and infested with *R. solani* inoculum at concn. of zero, 0.1, 1.0, 5.0, or 10.0 g/kg of soil. Seeds were coated with conidia of *Trichoderma harzianum* and planted in the acidified, infested soils. As inoculum concn. of *R. solani* increased from 0.1 g/kg of soil, there was a corresponding increase in disease incidence (proportion of plants damped off). Disease incidence was reduced by 32% in soil of pH 3.5 compared with soil of pH 5.6 and by 65% when seeds were treated with conidia of *T. harzianum* as opposed to untreated seed. Piecewise linear regression indicated that the rate of increase of damping-off was greater when the range of *R. solani* inoculum was from 0-0.1 than from 0.1-10.0 g/kg of soil. Results suggest that *T. harzianum* seed treatment of snap bean reduces incidence of *R. solani* damping-off in acidic soils. *(Author's summary)* E03

2852

0585

MERCER, P.C., WOOD, R.K.S. and GREENWOOD, A.D. Resistance to anthracnose of French bean. Physiological Plant Pathology 4(3):291-306. 1974. Engl. Sum. Engl. 29 Refs. Illus.

Phaseolus vulgaris. Pests. Resistance. Diseases and pathogens. Hosts. Mycoses. Colletotrichum lindemuthianum. Races. Hypocotyls. Electron microscopy.

.Resistance of Phaseolus vulgaris L. to Colletotrichum lindemuthianum Sacc. et Magn. Bri. et Cav., the cause of anthracnose, was studied physiologically and by light and electron microscopy of a number of combinations of host cultivar and pathogen race giving reactions ranging from highly susceptible to highly

resistant. Hypersensitive death of cells appeared to be the most important cause of resistance. Granulation of walls of killed cells did not extend beyond the middle lamella, and the pits between killed and adjacent living cells became occluded. The cytoplasm of these living cell differed in a number of ways from that of corresponding cells in uninfected plants; in particular, the volume of cytoplasm was increased about threefold, nuclei were convoluted and chlorophyll was not removable by the usual solvents. There was no evidence to suggest that the capacity to respond in a hypersensitive manner was confined to specific cells in a large group of visually similar cells. Epidermal cells of different parts of the same plant or of the same plant structure such as a leaf may respond differently to infection. Cells of susceptible cultivars occasionally responded in a manner very similar to the hypersensitive response characteristic of resistant cultivars. Filtrates from cultures of the pathogen also caused changes in fine structure that resembled those of hypersensitivity; activity of filtrates was non-specific. Reaction material sometimes appeared in the lumen of cells as an early response to penetration; its amount, type and its significance in resistance depended on the host-pathogen combination. Outer walls of epidermal cells appear to be significant only in the resistance of older hypocotyls in which a zone of cortical sclerenchyma may also be important in this context. The role in resistance of hypersensitive responses, reaction material and cell walls is discussed. (Author's summary).

0586

28907 MEREDITH, F.I. ; THOMAS, C.A.; HORVAT, R.J. 1986. Isolation of coumarin in snap beans and its effect on uredospore germination. Journal of Agricultural and Food Chemistry 34(3):456-458. En., Sum. En., 16 Ref., Il. [Richard B. Russell Agricultural Research Center, United States Dept. of Agriculture, Agricultural Research Service, Athens, GA 30613, USA]

Phaseolus vulgaris. Snap beans. Cultivars. Leaves. Pods. Analysis. Uromyces phaseoli. Disease physiology and biochemistry. USA.

Coumarin was isolated and identified for the 1st time from leaves and pods of 5 snap bean cv. Isolation of coumarin was by TLC and identification by thin-layer cochromatography, ultraviolet spectroscopy, and mass spectrometry. The max. concn. of coumarin in all leaf and pod tissues analyzed never exceeded 3.0 micrograms/g fresh wt. Results of uredospore germination test are presented, showing that coumarin concn. in the leaf and pod are below the threshold necessary to stimulate uredospore germination. [AS]

0587

11664 MOHAMED, A.K. Some cultural and environmental factors affecting snap bean (*Phaseolus vulgaris* L.) growth and root rot incidence. Ph.D. Thesis. Madison, University of Wisconsin, 1976. 147p. Engl., Sum. Engl., 202 Refs., Illus.

Phaseolus vulgaris. Fusarium solani phaseoli. Water absorption. Plant vascular system. Nutrient absorption. Field experiments. Herbicides. Seed characters. Nutrient solution. Yield components. Yields. Growth. Soil temperature. Water content. Hosts and pathogens. USA.

Root rot due to *Fusarium solani* f.sp. *phaseoli* is a great problem in the irrigated central sandy area of Wisconsin. In glasshouse trials root rot reduced root systems substantially, thus influencing water and nutrient uptake. In field trials yields were significantly higher in fields with

a low incidence of root rot than in those with a high incidence. Shallow sowing increased yields especially in high-incidence fields. (*Summary by Field Crop Abstracts*) E03

0588

11131 MONTEIRO, M.S.R. and COSTA, C.P. DA **Comportamento de cultivares de feijão vagem** (*Phaseolus vulgaris* L.) **em condições de campo a ferrugem** (*Uromyces phaseoli typica* Arth.). (*Reaction of climbing french bean varieties to rust under field conditions*). *In* São Paulo, Brasil. Escola Superior de Agricultura Luiz de Queiroz. Relatorio Cientifico no. 9. 1975. pp.115-117. Port., Sum. Engl., 4 Refs.

Phaseolus vulgaris. *Uromyces phaseoli*. **Disease control. Host-plant resistance. Races. Indeterminate cultivars. Cultivars. Brazil**

Bean rust caused by *Uromyces phaseoli* var. *typica* is an endemic disease of beans in São Paulo. Varietal resistance is the ideal method of control. About 19 climbing french bean var. were evaluated for resistance under natural epidemic conditions. The most resistant were Michelet à Rame and Dade (scale 1), followed by Acay Magrif, Polaris, MacCaslan, Coco Blanc, Kentucky Wonder and Campineira (scale between 1 and 2). These var. are promising progenitors for resistance breeding. (*Author's summary*) E03

0589

27742 MULLINS, C.A. ; HILTY, J.W. 1986. Snap bean response to new fungicides for rust control. Bean Improvement Cooperative. Annual Report 29:71-72. En., 3 Ref. [Depts. of Plant & Soil Science & Entomology & Plant Pathology, Univ. of Tennessee Plateau Experiment Station, Rt. 9, Box 363, Crossville, TN 38555, USA]

Phaseolus vulgaris. Snap beans. Uromyces phaseoli. Disease control. Fungicides. Yields. USA.

The effect of 8 fungicides (maneb, propiconazol, bitertanol, HWG 1608, RH-3866, KWH 0519, DPX H6573, and XE 779) in snap bean rust control was evaluated at Plateau Expt. Station (Tennessee, USA) in 1985. No crop injury or yield reductions were found. A table with the doses, the application frequency, and the yields obtained is included. (CIAT)

0590

27414. MULLINS, C.A.; HILTY, J.W. 1985. EVALUATION OF FUNGICIDE TREATMENTS FOR CONTROL OF SNAP BEAN RUST. TENNESSEE FARM AND HOME SCIENCE 135:9-10. EN. 6 REF. (DEPT. OF PLANT & SOIL SCIENCE, UNIV. OF TENNESSEE PLATEAU EXPERIMENT STATION, RT. 9, BOX 363, CROSSVILLE, TN 38555, USA)

THE EFFECTIVENESS OF 3 EXPTL. FUNGICIDES (TRIADIMEFON, BITERTANOL, AND PROPICONAZOL) FOR THE CONTROL OF UROMYCES APPENDICULATUS IN SNAP BEANS WAS EVALUATED IN 1983-84 AT THE PLATEAU EXPT. STATION OF THE U. OF TENNESSEE (USA). IN ADDITION, SEVERAL FORMULATIONS OF MANEB WERE EVALUATED AT A 7-DAY FREQUENCY. A RANDOMIZED COMPLETE

BLOCK DESIGN WITH 4 REPLICATIONS WAS USED. ALL CHEMICAL TREATMENTS CONTROLLED RUST, BUT SOME VARIATIONS WERE OBSERVED AMONG SEASONS FOR THE INDIVIDUAL TREATMENTS. TRIADIMEFON APPLIED AT A 7-DAY FREQUENCY AND BITERTANOL AND PROPICONAZOL APPLIED AT A 14-DAY SCHEDULE GAVE EXCELLENT RUST CONTROL BOTH YEARS. TREATMENTS THAT WERE PHYTOTOXIC [TRIADIMEFON AND PROPICONAZOL BOTH APPLIED AT A 7-DAY FREQUENCY] USUALLY RESULTED IN LOWER YIELDS. [CIAT].

0591

27368. MULLINS, C.A.; HILTY, J.W. 1985. EVALUATION OF FUNGICIDES FOR CONTROL OF SNAP BEAN RUST IN TENNESSEE. BEAN IMPROVEMENT COOPERATIVE. ANNUAL REPORT 28:109-110. EN. [DEPTS. OF PLANT & SOIL SCIENCE & ENTOMOLOGY & PLANT PATHOLOGY, UNIV. OF TENNESSEE PLATEAU EXPERIMENT STATION, RT. 9, BOX 363, CROSSVILLE, TN 38555, USA]

BEAN RUST CONTROL TRIALS HAVE BEEN CONDUCTED ANNUALLY AT THE U. OF TENNESSEE PLATEAU EXPT. STATION NEAR CROSSVILLE [USA] FOR SEVERAL YEARS. IN 1984, SNAP BEANS OF THE RUST-SUSCEPTIBLE CV. EAGLE WERE PLANTED. FUNGICIDE TREATMENTS [MANEB, RH 3866, PROPICONAZOL, TRIADIMEFON, AND BITERTANOL] WERE APPLIED AT DIFFERENT DOSIS AT A 7-DAY FREQUENCY. PROPICONAZOL CAUSED SEVERE CROP INJURY. YIELDS WERE HIGHEST WITH MANEB, TRIADIMEFON [14-DAY FREQUENCY], AND BITERTANOL [7- AND 14-DAY FREQUENCIES]. RUST RATINGS WERE INTERMEDIATE WITH THE TREATMENTS OF MANEB, TRIADIMEFON, AND BITERTANOL. MANEB IS THE ONLY SATISFACTORY FUNGICIDE LABELED FOR RUST CONTROL OF SNAP BEANS IN TENNESSEE. [CIAT].

0592

28288. MUNDT, C.C.; LEONARD, K.J. 1986. EFFECT OF HOST GENOTYPE UNIT AREA ON DEVELOPMENT OF FOCAL EPIDEMICS OF BEAN RUST AND COMMON MAIZE RUST IN MIXTURES OF RESISTANT AND SUSCEPTIBLE PLANTS. PHYTOPATHOLOGY 76[9]:895-900. EN. SUM. EN., 20 REF., IL. [DEPT. OF BOTANY & PLANT PATHOLOGY, OREGON STATE UNIV., CORVALLIS, OR 97331-2902, USA]

THE EFFECT OF HOST GENOTYPE UNIT AREA [GROUND AREA OCCUPIED BY AN INDEPENDENT, GENETICALLY HOMOGENEOUS UNIT OF A HOST POPULATION] ON THE EFFECTIVENESS OF HOST MIXTURES FOR CONTROLLING FOCAL EPIDEMICS OF COMMON MAIZE RUST AND BEAN RUST WAS STUDIED. FOR BOTH CROPS, MIXTURES OF RESISTANT AND SUSCEPTIBLE PLANTS WITH 4 GENOTYPE UNIT AREAS WERE ESTABLISHED BY ALTERING THE SPATIAL ARRANGEMENT OF HOST GENOTYPES WITHIN PLOTS. WITH BEANS, GENOTYPE UNIT AREA WAS INCREASED FROM 0.023 TO 0.84 SQUARE METERS IN MIXTURESOF EITHER 1:1

OR 1:3 SUSCEPTIBLE/RESISTANT PLANTS OVER 3 YR (1982-84). THERE WAS ALWAYS LESS DISEASE ON SUSCEPTIBLE PLANTS IN MIXTURES WITH THE SMALLER GENOTYPE UNIT AREAS THAN IN THE PURE-LINE SUSCEPTIBLE PLANTS. IN ALL 3 YR, THE EFFECTIVENESS OF THE MIXTURE DECLINED AS THE GENOTYPE UNIT AREA INCREASED; HOWEVER, THE QUANTITATIVE RELATIONSHIP BETWEEN MIXTURE EFFICACY AND GENOTYPE UNIT AREA VARIED AMONG YEARS. [AS (EXTRACT)].

0593

0692-3596 NATTI, J.J. **Epidemiology and control of bean white mold.** Phytopathology 61(6):669-674. 1971. Engl., Sum. Engl., 19 Refs.

Phaseolus vulgaris. **Diseases and pathogens. Pests. Mycoses. Disease control. Spraying.** *Whetzelinia sclerotiorum.*

Epidemics of white mold occurred 8-14 days after full bloom in french bean plantings, irrespective of planting dates and environmental conditions during the blossom period. First infections usually occurred in the axils of lower branches at the site of lodgment of cast bean blossoms and were caused by mycelium that emerged from blossoms in which the causal fungus *Whetzelinia sclerotiorum (= Sclerotinia sclerotiorum)* was established. Subsequent spread occurred by in situ contact of healthy with infected tissues and by distribution of infected plant parts by various agents. Direct invasion of healthy growing bean tissues by the primary infectious agent was not observed. Senescent and dead blossoms invaded by the fungus are therefore essential intermediaries in disease development. Foliage sprays with benomyl applied a few days before full bloom provided effective control, whereas sprays applied after full bloom did not. Effectiveness of benomyl was attributed to its systemic translocation into developing bean buds and blossoms and to retention of its fungicidal activity in senescent and dead blossoms. *(Author's summary)* 1 03

3687

0594

NIEDBALSKI, J.F. and RICHARD, S.F. Sclerotinia white mold control in snap and Lima beans with 2,6-dichloro-4-nitroaniline. Plant Disease Reporter 53(7): 573-575. 1969. Engl. Sum. Engl. 8 Refs.

Phaseolus vulgaris. Diseases and pathogens. Mycoses. Sclerotinia sclerotiorum. Disease control. Chemical control. Field experiments. Hosts. Pests.

Sclerotinia white mold of snap and lima beans was controlled in trials in western New York with applications of 2,6-dichloro-4-nitroaniline. Multiple spray applications provided the best disease control in snap beans when the initial spray was applied at first blossom and subsequent applications timed according to environmental conditions affecting the disease. (Author's summary).

0595

20639 NIK, W.Z.W.; YAP, M.Y. 1979. Rhizoctonia solani, a seed-borne pathogen of French bean in Malaysia. Pertanika 2(1):11-15. Engl., Sum. Engl., Mal., 18 Refs., Illus.

Phaseolus vulgaris. Rhizoctonia solani. Disease transmission. Isolation. Etiology. Pathogenicity. Disease control. Chemical control. Snap beans. Malaysia.

Biology, pathogenicity, and chemical control of Rhizoctonia solani (the imperfect state of Thanatephorus cucumeris) were studied using an isolate from infected French bean seed. The fungus was found to be seed-borne on

both imported and local bean var. Growth rate of fungus varied with temp. and culture medium used. Malt extract agar gave poor growth and lima bean agar supported fungal growth best at 28°C. The fungus infected aerial parts of bean plants. The strain had a wide host range. In vitro studies to test the efficacy of 5 fungicides (copper oxychloride, PCNB, benomyl, captan, and thiram) against the fungus showed that PCNB at 500 ppm gave good control. (Author's summary) E03

0596

26292. O'CONNELL, R.J.; BAILEY, J.A.; RICHMOND, D.V. 1985. CYTOLOGY AND PHYSIOLOGY OF INFECTION OF PHASEOLUS VULGARIS BY COLLETOTRICHUM LINDEMUTHIANUM. PHYSIOLOGICAL PLANT PATHOLOGY 27(1):75-98. ENGL., SUM. ENGL., 51 REFS., ILLUS. (LONG ASHTON RESEARCH STATION, UNIV. OF BRISTOL, DEPT. OF AGRICULTURE & HORTICULTURE, LONG ASHTON, BRISTOL BS18 9AF, ENGLAND)

THE PROGRESS OF INFECTION BY COLLETOTRICHUM LINDEMUTHIANUM WAS EXAMINED IN SUSCEPTIBLE AND RESISTANT FRENCH BEAN HYPOCOTYLS PRODUCING SPREADING LESIONS OR SINGLE HYPERSENSITIVE CELLS, RESP. IN SUSCEPTIBLE TISSUE, INTRACELLULAR INFECTION VESICLES FORMED IN EPIDERMAL CELLS, WHICH REMAINED ALIVE. INTRACELLULAR PRIMARY HYPHAE DEVELOPED FROM THE VESICLES AND COLONIZED FURTHER HOST CELLS. A MATRIX LAYER SEPARATED THE HYPHAL WALL FROM THE INVAGINATED HOST PLASMALEMMA. AFTER A PERIOD OF BIOTROPHY LASTING LESS THAN 24 H, THE CYTOPLASM OF INFECTED CELLS GRADUALLY DEGENERATED. THIS WAS ASSOCIATED WITH LOSS OF THE ABILITY OF CELLS TO PLASMOLYSE AND TO EXCLUDE TANNIC ACID, HERE USED AS A PERMEABILITY TRACER WITH PLANT TISSUE FOR THE 1ST TIME. LOSS OF THE ABILITY OF THE TONOPLAST TO CONTRACT AND FOR NEUTRAL RED TO ACCUMULATE IN THE VACUOLE OCCURRED LATER, AND WAS CONSIDERED TO INDICATE CELL DEATH. IN CV. CONTAINING THE PIGMENT MALVIDIN-3,5-DIGLUCOSIDE, LOSS OF COLOR COINCIDED WITH TONOPLAST RUPTURE. DURING THE DEVELOPMENT OF THE PRIMARY MYCELIUM, THE SEQUENCE OF A BRIEF BIOTROPHIC PHASE FOLLOWED BY GRADUAL DEGENERATION AND DEATH WAS REPEATED AS EACH HOST CELL BECAME INFECTED. THUS, DESPITE THE ABSENCE OF TISSUE BROWNING, ONLY RECENTLY COLONIZED CELLS AT THE EDGE OF THE INFECTION WERE ALIVE. AS LESIONS APPEARED, NARROWER SECONDARY HYPHAE GREW WITHIN HOST CELL WALLS. DEATH OF HOST PROTOPLASTS AND WALL DISSOLUTION THEN OCCURRED IN ADVANCE OF SECONDARY HYPHAE. IN RESISTANT TISSUE, INFECTION VESICLES WERE NOT FORMED, AND THE FUNGUS WAS RESTRICTED IN SINGLE HYPERSENSITIVE EPIDERMAL CELLS. MOST HYPHAE APPEARED DEAD, BUT SOME HAD NORMAL ULTRASTRUCTURE. THESE FINDINGS ARE DISCUSSED IN RELATION TO RACE SPECIFICITY AND THE IMPORTANCE OF BIOTROPHY TO SUCCESSFUL PATHOGENESIS BY C. LINDEMUTHIANUM. (AS).

OSHIMA, N., DICKENS, L. E. and COUNTER, B. F. Incidences of Pythium wilt of snap beans in Colorado. Plant Disease Reporter 53(9):766. 1969. Engl. 3 Refs.

Phaseolus vulgaris. Diseases and pathogens. Pests. Pythium butleri. ~~Bean wilts.~~ Mycoses. Phytophthora. Resistance.

Because of high summer temperature in 1968, snap beans in northern Colorado suffered considerable losses from Pythium wilt. The disease was frequently found in heavily irrigated fields or in poorly-drained portions of fields. Isolation studies from wilted plants revealed that not only Pythium butleri, as previously reported, but also a species of Phytophthora was involved in this disease. These observations on Pythium wilt provide leads for future studies. The role of Phytophthora in the wilt syndrome is not yet known. Differences of susceptibility to Pythium wilt among snap bean varieties was observed. (Summary by CEK)

0598

5139 PEGG, K.G. **Brown spot disease of french bean caused by** *Pleiochaeta setosa.* Queensland Journal of Agricultural and Animal Science 25:219-223. 1968. Engl., Sum. Engl., 5 Refs., Illus.

Phaseolus vulgaris. Pleiochaeta setosa. **Host range. Leaves. Stems. Pods. Seed transmission.**

Brown spot disease of french beans (*Phaseolus vulgaris*) caused by *Pleiochaeta setosa* is described for the 1st time in Queensland. Pathogenicity tests showed the fungus to be a wound pathogen, and abrasion by sand particles during cyclonic weather apparently predisposes the plants to infection. Two alternative weed hosts are *Crotalaria mucronata* and *C. goreensis.* On these the disease is seed borne. The disease has also been recorded on *Vigna sinensis.* (*Author's summary*) E03

0599

17426 PEGG, K.G.; ALCORN, J.L. 1967. Ascochyta disease of French beans. Queensland Agricultural Journal 93(6):321-323. Engl., Illus.

Phaseolus vulgaris. Ascochyta. Symptomatology. Plant injuries. Disease control. Snap beans.

The symptomatology, plant damage, and control of the Ascochyta leaf spot in snap beans in Queensland, Australia, are described. *(Summary by F.G. Trans. by L.M.F.)* E03

0600

5041 PIECZARKA, D.J. and ABAWI, G.S. **Influence of soil water potential and temperature on severity of** *Pythium* **rot of snap beans.** Phytopathology 68(5):766-772. 1978. Engl., Sum. Engl., 24 Refs., Illus.

Phaseolus vulgaris. Pythium ultimum. **Bean root rots. Soil water. Soil temperature. Seedlings. Roots. Hypocotyls.**

Soil water and temp had significant effects on the severity of root rot of french beans caused by *Pythium ultimum.* The disease was studied in pasteurized soil infested with the pathogen and maintained at fluctuating water potentials of 0 to -1.0 to -5, and 0 to -12 bars, each at 15, 21 and 27°C. At any one temp, root-rot severity increased as soil water potential increased. At any one water potential, root-rot severity decreased as soil temp increased. Pythium root rot was severest and caused the greatest plant dry wt loss in soil at 15°C and soil water potential of 0 to -1 bar. When plants grown in infested soil for 15 days at 15°C and at soil water potential of 0 to -1 bar were shifted to 27°C and or soil water potential 0 to -5 bars for another 15 days, they had greater

dry wt and less root rot than did plants maintained in soil at 15°C and 0 to -1 bar for 30 days. Damage from *Pythium* also occurred, although to a lesser extent, when plants were grown at 27°C and soil water potential of 0 to -12 bars for 15 days and then shifted to a 15°C and/or soil water potential of 0 to -1 bar. Soil populations of *P. ultimum* increased at all temperatures and soil water potentials tested. (*Author's summary*) E03

0601

10836 PIECZARKA, D.J. and ABAWI, G.S. **Populations and biology of *Pythium* spp. associated with snap bean roots and soils in New York.** Phytopathology 68:409-416. 1978. Engl., Sum. Engl., 31 Refs., Illus.

Phaseolus vulgaris. Pythium ultimum. Pythium irregulare. **Roots. Isolation. Temperature. Hypocotyls. USA.**

In a study of *Pythium* spp. in soils from french bean fields in NY, dry wt of plants was decreased progressively from 0.98 g plant on uninoculated soil to 0.68 g plant with inoculum density of 1 sporangia g dry soil and to 0.49 g plant with 500 sporangia g dry soil. Dry wt of 6- to 28-day-old plants transplanted onto pasteurized soil infested with 500 propagules g dry soil ranged form 63-88% of that of the uninoculated control, regardless of plant age. (*Summary by Field Crop Abstracts*) E03

0602

3055 PIECZARKA, D.J. **Ecology and biology of *Pythium* species associated with snap bean roots and soils in New York State.** Ph.D. Thesis. Ithaca, New York, Cornell University, 1977. 91p. Engl., Sum. Engl., 74 Refs., Illus.

Phaseolus vulgaris. Pythium ultimum. Fusarium solani phaseoli. Rhizoctonia solani. **Bean root rots. Soil water. Soil temperature. Isolation. Tissue culture. Roots. Hypocotyls. Laboratory experiments. Ecology. USA.**

Pythium ultimum, P. irregulare and unidentified sporangial-forming isolates (*Pythium* sp.) were recovered from bean soils at 21°C. *P. oligandrum* was the major species isolated at 37°C. The frequency of recovery of these species differed markedly between fields, hhn timu las lways the most abundant pathogenic species. The 4 *Pythium* species were also isolated from roots and hypocotyls of naturally infected beans as early as 7 days after planting, and the % recovery increased with plant age. Total *Pythium* spp. soil populations varied considerably between and within bean fields throughout the growing season and were not closely correlated with bean root rot severity. In pathogenicity tests, using pasteurized bean field soil, *P. ultimum* and *P. irregulare* caused pre- and postemergence damping-off and root rot. The other species caused little or no damage on beans. *P. ultimum*, at an inoculum density of one propagule/g oven-dry soil, reduced plant stands by more than 85%. Root rot was severe at 10 propagules but reached a max at 500 propagules/g oven-dry soil where severe root pruning and plant stunting occurred. Under humid conditions, *P. ultimum* often moved up the stem from established hypocotyl lesions below ground and infected the terminal bud, causing death of the plant. Furthermore, *P. ultimum* caused severe root rot on a plant introduction accession, a breeding line and cultivars that are known to be resistant to the seed decay stage caused by the same pathogen. A close correlation was found between soil water potential, soil temp and root rot development on beans grown in pasteurized bean field soil infested with *P. ultimum*. Root rot was severest when the soil moisture was high and temp was low. Disease severity and plant stunting were reduced as soil moisture and temp decreased and increased, respectively. Beans grown in soil at a high moisture level and low temp produced new and healthier roots when soil moisture was reduced and/or soil temp was increased. The reverse occurred, but to a lesser extent, when plants were 1st grown under soil conditions unfavorable for development of Pythium root rot and were then shifted to conditions

favorable for disease development. Root rot severity and growth retardation were greater for plants grown in soil infested with a combination of *P. ultimum* and *Fusarium solani* f. sp. *phaseoli*. Furthermore, the interaction between the 2 pathogens suggested a synergistic relationship since root rot severity caused by a combination of the 2 was greater than the sum of their effect individually. Growth and disease severity data from plants grown in soil infested with *Rhizoctonia solani* and *P. ultimum* suggested that an antagonistic relationship exists between the pathogens. No interaction occurred between *F. solani* f. sp. *phaseoli* and *R. solani*. (*Author's summary*) E03

0603

25650. RAO, B.M.; PANKAJA, S.; PRAKASH, H.S.; SHETTY, H.S. 1984. AFLAROOT PRODUCTION IN FRENCH BEAN BY ASPERGILLUS FLAVUS. INDIAN PHYTOPATHOLOGY 37(4):730-731. ENGL., 11 REFS. [DEPT. OF APPLIED BOTANY, UNIV. OF MYSORE, MYSORE 570 006, INDIA]]

THE PRODUCTION OF THE AFLAROOT SYMPTOM [ATTRIBUTED TO AFLATOXIN PRODUCTION], SEED ROT, AND SEEDLING MORTALITY IN FRENCH BEANS BY ASPERGILLUS FLAVUS IS BRIEFLY REPORTED. A TOTAL OF 100 SEEDS OF 3 SAMPLES OF FRENCH BEAN WERE USED; THE FUNGUS WAS RECORDED IN ALL SEEDCOMPONENTS: COAT, COTYLEDON, AND EMBRYO. [CIAT].

0604

8986 REYNOLDS, S.G. **Influence de *Sclerotium rolfsii*, du mulching et de la saison sur les rendements du haricot nain (*Phaseolus vulgaris*) dans l'Ouest de Samoa.** (*The effect of Sclerotium rolfsii, mulching and season on dwarf bean yields in Western Samoa*). Agronomie Tropicale 30(3):245-250. 1975. Fr., Sum. Fr., 11 Refs., Illus.

Phaseolus vulgaris. Sclerotium rolfsii. **Mulching. Dwarf beans. Yields. Germination.**

In the dry season bean germination was lowest on unmulched plots. Maximum germination and 73% yield increase was obtained with coconut frond mulch. Infection by *Sclerotium rolfsii* was initially highest on unmulched plots but became more severe on those mulched with white polythene and aluminum foil. Although mulching appeared to delay the onset of the disease, damage on mulched and unmulched plots was similar, but only half as severe as in the wet season and total yields were >doubled. On unmulched plots, yields increased in the dry season but were still the lowest of the 8 treatments. It is suggested that although the drier soil resulted in less wilt and an overall increase in bean yields in the dry season, the higher soil temp levels were associated with poor germination, restricted *Rhizobium* nodulation and reduced yields. (Summary by Review of Plant Pathology) E03

4675

0605

REZENDE, L.O.C. et al. Controle de Sclerotinia sclerotiorum em feijao vagem. (Control of Sclerotinia sclerotiorum in green beans). Biológico 35(1):8-12. 1969. Port. Sum. Engl. 2 Refs.

Phaseolus vulgaris. Sclerotinia sclerotiorum. Roots. Chemical control. Leaves. Statistical analyses. Field experiments. Toxicity. Brazil.

In order to control the sclerotinia rot (Sclerotinia sclerotiorum (Lib.) de Bary) in green beans, the authors made two fields experiments in Ana Dias (S.P.), where this disease causes serious losses to the culture in the winter season. The results

of the experiments of 1967 and 1968 showed the efficacy of the fungicide Allisan (2,6-dichloro-4-nitroaniline) at concentration of 0,15%, 0,20% and 0,25%. The last concentration showed a light phytotoxicity on the foliage. (Author's summary).

0606

*ROMING, W.R. 1972. Effects of herbicides on the defense mechanisms of Phaseolus vulgaris L. infected by Rhizoctonia solani Kuhn. Thesis. Pullman, Washington State Univ. 51p.

6116

0607

SAAD, S. and HAGEDORN, D. J. Growth and nutrition of an Alternaria pathogenic to snapbeans. Phytopathology 60(5):903-906. 1970. Engl., Sum. Engl. 12 Refs.

Phaseolus vulgaris. Diseases and pathogens. Pests. Alternaria tenuis. Alternaria leaf-spot. Mycoses. Laboratory experiments. Analysis. Growth. Culture media.

Alternaria tenuis (Syn. A. alternata), the causal organism of Alternaria leaf spot of bean, grew on potato-dextrose agar from 4 to 36 C, the optimum being 28 C. No isolate grew well at 4 or 36 C. Mannose, dextrose, and maltose were the best carbon sources, and fructose supported good growth of isolate H5. Casein hydrolysate, glutamic acid, asparagine, and tyrosine as amino acid sources supported maximum growth of the fungus. Peptone and sodium nitrate promoted best growth of isolate M4, whereas peptone and calcium nitrate were superior for isolate H5. Alternaria tenuis grew well over the wide pH range of 4.4 to 7.6, the optimum being 6.5. (Author's summary)

0608

18520 SEENAPPA, M.; KESWANI, C.L.; MATIKO, M. 1981. Aspergillus infection and aflatoxin production in beans (Phaseolus vulgaris) in Tanzania. International Biodeterioration Bulletin 17(3):79-82. Engl., Sum. Engl., Fr., Germ., Span., 12 Refs., Illus.

Phaseolus vulgaris. Snap beans. Cultivars. Inoculation. Aspergillus. Toxins. Tanzania.

Nineteen different samples of French beans from 7 regions of Tanzania were inoculated with Aspergillus parasiticis (NRRL 3145) and the degree of infection and aflatoxin production evaluated. All the bean samples supported growth of the fungus and aflatoxin was produced. The amount of aflatoxin (B + G) ranged between 149-1496 mg/kg of seed. There appeared to be no relationship between the seed color, size, or shape and fungal infection or aflatoxin production. (Author's summary) E03

0609

22151 SHARMA, S.R.; SOHI, H.S. 1981. Effect of different fungicides against Rhizoctonia root rot of French bean (Phaseolus vulgaris). Indian Journal of Mycology and Plant Pathology 11(2):216-220. Engl., Sum. Engl., Hindi, 11 Refs. [Indian Inst. of Horticultural Research, 255, Upper Palace Orchards, Bangalore 560080, India]

Phaseolus vulgaris. Seed treatment. Rhizoctonia solani. Disease control. Chemical control. Yields. Snap beans. India.

Studies were undertaken to investigate the efficacy of 17 fungicides as seed dressings against Rhizoctonia solani causing root rot in French bean. Benomyl, carbendazim, NF. 44, NF. 48, and tridemorph checked the growth of the pathogen completely at 100, 200, and 500 ppm concn. Out of the 10 different seed dressing treatments tested under field conditions in deficient soil, benomyl and NF. 48 either alone or with sandovit (sticker),

carbendazim, carboxin, and PCNB gave max. protection against pre- and post-emergence mortality and also increased the yield of green pods significantly. Percentage of increase in yield in 2 field trials varied from 10.668 to 139.40% in different treatments whereas mortality was reduced from 56.053 to 14.417%. (Author's summary) E03

0610

22150 SHARMA, S.R.; SOHI, H.S. 1981. Root rot of French bean - a serious problem in India. Indian Journal of Mycology and Plant Pathology 11(2): 236-242. Engl., Sum. Engl., Hindi, 18 Refs., Illus. [Indian Inst. of Horticultural Research, 255, Upper Palace Orchards, Bangalore, 560080, India]

Phaseolus vulgaris. Snap beans. Etiology. Symptomatology. Rhizoctonia solani. Resistance. Macrophomina phaseoli. Sclerotium rolfsii. Pythium. Fusarium. Irrigation. Rainfall. India.

Surveys were conducted at the Indian Institute of Horticultural Research, Hessaraghatta (Bangalore) and in farmers' fields in Karnataka to record the etiology, symptomatology, and incidence of root rot of French bean in India. Up to 15% infection was observed under field conditions; symptoms presented were root rot, collar rot, and wilt. Rhizoctonia solani was the most common pathogen, followed by Sclerotium rolfsii, Pythium sp., Fusarium sp., and Macrophomina phaseoli. In the rainy season, circular to irregular, sunken and dry lesions were also observed on pods. Plants of all the ages were susceptible. Inocula 1-56 days old were equally virulent except for the slight delay in developing infection in the case of old cultures. Dry season favored disease development. Frequent irrigations as well as delayed irrigations induced greater disease incidence. (Author's summary) E03

0611

17446 SHARMA, S.R.; SOHI, H.S. 1980. Assessment of losses in French bean due to *Rhizoctonia solani*. Indian Phytopathology 33(2):366-369. Engl., 8 Refs.

Phaseolus vulgaris. Snap beans. *Rhizoctonia solani*. Inoculation. Cultivars. Rots. Yields. India.

Two expt. were conducted at the Indian Institute of Horticultural Research Exptl. Farm at Hessaraghatta in 1978 to determine the losses in French bean due to *Rhizoctonia solani*. Cv. Premier and Contender were used in the 1st expt. Four hundred seeds of each cv. were sown on ridges in 5 x 3 m^2 plots, each having 5 rows. One wk. before planting, 100, 150, and 200 g of *R. solani* inoculum were applied per plot. Each treatment had 3 replications in a random block design. Plots without inoculum served as control. Observations were recorded on preemergence damping off, postemergence mortality, root rot index (0-5 scale), and green pod yield in both of the cv. separately. In the 2nd expt. seeds of cv. Premier were inoculated at planting and 10, 20, 30, and 40 days after germination with 200 g inoculum/plot. Data were recorded on pre- and postemergence mortality and green pod yield of surviving plants/plot. Preemergence damping off, postemergence mortality, and root rot index were greater with higher levels of inoculum in both cv. Loss in green pod yield varied from 28.5-53.64% in cv. Premier and 12.96-43.81% in cv. Contender at different levels of inoculum. In the 2nd expt. max. pre- and postmergence mortality was recorded when seed inoculation was followed by inoculation 10, 20, 30, and 40 days after germination. Loss in green pod yield varied from 8.45-64.78%. *(Summary by F.G. Trans. by L.M.F.)* E03

0612

27404. SILBERNAGEL, M.J.; DOYLE, T.J. 1985. INTERACTION OF GENETIC RESISTANCE TO FUSARIUM ROOT ROT WITH CULTURAL PRACTICES IN A WHITE-SEEDED BUSH SNAP BEAN. BEAN IMPROVEMENT

COOPERATIVE. ANNUAL REPORT 28:1-2. EN. [UNITED STATES DEPT. OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, BOX 30, PROSSER, WA 99350, USA]

A FIELD STUDY WAS UNDERTAKEN TO DETERMINE THE INTERACTION BETWEEN BEAN CV. RESISTANT TO FUSARIUM SOLANI SP. PHASEOLI AND CULTURAL PRACTICES. THE WHITE-SEEDED BUSH SNAP BEAN CV. BLUE MOUNTAIN AND FUSARIUM-RESISTANT BREEDING LINE FR-264 WERE USED. TREATMENTS WERE 28-CM ROW SPACING AT 4 SEEDS/30 CM OF ROW VS. 56-CM ROWS AT 8 SEEDS/30 CM OF ROW; DEEP SUBSOILING [46-51 CM] BETWEEN ROWS VS. NO SUBSOILING; AND DIFFERENTIAL SPRINKLER IRRIGATION FROM BLOOM TO HARVEST. EMERGENCE WAS ABOUT 13 PERCENT BETTER WITH BLUE MOUNTAIN THAT WITH FR-264. FR-264 HAD A CONSISTENTLY LOWER DISEASE INDEX THAN BLUE MOUNTAIN. DRY PLANT WT. WERE SIGNIFICANTLY INCREASED BY DEEP SUBSOILING IN BOTH CV.; HOWEVER, THE DETRIMENTAL EFFECT OF NOT SUBSOILING WAS MORE SEVERE ON THE SUSCEPTIBLE CV. THAN ON THE RESISTANT FR-264. EVEN UNDER THE WORST FIELD CONDITIONS, FR-264 YIELDED AS WELL AS BLUE MOUNTAIN UNDER THE BEST CONDITIONS [2020 AND 1906 KG/HA, RESP.]. [CIAT].

0613

17835 SINDHAN, G.S.; BOSE, S.K. 1981. Epidemiology of anthracnose of French bean caused by *Colletotrichum lindemuthianum*. Indian Phytopathology 34(4):484-487. Engl., Sum. Engl., 4 Refs.

Phaseolus vulgaris Snap beans. *Colletotrichum lindemuthianum*. Epidemiology. India.

In the hill region of Uttar Pradesh (India) anthracnose of French bean, caused by *Colletotrichum lindemuthianum*, appeared the 2nd or 3rd wk. of June with max. damage from the beginning of August to the middle of Sept. French bean plants of all ages were susceptible, but infection was less on 2 wk. than 6 wk. old plants. Disease intensity increased with the plant age. Inoculum, 10-20 days old with 400-800 spores/ml, was more infectious than inoculum 5, 30, and 60 days old with 100, 200, and 1600 spores/ml. Best planting time of French bean was between mid April-mid May for max. yields and min. disease incidence. *(Author's summary)* E03

0614

17834 SINDHAN, G.S.; BOSE, K. 1981. Evaluation of fungicides against anthracnose of French bean caused by *Colletotrichum lindemuthianum*. Indian Phytopathology 34(3):325-329. Engl., Sum. Engl., 9 Refs.

Phaseolus vulgaris. Snap beans. *Colletotrichum lindemuthianum*. Chemical control. Disease control.

Fourteen fungicides were applied as foliar sprays to control anthracnose (*Colletotrichum lindemuthianum*) in French bean var. Black Queen. Benomyl was effective in reducing disease incidence and in increasing seed yield, followed by carbendazim, ziram, carboxin, ferbam, and lime sulphur. Of 13 seed dressing fungicides tested, benomyl was effective in increasing seed germination, seed yield, and in reducing disease incidence, followed by carbendazim, carboxin, ziram, and Agrosan G.N. Benomyl, carbendazim, carboxin, and ziram were effective both as foliar sprays and as seed dressing. Benomyl, carbendazim,

carboxin, and tridemorph had a residual effect up to 15-20 days whereas all other fungicides lost their effect within 5-10 days after application. *(Author's summary)* E03

0615

15492 SINDHAN, G.S. and BOSE, S.K. Epidemiology of angular leaf spot of French bean caused by *Phaeoisariopsis griseola*. Indian Phytopathology 33(1):64-68. 1980. Engl., Sum. Engl., 9 Refs.

Phaseolus vulgaris. Isariopsis griseola. Etiology. Climatic requirements. Timing. Planting. India.

The disease angular leaf spot *(Phaeoisariopsis griseola)* appears in french bean crops in the Kumaon hills (India) from the beginning of July with peak damage from early Aug. to the middle of Sept. Under field conditions, RH and precipitation were more important for disease development than temp. Two-wk. old plants were not susceptible to disease. Three-wk. old plants were less susceptible than 4-, 5-, and 6-wk. old plants with 15-20 day old inoculum having 400-800 spores/ml. The best time for sowing french beans was found between April 1-May 15 to maximize yields. *(Author's summary)* E03

0616

16980 SINDHAN, G.S.; BOSE, S.K. 1979. Perpetuation of *Phaeoisariopsis griseola* causing angular leaf spot of French beans. Indian Phytopathology 32(2):252-254. Engl., Sum. Engl., 9 Refs.

Phaseolus vulgaris. Isariopsis griseola. Disease transmission. Seed transmission. Timing. Soil populations.

The seed and soil-borne pathogen *Phaeoisariopsis griseola* was perpetuated through infected plant (*Phaseolus vulgaris*) debris from one season to the next, remaining viable under field conditions for > 10 mo. Viability of conidia on debris was 6 mo. in the lab. and 8 mo. in the field. In seeds the fungus remained viable for > 1 yr as dormant mycelium, this being important in the initiation and spread of the disease in new localities. *(Author's summary)* E03

0617

21754 SINGH, D.B.; REDDY, P.P.; SHARMA, S.R. 1981. Effect of root-knot nematode Meloidogyne incognita on Fusarium wilt of French beans. Indian Journal of Nematology 11(1):84-85. Engl., 5 Refs. [Indian Inst. of Horticultural Research, Bangalore-80, India]

Phaseolus vulgaris. Meloidogyne incognita. Inoculation. Fusarium oxysporum. Snap beans. Plant injuries. India.

Simultaneous inoculation of Phaseolus vulgaris with Meloidogyne incognita and Fusarium oxysporum f. solani or inoculation of M. incognita prior to Fusarium inoculation, gave max. % wilting, indicating that Fusarium wilt is increased in French beans in the presence of M. incognita. (Summary by Plant Breeding Abstracts) E03

2864

0618

SMITH, I. M. Biochemical changes in French bean pods infected with Colletotrichum lindemuthianum. Annals of Applied Biology 65(1):93-103. 1970. Engl. Sum. Engl. 13 Refs. Illus.

Phaseolus vulgaris. Pests. Races. Diseases and pathogens. Mycoses. Sugars. Biochemistry. Colletotrichum lindemuthianum. Pods. Analysis. Amino acids.

.Infection of bean pods with Colletotrichum lindemuthianum leads to the appearance in diffusates of a range of fluorescent and phenolic compounds and of at least two inhibitory compounds. These compounds were found to be absent or in reduced concentration in control diffusates, although the inhibitors were frequently observed to appear at low concentrations without infection. Although sugars and amino acids were found to be released into diffusates, variation in the concentration of theses stimulants was found to have little effect on spore germination. Evidence from solvent partition, spectro-photometry and chromatography suggests that the two inhibitors can be tentatively identified with inhibitors previously described from French bean, and both appear to be phenolic substances. It is suggested that inhibitor production may be regarded as part of a general change in aromatic biosynthesis following infection. (Author's summary).

4733

0619

SPALDING, D. H. and REEDER, W. F. Postharvest control of sclerotinia rot of snap bean pods with heated and unheated chemical dips. Plant Disease Reporter 53 (1):59-62. 1974. Engl. Sum. Engl. 6 Refs.

Phaseolus vulgaris. Sclerotinia sclerotiorum. Pods. Chemical control. Experiment design.

Sclerotinia rot of snap bean pods was controlled during 10 to 14 days' storage at 60° F and 95% relative humidity by a 10-second postharvest dip in unheated suspensions of 450 ppm 2,6-dichloro-4-nitroaniline (DCNA) or 1140 ppm 2-(4-thiazolyl)-benzimidazole (thiabendazole). Hot (125°F) thiabendazole (570 ppm) or hot DCNA (225 ppm) dips were more fungicidal than comparable unheated suspensions. Snapbeans dipped for 30 seconds in hot water or hot DCNA (225 ppm) developed some bacterial ro in storage. (Author's summary).

0620

28068. STAVELY, J.R.; BAKER, C.J. 1985. SCIENTISTS ATTACK RUST WITH RESISTANCE AND BIOCONTROL. AGRICULTURAL RESEARCH 33(9):15. EN. IL. (UNITED STATES DEPT. OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, PLANT PATHOLOGY LABORATORY, BLDG. D04, BARC-WEST, BELTSVILLE, MD 20705, USA)

THE ADVANCES IN RESEARCH ACHIEVED BY SCIENTISTS IN BELTSVILLE (MARYLAND, USA) REGARDING THE CONTROL OF RUST IN DRY BEAN AND SNAP BEAN THROUGH VAR. RESISTANCE AND BIOCONTROL (BACILLUS SUBTILIS) ARE BRIEFLY DESCRIBED. (CIAT).

0621

27739. STUMPF, M.A.; HEATH, M.C. 1985. CYTOLOGICAL STUDIES OF THE INTERACTIONS BETWEEN THE COWPEA RUST FUNGUS AND SILICON-DEPLETED FRENCH BEAN PLANTS. PHYSIOLOGICAL PLANT PATHOLOGY 27(3):369-385. EN. SUM. EN., 28 REF., IL. (BOTANY DEPT., UNIV. OF TORONTO, TORONTO, ONTARIO, CANADA M5S 1A1)

TO INVESTIGATE THE ROLE OF SILICA-RICH WALL DEPOSITS IN RESISTANCE TO THE COWPEA RUST FUNGUS, FRENCH BEAN PLANTS WERE GROWN HYDROPONICALLY IN NUTRIENT SOLUTIONS SUPPLEMENTED WITH OR DEPLETED IN SI. PRIMARY LEAVES SUPPLIED WITH ADEQUATE SI RESPONDED TO

FUNGAL INFECTION BY THE AUTOFLOURESCENCE OF GUARD CELL WALLS, THE LIMITED AUTOFLUORESCENCE OF MESOPHYLL CELL WALLS (BOTH VISUALIZED IN CLEARED TISSUE), AND THE DEPOSITION IN AND ON THE LATTER OF SILICA. IF INFECTED, SI-DEPLETED PLANTS, LIGHT MICROSCOPY, ELECTRON MICROSCOPY, AND ENERGY DISPERSIVE X-RAY ANALYSIS INDICATED THAT SILICA DEPOSITS WERE ABSENT. THE INCIDENCE OF AUTOFLUORESCENCE OF GUARD CELLS WAS COMPARABLE WITH THAT IN THE SI-SUPPLEMENTED PLANTS, BUT THE INCIDENCE AND EXTENT OF MESOPHYLL WALL AUTOFLUORESCENCE WAS GREATLY ENHANCED. THE AUTOFLUORESCENCE OF MESOPHYLL CELLS, BUT NOT GUARD CELLS, CORRESPONDED TO AREAS OF THE WALL THAT GAVE A COLOR REACTION WITH TOLUIDINE BLUE INDICATIVE OF PHENOLIC COMPOUNDS. CALLOSE (ANILINE BLUE POSITIVE MATERIAL), IN THE FORM OF PAPILLAE, WAS ALSO EXTREMELY COMMON AT INFECTION SITES IN SI-DEPLETED LEAVES. INFECTION HYPHAE RARELY FORMED HAUSTORIA IN EITHER SI-DEPLETED PLANTSOR THOSE GIVEN ADEQUATE SI, ALTHOUGH THESE HYPHAE GREW AS WELL, AND APPEARED EQUALLY HEALTHY, IN BOTH TYPES OF PLANTS. IN SI-DEPLETED PLANTS, PREINOCULATION HEAT TREATMENTS OR INJECTION OF INTERCELLULAR FLUIDS FROM BEANRUST-INFECTED BEAN LEAVES, INCREASED THE INCIDENCE OF HAUSTORIUM FORMATION AND DECREASED THE INCIDENCE OF ALL OBSERVED PLANT RESPONSES. THE RESULTS SUGGEST THAT EITHER SILICA DEPOSITION IS NOT THE PRIMARY BARRIER TO HAUSTORIUM FORMATION IN NORMAL PLANTS, OR THAT A 2ND BARRIER, SUCH AS THE IMPREGNATION OF THE PLANT WALL WITH PHENOLIC MATERIALS, COMES INTO PLAY IF SILICA DEPOSITION IS PREVENTED. (AS).

2929

0622

SUMMER, D.R. Interactions of herbicides and nematicides with root diseases of snapbean and southern pea. Phytopathology 64:1353-1358. 1974. Engl. Sum. Engl. 27 Refs.

Phaseolus vulgaris. Phytopathology. Diseases and pathogens. Mycoses. Rhizoctonia solani. Bean damping-off. Fusarium solani. Bean dry root rot. Sclerotium rolfsii. Fusarium oxysporum. Bean root rot. Disease control. Chemical control.

In greenhouse experiments treating soil with trifluralin + dinoseb increased foliage wt and decreased root discoloration of snapbean, but treating soil with ethoprop had the opposite effect. Plants grown in soil treated with all three pesticides were similar to plants grown in untreated soil. DBCP, trifluralin + dinoseb, and ethoprop reduced growth and increased damping-off of snapbean in soils infested with Pythium myriotylum. In contrast, treatment with ethoprop alone increased root rot in soil infested with P. irregulare, but treatment with trifluralin + dinoseb reduced root rot. Root rot of snapbean was most severe in soil infested with Rhizoctonia solani, or a combination of several fungi, and only treatment with dimethyl tetrachlor terephthalate increased root rot while none of the pesticide treatments decreased root rot. Root disease in snapbean was increased by treating with ethoprop in soils infested with Fusarium roseum and foliage wt was reduced in soil infested with F. solani. Effects of pesticides on snapbeans in soil infested with F. oxysporum or Sclerotium rolfsii were variable. Pesticides did not significantly affect root disease and foliage wt in southern pea. Inoculum density of F. solani

was significantly increased in soil by treatment with trifluralin + dinoseb 1 day after snapbeans were planted, but there were no significant differences when plants were harvested 27 to 28 days later. Pesticides did not significantly influence inoculum density of F. oxysporum or F. roseum. (Author's summary).

0623

27063. SUMNER, D.R.; SMITTLE, D.A.; THREADGILL, E.D.; JOHNSON, A.W.; CHALFANT, R.B. 1986. INTERACTIONS OF TILLAGE AND SOIL FERTILITY WITH ROOT DISEASES IN SNAP BEAN AND LIMA BEAN IN IRRIGATED MULTIPLE-CROPPING SYSTEMS. PLANT DISEASE 70(8):730-735. EN. SUM. EN., 34 REF. [DEPT. OF PLANT PATHOLOGY, UNIV. OF GEORGIA, COASTAL PLAIN STATION, TIFTON, GA 31793, USA]

SNAP BEAN OR LIMA BEAN WAS PLANTED EACH AUG. FOLLOWING MAIZE IN A MULTIPLE CROPPING SYSTEM FOF 6 YR. ROOT AND HYPOCOTYL DISEASE SEVERITY AND POSTEMERGENCE DAMPING-OFF (CAUSED PRIMARILY BY RHIZOCTONIA SOLANI AG-4, FUSARIUM SOLANI, A STERILE WHITE BASIDIOMYCETE, AND PYTHIUM SPP.) WERE GREATER IN FALL SNAP BEAN THAN IN LIMA BEAN AND IN SUBSOILED OR DISKED THAN IN PLOWED TREATMENTS. IN 1 YR OF 3, POSTEMERGENCE DAMPING-OFF WAS INCREASED IN SNAP BEAN BY APPLYING N BROADCAST PREPLANT COMPARED WITH APPLYING IT THROUGH OVERHEAD IRRIGATION. PLOWING REDUCED POPULATIONS OF R. SOLANI AG-4 AND RHIZOCTONIA-LIKE FUNGI COMPARED WITH DISKING BUT INCREASED OR HAD NO EFFECT ON POPULATIONS OF PYTHIUM SPP. IN SPRING SNAP BEAN, ROOT DISEASE SEVERITY WAS GREATER IN SINGLE ROWS THAN IN TWIN ROWS AND WITH STARTER FERTILIZER THAN WITHOUT. SUBSOILING INCREASED THE NO. OF PLANTS WITH REDDISH BROWN SUNKEN CANKERS ON THE HYPOCOTYLS COMPARED WITH PLOWING. NO. OF MELOIDOGYNE INCOGNITA JUVENILES IN THE SOIL AND ROOT-GALL INDICES WERE GREATER IN FALL LIMA BEAN THAN IN SNAP BEAN. IN MOST TESTS, NO. OF M. INCOGNITA JUVENILES AND ROOT-GALL INDICES WERE NOT AFFECTED BY TILLAGE METHODS OR FERTILIZATION TREATMENTS. YIELD OF SNAP BEAN WAS GREATER IN THE SPRING THAN IN THE FALL. [AS].

0624

25686. SUMNER, D.R. 1985. VIRULENCE OF ANASTOMOSIS GROUPS OF RHIZOCTONIA SOLANI AND RHIZOCTONIA-LIKE FUNGI ON SELECTED GERM PLASM OF SNAP BEAN, LIMA BEAN, AND COWPEA. PLANT DISEASE 69(1):25-27. ENGL. SUM. ENG., 21 REFS. [DEPT. OF PLANT PATHOLOGY, UNIV. OF GEORGIA, COASTAL PLAIN EXPERIMENT STATION, TIFTON, GA 31793, USA]

RHIZOCTONIA SOLANI AG-4 AND AG-2 TYPE 2, INDIGENOUS TO THE GEORGIAN COASTAL PLAIN [USA], WERE HIGHLY VIRULENT ON CV. OF SNAP ANDPOLE BEAN AND COWPEA. SNAP BEAN BREEDING LINES B4175, B4173-2X, 208-8R,

5181R, AND VENEZUELA 54 WERE MORE RESISTANT TO HIGH INOCULUM DENSITIES [187 AND 492 COLONY FORMING UNITS/100 G SOIL] OF AG-4 THAN EAGLE SNAP BEAN, BUT AT 16 COLONY FORMING UNITS/100 G SOIL, THERE WERE NO SIGNIFICANT DIFFERENCES. NONE OF THE SNAP BEAN BREEDING LINESWERE RESISTANT TO R. SOLANI AG-2 TYPE 2. R. SOLANI AG-2 TYPE 1 WAS HIGHLY VIRULENT ON COWPEAS AND SLIGHTLY-MODERATELY VIRULENT ON BEANS.RHIZOCTONIA-LIKE CAG-5 WAS MODERATELY VIRULENT ON PI 165426 AND JACKSON WONDER LIMA BEAN. CAG-3 WAS HIGHLY VIRULENT ON COWPEAS AND CAG-4 WAS AVIRULENT. [AS].

0625

1630 SUMNER, D.R. *et al.* **Root diseases of snapbean and southern pea in intensive cropping systems.** Phytopathology 68:955-961. 1978. Engl., Sum. Engl., 29 Refs., Illus.

Phaseolus vulgaris. Pythium aphanidermatum. Fusarium solani phaseoli. Fusarium oxysporum. Rhizoctonia solani. **Bean root rots. Cultivation. Roots. Hypocotyls. Intercropping. Chemical control.**

Root diseases of french beans and cowpeas were studied in whole plots of cropping systems of beans/soybeans/cabbage, turnips/maize/beans, turnips/peanuts/beans and turnips/-cucumbers/cowpeas/turnips in S.E. USA. Each system was repeated yearly for 4 yr. Subplots were treated with the nematicide ethoprop or not treated; sub-subplots were treated with the herbicides trifluralin + dinoseb or not treated. The most frequently isolated fungi from spring beans were *Pythium* spp. (primarily *P. irregulare*) and from fall beans, *Rhizoctonia solani* and cultures of *Fusarium solani*. *R. solani* was most frequently isolated from cowpeas. Bean root diseases were severer in the fall than in the spring, but there were no differences between the 2 cropping systems in the amount of disease in the fall. Cowpea diseases were severest and yields the lowest in the 4th yr. Treating soil with ethoprop resulted in a significant ($P = 0.05$) increase in disease severity in 3 spring crops of beans and 1 crop of cowpeas, but it did not influence severity in fall beans. Herbicide treatments occasionally reduced but never increased root disease severity. Total *F. solani* soil populations increased in the bean/soybean/cabbage system and those of *Pythium* in the turnip/peanut/bean system. Total population of *F. solani* and *Pythium* spp. were often the lowest in herbicide-treated soils, but ethoprop rarely influenced populations of the soil fungi measured. (*Author's summary*) E03

0626

18546 THEODOROU, M.K.; SCANLON, J.C.M.; SMITH, I.M. 1982. Infection and phytoalexin accumulation in French bean leaves injected with spores of Colletotrichum lindemuthianum. Phytopathologische Zeitschrift 103(3): 189-197. Engl., Sum. Engl., Germ., 10 Refs., Illus.

Phaseolus vulgaris. Snap beans. Phytoalexins. Leaves. Colletotrichum lindemuthianum.

The differential response of French bean leaves injected with different concn. of conidia of races of Colletotrichum lindemuthianum was examined by light microscopy and in terms of phytoalexin accumulation. In the incompatible combination, high spore concn. elicited hypersensitive cell death and phytoalexin accumulation, while lower spore concn. gave less phytoalexins and no visible hypersensitivity. In the compatible combination, fungal development in injected tissue was similar to that seen in hypocotyls, and the tissue collapsed only after extensive cell colonization. Low amounts of phytoalexins were found in the injected

tissue, irrespective of the spore concn. used. The amount of phaseolin extracted from the tissue immediately surrounding collapsed injection sites was up to 14 times greater than the amounts detected within the collapsed sites, and twice as great as the highest amount detected in incompatible sites. (Author's summary) E03

0627

12684 THEODOROU, M.K. and SMITH, I.M. **The implications of a rapid method for the determination of differential interactions in french bean anthracnose.** Phytopathologische Zeitschrift 96:1-8. 1979. Engl., Sum. Engl., Germ., 11 Refs.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Cultivars. Races. Hypocotyls. Leaves. Hosts and pathogens.**

French bean cv. give a differential response to races of *Colletotrichum lindemuthianum* when conidia (1 x 10^6 spores/ml) are injected into the intercellular spaces of expanding unifoliate leaves. Susceptible leaf tissue collapses within 3-4 days, but resistant tissue shows no visible response unless higher spore concn are used. The method is reproducible, rapid and less variable than conventional methods. The technique is thought to have potential for research on early host/parasite interactions in bean anthracnose. *(Author's summary)* E03

0628

12393 THEODOROU, M.K. and SMITH, I.M. **The response of french bean varieties to components isolated from races of *Colletotrichum lindemuthianum*.** Physiological Plant Pathology 15:297-309. 1979. Engl., Sum. Engl., 18 Refs., Illus.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Races. Phytoalexins. Cotyledons. Cultivars. Plant tissues. Analysis.**

High mol wt cell-wall components were isolated from 4 races of *Colletotrichum lindemuthianum*. They elicited browning and phytoalexin accumulation when applied to cotyledons of several different french bean var. but the extent of these responses did not match the specific differential pattern of var. resistance and susceptibility to the races. There were, however, consistent differences between the responses of different var. to any race, Kievit in particular giving a greater response than the others. Kievitone was the main phytoalexin produced by cotyledons. Similar results were obtained using a new bioassay involving the injection of wall components into unifoliate bean leaves. *(Author's summary)* E03

0629

21030 TOMPKINS, F.D.; CANARY, D.J.; MULLINS, C.A.; HILTY, J.W. 1983. Effect of liquid volume, spray pressure, and nozzle arrangement on

coverage of plant foliage and control of snap bean rust with chlorothalonil. Plant Disease 67(9):952-953. Engl., Sum. Engl., 9 Refs., Illus. [Dept. of Agricultural Engineering, Univ. of Tennessee, Knoxville, TE 37901, USA]

Phaseolus vulgaris. Uromyces phaseoli. Disease control. Chemical control. Yields. Snap beans. USA.

Chlorothalonil (2.5 kg a.i./ha) solutions were sprayed on snap beans on a 7- to 10-day schedule to control bean rust (Uromyces appendiculatus var. appendiculatus). Solution application rates were 190, 375, and 560 l/ha at 345 and 690 kPa nozzle pressure, using 1, 2, and 3 nozzles/row. Foliage coverage was evaluated using fluorescent tracer particles applied similarly. Mean % of surface area covered on both top and bottom sides of the leaves increased with increases in application rate, nozzle pressure,

or no. of nozzles/row. Rust control, however, was not influenced by these factors. Plots treated with chlorothalonil had less bean rust and produced greater pod yields than untreated plots. (Author's summary) E03

0630

29103 TRIPATHI, K.C. 1985. Occurrence of floury leaf spot of French bean in Uttar Pradesh Hills. Indian Botanical Reporter 4(2):175. En., 2 Ref. [Govt. Valley Fruit Research Station, Srinagar (Garhwal) 246 174, India]

Phaseolus vulgaris. Ramularia phaseoli. Symptomatology. Etiology. Snap beans. India.

The symptomatology and atiology of floury leaf spot in French beans in Uttar Pradesh hills, India, are briefly described. Symptoms observed agree with those caused by Ramularia phaseolina. [CIAT]

0631

26543. VAN BRUGGEN, A.H.C.; ARNESON, P.A. 1985. A QUANTIFIABLE TYPE OF INOCULUM OF RHIZOCTONIA SOLANI. PLANT DISEASE 69(11):966-969. ENGL., SUM. ENGL., 22 REFS. [DEPT. OF PLANT PATHOLOGY, CORNELL UNIV., ITHACA, NY 14853, USA]

PRODUCTION OF SCLEROTIA OF RHIZOCTONIA SOLANI WAS COMPARED ON 6 TYPES OF SUBSTRATES IN VITRO. AUTOCLAVED GREEN BEAN PODS WERE THE MOST EFFICIENT SUBSTRATE. ABOUT 1 MILLION SCLEROTIA MEASURING 300-710MICRONS IN DIAMETER WERE PRODUCED ON 1 KG FROZEN CUT BEANS. THE VIABILITY OF SCLEROTIA ON PDA WAS GREATER WITH INCREASING SIZE OF SCLEROTIA. SIMILARLY, THE ABILITY OF LARGE SCLEROTIA TO GROW ON SAND AND INFECT A BEAN HYPOCOTYL PIECE WAS BETTER THAN THAT OF SMALL SCLEROTIA. SCLEROTIA FORMED ON BEAN PODS WERE MORE VIGOROUS THAN SCLEROTIA OF THE SAME SIZE PRODUCED ON LEAVES. ONLY GROWTH OF SMALL SCLEROTIA FROM BEAN LEAVES WAS STIMULATED BY THE PRESENCE OF A HYPOCOTYL PIECE. (AS).

0632

18778 VULSTEKE, G.; MEEUS, P. 1982. Chemical control of Botrytis cinerea and Sclerotinia sclerotiorum on dwarf snap beans. Netherlands Journal of Plant Pathology 88:79-85. Engl., Sum. Engl., Dutch., 3 Refs.

Phaseolus vulgaris. Snap beans. Botrytis cinerea. Whetzelinia sclerotiorum. Disease control. Yields. Chemical control.

The efficacy of different new fungicides against Botrytis cinerea and Sclerotinia sclerotiorum on dwarf snap beans, their influence on crop, pod yield and quality, and residue levels in the pods were studied in order to find an effective spraying scheme for farmers in West-Flanders, Belgium. Two sprays of vinclozolin (0.5 kg a.i./ha) or procymidone (0.5 kg a.i./ha), the 1st at the beginning of flowering and the 2nd 2 wk. later, gave the best control of B. cinerea. Good results were also obtained with iprodione

and with thiophanate-methyl. Vinclozolin and procymidone at the same program were the most active fungicides against S. sclerotiorum. Treatments with the latter 2 fungicides resulted in increased pod yields and had no influence on pod color and quality. Residue levels were below the tolerance level. (Author's summary) E03

0633

0046 WALKER, J. **Two seed borne fungi of french bean - *Phaseolus vulgaris* L.** Journal of the Australian Institute of Agricultural Science 26:60-63. 1960. Engl., 12 Refs., Illus.

***Phaseolus vulgaris. Rhizoctonia solani. Whetzelinia sclerotiorum.* Seed transmission. Seed. Climatic requirements. Seed production. Cultivars. Australia.**

French beans in N.S.W. are commonly attacked by *Rhizoctonia* sp. and *Whetzelinia* (*Sclerotinia*) *sclerotiorum*. Both have been found for the 1st time in N.S.W. to be carried by seed produced on the Far S. Coast. In samples of Brown Beauty and Hawkesbury Wonder *Rhizoctonia* infection was under 1%, while in one sample of the latter var. *W. sclerotiorum* infection was 1-3%. The degree of seed infection is probably related to weather conditions during seed maturation. (*Summary by Review of Applied Mycology*) E03 D04

6106

0634

WELLS, J. M. and COOLEY, T. N. Control of Pythium and Sclerotinia rots of snap beans with postharvest hot water and chemical dips. Plant Disease Reporter 57(3):234-236. 1973. Engl., Sum. Engl. 7 Refs. Illus.

Phaseolus vulgaris. Diseases and pathogens. Pests. Pythium butleri. Cottony leak. Sclerotinia sclerotiorum. Bean white mold. Mycoses. Disease control. Storage. Hot water treatments. Laboratory experiments.

In laboratory tests losses due to Pythium and Sclerotinia rots of snap beans were reduced significantly during a simulated transit and storage period without refrigeration, by a 30-second dip in 125°F water alone or with 450 ppm 2,6-dichloro-4-nitroaniline (DCNA). Ten-second, unheated dips in 1800 ppm DCNA or in fungicides such as chlorine, sodium orthophenylphenate, or dehydroacetic acid were not effective. (Author's summary)

0635

18748 WOODWARD, M.D. 1979. Phaseoluteone and other 5-hydroxyisoflavonoids from Phaseolus vulgaris. Phytochemistry 18(2):363-365. Engl., 26 Refs., Illus.

Phaseolus vulgaris. Snap beans. Phytoalexins. Phaseollin. Analysis. Mycoses.

The isolation and identification of a new isoflavone, phaseoluteone 3, and the isolation of 3 additional isoflavonoids which may be precursors of kievitone and or phaseoluteone are described. The new phytoalexins were isolated from several unidentified phenolic compounds, detected in the interaction between French bean pod tissue and the fungus Monilinia fructicola. The co-occurrence of the compounds isoflavone genistein 1, 2'-hydroxygenistein 2, phaseoluteone 3, isoflavanone dalbergioidin 5, and kievitone 5, in bean tissue, together with the relative amounts of each compound obtained, have particular significance for biosynthetic studies. The formation of phaseoluteone 3 probably follows the sequence 1-2-3. Similarly, the most direct route to kievitone would be 1-2-4-5. Although other pathways may be postulated for the formation of phaseoluteone and kievitone, the failure to detect any other 5,7-dihydroxylated isoflavone or isoflavanone tends to support the proposed pathways. (Summary by EDITEC. Trans. by L.M.F.) E03

0636

1553 YEN, D.E. and BRIEN, R.M. **French-bean rust** *(Uromyces appendiculatus)* **studies on resistance and determination of rust races present in New Zealand.** New Zealand Journal of Agricultural Research 3(2):358-368. 1960. Engl.Sum. Engl., 9 Refs.

Phaseolus vulgaris. Uromyces phaseoli. **Races. Identification. Cultivars. Host-plant resistance. Field experiments. Laboratory experiments.**

The probable races of bean rust present in New Zealand are 10, 17 and 28, as identified in the USA, with possibly another unidentified race which attacks the differential line U S 780. In crosses of the resistant variety Westralia with susceptible varieties, heterozygote plants show a delayed, but definite infection with rust in field and glasshouse trials. Homozygous susceptible plants show equal susceptibility with susceptible parents. Susceptibility can thus be termed recessive or dominant according to the time of recording the disease symptoms in segregating populations. The usefulmess of this heterozygote reaction for selection in breeding material is discussed. *(Author's summary)* E03

0637

9603 YORK, D.W., DICKSON, M.H. and ABAWI, G.S. **Inheritance of resistance to seed decay and pre-emergence damping-off in snap beans caused by** *Pythium ultimum.* Plant Disease Reporter 61(4):285-289. 1977. Engl., Sum. Engl., 13 Refs.

Phaseolus vulgaris. Pythium ultimum. **Inheritance. Host-plant resistance. Seed. Germination. Crossbreeding. Seed color. Backcrossing. Seed coat. USA.**

The inheritance of resistance to seed decay and preemergence damping-off caused by *Pythium ultimum* was studied in the white-seeded french bean line 1273, the colored-seeded line 5-161 and the colored-seeded cv. Spartan Arrow. Testing was performed in artificially infested soil under growth chamber conditions. Resistance was found to be quantitatively inherited. Resistant white-seeded lines were identified by testing F_3 lines derived from crosses between resistant colored-seeded beans (line 5-161 and Spartan Arrow) and white-seeded susceptible cv. (Maestro and Cascade). The result show that the association between seed coat color and *Pythium* resistance can be broken. (*Author's summary*) E03 G01

E04 Viroses

6147

0638

ATCHISON, B. A. Division, expansion and DNA synthesis in meristematic cells of French bean (Phaseolus vulgaris L.) root-tips invaded by tobacco ringspot virus. Physiological Plant Pathology 3:1-8. 1973. Engl., Sum. Engl. 19 Refs. Illus.

Phaseolus vulgaris. Diseases and pathogens. Pests. Tobacco ringspot virus. Viroses. Cytology. Plant physiological processes. Hosts and pathogens. Roots. Metabolism. Nucleic acids.

The division, expansion and DNA synthesis of meristematic cells of the root-tip of French beans were examined at different times after infection with tobacco ringspot virus. At about the same time that the terminal millimetre of the root was invaded by virus there was a drop in DNA synthesis, followed by a decrease in the mitotic index to about half that of healthy tissue. Cell elongation was unaffected, resulting in a gradual accumulation of expanded cells in the root-tip. Subsequently, the mitotic index of the root-tip returned to a normal level. (Author's summary)

0639

16060 BAILISS, K.W. and PLAZA-MORALES, G. Effects of postinoculation leaf water status on infection of French bean by tobacco necrosis virus. Physiological Plant Pathology 17:357-367. 1980. Engl., Sum. Engl., 32 Refs., Illus.

Phaseolus vulgaris. Tobacco necrosis virus. Leaves. Water content. Disease control.

A rapid but transient postinoculation increase in leaf water deficit increased tobacco necrosis virus lesion no. in detached and attached leaves of *Phaseolus vulgaris*. Increase in lesion no. in detached leaves was proportional to the degree of water stress and only occurred when stress was imposed within 3 h of inoculation and when infectible sites were abundant. Infectible sites disappeared at similar rates in stressed and unstressed leaves. Lesion no. were unaffected in leaves inoculated after stress and restoration of the prestress leaf water potential. Leaf detachment per se and a rapid postinoculation increase in leaf water potential reduced lesion production. It was concluded that postinoculation changes in leaf water balance exert an effect on the very early stages in the infection process, probably by affecting passive virus entry into abraded epidermal cells via leaf water fluxes. (*Author's summary*) E04

0640

28961 BARAKAT, A. ; STEVENS, W.A. 1986. Effects of Gypsophila paniculata extracts on the infectivity of plant viruses. Microbios Letters 31(123-124):137-142. En., Sum. En., 19 Ref. [Dept. of Botany, Faculty of Science, Ain Shams Univ., Cairo, Egypt]

Phaseolus vulgaris. Snap beans. Viroses. Resistance. Disease control. Egypt.

Aqueous extracts of Gypsophila paniculata when sprayed onto the upper leaf surfaces of Phaseolus vulgaris, Gomphrena globosa, and Nicotiana tabacum (local lesion hosts to tobacco necrosis virus, potato virus X, and TMV, resp., reduced local lesion no. Inhibition was most effective when the spray was made 1 day before inoculation with the virus, but was still effective after 6 days. The inhibition of local lesion production by potato virus X decreased more rapidly than inhibition of tobacco necrosis virus or TMV. Application of G. paniculata extracts to lower leaf surfaces brought about inhibition of virus applied to the upper surfaces and some form of induced resistance was indicated. Resistance also occurred in young leaves of French bean when G. paniculata inhibitor was applied to the primary leaf opposite to that receiving the virus. (AS)

0641

1311 BIRD, J. *et al.* Transmisión del mosaico dorado de la habichuela (*Phaseolus vulgaris*) en Puerto Rico por medios mecánicos. (*Mechanical transmission of bean golden mosaic*). Fitopatologia 12:28-30. 1977. Span., Sum. Engl., Illus.

Phaseolus vulgaris. Bean golden mosaic virus. *Bemisia tabaci*. Virus transmission. Host range. Leaves. Laboratory experiments. Vectors. Puerto Rico.

Bean golden mosaic was mechanically transmitted up to 25%, using undiluted sap from infected french bean plants. Up to 100% transmission was obtained by diluting to 1:4 with 0.1 M K_2HPO_4, pH 7, and inoculating with an air brush at 80 psi. (*Author's summary*) E04 F01

5463.

0642

BODNAR, J. and KVICALA, B.A. Effects of temperature on infection of French bean leaves (Phaseolus vulgaris L.) by Lucerne Mosaic Virus. Biologia Plantarum 10(4):251-256. 1968. Engl., Sum. Engl., Czech., Russ., 12 Refs. Illus.

Phaseolus vulgaris. Alfalfa mosaic virus. Temperature. Climatic requirements. Leaves. Laboratory experiments.

The effect of temperature on the number of lesions and the time of their appearance was studied by inoculating French bean leaves (Phaseolus vulgaris L.) cv. Perlička) with lucerne mosaic virus either 24 or 48 h before or, 24 or 48 h after they were exposed to various temperatures. The temperatures tested were 23, 25, 27, 30, 33 and 36°C. Before and after such exposures the plants were kept in a constant temperature of 25°C. By increasing the temperature before inoculation the number of lesions increased in comparison with the control. The optimal temperature for the maximum number of lesions is between 27°and 30°C. There is no significant difference between those experiments when the exposure time was 24 h or 48 h before inoculation. The same temperatures applied for 24 or 48 h after inoculation have a decreasing effect upon the number of lesions formed by LMV on French bean leaves. The decrease is 30 to 75%. In this case the first necrotic local lesions appeared 42 h after inoculation when exposed to higher temperatures above 27°C for 24 h, and 60 h after inoculation when exposed to these temperatures for 48 h. The shape of lesions varied a little in both cases as the pictures show. (Author's summary).

0643

26253. CAPOOR, S.P.; RAO, D.G.; SAWANT, D.M. 1985. A NOTE ON A VIRUS DISEASE OF FRENCH BEAN. INDIAN PHYTOPATHOLOGY 38(1):152-154. ENGL., 5 REFS., ILLUS. (7 BARROW ROAD, LAL BAGH, LUCKNOW 226 001, INDIA)

THE VIRAL NATURE OF A DISEASE OBSERVED ON SNAP BEAN CV. STRINGLESS GREEN POD, GROWN IN THE GLASSHOUSE, WAS CONFIRMED. THE VIRUS MAY BE RELATED TO BCMV OR BYMV REGARDING THE SIZE OF VIRUS PARTICLES; HOWEVER, IT DIFFERS FROM THEM ON THE BASIS OF ITS PHYSICALPROPERTIES, AND BECAUSE IT HAS DIFFERENT TYPES OF INSECT VECTORS. PROPOSED DESIGNATIONS FOR THIS VIRUS ARE FRENCH BEAN MOSAIC VIRUS (FBMV), BEAN VIRUS 5, OR MARMOR PHASEOLI F. RUGOSUM NOV. SP. (CIAT).

0644

28804 DESCHAMPS P., H.M. 1986. Hospedantes alternos del mosaico dorado de la habichuela (Phaseolus vulgaris L.). Tesis Mag.Sc. Mayaguez, Universidad de Puerto Rico. 64p. Es., Sum. Es., En., 45 Ref., Il.

Phaseolus vulgaris. Snap beans. Bean golden mosaic virus. Bemisia tabaci. Vectors. Host range. Disease transmission. Cultivars. Puerto Rico. Dominican Republic.

A survey of the host range of BGMV was conducted in the Dominican Republic and virus transmission tests were carried out with several plant species that are frequently associated with the insect vector Bemisia tabaci. The

inoculum used in these tests was obtained in the Dominican Republic. The geminivirus was detected in the families Nyctaginaceae, Papilionaceae, Euphorbiaceae, Tiliaceae, Malvaceae, Sterculiaceae, Convolvulaceae, and Compositae. Phaseolus lunatus cv. Haba de Todón, P. vulgaris cv. Top Crop and Pompadour, and Macroptilium lathyroides were the only species affected. These showed symptoms similar to those observed under field conditions in Puerto Rico. It was found that both strains of BGMV (Puerto Rican and Dominican) have the same host range. (AS)

0645

17447 FATING, K.B.; KHARE, M.N. 1978. Influence of virus infection on the phyllosphere mycoflora of frenchbean. Indian Phytopathology 31(3):387-388. Engl., 7 Refs.

Phaseolus vulgaris. Snap beans. Bean common mosaic virus. Leaves. Microbiology. Mycoses. Isolates.

The mycoflora present on leaves of healthy and BCMV-infected plants of snap bean cv. Tennessee green was compared at different stages of growth (vegetative, flowering, and crop maturity). Fungi were isolated by the washing and shaking 2 trifoliate leaves in 100 ml sterile water and were incubated in plates at room temp. (22-28°C). *Alternaria alternata, Aspergillus* spp., *Cladosporium* sp., *Helminthosporium* sp., *Penicillium variabile*, and *Trichoderma aureoviride* were observed in the phylloplane of both healthy and virus-infected plants while *Fusarium* sp., *Myrothecium roridum*, and *Rhizopus* sp. were obtained from leaves of healthy plants. Premature aging of plant organs and physiological disorders of virus-infected plant tissues may be responsible for the reduction in fungal flora in the phylloplane of these plants. The differences in the phylloplane mycoflora of healthy plants at different stages may be due to the changes in the physical nature of leaf surface and chemical nature of leaf exudates. *(Summary by C.P.G. Trans. by L.M.F.)* E04 100

0646

26265. GBAJA, I.S.; CHANT, S.R. 1985. THE EFFECTS OF CO-INFECTION BY SUNN-HEMP MOSAIC VIRUS (SHMV) AND FUSARIUM OXYSPORUM ON THE GROWTH OF FRENCH BEAN. PHYTOPATHOLOGISCHE ZEITSCHRIFT 113(3):252-259. ENGL., SUM. ENGL., GERM., 24 REFS., ILLUS. (DEPT. OF BIOLOGICAL SCIENCES, CHELSEA COLLEGE, UNIV. OF LONDON, HORTENSIA ROAD, LONDON SW10 OOX, ENGLAND)

IN THE SEEDLINGS OF 3 FRENCH BEAN CV., PRINCE, MASTERPIECE, AND PINTO, COINFECTION BY SUNN HEMP MOSAIC VIRUS WITH EITHER OF THE VASCULAR WILT PATHOGENS, FUSARIUM OXYSPORUM F. SP. PHASEOLI OR F. SP.TRACHEIPHILUM, CAUSED GREATER LOSSES IN TOTAL FRESH WT. AND IN LEAF AREA COMPARED WITH UNINFECTED PLANTS OR PLANTS INFECTED SINGLY WITH ANY ONE OF THESE PATHOGENS. COINFECTION OF A 4TH CV., CANADIAN WONDER, HAD NO GREATER EFFECTS ON GROWTH REDUCTION THAN SINGLE INFECTION. THE CONCN. OF SUNN-HEMP MOSAIC VIRUS IN THE LEAVES OF CV. PRINCE, AND TO A GREATER EXTENT IN THE LEAVES OF CV. MASTERPIECE, INCREASED MORE AFTER DOUBLE INFECTION THAN WITH

INFECTION BY THE VIRUS ALONE. THE NATURE AND POSSIBLE MECHANISMS OF THE PATHOGENIC EFFECTS IN FRENCH BEAN ARE DISCUSSED. [AS].

0647

23990 HUSSEIN, M.M. 1978. Diseases of French beans (Phaseolus vulgaris). In Ed-Damer, Sudan. Hudeiba Research Station. Annual Report 1977-1978. Ed-Damer. pp.10-11. Engl.

Phaseolus vulgaris. Snap beans. Curly top virus. Symptomatology. Disease transmission. Resistance. Cultivars. Sudan.

Information on symptoms, disease transmission, and bean var. resistance to curly top virus in Sudan is briefly presented. Although the virus is transmitted by Aphis craccivora, this specie is not a pest of French beans in this region. The disease is sporadic and local var. Beladi and RO 2/1 seem to be highly tolerant in comparison with introduced var. Red Kloud and Red Kote. [CIAT]

0648

17833 JOSHI, R.D.; GUPTA, A.K.; SHUKLA, K. 1981. Effect of bean common mosaic virus infection on primary productivity of French bean. Indian Phytopathology 34(1):48-49. Engl., Sum. Engl., 5 Refs.

Phaseolus vulgaris. Snap beans. Bean common mosaic virus. Leaves. Yields. Leaf area. Plant pigments.

The primary productivity of French bean infected by BCMV was assessed. Leaves of approx. uniform size from healthy and systemically infected plants were collected at 7 a.m. Care was taken to sample leaves of the same physiological age. Discs of 1 cm in Ø were taken and primary productivity was determined by the method described by Misra *et al* (1968). Morphological characteristics of infected plant parts were highly affected. The av. no. of trifoliate leaves was higher in healthy plants than in infected ones. Av. fresh wt. and leaf area were also less in infected samples. Net primary production in healthy leaves is much higher (250 mg/m²/h) than in diseased ones (-210 kg/m²/h). There is a 42.55% reduction in gross primary production in infected leaves. Analysis of pigment content revealed that there is a general loss of chlorophyll and carotenoids in the infected leaves. *(Summary by F.G. Trans. by L.M.F.)* E04

0649

4684 KIMMIS, W. C. and LITZ, R. E. The effect of leaf water balance on the susceptibility of french bean to tobacco necrosis virus. Canadian Journal of Botany 45:2115-2118. 1967. Engl., Sum. Engl., 8 Refs.

Phaseolus vulgaris. Leaves. Water content. Host-plant resistance. Tobacco necrosis virus. Osmotic pressure.

French beans were germinated under constant temperature, relative humidity and day period, and then transferred to Hoagland's culture solution. Variations of the preinoculation treatment were begun at an age of 10 days for a 24-h period. Treatments were selected that would induce turgor changes in the primary leaves. It was observed that susceptibility to tobacco necrosis virus infection was increased by preinoculation conditions of continuous darkness, high RH and low suction tension of the culture solution. Susceptibility was lowered by preinoculation conditions of continous light, low RH and high suction tension of the culture solution. Diffusion pressure deficit, osmotic pressure and turgor pressure measurements were made with the primary leaves at time of inoculation. Considerable agreement was noted between turgor changes and susceptibility. Preinoculation treatments such as darkening alter susceptibility through changes

in turgor pressure. It is suggested that there may be a direct effect of leaf turgor on the no. of infectible sites. (*Author's summary*) E04

2934

0650

KVICALA, B. A. The size growth of alfalfa mosaic virus lesions on French bean leaves, Phaseolus vulgaris L. under various pre- and post-inoculation heat treatment. Phytopathologische Zeitschrift 80(2):143-147. 1974. Engl. Sum. Engl., Germ. 13 Refs. Illus.

Phaseolus vulgaris. Heat treatment. Diseases and pathogens. Viroses. Alfalfa mosaic virus. Leaves Disease control. Temperature. Pests.

It was found that the lesion size growth of AMV upon the primary leaves of Phaseolus vulgaris L. cv. Perlicka in the same temperatures is very rapid between the first and second day after infection. The increase in size is above 100%. In the further days the lesions do not grow but have a tendency to coalesce and the necrosis spreads into the veins. The temperatures 23, 27, 30, 33 and 36°C under which the experimental plants were grown before the AMV inoculation resulted in a decrease of the average necrotic lesions size, but the average number of lesions was higher. However, the same temperatures in which the plants were cultivated 24 or 48 hours after AMV inoculation caused an increase in the average lesions size and the average lesions number was lower. The possible effect of AMV strains components in this phenomenon is discussed. (Author's summary).

0651

10304 MALONE, M.T Field reaction of green beans to subterranean clover red leaf virus. New Zealand Journal of Experimental Agriculture 6(1):95-97. 1978. Engl., Sum. Engl., 7 Refs.

Phaseolus vulgaris. Subterranean clover stunt virus. Dwarf beans. Cultivars. Host-plant resistance. New Zealand.

Of 125 french bean cv. screened for resistance to subterranean clover red leaf virus, all climbing bean cv. and several dwarf cv. were either tolerant or apparently immune to the disease. (*Author's summary*) E04

0652

17714 SHIMOMURA, T. 1982. Effects of boron on the formation of local lesions and accumulation of callose in French bean and Samsun NN tobacco leaves inoculated with tobacco mosaic virus. Physiological Plant Pathology 20:257-261. Engl., Sum. Engl., 13 Refs., Illus.

Phaseolus vulgaris. Tobacco mosaic virus. Inoculation. Leaves. Symptomatology. Plant nutrition. B. Host-plant resistance. Laboratory experiments.

Bean plants grown in culture solution containing excess B and inoculated on their primary leaves with TMV yielded fewer and smaller local lesions with intense callose fluorescence around the lesions. Fluorescence lasted for 5 days after inoculation vs. 2 days for control plants. Similar phenomena occurred in leaf-halves of bean floated on a solution of excess B after inoculation with TMV. Contrary to this, when leaf-halves of Samsun NN tobacco plants were floated on B solution after inoculation with TMV, the treatment had no effect on lesion formation and callose fluorescence. There is a correlation between the amount of callose accumulation in the leaves and the ultimate size of lesions formed in the inoculated leaves. (*Author's summary*) E04

0653

8943 SHIMOMURA, T. and DIJKSTRA, J. **Effect of eosin Y on the formation of local lesions and on the accumulation of callose in 'Samsun NN' tobacco and French bean leaves inoculated with tobacco mosaic virus.** Netherlands Journal of Plant Pathology 82:109-118. 1976. Engl., Sum. Engl., 13 Refs., Illus.

Phaseolus vulgaris. **Tobacco mosaic virus. Host range. Leaves. Hosts and pathogens. Temperature.**

When leaf halves of Samsun NN tobacco or Otebo french bean plants were floated on a solution of 10-15 uM eosin Y after inoculation with tobacco mosaic virus (TMV) and kept at 20°C, local lesion formation was markedly diminished. There was also a decrease in the size of the lesions. Depending on the temp, very strong fluorescence due to callose formation was seen around the lesions in eosin Y-treated leaf-halves of Samsun NN tobacco and bean plants. It lasted from 3-5 days after inoculation, whereas fluorescence around lesions in the water-treated control leaves disappeared within 2-3 days after inoculation. When leaf discs of Samsun tobacco, a systemic host for TMV, were floated on a solution of eosin Y after inoculation with TMV and kept at 20°C for 5 days, TMV multiplication was not prevented. Callose deposition could be detected, neither in eosin Y-treated nor in water-treated control leaves. The relation between the inhibition of local lesion formation and the accumulation of callose in cosin Y-treated leaves is discussed. (*Author's summary*) E04

0654

22103 SILBERNAGEL, M.J.; DRAKE, S.R. 1983. Blue Mountain bush snap bean. HortScience 18(1):111. Engl., Illus. [Washington State Univ., Irrigated Agriculture Research and Extension Center, Prosser, WA 99350, USA]

Phaseolus vulgaris. Snap beans. Cultivars. Resistance. Bean common mosaic virus. Curly top virus. Plant breeding. USA.

Snap bean cv. Blue Mountain is a bush Blue Lake-type developed for commercial processing, home gardens, and market garden use. The plants are upright (51-56 cm) and narrow (46-56 cm). Most of the pods are borne in the mid-to-upper part of the bush. In western USA, time from planting to optimum harvest is 65-70 days. Under irrigated conditions, yields range between 3.6-5.4 t/ha. It is resistant to BCMV, 1 gene, and curly top virus. A description of its origin is presented. [CIAT]

0655

0913-2747 SMITH, P.R. **A disease of french beans (*Phaseolus vulgaris* L.) caused by subterranean clover stunt virus.** Australian Journal of Agricultural Research 17(6):875-883. 1966. Engl., Sum. Engl., 9 Refs., Illus.

Phaseolus vulgaris. **Pests. Diseases and pathogens. Viroses. Subterranean clover stunt virus. Hosts. Vectors. Virus transmission. Laboratory experiments. Chlorosis. Leaves. Crop losses.**

A disease causing serious crop losses in early-sown french beans in the East Gippsland area of Victoria was shown to be caused by subterranean clover stunt virus. The virus infected a wide range of leguminous plants and persisted through a moult of its principal vector, *Aphis craccivora* Koch. It was not seed borne nor was it mechanically transmissible. The field symptoms of the disease on french beans consisted of chlorosis and epinasty of leaves, the whole plant being markedly stunted, with a reduction in the length of the internodes. These symptoms were reproduced in the glasshouse by aphid inoculation of the virus to french beans, however, the virus was recovered from both naturally infected and artificially inoculated beans with difficulty. In field tests, no french bean cultivar tested was immune to the virus, although a high degree of tolerance was observed in Red Mexican U.I. 3, U.I.34 and U.I.37 and Pinto U.I.72 and U.I.78. (*Author's summary*) E04

0656

22957 TANIGUCHI, T. 1983. Inhibition of tobacco mosaic virus infection by proteinase K. Microbios Letters 24(95-96):149-152. Engl., Sum. Engl., 12 Refs., Illus. [Plant Pathology Laboratory, Faculty of Agriculture, Nagoya Univ., Chikusa-Ku, Nagoya 464, Japan]

Phaseolus vulgaris. Snap beans. Tobacco mosaic virus. Enzymes. Virus inhibition. Japan.

The effects of proteinase K on the no. of local lesions produced by TMV-ordinary strain (TMV-OM) in French bean var. America and Nicotiana tabacum var. Samsun NN leaves were studied. The enzyme caused about 90% inhibition on infection of bean leaves at the concn. of 5 x 10^{-5} mg/ml, and more effectively prevented infection of bean than of Samsun NN. The inhibitory activity was destroyed by heating at 100°C for 5 min. When the primary leaves of bean were treated with the enzyme 1 day to immediately before inoculation, the enzyme inhibited the development of local lesions. When the enzyme was applied after inoculation, the inhibitory effect decreased rapidly with time. (Author's summary) E04

0657

22299 TOLBA, M.A. 1977. Cowpea isolated viruses: a seed-borne virus in Blackeye cowpea (Vigna sinensis). In _____. Studies on virus diseases of legume plants. Giza, Egypt, Institute of Plant Pathology. Agricultural Research Center. Project no.EG-ARS-31. pp.27-32. Engl., 6 Refs.

Phaseolus vulgaris. Cultivars. Isolation. Viroses. Inoculation. Disease transmission. Pathogenicity. Host range. Seed transmission. Snap beans. Egypt.

In expt. conducted under greenhouse conditions during 1976-77 at the Institute of Plant Pathology of the Agricultural Research Center (Giza, Egypt), a seed-borne virus was observed in Blackeye cowpea seedlings and symptoms of mosaic appeared on primary leaves. The virus was inoculated into 10 seedlings of each bean cv. tested. The ability of aphids (Myzus persicae and Aphis craccivora) to transmit the virus was studied. French bean cv. Giza 3 and Contender reacted with systemic infection while bean cv. Top Crop, Suisse Blanc, and Pinto were not susceptible to inoculation. The virus could not be identified with any of the known viruses transmitted in cowpea seeds. (Summary by T.F.) E04

0658

5768 WALKEY, D.G.A. and INNES, N.L. **Resistance of dwarf french beans to bean common and bean yellow mosaic viruses.** Journal of the National Institute of Agricultural Botany 14:428-432. 1978. Engl., Sum. Engl., 5 Refs. Illus.

Phaseolus vulgaris. **Bean common mosaic virus. Bean yellow mosaic virus. Host-plant resistance. Cultivars. Isolation. Leaves. Laboratory experiments. England.**

Glasshouse tests were made in England of the resistance of dwarf french bean cv. to 3 strains of BCMV and to one strain of BYMV. All cv. were resistant to a strain of BCMV isolated at Wellsbourne, most were resistant to the Dutch NL4 strain, but only 2 had some tolerance of the Dutch NL3 strain; the remainder being susceptible. Many cv. were resistant to a BYMV strain isolated at Wellsbourne. (*Author's summary*) E04

0659

20882 WALLACE, G.B. 1941. Yellow bean mosaic and notes on other bean diseases. East African Agricultural Journal 7:114-115. Engl., 2 Refs.

Phaseolus vulgaris. Snap beans. Cultivars. Plant introductions. Resistance. Bean yellow mosaic virus. Bean common mosaic virus. Symptomatology. Ophiomyia phaseoli. Tanzania.

Certain French bean var. which were reported to be only slightly susceptible to the BYMV of North America were imported from the USA on account of their resistance to common mosaic, and were sown at Lyamungu in Tanganyika Territory (Tanzania). Under these conditions the beans maintained their resistance to common mosaic, but were so severely attacked by yellow mosaic as to rule out any possibility of growing these otherwise useful var. in the area. The North American yellow mosaic cannot be carried in the seed, and therefore the disease was not introduced with the imported seeds. If the Tanganyika disease is the same as the North American one it must have already been present in the land. If, however, it is different no conclusion can be drawn. The Tanganyika disease resembles the North American yellow mosaic in symptoms, but not all diagnostic characters have been seen in the local disease. A bacterial disease, which produces sun-scorch symptoms in bean fields, and a bean fly problem which can cause 100% loss of the crop in the short rains, but is unsignificant in the main crop, are also briefly mentioned. (Summary by J.R.) E04

E05 Nematodes

0660

8025 FASSULIOTIS, G. and DEAKIN, J.R. **Stem galls on root-knot nematode resistant snap beans.** Journal of the American Society for Horticultural Science 98(5):421-425. 1973. Engl., Sum. Engl., 12 Refs. Illus.

Phaseolus vulgaris. Meloidogyne incognita **Hosts and pathogens. Stems. Host-plant resistance. Roots. Backcrossing. Plant anatomy. USA.**

A successful host/parasite relationship was established in the stems of both resistant and susceptible french beans (*Phaseolus vulgaris* L.) with the root knot nematode *Meloidogyne incognita*. Thirty days after beans were planted in infested soil, all had stem galls containing egg-laying females. Histological studies showed giant cells developed from both vascular and cortical tissues. (*Author's summary*) E05

0661

5477 FASSULIOTIS, G., DEAKIN, J.R. and HOFFMAN, J.C. **Root-knot nematode resistance in snap beans: breeding and nature of resistance.** Journal of the American Society for Horticultural Science 95(5):640-645. 1970. Engl., Sum. Engl., 29 Refs., Illus.

Phaseolus vulgaris. Meloidogyne incognita **Plant breeding. Host-plant resistance. Germplasm. Inheritance. Roots. Temperature. Hosts and pathogens. Dwarf beans.**

Bush-type french beans (*Phaseolus vulgaris* L.) with resistance to the root knot nematode *Meloidogyne incognita* (cotton strain) are being developed by using PI-165426 as the resistant parent. PI-165426 (resistant), Black Valentine (susceptible) and F_5 breeding line B3864 (resistant) were inoculated with 2nd-stage larvae. There were no significant differences in larval penetration of roots; root tips showed slight swellings at infection loci of both resistant and susceptible plants. Necrosis was evident in the resistant lines 4 days after inoculation. Histological studies of early infections showed that resistance was due to absence of adequate giant cell development and to hypersensitive reaction within the infected portion of the root. When soil temperature was changed from 16 to 28°C, galling, female development and egg mass production in the resistant plants increased. (*Author's summary*) E05 G00

0662

*JOHNSON, A.W. 1973. Effect of nematicides and row spacing on control of root-knot nematodes and yield of snap beans. In International Congress of Plant Pathology, Minneapolis, Minnesota, 1973. Abstracts of papers. St. Paul, Minnesota, American Phytopathological Society Inc. p.216.

0663

21087 McSORLEY, R.; PARRADO, J.L. 1983. Control of nematodes on snap bean with soil fumigants. Fungicide and Nematicide Tests 38:1. Engl. [Univ. of Florida, Agricultural Research & Education Center, 18905 S.W. 280 Street, Homestead, FL 33031, USA]

Phaseolus vulgaris. Snap beans. Rotylenchulus reniformis. Helicotylenchus dihystera. Quinisulcius acutus. Nematode control. Yields. USA.

Application of ethylene dibromide or ethylene dibromide + chloropicrin to Phaseolus vulgaris in a field expt. near Homestead, Florida, USA, significantly reduced populations of Rotylenchulus reniformis, Helicotylenchus dihystera, and Quinisulcius acutus. Yields were not significantly increased. (Summary by Helminthological Abstracts) E05

0664

17705 McSORLEY, R.; POHRONEZNY, K.; STALL, W.M. 1981. Aspects of nematode control on snap bean with emphasis on the relationship between nematode density and plant damage. Proceedings of the Florida State Horticultural Society 94:134-136. Engl., Sum. Engl., 17 Refs., Illus.

Phaseolus vulgaris. Snap beans. *Meloidogyne incognita. Rotylenchulus reniformis.* Nematode control. Host-plant resistance. Cultivars. USA.

Relationships between nematode density and yield of snap bean were examined in several field studies conducted near Homestead, Florida (USA) in 1979. Regression equations were developed describing the inverse relationship between final density of *Meloidogyne incognita* and yield of snap bean cv. Sprite. An inverse relationship between nematode no. and yield was also found in 18 plots of snap bean which were naturally infested with *Rotylenchulus reniformis.* Control of *R. reniformis* in these plots was attempted with a soil drench of 2.24 kg a.i. oxamyl/ha followed by weekly foliar sprays of 0.56 kg a.i. oxamyl/ha. Control of *R. reniformis* resulted in yield increases at high nematode population levels, but no consistent yield increase was obtained by treating plots having low population levels, even though nematode populations were reduced by treatment. Such results indicate that there may be an opportunity to make future treatment decisions based on population levels. Control of the root-knot nematode, *M. incognita,* was attempted using nematode-tolerant cv. In a field test, 4 *M. incognita*-tolerant snap bean cv. (G698, G699, G700, and G701) showed significantly less galling than the commercial cv. Harvester. *(Author's summary)* E05

0665

17738 McSORLEY, R. 1980. Effect of *Rotylenchulus reniformis* on snap bean and methods for control by oxamyl. Nematropica 10(2):89-95. Engl., Sum. Engl., Span., 19 Refs., Illus.

Phaseolus vulgaris. Rotylenchulus reniformis. Quinisulcius acutus. Helicotylenchus dihystera. Nematode control. Chemical control. Soil populations. Timing. USA.

Of several methods of applying oxamyl to snap beans, 6 weekly foliar sprays of 0.56 kg a.i. oxamyl/ha combined with a soil drench of 2.24 kg a.i. oxamyl/ha at planting was the most effective in reducing soil populations of *Rotylenchulus reniformis* and *Quinisulcius acutus* at 4 sites near Homestead, Florida (USA). Yield of snap beans was negatively corre-

lated with soil populations of *R. reniformis* at harvest, but not with populations at planting time or at midseason. Final populations of *R. reniformis* were not correlated with initial populations in 18 test plots, whereas highly significant (P = 0.01) correlations between final and initial populations existed for *Q. acutus* and *Helicotylenchus dihystera*. However, there was no correlation of yield with initial, midseason, or final population levels of these 2 nematodes. *(Author's summary)* E05

0666

27086. MELAKEBERHAN, H.; BROOKE, R.C.; WEBSTER, J.M. 1986. RELATIONSHIP BETWEEN PHYSIOLOGICAL RESPONSE OF FRENCH BEANS OF DIFFERENT AGE TO MELOIDOGYNE INCOGNITA AND SUBSEQUENT YIELD LOSS. PLANT PATHOLOGY 35(2):203-213. EN. SUM. EN., 17 REF., IL. [DEPT. OF NEMATOLOGY, UNIV. OF CALIFORNIA, DAVIS, CA 95616, USA]

THE EFFECT OF A SINGLE GENERATION OF THE ROOT-KNOT NEMATODE, MELOIDOGYNE INCOGNITA, ON THE GROWTH OF POTTED FRENCH BEAN PLANTS INOCULATED AT DIFFERENT STAGES OF PLANT MATURITY WAS STUDIED. IN SEPARATE EXPT. 3-, 11-, AND 13-DAY- OLD PLANTS WERE INOCULATED BEFORE PRIMARY LEAF EXPANSION, AT THE APPEARANCE OF TRIFOLIATE LEAVES, AND AT THE FLOWER BUD STAGES, RESP., WITH 0, 2000, 4000, OR 8000 2ND-STAGE JUVENILE NEMATODES AND MAINTAINED IN A GROWTH CHAMBER UNDER CONTROLLED CONDITIONS. THE PHOTOSYNTHETIC RATE OF THE PLANTS INOCULATED AT THE TRIFOLIATE LEAVES AND FLOWER BUD STAGES DECREASED SIGNIFICANTLY WITH INCREASING INOCULUM LEVEL 7 DAYS AFTER INOCULATION. ALTHOUGH THE RESPIRATION RATE DID NOT SIGNIFICANTLY CHANGE THROUGHOUT THE EXPTL. PERIOD, THE RATIO OF PHOTOSYNTHETIC TO RESPIRATION RATE DECREASED SIGNIFICANTLY WITH INCREASING NEMATODE INOCULUM LEVEL AND DURATION OF INFECTION. CHLOROPHYLL CONTENT, PLANT DRY WT., AND THE NO. OF BUDS, FLOWERS, PODS, AND SEEDS WERE SIGNIFICANTLY LOWER IN INFECTED PLANTS THAN IN THE CONTROLS; THIS EFFECT INCREASED WITH INCREASING LEVELS OF NEMATODE INOCULUM FOR ALL 3 PLANT STAGES. THE LEAF AREA WAS SIGNIFICANTLY SMALLER ONLY WHEN NEMATODE INFECTION OCCURRED BEFORE PRIMARY LEAF EXPANSION. THE PLANTS WHICH WERE YOUNGEST AT THE TIME OF NEMATODE INFECTION PRODUCED THE LOWEST YIELD; THIS APPEARED TO RESULT FROM THE EFFECT OF NEMATODES ON PHOTOSYNTHESIS AND RELATED PHYSIOLOGICAL PROCESSES. [AS].

0667

25875. MELAKEBERHAN, H.; BROOKE, R.C.; WEBSTER, J.M.; D'AURIA, J.M.D. 1985. THE INFLUENCE OF MELOIDOGYNE INCOGNITA ON THE GROWTH, PHYSIOLOGY AND NUTRIENT CONTENT OF PHASEOLUS VULGARIS. PHYSIOLOGICAL PLANT PATHOLOGY 26(3):259-268. ENGL. SUM. ENGL., 29 REFS., ILLUS. [CENTRE FOR PEST

MANAGEMENT, DEPT. OF BIOLOGICAL SCIENCES, SIMON FRASER UNIV., BURNABY, VANCOUVER, B.C., CANADA, V5A 1S6]

ONE-WK.-OLD PHASEOLUS VULGARIS CV. TOPNOTCH GOLDEN WAX PLANTS WERE INOCULATED WITH 0, 1000, 5000, OR 10,000 FRESHLY HATCHED MELOIDOGYNE INCOGNITA LARVAE/PLANT, AND MAINTAINED UNDER CONTROLLED CONDITIONS (21 DEGREES CELSIUS, 14-H DAY AT 400 MICROEINSTEINS/SQUAREMETER/S; 16 DEGREES CELSIUS, 10-H NIGHT CYCLE). AT 3 WK. AFTER INOCULATION, LEAF AREA, DRY WT., NO. OF FLOWERS, THE TOTAL C, H, N, CA, CU, FE, MN, K, AND Z CONTENTS OF SHOOTS AND ROOTS, LEAF CHLOROPHYLL CONTENT, AND DARK RESPIRATION AND PHOTOSYNTHETIC RATES WERE MEASURED. RESPIRATION RATE, PERCENTAGE SHOOT N CONTENT, AND CA, CU, AND FE CONTENTS (PER UNIT WT. AND ON A SHOOT:ROOT RATIO BASIS) WERE SIGNIFICANTLY INCREASED WITH INCREASING INOCULUM LEVEL. OTHER MEASURED PARAMETERS WERE SIGNIFICANTLY DECREASED. CA, CU, AND FE IN THE SHOOT AND K IN THE ROOT INCREASED/UNIT WT., WHILE CU AND ZN IN THE ROOTS DECREASED SIGNIFICANTLY AS A RESULT OF NEMATODE INFECTION. HOWEVER, THE OVERALL TOTAL CONTENT OF THE NUTRIENT ELEMENTS/PLANT WASSIGNIFICANTLY DECREASED BY NEMATODE INFECTION. DIFFERENCES IN THE PHYSIOLOGY AND NUTRIENT CONTENT OF P. VULGARIS PLANTS, AS THEY RELATETO ALTERED GROWTH AND LOSS OF YIELD OF NEMATODE-INFECTED PLANTS, ARE DISCUSSED. (AS).

0668

29184 MELTON, T.A. ; JACOBSEN, B.J.; NOEL, G.R. 1988. Effects of temperature on development of Heterodera glycines on Glycine max and Phaseolus vulgaris. Journal of Nematology 18(4):468-474. En., Sum. En., 23 Ref., Il. [USDA, ARS, Dept. of Plant Pathology, Univ. of Illinois, Urbana, IL 61801, USA]

Phaseolus vulgaris. Snap beans. Heterodera glycines. Glycine max. Temperature. Hosts and pathogens. Cultivars. Resistance. USA.

Soybean cyst nematode-resistant Fayette and susceptible Williams 79 soybeans and resistant WIS (RRR) 36 and susceptible Eagle snap beans were used to determine the effects of host and temp. on the development, female production, sex ratios, and host response to Heterodera glycines. Temp. were maintained constant at 16, 20, 24, 28, and 32 degrees Celsius using water-filled tanks. The developmental stage of the nematode was predicted by an equation and accounted for 84 percent of the variation. Male: female ratios did not differ within this range and were generally less than one. At all temp. the resistant soybean produced the greatest no. of necrotic

responses to H. glycines infection, followed by the resistant snap bean. The susceptible soybean and snap bean produced the fewest necrotic responses. (AS)

0669

22521. MELTON, T.A.; NOEL, G.R.; JACOBSEN, B.J.; HAGEDORN, D.J. 1985. COMPARATIVE HOST SUITABILITIES OF SNAP BEANS TO THE SOYBEAN CYST NEMATODE (HETERODERA GLYCINES). PLANT DISEASE 69(2):119-122. ENGL. SUM. ENGL., 20 REFS. (DEPT. OF PLANT PATHOLOGY, UNIV. OF ILLINOIS, URBANA, IL 61801, USA)

TWENTY-THREE BUSH-TYPE SNAP BEAN LINES WERE EVALUATED FOR THEIR SUITABILITIES AS HOSTS FOR 2 POPULATIONS OF HETERODERA GLYCINES USINGNATURALLY INFESTED SOIL IN A GLASSHOUSE. EXCEPT FOR ITS SISTER LINE WIS (RRR) 46, WIS (RRR) 36 WAS A LESS SUITABLE HOST THAN ALL OTHER SNAP BEANS. POPULATIONS OF WHITE FEMALES FROM 12 COMMERCIAL SNAP BEANCV. WERE EQUAL TO OR GREATER THAN THE SUSCEPTIBLE SOYBEAN WILLIAMS 79FOR THE RACE 3 POPULATION. ADDITIONALLY, 18 SNAP BEAN CV. SUPPORTED THE SAME NO. OF WHITE FEMALES/PLANT AS DID WILLIAMS 79 FOR THE 2ND POPULATION, WHICH WAS SIMILAR TO RACE 4. THIS WIDE RANGE OF HOST RESPONSES SUGGESTS THAT RESISTANCE IS CONTROLLED BY MORE THAN 1 GENE.(AS).

0670

27324. MELTON III, T.A. 1985. HOST-PARASITE INTERACTIONS ON THE SOYBEAN CYST NEMATODE AND SNAP BEANS COMPARED TO SOYBEANS. PH.D. THESIS. URBANA, UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN. 55P. EN. SUM. EN., 56 REF., IL.

SOYBEAN CYST NEMATODE (HETERODERA GLYCINES), A DEVASTATING PARASITE OF SOYBEAN, WAS RECENTLY REPORTED AS DAMAGING SNAP BEANS IN AN ILLINOIS (USA) COMMERCIAL SNAP BEAN FIELD. BECAUSE LITTLE INFORMATION CONCERNING THE HOST- PARASITE RELATIONS OF SNAP BEAN AND H. GLYCINES EXISTS, STUDIES WERE CONDUCTED TO: (1) DISCOVER SOURCES OF RESISTANCE IN SNAP BEAN TO H. GLYCINES, (2) DETERMINE EFFECTS OF TEMP. ON SCN IN RESISTANT AND SUSCEPTIBLE SNAP BEANS AND SOYBEANS, AND (3) DETERMINE PATHOGENICITY OF THE H. GLYCINES ON SNAP BEAN. THIS STUDY WAS DIVIDED INTO 3 SECTIONS. THE 1ST SERIES OF EXPT. WAS DESIGNED TO SCREEN SNAP BEAN LINES FOR HOST SUITABILITY AND RESISTANCE AGAINST 2 POPULATIONS OF H. GLYCINES. THE 2ND SECTION WAS DESIGNED TO REPRESENT 5 TEMP., 4 HOST GENOTYPES (RESISTANT AND SUSCEPTIBLE SNAP BEANS AND RESISTANT AND SUSCEPTIBLE SOYBEANS), AND 10 SAMPLING TIMES TO INVESTIGATE THESE EFFECTS ON THE NEMATODE DEVELOPMENT AND PLANT RESPONSE. THIRDLY, 1 EXPT. WAS

DESIGNED WITH 5 INOCULATION TREATMENTS ON 2 SNAP BEAN GENOTYPES TO COMPARE THE PATHOGENICITY OF H. GLYCINES ON SNAP BEAN WITH THAT ON SOYBEAN. SEVERAL SNAP BEAN CV. WERE SHOWN TO BE EQUALLY SUITABLE HOSTS AS THE SUSCEPTIBLE SOYBEAN CONTROL, WHEREAS WIS (RRR) 36 BREEDING LINE WAS RESISTANT TO BOTH POPULATIONS. TEMP. AND HOST GENOTYPE HAD A PROFOUND EFFECT ON THE NEMATODE DEVELOPMENTAL RATE. AT 28 DEGREES CELSIUS DEVELOPMENT WAS MOST RAPID, CLOSELY FOLLOWED BY 20 AND 24 DEGREES CELSIUS. AT 20, 24, AND 28 DEGREES CELSIUS, MOST NEMATODES REACHED MATURITY. (AS (EXTRACT)).

0671

17776 NOEL, G.R.; JACOBSEN, B.J.; LEEPER, C.D. 1982. **Soybean cyst nematode in commercial snap beans.** Plant Disease 66(6):520-522. Engl., Sum. Engl., 8 Refs., Illus.

Phaseolus vulgaris. Snap beans. Nematodes. *Heterodera glycines.* Plant injuries. USA.

In July 1981, chlorotic, stunted snap beans in a 30-ha commercial production field in Mason County, Illinois were found to be infected by a cyst nematode that was subsequently identified as the soybean cyst nematode, *Heterodera glycines* race 3. This is the 1st report of the occurrence of this nematode in a commercial production area of *Phaseolus* spp. in the USA. *(Author's summary)* E05

0672

14653 REDDY, P.P.; SINGH, D.B.; SHARMA, S.R. 1979. Interaction of *Meloidogyne incognita* and *Rhizoctonia solani* in a root rot disease complex of French bean. Indian Phytopathology 32(4):651-652. Engl., 2 Refs.

Phaseolus vulgaris. Meloidogyne incognita. Rhizoctonia solani. Inoculation. Plant development.

In pot tests combined inoculations of *Meloidogyne incognita* and *Rhizoctonia solani* caused greater damage to French beans than either pathogen inoculated alone, reducing plant height and fresh wt. *(Summary by Review of Plant Pathology)* E05 E03

0673

9337 RHOADES, H.L. **Comparison of two methods of applying granular nematicides for control of sting nematodes on snap beans, sweet corn and field corn.** Soil and Crop Science Society of Florida Proceedings 33:77-79. 1974. Engl., Sum. Engl., 7 Refs., Illus.

Phaseolus vulgaris. Meloidogyne incognita. Nematodes. Nematode control. Yields. Pesticides. Host range.

Good control of the sting nematode, *Belonolaimus longicaudatus*, and excellent increases in yield of french beans (*Phaseolus vulgaris*), sweet maize (*Zea mays* var. *saccharata*) and field maize (*Zea mays*), were obtained by applying fensulfothion, phenamiphus and carbofuran at a rate of 2.24 kg a.i./ha. The granules were applied in a 38-cm band incorporated in the soil 5-8 cm deep prior to planting and in a 20-cm band between the planter shoe and the press wheel during the planting operation. Slightly increased stands of sweet and field maize resulted from wide band treatments. Ethoprop performed equally as well for both methods on french beans and for the 38-cm band treatment on sweet and field maize, but was phytotoxic to maize when concentrated in the 20-cm band. Oxamyl performed erratically in that good nematode control was obtained for french beans, but very poor control for sweet and field maize by both methods of application. (*Author's summary*) E05

0674

RHOADES, H. L. and BEEHAN, J.F. Efficacy of some experimental nematicides applied in-the-row on vegetables. Proceedings of the Florida State Horticultural Society 80:156-161. 1967. Engl. Sum. Engl. 5 Refs. Illus.

Phaseolus vulgaris. Pests. Nematodes. Meloidogyne incognita. Nematode control. Chemical control.

Several experimental nematicides were applied in-the-row on cabbage, celery, cucumbers, snap beans, and sweet corn in comparison with a standard broadcast application of D-D and untreated check plots. Those that gave effective nematode control and increased crop yields on one or more crops were Dasanit, Niagara 10242, Thimet, Temik, TH 336-N, and Zinophos. (Author's summary).

0675

14748 SANTOSO, I. The effect of various factors on the expression of genetic resistance to root-knot nematode *(Meloidogyne incognita* (Kofoid and White) Chitwood) in snap-bean *(Phaseolus vulgaris* L.), tomato *(Lycopersicon esculentum* Mill.), soybean *(Glycine max* Merr.), and lima bean *(Phaseolus lunatus* L.). Ph.D. Thesis. Honolulu, Hawaii, University of Hawaii. 1973. 111p. Engl., Sum. Engl., 111 Refs., Illus.

Phaseolus vulgaris. Meloidogyne incognita. Host-plant resistance. Genes. Genetics. Roots. Soil temperature. Inoculation. Planting. Field experiments. Ecology. Climatic requirements. Cultivars. Hawaii.

Cv. of vegetables resistant and tolerant to root-knot nematode *(Meloidogyne incognita)* bred in Hawaii were tested to determine the factors which lower the effectiveness of the resistance. Emphasis was placed on possible formation of pathogenic races of *M. incognita* which could result from continuous cropping of resistant cv. and the effect of high soil temp. on expression of resistance. Cv. tested were Manoa Wonder snap bean. Healani tomato, Kailua soybean, and White Ventura N lima bean. Field tests were conducted in 3 root-knot nematode infested fields (fields P-1, P-2, and Q-1) at the Poamoho Exptl. Farm where galling of the resistant cv. had occurred. Tests were conducted throughout the yr to obtain seasonal effects on the performance of the cv. Root-knot nematode populations established in the greenhouse on a susceptible tomato cv. from galled roots of both resistant and susceptible cv. from field: P-2 and Q-1. These were used in tests to investigate the formation of a more virulent race of root-knot nematode, the effect of soil temp. and level of inoculum on the rate of galling, and the development of a root-knot nematode population which can parasitize resistant cv. of more than one crop. Data used to measure the resistance were the gall formation and egg-mass production of the root-knot nematode on the plant roots. Manoa Wonder snap bean showed considerably increased galling when exposed to the field P-2 *M. incognita* population. This population showed an increase in pathogenicity on Manoa Wonder under continuous planting. No increase of pathogenicity was observed in the field Q-1 population. Effectiveness of the genetic resistance was reduced when the soil temp. was kept at 29° ± 1°C, but was effective under fluctuating soil temp. (21° - 33°C), although scattered galls were sometimes found. The attempt to induce a root-knot nematode population which is able to parasitize more than 1 resistant cv. was not successful. *(Author's summary)* E05

0676

15824 SINGH, D.B. *et al.* Cultivars of French bean resistant to root-knot nematode, *Meloidogyne incognita*, in India. Tropical Pest Management 27(1):29-31. 1981. Engl., Sum. Engl., 5 Refs.

Phaseolus vulgaris. Meloidogyne incognita. Host-plant resistance. Cultivars. Snap bean. Selection. Field experiments. India.

Root-knot nematode, *Meloidogyne incognita*, can limit production of french beans. The cheapest and best method of control is the use of resistant var. Although screening for resistance has been carried out in different parts of the world no such work has been carried out in India. The screening and evaluation of 302 cv. of french bean for resistance to *M. incognita* in replicated trials in the field and glasshouse under Indian conditions is described. Results showed 31 cv. were resistant in both field and glasshouse conditions while 64 cv. were moderately resistant. These 95 cv. will be important to breeders interested in nematode-resistant cv. of french bean. *(Author's summary)* E05 G00

0677

18517 SINGH, D.B.; REDDY, P.P. 1981. Influence of Meloidogyne incognita infestation on Rhizobium nodule formation in French bean. Nematologia Mediterranea 9(1):1-5. Engl., Sum. Engl., Ital., 10 Refs.

Phaseolus vulgaris. Snap beans. Meloidogyne incognita. Growth. Nodulation. Inoculation. Rhizobium.

The effect of the root knot nematode, Meloidogyne incognita, on plant growth and nodulation was investigated in 10 day-old seedlings of French bean cv. Premier. Treatments (replicated 5 times) were: nematodes alone; rhizobia alone; nematodes and rhizobia inoculated simultaneously; rhizobial inoculation 2 wk. after nematode inoculation; nematode inoculation 2 wk. after rhizobial inoculation; control (without nematodes and rhizobia). Observations on plant growth and nodulation were recorded 40 days after the 1st inoculation. Inoculation expt. showed that the nematode caused reduction in plant height, fresh wt. of shoot and root, root length, and no. of nodules in the root system. A greater nodule reduction was noticed when rhizobia and nematodes were inoculated simultaneously or when nematodes were established before the inoculation of rhizobia than when rhizobia were established before the introduction of nematodes. (Author's summary) E05

0678

14940 SINGH, D.B.; REDDY, P.P. 1981. Note on the chemical control of root-knot nematodes infesting French-bean. Indian Journal of Agricultural Sciences 51 (7):534-535. Engl., 4 Refs.

Phaseolus vulgaris. Meloidogyne incognita. Nematode control. Chemical control. Yields. Snap bean. India.

The effect of 6 nematicides (aldicarb, carbofuran, dichlofenthion, fensulfothion, phenamiphos, and ethoprophos) in controlling the root-knot nematode (*Meloidogyne incognita*) in the field was studied using French bean var. Burfee's Stringless. The expt. was established in 1979 on a red sandy loam soil with a nematode larvae population of 242/250 cc of soil. A randomized block design was used with 2 replications/treatment. Nematicides were applied to the rows before planting at rates of 0.5, 1.0, and 2.0 kg a.i./ha. Ten plants from each replicate were selected at random and the root-knot index was rated on a 1-to-5 scale (1 = no galling, 5 = severe galling). All the nematicides significantly lowered the root-knot index. The least root-knot index was obtained with the rate of 2 kg a.i./ha. The effect of the different nematicides on French bean yield was also significant. Phenamiphos and aldicarb were effective both in controlling root-knot nematodes and in increasing French bean yield. *(Summary by C.P.G. Trans. by L.M.F.)* E05

0679

22278 SINGH, D.B.; REDDY, P.P.; RAO, V.R.; RAJENDRAN, R. 1981. Reaction of some varieties and selections of French bean to Meloidogyne incognita. Indian Journal of Nematology 11(1):81-83. Engl. [Indian Inst. of Horticultural Research, Bangalore-560080, India]

Phaseolus vulgaris. Nematodes. Meloidogyne incognita. Snap beans. Selection. Cultivars. Resistance. India.

Of 160 var./selections of French beans evaluated for their reaction to Meloidogyne incognita under glasshouse and field conditions in Bangalore, India, 18 were rated as resistant, 37 moderately resistant, 10 moderately susceptible, and 95 susceptible. (Summary by Field Crop Abstracts) E05

0680

17817 SMITTLE, D.A.; JOHNSON, A.W. 1982. Effects of management practices on *Meloidogyne incognita* and snap bean yield. Journal of Nematology 14(1):63-68. Engl., Sum. Engl., 13 Refs.

Phaseolus vulgaris. Snap beans. *Meloidogyne incognita.* Nematode control. Irrigation. Cultivation. Mulching. USA.

Phenamiphos applied at 6.7 kg a.i./ha through a solid set or a center pivot irrigation system with 28 mm of water effectively controlled root knot nematodes, *Meloidogyne incognita*, and resulted in greater snap bean growth and yields irrespective of growing season, tillage method, or cover crop system. The % yield increases attributed to this method of *M. incognita* control over nontreated controls were 45% in the spring crop, and 90 and 409% in the fall crops following winter rye and fallow, resp. Root galling was not affected by tillage systems or cover crop, but disk tillage resulted in > 50% reduction in bean yield compared with yields from the subsoil-bed tillage system. *(Author's summary)* E05

0681

8304 WALKER, G. E. and WALLACE, H. R. **The influence of root-knot nematode *(Meloidogyne javanica)* and tobacco ringspot virus on the growth and mineral content of french beans *(Phaseolus vulgaris).*** Nematologica 21:455-462. 1975. Engl., Sum. Engl., Germ., 6 Refs., Illus.

Phaseolus vulgaris. Meloidogyne javanica. Viroses. P. Cl. Cu. Mn. Zn. **Growth. Mineral content. Experiment design. Statistical analysis. Analysis. Leaves. Laboratory experiments.**

The effects were investigated of tobacco ringspot virus and *Meloidogyne javanica,* individually and combined, on the growth and mineral content of *Phaseolus vulgaris* grown in pots of steam-sterilized soil in the glasshouse. The plants were clearly intolerant to TRSV infection as shown by their stunted growth and marked differences from uninfected plants in the content of P, Cl, Cu, Mn and Zn. In contrast, plants were tolerant to infection with *M. javanica* and no difference was detected between nematode-infected plants and controls. Plants inoculated with both virus and nematode consistently deviated most from the controls, but there was no statistically significant evidence of interaction between the 2 pathogens on the bean plants. *(Summary by Helminthological Abstracts)* E05 E04 C00

0682

20684 WYATT, J.E.; FASSULIOTIS, G.; HOFFMAN, J.C.; DEAKIN, J.R. 1983. NemaSnap snap bean. HortScience 18(5):776. Engl., 2 Refs., Illus. [U.S. Vegetable Laboratory, Agricultural Research Service, U.S. Dept. of Agriculture, Charleston, SC 29407, USA]

Phaseolus vulgaris. Snap beans. Cultivars. Resistance. Meloidogyne incognita. USA.

NemaSnap is the 1st bush snap bean cv. with resistance to the southern root knot nematode, Meloidogyne incognita. This resistance of NemaSnap was derived from PI 165426. Nematode reproduction was reduced to less than 2 egg masses/root system on NemaSnap compared with more than 50 egg

masses/root system on susceptible cv. Astro. NemaSnap is resistant to most races of bean rust and to the type strain and NY 15 strain of BCMV. [CIAT]

0683

16956 WYATT, J.E.; FASSULIOTIS, G.; JOHNSON, A.W. 1980. **Efficacy of resistance to root-knot nematode in snap beans.** Journal of the American Society for Horticultural Science 105(6):923-926. Engl., Sum. Engl., 19 Refs.

Phaseolus vulgaris. Meloidogyne incognita. **Host-plant resistance. Nematode control. Cultivars. Yields. Field experiments. Experiment design. USA.**

Four snap bean breeding lines, resistant PI 165426, and 2 susceptible commercial cv. were tested for resistance to root galling and root knot nematode (*Meloidogyne incognita*) reproduction under greenhouse and field conditions. Root gall and reproduction indices, and no. of eggs/g of root were significantly less on resistant lines than on cv. White Seeded Provider in 2 greenhouse tests. In field tests, soil treatment with the nematicide DBPC resulted in significant control. In nontreated plots, resistant bean lines had less root galls than cv. Early Gallatin. Plots planted with resistant lines had fewer *M. incognita* larvae than those with cv. Early Gallatin. Mean yield of pods from resistant lines in nontreated soil was about 3 times the yield of cv. Early Gallatin. Yield of pods from treated and nontreated subplots were not significantly different. These results indicate that resistance is equivalent to soil fumigation for root-knot nematode control in snap beans. *(Author's summary)* E05

0684

11113 WYATT, J.E. and FASSULIOTIS, G. **Methods for screening snap beans for resistance to root-knot nematodes.** HortScience 14(1):27-28. 1979. Engl., Sum. Engl., 2 Refs., Illus.

Phaseolus vulgaris. Meloidogyne incognita. **Host-plant resistance. Yields. Seed. Cultivars. Plant breeding.**

A method was developed to evaluate french beans for resistance to root-knot nematodes (*Meloidogyne* spp.), which permits selected plants to survive, making either hybridizations or seed increase possible in the same generation. Nematode inocula are added to commercial potting medium in greenhouse benches and beans are grown either in peat or clay pots filled with uninoculated soil and buried in the inoculated media. Roots protruding through holes in the bottom of the pots are evaluated for root gall and reproduction indices. (*Author's summary*) E05 G00

E06 Physiological Disorders

0685

8374 AQIL, B. A. and BOE, A. A. **Occurrence of cotyledonal cracking in snapbeans and its relation to nutritional status in the seed.** HortScience 10(5):509-510. 1975. Engl., Sum. Engl., 10 Refs.

Phaseolus vulgaris. **Cotyledon cracking. Seed. Host-plant resistance. Zn. B. Ca. Mg. N. Germination. Cultivars.**

Seeds of 16 *Phaseolus vulgaris* cultivars were harvested and examined for cotyledon cracking after wetting and drying. Bountiful was the most resistant to cracking while White Seeded Tendercrop was the most susceptible. Cracking-resistant cultivars had higher seed Ca, Mg and N contents than susceptible ones. Site variation in cracking occurred when Earlywax and Kinghorn Wax (resistant) and Slimgreen and Slenderwhite (susceptible) were grown at 4 different sites. *(Summary by Field Crop Abstracts)* E06 D04

0688

21963 BENNETT, J.P.; BARNES, K.; SHINN, J.H. 1980. Interactive effects of H_2S and O_3 on the yield of snap beans (Phaseolus vulgaris L.). Environmental and Experimental Botany 20(2):107-114. Engl., Sum. Engl., 11 Refs., Illus. [Dept. of Vegetable Crops, Univ. of California, Davis, CA 95616, USA]

Phaseolus vulgaris. Snap beans. Ozone. H_2S. Yield components. Leaf area. Plant injuries. Leaves. Air pollution. Plant physiological disorders. USA.

Field grown plants of Phaseolus vulgaris cv. GV 50 were fumigated with 0.046-0.127 ppm O_3 and 0.3-7.0 ppm H_2S in several combinations for 4 h/day from emergence of the 1st trifoliate leaf until pod set (day 40). Pod yield, total plant wt., leaf area, branch, raceme and pod no. were measured at 55 days after emergence. During vegetative growth there was a significant dose-response relationship for visible leaf injury to H_2S but no interaction with O_3. Plants treated with the highest H_2S + O_3 dose and harvested at 55 days showed 58% decrease in pod fresh wt. Plants harvested at 62 days had recovered from the treatment and showed a 1% reduction in pod fresh wt./plant. (Summary by Field Crop Abstracts) E06

0687

15828 BLUM, U. and HECK, W.W. Effects of acute ozone exposures on snap bean at various stages of its life cycle. Environmental and Experimental Botany 20(1): 73-85. 1980. Engl., Sum. Engl., 27 Refs., Illus.

Phaseolus vulgaris. Air pollution. Ozone. Developmental stages. Nodulation. N. Growth.

Plants of *Phaseolus vulgaris*, cv. BBL-290, were exposed to 0, 30, or 60 pphm ozone for two 1.5-h periods 3 days apart at one of 6 different stages (8 + 11, 14 + 17, 20 + 23, 26 + 29, 32 + 35, or 38 + 41 days after seeding). Half the plants were harvested 7 days after the 2nd exposure and the other half 48 days after planting. Ozone reduced RGR, absolute growth rate, pod production, nodulation, and total N content, but increased the amount of N/g of plant tissue. The magnitude of the responses in growth, nodulation, and N content varied with the O_3 concn. and plant age at the time of exposure. Recovery of growth and nodulation at the final harvest was partial for plants exposed at 8 + 11 and 14 + 17 days. N content was correlated with both plant dry wt. and nodule no. *(Summary by Horticultural Abstracts)* E06

0688

8972 BOWYER, J.W. and ATHERTON, J.G. Summer death of french bean: new hosts of the pathogen, vector relationship, and evidence against mycoplasmal etiology. Phytopathology 61:1451-1455. 1971. Engl., Sum. Engl., 17 Refs., Illus.

Phaseolus vulgaris. Summer death. *Orosius argentatus.* Vectors. Host range. Electron microscopy. Leaves. Chlorosis. Australia.

Summer death (SD), an economically important disease of french beans (*Phaseolus vulgaris*), was 1st described from Australia in 1968. The causal agent is unknown, but it has been transmitted experimentally from bean to bean by the leafhopper *Orosius argentatus*. Information is given on further studies on transmission of the agent to other plants, on the vector/pathogen relationship and on the nature of the pathogen. The agent was transmitted experimentally by *O. argentatus* to and recovered from *Datura stramonium*, *Beta vulgaris* var. *vulgaris* (beet), *B. vulgaris* var. *cicla* (silver beet), *Callistephus chinensis* and 5 susceptible cultivars of *P. vulgaris*. It was also transmitted to and recovered from 2 cultivars of *P. vulgaris* tolerant to the disease, but not *P. aureus*, *P. lathyroides* or *Solanum nigrum*. Only *D. stramonium*, *B.* var. *vulgaris* and the susceptible bean cultivars showed symptoms of the disease; the remainder were symptomless

carriers. The pathogen was also transmitted by grafting between *D. stramonium* and tomato. The minimum latent period of the pathogen in the leafhoppers was 24-48 h, and the insects remained infective for at least 21 days after having had access to a diseased plant. Individuals that acquired the pathogen in the nymphal stage remained infective as adults. Some leafhoppers transmitted both the causal agent of legume little-leaf and that of SD. No viruslike particle or micro organisms were detected by electron microscopy in plants infected with SD or in infective leafhoppers. Treatment of infected tomato plants with achromycin (tetracycline hydrochloride) had no apparent effect on transmission either by leafhoppers or by grafting. These results are taken to indicate that a mycoplasmal etiology of the disease is unlikely. The causal agent is apparently similar in many respects to that causing beet curly-top. (*Summary by Review of Plant Pathology*) E06 F01

0689

19043 BUESCHER, R.W.; ADAMS, K. 1983. Basis for enhanced softening of snap beans (Phaseolus vulgaris L.) from postharvest exposure to carbon dioxide. Journal of the American Society for Horticultural Science 108(1):58-60. Engl., Sum. Engl., 25 Refs., Illus. [Dept. of Horticultural Food Science, Univ. of Arkansas, Route 11, Fayetteville, AR 72701, USA]

Phaseolus vulgaris. Pods. CO_2. Processing. pH. Snap beans. Plant injuries. Amino acids. Plant physiologfcal disorders. USA.

Postharvest exposure of snap bean cv. Cascade to elevated CO_2 (40%), but not reduced O_2 (2.5%), enhanced softening when the pods were subsequently heated. Softening and solubilization of pectic substances induced by CO_2 were related to lowered hydrogen ion concn., which were caused by the depletion of malic acid. In contrast, high CO_2 stimulated succinic acid accumulation but did not alter citric acid levels. Blanching and boiling reduced the content of both succinic and malic acids in pods. Transelimination was effective in depolymerizing and solubilizing pectic substances in snap bean pods. The shift in pH induced by CO_2 increased the transelimination reaction and thus increased pod softening. (Author's summary) E06

0690

8500 CHIN, H.F., NEALES, T.F. and WILSON, J.H. **The effects on seedling growth of simulated seed damage in French beans.** Seed Science and Technologist 3:837-841. 1975. Engl., Sum. Engl., Fr., Germ., 7 Refs., Illus.

Phaseolus vulgaris. Seed. **Mechanical damage. Seedlings. Cotyledons. Photosynthesis.** Chlorophyll. Growth.

It is well known that the seeds of many varieties of french beans (*Phaseolus vulgaris*) are very susceptible to mechanical injury the result of which, uneven growth of seedling stands, is common. In this study, mechanical injury of the seeds was simulated by removing part or all of the cotyledons after 24 h imbibition. The effects of these treatments on the subsequent growth of seedlings were studied over 28 days. *(Author's summary)* E06 C02

0691

17347 COYNE, P.I.; BINGHAM, G.E. 1978. Photosynthesis and stomatal light responses in snap beans exposed to hydrogen sulfide and ozone. Journal of the Air Pollution Control Association 28(11):1119-1123. Engl., Sum. Engl., 26 Refs., Illus.

Phaseolus vulgaris. Plant physiological processes. Photosynthesis. Air pollution. Ozone. **Light. Stomata. Plant physiological disorders.**

Apparent photosynthesis and leaf stomatal conductance were measured in well watered, field grown snap bean cv. GV50 fumigated with various levels of H_2S alone and in the presence of 0.072 ppm ozone. Mean concn. of H_2S were 0, 0.74, 3.25, and 5.03 ppm. Plants were fumigated each day beginning at the 1st trifoliate leaf stage. The youngest fully expanded leaves were sampled after 18 ± 2 days of fumigation. The plants had 10-11 leaves and were flowering with approx. 80% of the flowers open. Hydrogen sulfide at 0.74 ppm increased max. stomatal conductance ($C_{max.}$) by 25% and max. apparent photosynthesis ($P_{max.}$) by 10%. Higher concn. of H_2S depressed stomatal opening and CO_2 uptake, and O_3 + H_2S depressed stomatal and photosynthetic response more than H_2S alone. At the highest H_2S concn. + O_3, $C_{max.}$ was 41%, and $P_{max.}$ was 52% of the control. Both $C_{max.}$ and $P_{max.}$ responded similarly to the 8 treatments but the difference between max. and min. responses was greater for conductance. As pollutant stress increased, photosynthesis ceased to respond linearly to increasing conductance at lower conductance values indicating that mesophyll resistance to CO_2 transfer was more limiting than CO_2 diffusion through the stomata at higher light intensities. The initial slope of the curves of both conductance and photosynthesis as a function of irradiance decreased with increasing stress, suggesting decreased sensitivity to light. This indicates an increased sluggishness in the guard cells, which could be related to induced leaf senescence caused by the pollutants. It also indicates a loss of photochemical conversion efficiency resulting from loss of chlorophyll and development of necrotic areas on the leaves of the more stressed plants. *(Author's summary)* E06

0692

1088 DICKSON, M.H. and BOETTGER, M.A. **Inheritance of resistance to mechanical damage and transverse cotyledon cracking in snap beans (*Phaseolus vulgaris* L.).** Journal of American Society for Horticultural Science 102(4):498-501. 1977. Engl., Sum. Engl., 14 Refs.

Phaeolus vulgaris. **Inheritance. Cotyledon cracking. Plant injuries. Crossbreeding. Host-plant resistance. Seed color. Mechanical damage.**

Colored and white-seeded inbred bean lines resistant to mechanical damage (MD) and transverse cotyledon cracking (TVC) were crossed with 2 susceptible white-seeded french bean cv. Resistance to both MD and TVC was inherited quantitatively; although colored segregants were more resistant than white-seeded segregants, MD and TVC resistant white-seeded selections were obtained. Broad-sense heritability varied from 55-79% for MD and 53-93% for TVC; narrow-sense heritability resistance varied from 22-73% for MD and from 22-58% for TVC. Severe selection pressure for MD resistance on bulked F_4 seed was shown to be a simple, practical method to obtain resistance. *(Author's summary)* E06 G00

0693

8497 DICKSON, M.H. **Factors associated with resistance to mechanical damage in snap beans (*Phaseolus vulgaris* L.).** Journal of the American Society for Horticultural Science 101(5):541-544. 1976. Engl., Sum. Engl., 16 Refs., Illus.

Phaseolus vulgaris. **Mechanical damage. Host-plant resistance. Seed. Germination. Cotyledon cracking. Cultivars.**

Lines and cultivars resistant to mechanical damage with white and colored seeds germinated 60-80% compared to under 20% for several major cultivars. Seed damage resistance was associated with transverse cotyledon cracking (TVC) resistance, (r = .649), seed coat shattering (SH resistance, (r = .488), and seed coat wt (r =.373). The SH test indicates whether the seed coat is tightly or loosely adhered to the cotyledons. If percentage of seed coat as a proportion of seed wt exceeded 10% and TVC and SH were under 10%, then damage resistance was almost always good. Weakness in any one character resulted in damage susceptibility. Damage-resistant lines

produced more vigorous seedlings than susceptible lines following seed maltreatment. Damage resistance was correlated (r=.722), with seedling vigor following seed impaction. *(Author's summary)* E06

0694

27331. HASHIM, Z.N.; CAMPBELL, W.F. 1984. ELECTROPHORETIC PATTERNS OF STORAGE PROTEINS IN PHASEOLUS PRONE TO COTYLEDONAL CRACKING. JOURNAL OF SEED TECHNOLOGY 9(2):150-161. EN. SUM. EN., 24 REF., IL. (PLANT SCIENCE DEPT., UTAH STATE UNIV., LOGAN, UT 84322, USA)

THE HYPOTHESIS THAT COTYLEDONAL- OR TRANSVERSE-CRACKING RESULTS FROM THE SWELLING OF STORAGE PROTEINS IN SEEDS DURING IMBIBITION IS EXAMINED USING 15 SNAP BEAN CV. A TOTAL OF 100 SEEDS WERE SELECTED AT RANDOM FROM EACH OF 17 SEED LOTS. EACH BULK SAMPLE WEIGHED 225 G. SEPARATED PROTEINS WERE SUBJECTED TO ELECTROPHORESIS UNDER DENATURING AND NON-DENATURING CONDITIONS, AND THE MOL. WT. OF THE DIFFERENT PROTEIN BANDS WERE DETERMINED. DIFFERENCES IN PATTERNS OF POLYACRYLAMIDE GEL ELECTROPHORETOGRAMS OF PROTEINS FROM RESISTANT AND SUSCEPTIBLE CV. ARE REPORTED. DIFFERENT PROTEIN BANDING PATTERNS WERE IDENTIFIED AND CORRELATIONS WITH THE COTYLEDONAL- OR TRANSVERSE-CRACKING PHENOMENON WERE ATTEMPTED. THERE WERE VISUAL DIFFERENCES BETWEEN BANDING PATTERNS OF RESISTANT AND SUSCEPTIBLE CV., ALTHOUGH IT IS NOT CLEAR WHICH PROTEIN BANDS ARE ASSOCIATED WITH THE COTYLEDONAL- OR TRANSVERSE-CRACKING PHENOMENON. THE TECHNIQUE REQUIRES FURTHER REFINEMENT BEFORE PLANT BREEDERS CAN USE FOR SCREENING FOR COTYLEDONAL- OR TRANSVERSE-CRACKING RESISTANCE IN SNAP BEAN CV. [AS [EXTRACT]].

0695

2309 HOFSTRA, G., LITTLEJOHNS, D.A. and WUKASCH, R.T. **The efficacy of the antioxidant ethylene-durea (EDU) compared to carboxin and benomyl in reducing yield losses from ozone in navy bean.** Plant Disease Reporter 62(4):350-352. 1978. Engl., Sum. Engl., 8 Refs.

Phaseolus vulgaris. **Ozone. Air pollution. Plant injuries. Leaves. Seed characters. Yields. Pesticides. USA.**

The antioxidant *N*-[2-(2-oxo-1-imidazolidinyl)ethyl]-*N'*-phenylurea (EDU) was compared with carboxin and benomyl, 2 fungicides with antioxidant properties, for effectiveness in suppressing ozone injury on navy beans. EDU was most effective in reducing bronzing and delaying leaf drop and increased yield by up to 36%. Part of the yield increase was due to larger seed size. Effectiveness was influenced by timing of applications of the antioxidant, the amount of bronzing on the crop and varietal sensitivity to ozone. (*Author's summary*) E06

0696

8668 ISENBERG, F.M. and SANDSTED, R. F. **Results of using sodium dehydroacetate applications to reduce discoloration of snapbeans damaged by machine harvesting.** Journal of American Society for Horticultural Sciences 94(6):631-635. 1969. Engl., Sum. Engl., 7 Refs.

Phaseolus vulgaris. **Na. Harvesting. Mechanical damage. Pods. Food tecnology. Analysis. Statistical analysis. Pods.**

Discoloration of cut and bruised surfaces of mechanically harvested pods of *Phaseolus vulgaris* was reduced by applying sodium dehudroacetate solutions at concentrations up to 0.8% after harvesting. Mold and bacterial damage were also reduced. *(Summary by Field Crop Abstracts)* E06

0697

26241. LEE, E.H.; JERSEY, J.A.; GIFFORD, C.; BENNETT, J. 1984. DIFFERENTIAL OZONE TOLERANCE IN SOYBEAN AND SNAPBEANS: ANALYSIS OF ASCORBIC ACID IN O3-SUSCEPTIBLE AND O3-RESISTANT CULTIVARS BY HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY. ENVIRONMENTAL AND EXPERIMENTAL BOTANY 24(4):331-341. ENGL., SUM. ENGL., 38 REFS., ILLUS. (UNITED STATES DEPT. OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, PLANT STRESS LABORATORY, BELTSVILLE, MD 20705, USA)

THE RELATIONSHIP BETWEEN FOLIAR O3 TOLERANCE AND LEAF ASCORBIC ACID CONCN. IN O3-SUSCEPTIBLE (O3-S) SOYBEAN CV. HARK AND O3-RESISTANT (O3-R) SOYBEAN CV. HOOD AND IN PHASEOLUS VULGARIS CV. BBL-290 (O3-S) AND ASTRO (O3-R) WAS EXAMINED BY USING HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY. ISOCRATIC SEPARATION OF ASCORBIC ACID FOR LEAF TISSUES WAS ACCOMPLISHED IN LESS THAN 5 MIN ONA MICROBONDAPAK C-8 REVERSE PHASE COLUMN USING 2 PERCENT NH4H2PO4 (PH2.8) AS THE SOLVENT. TISSUES WERE EXTRACTED WITH 6 PERCENT METAPHOSPHORIC ACID CONTAINING 1 X 10 E-6 MOLAR EDTA. RESISTANT CV. CONTAINED MORE ASCORBIC ACID IN THEIR TRIFOLIATE LEAVES THAN DID THE CORRESPONDING SUSCEPTIBLE CV. YOUNG TRIFOLIATE LEAVES WERE HIGHLY TOLERANT TO O3 AND HAD PROPORTIONALLY HIGHER ASCORBIC ACID CONCN. THAN NEWLY EXPANDED LEAVES. A THRESHOLD CONCN. OF APPROX. 1000 MICROGRAMS ASCORBIC ACID/G LEAF FRESH WT. WAS REQUIRED FOR GOOD O3 PROTECTION. O STRESS WAS SHOWN TO INDUCE THE PRODUCTION AND ACCUMULATION OF ASCORBIC ACID IN O3-TREATED LEAVES. POSSIBLE MECHANISMS FOR ENHANCED TOLERANCE TO O3 STRESS ARE DISCUSSED. (AS).

0698

18096 LEE, E.H.; BENNETT, J.H. 1982. Superoxide dismutase a possible protective enzyme against ozone injury in snap beans (*Phaseolus vulgaris* L.). Plant Physiology 69(6):1444-1449. Engl., Sum. Engl., 23 Refs., Illus.

Phaseolus vulgaris. **Enzymes. Plant injuries. Snap beans. Ozone. Air pollution. Plant physiological disorders.**

An exptl. chemical, *N*-[2-(2-oxo-1-imidazolidinyl)ethyl]-*N'*-phenylurea (EDU), is an effective protectant against acute and chronic foliar injury due to O_3 when sprayed on intact leaves or supplied to the plants through soil application. O_3-sensitive snap bean cv. Bush Blue Lake 290 was systemically treated with EDU (0, 25, 50, and 100 mg/15-cm Ø pot) to determine if EDU induced or activated protective oxyradical and peroxyl scavenging enzymes. EDU-enhanced tolerance to O_3 injury always correlated with increases in superoxide dismutase (SOD) and catalase activities in the leaves. Peroxidase levels correlated more closely with foliar injury. Greater SOD levels in young leaves compared with older leaves were associated with lower O_3 sensitivities in these tissues. Polyacrylamide slab gel electrophoresis separations and specific determinations of SOD activity showed that EDU-treated plants possessed markedly greater SOD activity than non-treated plants. Tolerant plant tissues may have enhanced enzyme scavenging capabilities for the protection against toxic oxyradicals. Exptl. confirmation for the oxyradical theory for O_3 phytotoxicity and SOD involvement in the detoxification process are presented. *(Author's summary)* E06

0699

19701 LEE, E.H.; WANG, C.Y.; BENNETT, J.H. 1981. Soluble carbohydrates in bean leaves transformed into oxidant-tolerant tissues by EDU treatment. Chemosphere 10(8):889-896. Engl., Sum. Engl., 11 Refs., Illus. [Plant Stress Laboratory, Plant Physiology Inst., Science & Education Administration, Agricultural Research, USDA, Beltsville, MD 20705, USA]

Phaseolus vulgaris. Leaves. Seedlings. Ozone. Plant injuries. Analysis. Sugars. Snap beans. Carbohydrate content.

Improved GLC techniques were used to evaluate the effects of EDU [N-[2-(2-oxo-1-imidazolidinyl)ethyl]-N'-phenylurea] on soluble leaf carbohydrates in snap bean cv. bush Blue Lake 290, normally sensitive to O_3 but slightly tolerant when treated systemically with EDU. Less than 24 h is required to induce the resistance. Standardized trifoliate leaves from EDU-treated and control plants were sampled 48 h after treatment. Additional plants were sampled 48 h after treatment and exposed to O_3 1 day after EDU soil application to assess the plant tolerance induced. The optimal dose required to enhance oxidant tolerance was 50 mg/pot. Major sugars in both EDU-treated (O_3-tolerant) and untreated (O_3-sensitive) leaves were glyceraldehyde, erythritol, fructose, glucose, and sucrose. Myo-inositol, ribose, and arbitol were present in lesser or trace amounts. EDU-treatment resulted in significant increases (35-62%) in all soluble carbohydrates except glyceraldehyde and myo-inositol. Implications relating to plant tolerance, oxidants, and stress-induced senescence are discussed. (Author's summary) E06

0700

8937 LEE, J.M., READ, P.E. and DAVIS, D.W. **Effect of irrigation on interlocular cavitation and yield in snap bean.** Journal of the American Society for Horticultural Science 102(3):276-278. 1977. Engl., Sum. Engl., 10 Refs., Illus.

Phaseolus vulgaris. **Irrigation. Pods. Plant physiological disorders. Experiment design. Cultivars. P. K. Ca. Mg. Seed. Yields.**

Interlocular cavitation (IC) in french bean pods was studied in 8 commercial varieties under several irrigation regimes on a sandy soil. In susceptible varieties, IC was consistently associated with heavy irrigation during pod growth. Little or no IC was found when no more than 1.27 cm of water was applied per week. Irrigation also influenced pod yield, plant wt, ratio of pod wt to plant wt, pod composition and seed number. Cultivars susceptible to IC showed rapid increase in pod wt when irrigated after 2-3 wk of moisture stress conditions. However, this rapid increase in pod wt did not induce IC under the conditions tested. Proportion of pod P and K in relation to Ca and Mg increased as irrigation levels were increased. Seed no. was related to irrigation and the severity of IC, depending upon the variety. (*Author's summary*) E06 D01

0701

11947 MEINERS, J.P. and HEGGESTAD, H.E. **Evaluation of snap bean cultivars for resistance to ambient oxidants in field plots and to ozone in chambers.** Plant Disease Reporter 63(4):273-277; 1979. Engl., Sum. Engl., 13 Refs.

Phaseolus vulgaris. **Ozone. Host-plant resistance. Cultivars. Air pollution. Field experiments. Seedlings. Plant injuries. Leaves. USA.**

Of 387 french bean cv. and breeding lines tested for resistance to O_3 pollution in Maryland, 270 were classified as resistant, 86 intermediate and 31 susceptible. Responses of seedlings with one expanded trifoliate leaf to high concn of O_3 revealed statistically significant differences among cv. The correlation between leaf injury induced by O_3 on seedlings and O_3 injury on the same cv. as adult field-grown plants was low ($r = 0.20$) but significant. (*Author's summary*) E06

0702

18594 MOHAMED, M.B. 1978. Response of vegetable crops to acid rain under field and simulated conditions. Ph.D. Thesis. Ithaca, N.Y., Cornell University. 157p. Engl., 22 Refs., Illus.

Phaseolus vulgaris. Snap beans. Cultivars. pH. Plant physiological disorders. Acid rain.

In field and greenhouse trials in New York, USA, the effect of acid rain on 30 cv. of 16 vegetable crops was studied. Emergence and early growth of Phaseolus vulgaris were adversely affected at pH equal to or less than 2.0; root growth was more responsive to pH than stem growth. Simulated rainfall of pH 3.0 for 1 h/day caused severe morphological and anatomical injury and reduced growth in all cv. The adverse effects decreased at pH 4.0. No injury was visible at pH 5.0 but growth was less than in plants watered through the soil. Sweet corn was the least susceptible species to acid rainfall. The effect of frequency and pH of simulated rainfall on P. vulgaris cv. Kentucky Wonder was studied. With increase in frequency and decrease in pH of simulated rainfall, plant growth was more adversely affected. There was a cumulative effect of rainfall, especially at the lowest pH, but plants outgrew their stressed condition when the low pH treatment was discontinued. (Summary by Dissertation Abstracts International) E06

0703

11619 PECK, N.H. and CLARK, B. E. **Snap bean seed injury by seed metering devices on planters.** Acta Horticulturae no.72:127-133. 1978. Engl., Sum. Engl., 9 Refs.

Phaseolus vulgaris. **Plant injuries. Seed. Seedlings. Planting. Agricultural equipment. Mechanization. Germination.**

Seeds of 4 french bean var., ungraded for size, were metered through 5 different planter seed plates in 3 planter assemblies at 5 rotation speeds to determine effects of plate type and rotation speed on the no. of seeds metered/seed plate cell and on injury to the seeds and seedlings. The no. of seeds metered/seed plate cell decreased as rotation speed increased, especially at the highest speeds. A horizontal plate holding about 2 seeds/cell caused broken seeds and decreased the % of seedlings with 2 complete cotyledons. Seed injury caused by the plate increased with increasing rotation speed. A horizontal plate holding 4 seeds/cell caused moderate injury to the seeds, especially at the highest speeds. There was only slight evidence of seed injury caused by (a) a horizontal plate holding 6 seeds/cell, (b) by holding the plates at a 45° angle and (c) by the vertical plates holding 1 seed/cell regardless of rotation speed. *(Extracted from author's summary)* E06 D02

0704

22133 EL-GUINDY, M.A.; ABO-ELGHAR, M.R.; ABDEL-FATTAH, M.I.; ISSA, Y.H. 1979. Laboratory mass rearing of the bollworm, Heliothis armigera Hbn., on natural and artificial diets. Bulletin de la Societé Entomologique d'Egypte no.62:161-174. Engl., Sum. Engl., 13 Refs.

Phaseolus vulgaris. Heliothis zea. Insect biology. Snap beans. Egypt.

Following several years of severe damage to cotton by Heliothis armigera in different parts of Egypt, lab. investigations were made on natural and artificial diets for this pest to obtain information on its nutritional requirements and biology. The duration of the larval instars and whole stage, pupal stage, larval and pupal wt., head-capsule width, adult emergence rate, preoviposition period, adult life span and fecundity, duration of egg stage, and hatch rate were used to evaluate the relative development of H. armigera on castor leaves and on 3 artificial diets, of which 2 were based on snap beans and 1 on horse beans (Vicia faba). The insects were reared on the 2nd and 3rd diet for 6 generations, and the results indicated that the 2nd diet was the most suitable, followed by the horse bean diet, castor and the 1st snap bean diet (on which H. armigera did not survive beyond the 2nd generation). (Summary by Review of Applied Entomology) F00

0705

12326 GOKHALE, V.G. and SRIVASTAVA, B.K. **French bean seed coat as an ovipositional attractant for the pulse beetle, *Callosobruchus maculatus* (Fabricius).** Experientia 29(5):630-631. 1973. Engl., Sum Germ., 9 Refs., Illus.

Phaseolus vulgaris. Callosobruchus maculatus. **Insect biology. Host range.**

In studies with pairs of *Callosobruchus maculatus* placed in petri dishes containing intact seeds or seeds without testae, significantly more eggs were laid on intact seeds of french beans in particular, pigeon peas, cowpeas, peas, mung beans and lentils. Seed coats of beans were then finely ground and extracted with distilled water. Ovipositional attractancy of filter paper soaked in extract or in distilled water was compared; 10 times more eggs were obtained from the former. (*Summary by T.B.*) F00 L01

0706

5416 GREENE, G.L. and MINNICK, D.R. Snap bean yields following simulated insect defoliation. Proceedings of the Florida State Horticultural Society 80:132-134. 1968. Engl., 7 Refs.

Phaseolus vulgaris. Yields. Defoliation. Integrated control. USA.

The effect of leaf removal on snap bean yields and quality was studied to recommend insect control practices. Expt. were conducted between 1966-67 on 2 soils (sandy and peat) in Florida (USA). A random block design with 3 treatments and 4 replications was used. The plots consisted of a single row of 50 plants of snap bean var. Harvester. Insect defoliation was controlled by the application of insecticides. Plants grown in sandy soil received the following treatments of hand defoliation: 0, 25 (removal of the 2nd trifoliate leaf at the base of the petiole),and 50% (removal of the 2nd and 3rd trifoliate leaves). This operation was carried out 1 wk. prior to bloom and at bloom. On the peat soil, defoliation was 0, 33, and 67% by removing 0, 1,and 2 leaflets of each trifoliate petiole. Plants were harvested to determine quality and yield. The treatments did not affect pod quality. The results of the expt. indicate that yield reduction begins when defoliation reaches 33-50% . The large

difference between yields of the 2 groups is due to the greater fertility of peat soil. *(Summary by C.P.G. Trans. by L.M.F.)* F00 D00

0707

14231 LATHEEF, M.A. and IRWIN, R.D. Effects of companionate planting on snap bean insects, *Epilachna varivestis* and *Heliothis zea*. Environmental Entomology 9(2):195-198. 1980. Engl., Sum. Engl., 16 Refs.

Phaseolus vulgaris. Intercropping. Integrated control. Injurious insects. *Heliothis zea*. *Epilachna varivestis*. USA.

The effects of companionate planting on insect pests of snap beans were investigated in Chesterfield Co., Virginia (USA), during 1977-78. Significantly fewer Mexican bean beetles (*Epilachna varivestis*) occurred on bean plots bordered by *Tagetes patula* than on borderless controls ($P < 0.01$). However, this effect was overshadowed by the allelopathic response of *Tagetes patula* to beans ($P < 0.01$). No such effect was observed on bean plots bordered by *Calendula officinalis*, *Petunia hybrida*, *Satureja hortensis*, *Chrysanthemum cinerariaefolium*, *Nicandra physalodes* and *Tropaeolum minus*. The corn earworm, *Heliothis zea*, occurred significantly more on bean plots bordered by *C. officinalis* and *S. hortensis* ($P < 0.05$). *N. physalodes* was completely defoliated by the 3-lined potato beetle, *Lema trilineata*. Companionate planting described in this study does not appear to be a useful control of strategy for insect pests of *P. vulgaris* in home garden plots. *(Author's summary)* F00

0708

17710 SANBORN, S.M.; WYMAN, J.A.; CHAPMAN, R.K. 1982. Studies on the European corn borer in relation to its management on snap beans. Journal of Economic Entomology 75(3):551-555. Engl., Sum. Engl., 7 Refs.

Phaseolus vulgaris. *Ostrinia nubilalis*. Insect biology. Plant injuries. Leaves. Pods. Stems. Timing.

Egg masses or larvae of *Ostrinia nubilalis* were placed on snap beans to determine the effect of egg hatch at various days before harvest, on crop damage at harvest, and the length of time larvae feed externally on the plants before boring into stems and pods. When egg hatch occurred between 14-30 days before harvest, damaged stems and pods were found at harvest. Egg hatch at 7 and 35 days before harvest resulted in little crop damage. In lab. and field studies of larval feeding behavior, larvae fed externally on the plants (primarily on the undersides of leaves) for 6-7 days and had completed the 1st or 2nd instar before they began to bore. Day degrees accumulations > 10°C were related to the interval between egg hatch and the onset of boring. *(Author's summary)* F00

0709

15475 WADDILL, V.H., McSORLEY, R. and POHRONEZNY, K. Field monitoring: basis for integrated management of pests on snap beans. Tropical Agriculture 58(2):157-169. 1981. Engl., Sum. Engl., 16 Refs., Illus.

Phaseolus vulgaris. Pests. Integrated control. *Diabrotica balteata*. *Liriomyza* spp. *Anticarsia gemmatalis*. *Trichoplusia ni*. *Urbanus proteus*. Nematodes. Snap bean.

Insects, diseases, and nematodes were monitored on snap beans in 4 expt. conducted in Florida (USA). Although the insect defoliators *Anticarsia gemmatalis*, *Urbanus proteus*, *Trichoplusia ni*, *Liriomyza sativae*, and *Diabrotica balteata* were present, defoliation did not surpass the action thresholds of 20 and 10% for pre-bloom and post-bloom, resp. Insecticide costs were reduced by 48 and 83% in 2 field tests where field monitoring was utilized in making management decisions. Max. initial nematode densities/100 cm^3 soil were 20 for *Rotylenchulus reniformis*, 15 for *Helicotylenchus dihystera*, and 72 for *Quinisulcius acutus*. Chemical treatments reduced nematode no. but bean yields were not significantly increased. *(Author's summary)* F00 E00

0710

3846 WEBB, R.E. and SMITH, F.F. **Influence of reflective mulches on infestations of *Liriomyza munda* in snap bean foliage.** Journal of Economic Entomology 66(2):539-540. 1973. Engl., 10 Refs.

Phaseolus vulgaris. Liriomyza munda. **Mulching. Field experiments. Entomology. USA.**

Contrary to the findings of Wolfenbarger & Moore (1968), reflective mulches (made from aluminum foil or painted or unpainted polyethylene strips) did not prevent *Liriomyza sativa* (*munda*) from infesting french bean plants in the field in Maryland in 1967-69. (*Summary by Review of Applied Entomology*) F00

0711

27212. WEINZIERL, R.A.; BERRY, R.E.; FISHER, G.C. 1986. SWEEP-NET SAMPLING FOR WESTERN SPOTTED CUCUMBER BEETLE [COLEOPTERA:CHRYSOMELIDAE] IN SNAP BEANS: DAILY FLUCTUATIONS IN BEETLE COUNTS AND CORRELATION BETWEEN RELATIVE AND ABSOLUTE DENSITY ESTIMATES. JOURNAL OF ECONOMIC ENTOMOLOGY 79[4]:1100-1105. EN. SUM. EN., 9 REF., IL. [EXTENSION ENTOMOLOGY, UNIV. OF ILLINOIS, 172 NATURAL RESOURCES BLDG., 607 E. PEABODY DR., CHAMPAIGN, IL 61820, USA]

SWEEP NET SAMPLING WAS EVALUATED AS A METHOD OF SAMPLING POPULATIONS OF ADULT WESTERN SPOTTED CUCUMBER BEETLES, DIABROTICA UNDECIMPUNCTATA UNDECIMPUNCTATA, IN SNAP BEANS. EACH OF 18 FIELDS WAS SAMPLED INITIALLY BETWEEN 0800 AND 1000 H; 1-6 SUBSEQUENT SETS OF SAMPLES WERE COLLECTEO LATER ON THE SAME DATE. FIELD MEANS OF BEETLE COUNTS IN SWEEP NET SAMPLES COLLECTED AFTER THE INITIAL SAMPLING EPISODE [SUBSEQUENT MEANS] WERE SIGNIFICANTLY LOWER THAN THE FIELD MEAN OF INITIAL SAMPLES COLLECTED IN THE SAME FIELD [INITIAL MEAN] IN 16 OF 42 COMPARISONS. SUBSEQUENT MEAN/INITIAL MEAN RATIOS WERE NEGATIVELY CORRELATED [R[2] = 0.72] WITH THE AMOUNT OF INCREASE IN SOLAR RADIATION INTENSITY BETWEEN INITIAL AND SUBSEQUENT SAMPLING EPISODES. WHEN FLUCTUATIONS IN BEETLE COUNTS IN SWEEP SAMPLES WERE DESCRIBED IN RELATION TO AN AV. DAILY RADIATION CURVE, ESTIMATED COUNTS WERE LOWEST FOR SAMPLING CONDUCTED AT 1300 H. TIME-BASED CORRECTION FACTORS USED AS MULTIPLIERS TO STABILIZE RELATIVE DENSITY ESTIMATES ACCORDING TO A STANDARD [0900 H] SAMPLING TIME RANGED FROM 0.9 FOR 1800 H TO 2.5 FOR 1300 H. THE LINEAR RELATIONSHIP BETWEEN CORRECTED COUNTS OF D. UNDECIMPUNCTATA UNDECIMPUNCTATA IN SWEEP NET SAMPLES AND MEASURES OF D. UNDECIMPUNCTATA UNDECIMPUNCTATA ABSOLUTE DENSITY [BEETLES/M OF ROW] WAS DESCRIBED BY THE EQUATION: Y = 0.44 + 2.55X [R[2] = 0.69], WHERE X = NO. OF D. UNDECIMPUNCTATA UNDECIMPUNCTATA/M OF ROW AND Y = CORRECTED NO. OF D. UNDECIMPUNCTATA UNDECIMPUNCTATA/10 SWEEPS. [AS].

0712

27322. WEINZIERL, R.A. 1985. SAMPLING METHODS AND INJURY THRESHOLDS FOR WESTERN SPOTTED CUCUMBER BEETLE IN SNAP BEANS. PH.D. THESIS. CORVALLIS, OREGON STATE UNIVERSITY. 120P. EN. SUM. EN., 104 REF., IL.

SWEEP NET SAMPLING AND PHEROMONE TRAPPING WERE EVALUATED TO QUANTIFY ADULT DIABROTICA UNDECIMPUNCTATA UNDECIMPUNCTATA POPULATION IN SNAP BEANS. ECONOMIC INJURY LEVELS, ECONOMIC THRESHOLDS, AND SEQUENTIAL SAMPLING PLANS BASED ON SWEEP NET SAMPLING WERE ESTABLISHED. DIFFERENCES IN MEAN NO. OF D. UNDECIMPUNCTATA UNDECIMPUNCTATA IN SEPARATE SETS OF SWEEP NET SAMPLES COLLECTED FROM THE SAME FIELD ON THE SAME DAY WERE NEGATIVELY CORRELATED (R(2) = 0.72) WITH THE DIFFERENCE BETWEEN RADIATION INTENSITY MEASUREMENTS TAKEN DURING SAMPLING. WHEN CHANGES IN D. UNDECIMPUNCTATA UNDECIMPUNCTATA COUNTS IN SWEEP SAMPLES WERE DESCRIBED IN RELATION TO AN AV. DIEL RADIATION CURVE, ESTIMATED COUNTS WERE LOWEST FOR SAMPLING CONDUCTED AT 1:00 P.M. TIME- BASED CORRECTION FACTORS THAT STABILIZED RELATIVE DENSITY ESTIMATES ACCORDING TO A STANDARD (9:00 A.M.) SAMPLING TIME RANGED FROM 0.9 FOR 6:00 P.M. TO 2.5 FOR 1:00 P.M. THE LINEAR RELATIONSHIP (R(2) = 0.69) BETWEEN CORRECTED SWEEP NET AND ABSOLUTE ESTIMATES OF D. UNDECIMPUNCTATA UNDECIMPUNCTATA DENSITY INDICATED SWEEP NET SAMPLING EFFICIENCY VARIED FROM 15 TO 41 PERCENT DEPENDING ON SAMPLING TIME. (AS (EXTRACT)).

F01 Injurious Insects, Mites and their Control

0713

17497 BERNHARDT, J.L. 1979. Ecology of the Mexican bean beetle (*Epilachna varivestis* Mulsant) on soybeans (*Glycine max* (L.) Merrill) and snap beans (*Phaseolus* spp.). Ph.D. Thesis. South Carolina, Clemson University. 85p. Engl., Sum. Engl., 50 Refs., Illus.

Phaseolus vulgaris. Epilachna varivestis. Ecology. Insect biology. Climatic requirements. Insect control. Biological control.

The ecology of *Epilachna varivestis* in soybeans and *Phaseolus* spp. was studied to elucidate fundamental relationships among this pest, host plants, and environmental factors. These data were essential for the refinement of a computer simulation model. *E. varivestis* adults preferred pine litter for overwintering. Emergence began in March and continued until May when most emergence occurred, generally following periods of rainfall. Adults fed with *Phaseolus lunatus* and *P. vulgaris* had increased fecundity and longevity of males and females, shortened preoviposition period and less days between ovipositions in comparison with those adults fed soybeans and other diets. On a per weekly basis, adults damaged 30% more soybean surface area than on *Phaseolus lunatus*. Lab. expt. using constant and alternating temp. regimes and soybeans as a diet indicated that preoviposition period and longevity were inversely related to temp., and fecundity was directly related to longevity. Field observations showed that plant canopy of soybeans had a positive influence on

% hatch, which was reduced from 62.4 to 25.7% as a result of low rainfall and humidity, and high temp. Results from field and lab. expt. were used to validate a physiological day equation used in predicting developmental periods of larvae. Correction coefficients, which allowed adjustments for variations in the daily temp. cycle due to geographical location, were added to the equation. Other studies were also conducted on larval development, leaf area damage, and predators of *E. varivestis* in soybeans. *(Summary by C.P.G. Trans. by L.M. F.)* F01

0714

1093 BERNAHARDT, J.L. and SHEPARD, M. **Validation of a physiological day equation: development of the Mexican bean beetle on snap beans and soybeans.** Environmental Entomology 7(1):131-135. 1978. Engl., Sum. Engl., 10 Refs., Illus.

Phaseolus vulgaris. Epilachna varivestis. **Temperature. Leaves. Insect biology. Statistical analysis.**

A physiological day equation proposed by Waddill et al.(1976) of the form PD = 1.24 {[.55 (TMAX - TMIN) + TMIN - THT + [.15(TMAX - TMIN) + TMIN] - THT }, where TMAX = Max Temp, TMIN = Min Temp and THT = Developmental Threshold, predicted development of larvae of the Mexican bean beetle *Epilachna varivestis* on soybeans and french beans with only ca. a 2% error. This sine curve-based equation incorporates geographical location coefficients, and predictions were accurate enough for acceptable simulation limits, especially with fluctuating temp such as those that occur in the field. Predictions by the equation were improved when temp did not approach the physiological limits of beetle development. The total no. of days required for larvae to mature on french beans was 16.5. *(Author's summary)* F01

0715

28652 CANTWELL, G.E. ; CANTELO, W.W.; SCHRODER, R.F.W. 1985. The integration of a bacterium and parasites to control the Colorado potato beetle and the Mexican bean beetle. Journal of Entomological Science 20(1):98-103. En., Sum. En., 5 Ref. [Vegetable Lab., Horticultural Science Inst., Agricultural Research Service, USDA, BARC-East, Beltsville, MD 20705, USA]

Phaseolus vulgaris. Snap beans. Epilachna varivestis. Biological control. Predators and parasites. Bacillus thuringiensis. USA.

Sprays of Bacillus thuringiensis subsp. thuringiensis, which contained the beta-exotoxin, were applied to small-scale field plots of tomatoes infested with the Colorado potato beetle and to bush snap bean plots infested with the Mexican bean beetle [Epilachna varivestis] in Maryland, USA. Two species of eulophid parasites were used in conjunction with the bacterium in an effort to reduce beetle populations. The larval parasite Pediobius foveolatus was released on beans. Treatments in which the bacterium was used, either alone or in combination with a parasite, significantly reduced adults and 3rd- and 4th-instar larvae of beetles. P. foveolatus by itself was able to significantly reduce both 3rd and 4th instar larval and adult populations of E. varivestis. [AS (extract)]

0716

20893 CHINA, W.E. 1931. A new species of Erythroneura (Homoptera, Jassoidea) injurious to French beans (Phaseolus vulgaris) in the Sudan. Bulletin of Entomological Research 22:53-54. Engl.

Phaseolus vulgaris. Snap beans. Erythroneura. Injurious insects. Insect biology. Sudan.

Erythroneura lubiae sp.n. was received for identification from the Imperial Institute of Entomology. Diagrams and a detailed description of this new species, which is a pest of French beans in the Sudan, are given, and the manner in which its structure and color differ from all other Ethiopian species of Erythroneura is noted. (Summary by J.R.) F01

0717

27486. COHEN, A.C.; PATANA, R. 1984. EFFICIENCY OF FOOD UTILIZATION BY HELIOTHIS ZEA (LEPIDOPTERA:NOCTUIDAE) FED ARTIFICIAL DIETS OR GREEN BEANS. CANADIAN ENTOMOLOGIST 116(2):139-146. EN. SUM. EN., FR., 17 REF., IL. [BIOLOGICAL CONTROL OF INSECTS LABORATORY, UNITED STATES DEPT. OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, TUCSON, AZ 85719, USA]

SECOND-INSTAR HELIOTHIS ZEA (MORE THAN THE 275TH GENERATION) LARVAE, FROM A 16-YR-OLD CULTURE, WERE FED EITHER GREEN BEANS OR ARTIFICIAL DIET UNTIL THEY REACHED THE PUPAL STAGE AND THEN WERE COMPARED TO DETERMINE THEIR RELATIVE FITNESS TO THE 2 DIETS. THEY PROVED AT LEAST AS WELL ADAPTED TO BEANS AS TO ARTIFICIAL DIET WITH REGARD TO MOST PARAMETERS. FINAL LARVAL WT. WERE EQUAL, AS WERE PUPAL DRY WT. WET WT. WERE HIGHER IN DIET-FED THAN IN BEAN-FED PUPAE. DRY FOOD CONSUMPTION WAS HIGHER IN DIET-FED LARVAE THAN IN BEAN-FED LARVAE, BUT THE REVERSE WAS TRUE OF WET FOOD CONSUMPTION. TOTAL FOOD CONSUMPTION BY LARVAE WAS LIMITED BY FOOD VOL. RATHER THAN WT. OR COMPOSITION. THE LARVAL STAGE WAS SHORTER IN DIET-FED THAN IN BEAN-FED LARVAE, AND DIET-FED LARVAE HAD BETTER SURVIVAL, HIGHER BODY N, AND BODY ENERGY CONTENT. O CONSUMPTION WAS LOWER IN BEAN-FED THAN IN DIET-FED LARVAE. EFFICIENCY OF FOOD UTILIZATION WAS HIGHER FOR BEAN-FED THAN FOR DIET-FED LARVAE BOTH IN TERMS OF DM CONVERSION AND ENERGY CONVERSION. N UTILIZATION EFFICIENCIES WERE THE SAME FOR BOTH DIETS. (AS).

0718

*COSTA, C.L.; ROSSETTO, C.J.; COSTA, A.S.; FORSTER, R.; MENEZES, J.F. DE; RIGITANO, A.; WETZEL, C.T.; ALMEIDA, L. D'A. DE; TOLEDO, F.F.; ABRAHAO, J.T.M.; MIYASAKA, S.; NAVARRO, O.P.; ADAMS, W.; GORGATTI NETTO, A.; ROCHA, J.L.V.; JUNQUEIRA, P.C.; CANCEGLIERO, L.F.B.; MATSUNAGA, M.; YAMAGUISHI, C.T.; GUAZZELLI, R.J. 1972. Simposio brasileiro de feijao, 1, 1972. Anais. Brazil, Universidade Federal de Vicosa. v.2, 646p.

0719

7989 CRUZ, C. and SABSTATION, I. **Chemical control of the leafhopper (*Empoasca fabae* Harris) on snap beans.** Journal of Agriculture of University of Puerto Rico 59(1):82-84. 1975. Engl.

Phaseolus vulgaris. Empoasca fabae. **Insect control. Chemical control. Yields. Field experiments.**

Since the leafhopper is one of the most limiting factors in bean production, an experiment was conducted with french beans var. Wade at the Isabela Agricultural Experiment Substation in Puerto Rico to evaluate the effectiveness of newer insecticides in controlling this pest. All insecticidal applications gave excellent control; the best was carbofuran. Increases in yield value per acre are also given. (*Summary by T.M.*) F01

0720

17876 DEBOLT, J.W. 1982. Meridic diet for rearing successive generations of *Lygus hesperus.* Annals of the Entomological Society of America 75(2):119-122. Engl., Sum. Engl., 7 Refs.

Phaseolus vulgaris. Uses. Predators. *Lygus hesperus.* Insect biology. Snap beans. *Spodoptera exigua.*

An artificial diet is described that was developed in the USA and tested for rearing the predacious mirid *Lygus hesperus.* Nymphs were reared successfully individually and en masse. The development time was comparable with that on a diet of green beans. Females reared on the artificial diet laid more eggs and lived longer than those reared on green beans. The % egg hatch for diet-reared bugs was 5.5% lower than for bugs on green beans, but diet-reared bugs weighed more than those on green beans. *L. hesperus* was reared continuously for more than 13 generations on the artificial diet. The % of 1st-instar nymphs reaching the adult stage was 16.7% higher on artificial diet than on a diet of green beans + heat-killed larvae of *Spodoptera exigua.* This is the 1st report of the continuous rearing of any mirid on an atificial diet. (*Author's summary*) F01

0721

11623 DIVELY, G.P. and McCULLY, J.E. **Nature and distribution of European corn borer feeding injury on snap beans.** Journal of Economic Entomology 72(1):152-154. 1979. Engl., Sum. Engl., 3 Refs.

Phaseolus vulgaris. **Plant injuries. Injurious insects. Timing. Leaves. Stems. Pods. Entomology.**

Egg masses were placed on french beans at 7, 14, 21 and 28 days before harvest to determine the nature and distribution of feeding injury by *Ostrinia nubilalis.* Early instars fed 1st on leaves and then bored into stems and pods as they reached the late 2nd and 3rd instars. About 37% of stem damage occurred inside the lower portion of the main stem, with the remaining damage distributed among lateral stems. Second and later instars invaded all sizes of pods with a significant preference toward the marketable pods (sieve sizes 3-6). External symptoms, indicating that the pods had been damaged, were not consistently observed. Many marketable pods were completely normal in appearance despite extensive boring, and the only sign of injury was the entry hole. Injury to pin pods (sieve sizes 0-2) invariably was associated with external symptoms, and it is unlikely that these pods would develop to a marketable size. The nature and distribution of feeding injury to pods and stems depended on time of oviposition. When hatching occurred at bloom, ca. ½ the surviving larvae invaded pods of all sizes and caused little external evidence of injury by harvest time. When hatching occurred $\geqslant$ 1 wk before bloom, surviving larvae bored primarily into lateral stems; however, ca. 1/3 of these larvae shifted their feeding activity to pods as they became available. (*Author's summary*) F01

0722

23619 FLANDERS, R.V. 1984. Comparisons of bean varieties currently being used to culture the Mexican bean beetle (Coleoptera: Coccinellidae). Environmental Entomology 13(4):995-999. Engl., Sum. Engl., 12 Refs. [Dept. of Entomology, Purdue Univ., West Lafayette, IN 47907, USA]

Phaseolus vulgaris. Epilachna varivestis. Cultivars. Snap beans. Insect biology. USA.

Lima and snap bean var. that are currently being used to culture the Mexican bean beetle (Epilachna varivestis) were examined to identify the most efficient var. for the culture of the insect. Snap bean var. Top Crop, Provider, Spartan Arrow, and Burpee's Stringless, and lima bean var. Henderson, were compared by constructing life tables for E. varivestis on each var. The preoviposition period was shortest and oviposition period longest on Provider, being 8.9 and 27.2 days, resp. Larval and pupal survivorships were higher on Henderson (61.7%) and Provider (60.4%) than on the other var. E. varivestis females produced significantly more egg masses (16.5) and eggs (839.7) on Provider than on any other var. The results and observations on growth rates of the var. and their responses to E. varivestis culture conditions indicated that lima bean var. Henderson was the best var. of those studied for culturing the Mexican bean beetle. (Summary by Entomology Abstracts) F01

0723

3677 GENUNG, W.G. The bean leaf skeletonizer, *Autoplusia egena*, and its control on bush snap beans in the Everglades. Journal of Economic Entomology 53(4) 566-569 1960. Engl., Sum. Engl., 11 Refs. Illus.

Phaseolus vulgaris. Entomology. Injurious insects. *Autoplusia egena*. Pests. Biological control. Chemical control. *Bacillus thuringiensis*. Apanteles. Insect biology. Predacious insects.

Autoplusia egena (Guen.) infestation occurred in the Everglades in the spring of 1957, 1958 and 1959. The mean time required from egg to adult approximated 35 days. The parasite genera *Apanteles*, *Meteorus* and *Copidosoma* and predatory Pentatomidae *Podisus* spp. attacked the larvae. Of the materials tested toxaphene, dieldrin, Thiodan, Phosdrin, Kepone, Perthane, SD-4402, and *Bacillus thuringiensis* gave best control. *(Author's summary)* F01

0724

*GESELL, S.G.; HOWER JUNIOR, A.A. 1973. Garden symphylan: comparison of row and broadcast application of granular insecticides for control. Journal of Economic Entomology 66(3):822-823.

3589

0725

GREENE, G.L. Economic damage levels of bean leaf roller populations on snap beans. Journal of Economic Entomology 64(3):673-674. 1971. Engl. Sum. Engl. 5 Refs.

Phaseolus vulgaris. Lepidoptera. Urbanus proteus. Productivity. Leaf area. Laboratory experiments. USA.

Urbanus proteus (L.) populations seldom cause yield reductions of snap beans in Florida. Yield reduction occurred after 725 cm^2 of leaf area per plant was removed. The first 3 larval stages do not reduce bean yields based on leaf area eaten and feeding habits. The 4th-stage larvae ate 27.7 cm^2 leaf area, and over 26 larvae per plant would reduce yields. The 5th-stage larvae ate 162.4 cm^2 leaf area, and 4.4 larvae per plant would result in yield reductions. Based on 50%

survival of individuals from one life stage to the next, an estimated 140.8 eggs per plant must be present to reduce yields of Florida snap beans. (Author's summary)

0726

25385. HOUGH-GOLDSTEIN, J.A.; HESS, K.A. 1984. SEEDCORN MAGGOT [DIPTERA:ANTHOMYIIDAE] INFESTATION LEVELS AND EFFECTS ON FIVE CROPS. ENVIRONMENTAL ENTOMOLOGY 13[4]:962-965. ENGL. SUM. ENGL., 14 REFS. [DEPT. OF ENTOMOLOGY & APPLIED ECOLOGY, UNIV. OF DELAWARE, NEWARK, DE 19717-1303, USA]

DURING 2 YR. OF FIELD EXPT. IN DELAWARE, USA, 5 CROPS SHOWED CONSISTENT DIFFERENCES IN THEIR RESPONSE TO DELIA PLATURA. WATERMELONS AND MELONS [CANTALDUPES] SHOWED GREATEST STAND LOSSES, SNAP BEANS AND LIMA BEANS WERE INTERMEDIATE, AND SWEET MAIZE APPEAREDTD BE UNAFFECTED DESPITE A SEED INFESTATION LEVEL OF AT LEAST 50 PERCENT. MORE THAN TWICE AS MANY LARVAE AND PUPAE WERE COLLECTED FROMLIMA BEANS THAN FROM THE MELON CROPS. THE SMALLEST NO. OF LARVAE AND PUPAE WERE TAKEN FROM PLOTS WHERE NO SEEOS WERE PLANTED. IN THESE PLOTS, LARVAE THAT WERE PRESENT EITHER IMMIGRATED BEFORE PUPATION OR DEVELOPED ON ORGANIC SO .L DEBRIS AND WEED SEEDS. IN 1982, THE BEAN AND MAIZE PLOTS PRODUCED HEAVIER PUPAE THAN THE MELON PLOTS. THUS, POPULATIONS OF D. PLATURA MAY BUILD UP MORE RAPIDLY IN BEAN AND MAIZECROP AREAS THAN IN THOSE PLANTED WITH MELONS, ALTHOUGH STAND LOSS MAYBE MORE EVIDENT IN THE LATTER. [AS].

D727

17301 JAGTAP, A.B.; AWATE, B.G.; NAIK, L.M. 1979. Chemical control of stem fly *Ophiomyia phaseoli* Tryon (Agromyzidae-Diptera) infesting French-bean (*Phaseolus vulgaris* Linn.) in Maharashtra. Journal of Maharashtra Agricultural Universities 4(1):83-84. Engl., Sum. Engl., 5 Refs.

Phaseolus vulgaris. Ophiomyia phaseoli. Insect control. Chemical control. India.

Three field-plot tests were carried out in Pune, Maharashtra, India, during the rabi seasons (Nov.-April) of 1975-78 to evaluate the effectiveness of foliar sprays of 9 insecticides for the control of *Ophiomyia phaseoli* (Tryon) on French bean. Percentage infestation 7 days after treatment showed that 0.03% diazinon and 0.05% quinalphos gave the best control of the agromyzid; treatment with the former compound was less expensive than that with the latter. *(Summary by Review of Applied Entomology)* F01

0728

19704 JARRY, M. 1981. Evolution of spatial pattern of attacks by Acanthoscelides obtectus Say (Coleoptera:Bruchidae) of Phaseolus vulgaris L. pods in South West France. In Labeyrie, V., ed. International Symposium on the Ecology of Bruchids Attacking Legumes (Pulses), Tours, France, 1980. Proceedings. The Hague, Junk. Series Entomologica v.19. pp.131-141. Engl., 20 Refs., Illus. [Université Francois Rabelais, Parc de Grandmont, 37200 Tours, France]

Phaseolus vulgaris. Acanthoscelides obtectus. Pods. Snap beans. Maturation. Plant injuries. France.

The frequency of attack of Acanthoscelides obtectus in snap beans was assessed in trials carried out in Aire sur Adour, SW France. Snap bean were planted in rows 1.50 m apart in isolated lots in the middle of maize fields in a 1:10,000 acreage ratio and over 500 m away from possible sources of infestation. Two harvesting techniques were used: (a) harvesting pods 5 days after maturity, and (b) simultaneous harvesting of pods of 27 plants chosen at random. Attack was evaluated by the frequency of pods giving one emergence or more adults in the lab. Isolation of lots did not prevent 57 out of the 58 plants from being colonized by adult A. obtectus, implying that the insects must be present on the plants before pod maturity or they respond immediately after pod ripening and to the sensitive phenological stage reached. The rate of attack was remarkably constant in space and time, attributed to the reduced female reproductive activity during the test period. Harvesting technique did not seem to alter considerably the results. The implications of these results for methods of protection against A. obtectus are analyzed and the most promising line of research is indicated. (Summary by EDITEC. Trans. by L.M.F.) F01

0729

*LAMBDIN, P.L.; BAKER, A.M. 1986. Evaluation of dewinged spined soldier bugs, Podisus maculiventris (Say), for longevity and suppression of the Mexican bean beetle, Epilachna varivestis Mulsant, on snapbeans. Journal of Entomological Science 21(3):263-266.

0730

27215. MAYSE, M.A.; GONZALEZ, A.R. 1984. LEAFMINER MAY CAUSE PROBLEMS IN ARKANSAS VEGETABLE CROPS. ARKANSAS FARM RESEARCH 33(1):2. EN. IL.

A NEW LEAFMINER, LIRIOMYZA TRIFOLII, WAS FOUND INFESTING BEAN PLANTS IN A FALL 1980 VAR. TRIAL AT THE U. OF ARKANSAS AGRICULTURAL EXPT. STATION IN FAYETTEVILLE, USA. FIELD TESTS CONDUCTED IN CALIFORNIA AND FLORIDA SUGGEST THAT L. TRIFOLII HAS DEVELOPED RESISTANCE TO MANY COMMERCIALLY AVAILABLE CHEMICAL INSECTICIDES. THUS, THIS LEAFMINER, PREVIOUSLY UNRECORDED IN ARKANSAS, REPRESENTS A POTENTIAL PEST TO VARIOUS VEGETABLE CROPS. [ENTOMOLOGY ABSTRACTS].

0731

20046 MELLORS, W.K.; BASSOW, F.E. 1983. Temperature-dependent development of Mexican bean beetle (Coleoptera:Coccinellidae) immatures on snap bean and soybean foliage. Annals of the Entomological Society of America 76(4):692-698. Engl., Sum. Engl., 11 Refs., Illus. [Dept. of Entomology, Univ. of Maryland, College Park, MD 20742, USA]

Phaseolus vulgaris. Snap beans. Epilachna varivestis. Insect biology. Temperature.

Developmental periods and survival were determined for immature stages of the Mexican bean beetle (Epilachna varivestis) at constant temp. of 11, 15, 20, 25, and 30°C. Rearings were conducted on greenhouse-grown snap bean foliage and soybean foliage, and field-grown soybean foliage. Comparisons between rearings on greenhouse snap bean and greenhouse soybean foliage

indicated that larval developmental periods for individual instars did not differ between host plants, but larval survival was different depending on temp. Comparisons between rearings on greenhouse and field soybean foliage indicated no differences in larval developmental periods or survival. The constant temp. developmental rates for eggs and larvae permitted satisfactory simulation of egg and larval development under changing temp. regimes in the lab. For each stage, a fitted equation for the developmental rate - temp. relationship on snap bean and on soybean foliage was determined. (Author's summary) F01

0732

25623. MORGAN, W.L. 1983. FOR BEAN FLY CONTROL USE WHITE OIL-NICOTINE SULPHATE MIXTURE. AGRICULTURAL GAZETTE OF NEW SOUTH WALES 49:22-24. ENGL. ILLUS.

DAMAGE SYMPTOMS OF THE BEAN FLY ARE DESCRIBED, AND OBSERVATIONS ON ITS BIOLOGICAL CYCLE ARE GIVEN IN ADDITION TO CHEMICAL CONTROL RECOMMENDATIONS. UNDER WARM CONDITIONS LARVAE LAST 8-9 DAYS AND PUPAE, 9-10 DAYS. IN FALL AND WINTER EGGS LAST 4-7 DAYS, LARVAE 3-4 WK., AND PUPAE 2-3 WK.; ADULTS LIVE 3-4 WK. THE AV. NO. OF EGGS LAID BY 17 FEMALES WAS 99. A MIXTURE OF NICOTINE SULFATE [1:800 DILUTION] + WHITE OIL EMULSION [1:100 DILUTION] APPLIED 4 DAYS AFTER PLANT EMERGENCE, AND THEN AT 4-DAY INTERVALS, IS RECOMMENDED. [CIAT].

0733

23900 MOTE, U.N. 1983. Seasonal incidence and chemical control of stem fly on French bean and pea. Journal of Maharashtra Agricultural Universities 8(2):159-161. Engl., Sum. Engl., 7 Refs., Illus. [Mahatma Phule Agricultural Univ., Rahuri-413 722, India]

Phaseolus vulgaris. Ophiomyia phaseoli. Insect control. Chemical control. Snap beans. Yields. India.

Investigations were carried out on seasonal incidence and chemical control of Ophiomyia phaseoli on French bean and pea in India. The infestation of the pest starts from the 2nd wk. after sowing and reaches its peak during the 10th wk. Thereafter the infestation decreases gradually in both kharif (July-Oct.) and summer seasons. Spraying of dimethoate (0.03%) and diazinon (0.03%) reduced pest incidence and increased yield. Among the granular insecticides, phorate and aldicarb at 1 kg a.i./ha at sowing increased yield and reduced stem fly damage considerably. (Author's summary) F01

0734

29178 MUNTHALI, D.C. ; WYATT, I.J. 1986. Factors affecting the biological efficiency of small pesticide droplets against Tetranychus urticae eggs. Pesticide Science 17[2]:155-164. En., Sum. En., 19 Ref., Il.

Phaseolus vulgaris. Snap beans. Tetranychus urticae. Acaricides. Malawi.

The interaction between droplet size [18-146 microns] and pesticide concn. [0.5-40.0 g a.i./liter] on the biological efficiency of small, monosized spray droplets was assessed by determining the effects on mortality of

Tetranychus urticae eggs using oil-based formulations of dicofol as the toxicant and leaf discs of French bean cv. The Prince as the test surface. A positive curvilinear relationship was found between the spacing of droplets that was required to produce 50 percent kill (LS50) and the original diameter of the droplet, D, such that LS50 = 14.48D(b), where b varied from 0.65 to 1.44 and bore a U-shaped relationship to concn. The optimum concn. was therefore approx. 10 g/liter. The theoretical, practical, and economic implications of these results are discussed. (AS)

0735

20665 OLIVEIRA, A.M. DE; COELHO, R.G.; SUDO, S.; LEAL, N.R.; LIBERAL, M.T. 1982. Incidencia de Thecla jebus Godart, 1819 (Lepidoptera:Lycaenidae) em cultivares de feijao-de-vagem, no municipio de Itaguaí, Estado do Rio de Janeiro. [Incidence of Thecla jebus (Lepidoptera:Lycaenidae) on snap bean cultivars in the municipality of Itaguaí, state of Rio de Janeiro]. Anais da Sociedade Entomológica do Brasil 11(1):163-166. Port., Sum. Port., Engl., 4 Refs. [Empresa de Pesquisa Agropecuária do Estado do Rio de Janeiro, Estacao Experimental de Itaguaí, Estrada Rio Sao Paulo, km 47, 23.460 Seropédica-RJ, Brasil]

Phaseolus vulgaris. Thecla jebus. Cultivars. Snap beans. Insect biology. Plant injuries. Resistance. Brazil.

The incidence of Thecla jebus on snap bean cv. Campineiro, Kentucky Wonder, Macarrao, Namorada de Atlabia, Romano, and Teresópolis under field conditions was evaluated in the municipality of Itaguaí, RJ, Brazil. The % of pods attacked ranged from 2.67 to 4.27, with cv. Kentucky Wonder with the highest % and Romano and Macarrao with the lowest (2.75 and 2.67%, resp.). Larval stage averaged about 15 days and the pupal stage 8 days. (Summary by L.M.F.) F01

0736

1567 PLAY, W.E. and OLIVER, W.N. Curly top prevention by vector control on snap beans grown for seed. Journal of Economic Entomology 57(1):3-5. 1964. Engl., Sum. Engl., 2 Refs.

Phaseolus vulgaris. Entomology. Injurious insects. Cicadellidae. *Circulifer tenellus*. Insect control. Cultivars. Chemical control. Field experiments. Curly top. Viroses. Host-plant resistance.

Laboratory tests in 1959 showed that a combination spray of phorate and juice from curly top-resistant sugar beets controlled the beet leafhopper, *Circulifer tenellus* (Baker), and curly top on french beans. Since then, further tests, have shown that some systemic insecticides and juices from some varieties of beets were superior to others. Combination sprays of systemic insecticides and sugar also showed promise. The factors involved in these methods of reducing curly top were not determined. *(Author's summary)* F01 E04

0737

19069 PENMAN, D.R.; CHAPMAN, R.B. 1983. Fenvalerate-induced distributional imbalances of two-spotted spider mite on bean plants. Entomologia Experimentalis et Applicata 33:71-78. Engl., Sum. Engl., Fr., 17 Refs., Illus. [Dept. of Entomology, Lincoln College, Canterbury, New Zealand]

Phaseolus vulgaris. Snap beans. Tetranychus telarius. Mite control. Chemical control.

The pyrethroid fenvalerate-induced avoidance was repellent to adult female two-spotted spider mites, Tetranychus urticae, on treated French dwarf bean plants. With treatment of halves of primary leaves, T. urticae showed significant avoidance of fenvalerate-treated halves and significant spin-down to leave the plant when whole leaves were treated. Azinphosmethyl and water treatments had no effect on mite distribution. Proportional treatment of leaves of Vicia faba induced spin-down where any fenvalerate was added. No colonization took place on fenvalerate-treated leaves. Where the basal release leaf, on which the artificial colonization took place, was sprayed, mites either left the plant or located unsprayed leaves. Complete coverage of the plant with fenvalerate significantly reduced the remaining mite population. Implications of these distributional imbalances in understanding pyrethroid-induced spider mite outbreaks are discussed. (Author's summary) F01

0738

17706 POHRONEZNY, K.; McSORLEY, R.; WADDILL, V.H. 1981. **Integrated management of pests of snap bean in Florida.** Proceedings of the Florida State Horticultural Society 94:137-140. Engl., Sum. Engl., 17 Refs., Illus.

Phaseolus vulgaris. Snap bean. Cultivation. *Diabrotica balteata*. *Trichoplusia ni*. *Liriomyza* spp. *Pythium* spp. Disease control. Insect control. *Rotylenchulus reniformis*. Nematode control. Chemical control. USA.

Insects, diseases, and nematodes were monitored in several expt. in Homestead (Florida, USA) area snap bean fields. Traditional management (TM) plots were compared with adjacent integrated pest management (IPM) plots. Although low levels of insect defoliators, such as banded cucumber beetle (*Diabrotica balteata*) and cabbage looper (*Trichoplusia ni*), were present, in addition to moderate levels of the vegetable leafminer (*Liriomyza sativae*), levels of defoliation in the IPM plots did not exceed action thresholds of 20 and 10% for prebloom and postbloom, resp. Extension recommendations were developed for an insecticide spray at the pinpod stage, based on monitoring of crop phenology. There were substantial savings in insecticide costs in the IPM plots compared with the TM plots, ranging from 48-83% , with no demonstrable reduction in yield or quality. In 2 of 3 large-plot demonstration tests, there was significant insecticide-induced buildups of vegetable leafminer populations in the TM plots. A *Pythium* crown rot was identified during the course of 1 of the demonstration expt. and appropriate alternatives in the fungicide spray program were initiated. Yields of snap beans were negatively correlated with populations of *Rotylenchulus reniformis* at harvest, but not with populations of *Quinisulcius acutus* or *Helicotylenchus dihystera* at anytime in crop development. In several expt. in commercial fields, growers did not experience sufficient nematode populations to significantly affect yield. *(Author's summary)* F01

0739

18518 PUTTASWAMY.; REDDY, D. N. R. 1981. Record of some new pests infesting French bean (Phaseolus vulgaris L.) a popular vegetable. Current Research 10(3):39-41. Engl., 6 Refs., Illus.

Phaseolus vulgaris. Snap beans. Frankliniella dampfi. Scirtothrips. Ascotis imperata. Diacrisia obliqua. Polyphagotarsonemus latus. India.

In a survey in Karnataka, India, in July-Oct. 1980, Ascotis imperata, Spilosoma obliqua (Diacrisia obliqua), Frankliniella schultzei, Megalurothrips distalis, Scirtothrips dorsalis, and Polyphagotarsonemus latus were found infesting French bean for the 1st time. Of these, A. imperata, S. obliqua, and P. latus were considered important. (Summary by Review of Applied Entomology) F01

0740

8942 ROGERS, D.J. **Studies in host plant resistance involving the french bean (*Phaseolus vulgaris* L.) and the bean fly [*Melanagromyza phaseoli* (Tyron)]** Mag. Sc. Thesis. Brisbane, University of Queensland, 1974. 114p. Engl., Sum. Engl., 81 Refs., Illus.

Phaseolus vulgaris. Melanagromyza phaseoli. **Host-plant resistance. Insect biology. Experiment design. Cultivars.**

Host plant resistance to the bean fly *Melanagromyza phaseoli* (Diptera, Agromyzidae) was studied in french beans (*Phaseolus vulgaris*). It was possible to develop parameters that permit the quantification of host plant resistance characters. These parameters and the character they measure are (1) viable *M. phaseoli* eggs. laid/plant, which quantified ovipositional nonpreference; (2) percentage of survival from egg hatch until adult emergence, mean development period and mean female size, which quantify various aspects of antibiosis; and (3) the slope of the linear regression line relating to *P. vulgaris* yield and *M. phaseoli* infestation level, which allows differences in plant tolerance to be measured. Factors influencing the validity of these parameters are (a) competition among *M. phaseoli* females for oviposition sites and (b) larval-density-related effects on characters in (2) as the *M. phaseoli* larval density increases. It was shown experimentally that of these factors, only larval and pupal development period was affected, this parameter decreasing as the *M. phaseoli* level rose. "No choice" host plant resistance tests gave highly variable results. Of the "choice" exposure techniques examined, the use of a circular rotating cage and a modified latin square experimental design allowed control over light-related ovipositional preference gradients. The rotating cage ensured that all plants in a replication received the same light exposure while the experimental design made it possible to measure the ovipositional preference gradients within the cage. The ovipositional preference status of the *P. vulgaris* varieties was significantly correlated with leaf hairiness, stem thinness and internode length. No significant differences were found for antibiosis, larval and pupal survival, mean development period and mean female size. There were significant differences among varieties with regard to slope of the pest infestation level, plant yield line, indicating differences in tolerance. Seed wt. plant declined linearly with an increase in the no. of *M. phaseoli* eggs. plant. Yield components affected by *M. phaseoli* infestation were different for different *P. vulgaris* varieties, suggesting that different compensatory mechanisms may exist. Sufficient data were obtained to plant a breeding program aimed at producing a *P. vulgaris* variety resistant to *M. phaseoli*. (*Summary by T.M.*) F01

0741

17772 SINGH, S.J.; SASTRY, K.S.; SASTRY, K.S.M. 1981. **Field tests with insecticides and mineral oil for the protection of French beans from yellow mosaic virus disease.** Gartenbauwissenschaft 46(2):88-91. Engl., Sum. Engl., Germ., Fr., Russ., 6 Refs.

Phaseolus vulgaris. Snap beans. *Bemisia tabaci.* **Insect control. Chemical control. Bean yellow mosaic virus. Disease control. India.**

In a 3-yr trial conducted at the exptl. farm of the Indian Institute of Horticultural Research, Hessaraghatta, Bangalore (India), plants of French bean cv. Contender, were sprayed 4 times at 10-day intervals with one of 8 insecticides (monocrotophos, dimethoate, mancozeb, carbaryl, chlorfenvinphos, endosulfan, leptophos, and tetrachlorvinphos) or 1% mineral oil to control whitefly (*Bemisia tabaci*), the vector of BYMV. In the 2 later yr 4 granular insecticides (carbofuran, fensulfothion, disulfoton, and phorate) were also used on other plots before planting. In general monocrotophos and dimethoate each at 0.05% or mineral oil controlled whitefly and reduced BYMV incidence; the granular insecticides were also

effective. Plots of plants free from BYMV produced nearly double the yield of control plots of infected plants. *(Summary by Field Crop Abstracts)* F01 E04

0742

14331 STEWART, R.K. and KHATTAT, A.R. **Economic injury levels of the tarnished plant bug, *Lygus lineolaris* [Hemiptera (Heteroptera): Miridae], on green beans in Quebec.** Canadian Entomologist 112(3):306-310. 1980. Engl., Sum. Engl., 9 Refs., Illus.

Phaseolus vulgaris. Injurious insects. *Lygus lineolaris.* Economic injury thresholds. Flowering. Podding. Pods. Yields. Chemical control. Costs. Canada.

Caged microplots of "Contender" green beans were artificially infested with various densities of *Lygus lineolaris* to determine the effect of feeding on yield and quality, and to establish economic injury levels. Plants infested at bloom or pod set stage were more severely injured than those infested at the flower bud stage. Higher infestation levels reduced crop yield, but the % of CP in bean seeds was not affected. Based on 1975 crop values and chemical control costs, economic injury levels ranged between 0.3 and 4.4 insects/10 plants depending on crop use, chemical control, and plant stage infested. *(Author's summary)* F01

0743

14332 STEWART, R.K. and KHATTAT, A.R. **Pest status and economic thresholds of the tarnished plant bug, *Lygus lineolaris* (Hemiptera (Heteroptera): Miridae), on green beans in Quebec.** Canadian Entomologist 112(3):301-305. Engl., Sum. Engl., 10 Refs., Illus.

Phaseolus vulgaris. Injurious insects. *Lygus lineolaris.* Economic injury thresholds. Insect biology. Insect control. Pesticides. Planting. Spacing. Timing.

Adult and nymphal populations of the tarnished plant bug, *Lygus lineolaris*, on "Contender" green beans were sampled during the summers of 1971-72. Sweep net and D-Vac suction apparatus samples were taken concurrently, and both estimates were compared by regression analysis. The tarnished plant bug reached levels above the economic injury levels for both early and late crops in 1971-72. The economic threshold was determined as 0.5 insect/10 plants below the economic injury level. *(Author's summary)* F01

0744

28937 TABANGIN, N.T. ; TABBUAC, A.T.; TIBUNSAY, G.B.; CARDONA JUNIOR, E.V. 1980. Seasonal abundance of thrips on snap beans with notes on their insecticidal control. MSAC Research Journal no.6-7:56-63. En., Sum. En., 6 Ref., Il.

Phaseolus vulgaris. Snap beans. Thysanoptera. Insect control. Chemical control. Philippines.

Thrip population during the planting season (Nov. 1978-May 1979) and the effect of insecticide application to control thrips were studied at the College Exptl. Station of Mountain State Agricultural College (La Trinided, Benguet, Philippines). Snap bean leaves were sampled weekly with the aid of a magnifying glass. The efficacy of the insecticides was determined by the no. of thrips found before and after application. The heaviest infestations occurred during the vegetative and the flower initiation

stages. Consequently, peak infestetion was during Jan. and Feb. Thrip population decreased considerably from April to May. Strict control of thrips is necessary during peak mo. Phosalone (Zolone 35 percent emulsifiable concentrate) at 500, 600, and 700 g a.i. is recommended. (AS)

0745

7959 VEA, E.V. and ECKENRODE, C.J. **Resistance to seedcorn maggot in snap bean.** Environmental Entomology 5(5):735-737. 1976. Engl., Sum. Engl., 8 Refs.

Phaseolus vulgaris. Hylemya platura. **Cultivars. Host-plant resistance. Laboratory experiments. Field experiments. USA.**

Colored-seeded french bean *Phaseolus vulgaris* (L.) lines PI 165426, PI 16435 and Cornell 2114-12 were resistant to the seedcorn maggot *Hylemya platura* (Meigen) in laboratory and field tests. A colored-seeded commercial variety Spartan Arrow showed moderate resistance while all white-seeded french bean cultivars tested were susceptible. It appears that rapid emergence and/or hard seed coat influence resistance to seedcorn maggot in french beans. (*Author's summary*) F01

0746

23653 WADDILL, V.; POHRONEZNY, K.; McSORLEY, R.; BRYAN, H.H. 1984. Effect of manual defoliation on pole bean yield. Journal of Economic Entomology 77(4):1019-1023. Engl., Sum. Engl., 15 Refs., Illus. [Univ. of Florida, Inst. of Food & Agriculture Sciences, Tropical Research & Education Center, 18905 S.W. 280 Street, Homestead, FL 33031, USA]

Phaseolus vulgaris. Snap beans. Defoliation. Timing. Yields. USA.

Manual defoliation of pole snap bean McCaslan 42 resulted in yield losses which were best described by the quadratic model $y = a + b_1X + b_2X^2$ where y = yield and X = % of defoliation. The plants were most sensitive to one-time foliage loss 5 wk. after planting. The removal of both primary leaves, when only primary leaves were present, reduced yield by approx. 65%. Repeated weekly defoliation of 50% resulted in yield losses of approx. 34%. (Author's summary) F01

0747

25364. WEINZIERL, R.; FISHER, G.; KOEPSELL, P. 1982. OREGON STATE UNIVERSITY'S EXTENSION PEST MANAGEMENT PROGRAM FOR SNAP BEAN PRODUCTION. BEAN IMPROVEMENT COOPERATIVE. ANNUAL REPORT 25:14-15. ENGL. [OREGON STATE UNIV., CORVALLIS, OR 97331, USA]

WORK CARRIED OUT BY THE EXTENSION PEST MANAGEMENT PROGRAM FOR SNAP BEAN PRODUCTION OF OREGON STATE U. [USA], AND PLANS FOR 1982, ARE REPORTED. BRIEF INFORMATION IS PROVIDED ON SCUTIGERELLA IMMACULATA, DIABROTICA UNDECIMPUNCTATA, MOLDS [SCLEROTINIA SCLEROTIORUM AND BOTRYTIS CINEREA], AND OTHER PROBLEMS. [CIAT].

G00 GENETICS AND PLANT BREEDING

0748

1689 ATKIN, J.D. **Nature of the stringy pod rogue of snap beans,** *Phaseolus vulgaris.* Search Agriculture 2(9):1-3. 1972. Engl., Sum. Engl., 7 Refs.

Phaseolus vulgaris. **Pods. Crossbreeding. Pod characters. Mutation. Processing. Laboratory experiments. USA.**

Seventeen stringy pod rogues from 2 french bean breeding lines and 2 var. were identical with their respective parents in all characters, except the pod string which is a problem in canning and freezing. All bred true for the stringy character, and in crosses with the parents there was generally a segregation of stringless:stringy in a 3:1 ratio, indicating that stringy pods resulted from a single recessive gene. Crosses among rogues produced stringy plants in the F_1 and F_2, and it is concluded that the rogues are identical with respect to pod string. (*Summary by Plant Breeding Abstracts*) G00

0749

24280 CARRIJO, I.V.; BAKIA, W.H.; MACIDO, A.A. 1983. Feijao-vagem Macarrao Favorito Ag 480. (Snap beans Macarrao Favorito Ag 480). Horticultura Brasileira 1(1):51. Port.

Phaseolus vulgaris. Snap beans. Cultivars. Resistance. Uromyces phaseoli. Erysiphe polygoni. Brazil.

The origin, characteristics, uses, and adaptation of the new high yielding snap bean cv. Macarrao Favorito Ag 480 are briefly described. This cv. is resistant to Uromyces phaseoli and Erysiphe polygoni. [CIAT]

0750

12676 COLLINS, J.L. **Quality of snap beans for canning and freezing-1976 crop.** Tennessee Farm and Home Science Progress Report no. 103:29-32. 1977. Engl., 5 Refs.

Phaseolus vulgaris. **Plant breeding. Cultivars. Industrialization. Pods. Seed characters.**

Data are included on the physical characteristics of 30 freshly harvested breeding lines and french bean cv. *(Summary by Horticultural Abstracts)* G00

0751

5771 COYNE, D.P. **Breeding behavior and effect of temperature on expression of a variegated rogue in green beans.** Journal of the American Society of Horticultural Science 94:488-491. 1969. Engl., Sum. Engl., 14 Refs., Illus.

Phaseolus vulgaris. **Plant breeding. Temperature. Crossbreeding. Leaves. Laboratory experiments. Pods. Field experiments.**

Mosaiclike, crinkled-leafed variegated rogues were found in the Stringless Green Refugee french bean variety. Grafting experiments suggested that this condition was not due to an infectious virus. The degree of symptom expression was influenced by temperature; symptoms were almost completely masked at 80°F. This suggests that effective selection against the rogue should be done in cool climates. Differences in the expression of the character was observed between field- and greenhouse-grown plants. Segregation in the F_2 G.N. 1140 x variegated rogue indicated that this character was controlled by a major gene, with variegation being recessive. In reciprocal crosses between 2 bush Blue Lake lines x variegated rogue, almost complete elimination of the variegated

plants was noted in segregating generations. The similarity of some of these results to serotype mechanisms and/or virus tolerance is discussed. *(Author's summary)* G00

0752

9017 DAVIS, J.H.C. and EVANS, A.M. **Selection indices using plant type characteristics in navy beans (*Phaseolus vulgaris* L.)** Journal of Agricultural Science 89:341-348. 1977. Engl., Sum. Engl., 16 Refs.

Phaseolus vulgaris. **Cultivars. Selection. Plant breeding. Yields. Seed. Pods. Yield components. Agronomic characters.**

A replicated trial of 18 families of navy bean breeding lines in the F_4 generation was grown at Cambridge. The selection-index technique was used to investigate means of improving the efficiency of simultaneous selection for 4 criteria: yield, seed shape (numerical scores from 'good' to 'poor'), early maturity and increased height of pod tips. Relative economic weights were chosen. The yield components and a range of characters describing plant type were measured making 15 characters in all, and combinations of these were include in 32 indices. It was predicted that simultaneous selection would be limited by adverse correlations between some of the 4 selection criteria, especially early maturity and height. The estimated efficiency of selection would hardly be improved by including information on the yield components. Combinations of the plant type characters, on the other hand, were predicted to provide considerable additional advance amounting to a 10% improvement when information on total no. of nodes and inflorescences and hypocotyl diameter was included. It was concluded that the time involved in collecting yield component data would be better spent collecting information on a limited number of plant type characteristics in future trials, and that an ideal plant was one with reduced branching and a few heavily podded inflorescences born on a tall plant with a strong base. *(Author's summary)* G00

0753

25356. GOMES, M.M.; LEAL, N.R.; CORDEIRO, A.R. 1984. PADROES ELETROFORETICOS EM PROGENITORES E LINHAGENS DE FEIJAO-DE-VAGEM (PHASEOLUS VULGARIS L.). (ELECTROPHORETIC PATTERNS IN FRENCH BEAN LINES AND THEIR PROGENITORS). REVISTA CERES 31(176):231-237. PORT. SUM. PORT., ENGL., 15 REFS., ILLUS. (ESTACAO EXPERIMENTAL DE ITAGUAI, ESTRADA RIO-SAO PAULO KM 47, 23.460 SEROPEDICA, ITAGUAI-RJ, BRASIL)

EXTRACTS FROM SEEDLINGS AND GERMINATING SEEDS OF 3 DWARF FRENCH BEAN VAR. (BUSH BLUE LAKE 274, GREEN ISLE, AND CASCADE) AND 4 BREEDING LINES (6204, 6163, 6185-C, AND 6185-CA) WERE INVESTIGATED BY HORIZONTAL POLYACRYLAMIDE GEL ELECTROPHORESIS. NO DIFFERENCES WERE FOUND IN PEROXIDASE OR ACID PHOSPHATASE ELECTROPHOREGRAM PATTERNS. BUSH BLUE LAKE 274 DIFFERED FROM GREEN ISLE AND CASCADE IN THE PATTERNS PRESENTED BY LEUCINE AMINOPEPTIDASE AND SOLUBLE NONENZYME PROTEINS. LINE 6204 DISPLAYED THE SAME PATTERNS AS CASCADE, WHILE THE COMMON PATTERN OF THE OTHER 3 LINES WAS DIFFERENT AGAIN. AMONG THEM, 6163 DIFFERED FROM 6185-C AND 6185-CA IN ITS ESTERASE PATTERN. IT WAS CONCLUDED THAT THE DIFFERENCES

FOUND AMONG THE MATERIALS STUDIED WERE SLIGHT BECAUSE OF THE NARROW GENETIC BASE, THE SYSTEM OF REPRODUCTION, AND CONVERGENT SELECTION. NEVERTHELESS, COMPARISON ON THIS BASIS COULD SERVE AS A USEFUL COMPLEMENT TO MORPHOLOGICAL AND AGRONOMIC FEATURES IN THE CHARACTERIZATION OF CV. [PLANT BREEDING ABSTRACTS].

0754

24883 GOVINDARASU, P.; PAMPATH, V. 1981. Genetic variability in snap bean (Phaseolus vulgaris L.). Legume Research 6(2):97-98. Engl., 9 Refs. [Horticultural Research Station, Kodaikanal-624103, Tamil Nadu, India]

Phaseolus vulgaris. Snap beans. Yields. Yield components. Genetics. Inheritance. Plant breeding. India.

Studies on genetic variability in snap beans were conducted at the Horticultural Research Station, Kodaikanal (Tamil Nadu, India), to investigate the magnitude of genetic variability, heritability, and expected genetic advance for yield and its components so as to serve as the basis for further breeding programs for the region. Twenty-one dwarf snap bean cv. of diverse origin were grown in a randomized complete block design with 3 replications. It is indicated that wt. and no. of pods exhibited a high genetic coefficient variation, heritability, and genetic advance as % of mean; they thus form the most reliable indices for selection in snap beans. [CIAT]

0755

14756 HAMAD, I.A. **Inheritance of yield, yield components, number of days to flowering, plant height and incidence of interlocular cavitation of pods in snap beans** *(Phaseolus vulgaris* L.). Ph.D. Thesis. Madison, The University of Wisconsin, 1975. 118p. Engl., Sum. Engl., 81 Refs., Illus.

Phaseolus vulgaris. Yields. Yield components. Agronomic characters. Inheritance. Hybridizing. Plant habit. Flowering. Plant development. Plant breeding. Selection.

Five snap bean cv. (Green Isle, Tempo, Bush Blue Lake 274, GalaGreen and Cascade) were selected as parents and crossed in all possible combinations to produce a diallel set without reciprocals. In the 1st expt., parents, F_1's and F_2's were evaluated for yield/plant (as total wt. of immature pods/plant), no. of pods/plant, individual pod wt., no. of days to flowering, plant height and incidence of interlocular cavitation of pods. Additive genetic variance was predominant for all traits except yield/plant, no. of pods/plant and individual pod wt. Dominance variance was predominant for all traits except plant height and interlocular cavitation. Overdominance was observed for yield/plant, no. of pods/plant and individual pod wt. No. of days to flowering, plant height and interlocular cavitation exhibited partial dominance. Narrow-sense heritability estimates were calculated as the ratio of additive to total phenotypic variance. The low estimates obtained for yield/plant, no. of pods/plant and individual pod wt. indicated that early generation selection for improved yield would be inefficient and would result in limited gain. Heterosis for yield/plant, no. of pods/plant, individual pod wt. and no. of days to flowering was calculated as % superiority of the F_1 hybrid over the better parent. The ranges were 23-73% for yield/plant, 21-65% for no. of pods/plant, 1-15% for individual pod wt. and 14-30% for days to flowering. In the 2nd expt., parents and F_2's were evaluated for seed yield/plant (as total no. of seeds/plant), no. of dry pods/plant, 100-seed wt., and no. of seeds/pod. Additive genetic variance was predominant for all traits. Inheritance of seed yield exhibited gene interaction when Tempo was included, but without Tempo the inheritance was additive. Overdominance for high no. of pods was observed. Seed yield and seeds/pod showed partial dominance while 100-seed

wt. showed little or no dominance. Seed yield/plant was positively correlated with no. of pods/plant and seeds/pod. No significant correlations were observed between seed yield/plant and 100-seed wt. No. of pods/plant was positively correlated with 100-seed wt. but negatively correlated with seeds/pod. Positive and negative correlations were found between 100-seed wt. and seeds/pod. The positive correlation between no. of pods/plant and 100-seed wt. suggest that both traits could be improved sumultaneously. Negative correlations among the yield components may cause difficulty in combining desirable levels of these components for high yield. *(Summary by Dissertation Abstracts International)* G00

0756

24279 MALUF, W.R.; FERREIRA, P.E. 1983. Análise multivariada da divergencia genetica em feijao-vagem (Phaseolus vulgaris L.). (Multivariate analysis of genetic diversity in snap bean). Horticultura Brasileira 1(2):31-34. Port., Sum. Port., Engl., 8 Refs., Illus. [Empresa Brasileira de Pesquisa Agropecuária, Centro Nacional de Pesquisa de Hortalicas, Caixa Postal 11.1316, 70.333 Brasilia-DF, Brasil]

Phaseolus vulgaris. Snap beans. Cultivars. Crossbreeding. Genetics. Yields. Brazil.

Genetic diversity among 10 bush snap bean cv. (Astro, Bush Blue Lake 47, Bush Blue Lake 92, Cape, Checkmate, Eagle, Goldrush, Provider, Strike, and XPB 3069) was studied by multivariate analysis tehniques. Little diversity was found between Bush Blue Lake 47 and Eagle, and between Bush Blue Lake 92 and Cape. Large diversity was found between Checkmate and Provider, Astro and Strike, Provider and Strike, and Astro and Bush Blue Lake 47. For breeding purposes, the crosses Bush Blue Lake 92 x Strike, Cape x Strike, or Cape x XPB 3069, which combine high parental av. with considerable genetic diversity, are recommended. (Author's summary) G00

0757

26093. MURRAY, M.G.; KENNARD, W.C. 1984. ALTERED CHROMATIN CONFORMATION OF THE HIGHER PLANT GENE PHASEOLIN. BIOCHEMISTRY 23(18):4225-4232. ENGL., SUM. ENGL., 41 REFS., ILLUS. [AGRIGENETICS ADVANCED RESEARCH DIVISION, AGRIGENETICS CORPORATION, MADISON, WI 53716, USA]

MICROCOCCAL NUCLEASE, DNASE I, AND S1 NUCLEASE WERE USED TO PROBE ALTERATIONS IN THE CHROMATIN CONFORMATION OF PHASEOLIN GENES WHICH ENCODE THE MAJOR SEED STORAGE PROTEINS OF THE FRENCH BEAN CV. TENDERGREEN. COMPARISONS WERE MADE BETWEEN COTYLEDON TISSUE WHERE THE GENES ARE EXPRESSED AND LEAF TISSUE WHERE THE GENES ARE NOT EXPRESSED. PHASEOLIN GENES ARE PREFERENTIALLY SENSITIVE TO DNASE I IN COTYLEDONS RELATIVE TO LEAVES. DNASE I HYPERSENSITIVE SITES COULD NOT BE IDENTIFIED IN THE FLANKING DNA OF PHASEOLIN GENES IN CHROMATIN. ALTHOUGH S1 NUCLEASE HYPERSENSITIVE SITES COULD BE IDENTIFIED IN DNA SEQUENCES FLANKING THE PHASEOLIN GENES WHEN ANALYSIS WAS PERFORMED ON PURE, SUPERCOILED DNA, THEY COULD NOT BE DEMONSTRATED IN CHROMATIN. [AS [EXTRACT]].

0758

13599 NATARAJAN, S. and ARUMUGAM, R. **Studies on variability in french beans (*Phaseolus vulgaris* L.).** Madras Agricultural Journal 66(2):89-93. 1979. Engl., Sum. Engl., 7 Refs.

Phaseolus vulgaris. **Plant breeding. Genes. Yield components. Selection.**

Studies on the variability of french beans revealed wider variations for wt. and no. of pods/plant and length and ϕ of the pod. The genetic analysis showed high genotypic C.V. genetic variance and genetic C.V., heritability, as well as genetic advance for wt. of pods and no. of pods/plant. Thus, the no. and wt. of pods/plant with additive gene effects would serve as useful indices for selection in french beans. *(Author's summary)* G00

0759

9991 PRAKKEN, R. **Linkage relations in *Phaseolus vulgaris* L.** Genetica 19:242-272. 1937. Engl., Sum. Engl., 13 Refs.

Phaseolus vulgaris. **Inheritance. Seed color. Seed coat. Plant habit. Backcrossing. Pod characters. Agronomic characters.**

The cross of the french beans Fijne Tros and Wagenaar was analyzed for 10 factors (stem height, strength of the string, toughness of the pod wall, 7 color factors); their linkage relations are discussed here. The material consisted of 2042 F_2 and 434 backcross plants. Only one F_2 family (of 219 plants) segregated for the shine factor for seed coat color *Sh-sh;* the information regarding the linkage relations of this factor is rather inadequate; no case of linkage with the other factors could be stated with certainty. The factors for mottling *C-c* and *M-m* are absolutely linked; Fijne Tros in *cM cM*, Wagenaar *Cm Cm;* the dominant allele *M* locally suppresses the darkening influence of the complementary color factor *C;* mottling therefore is of the ever-segregating type. A rather strong linkage exists between the complementary color factor *B-b* (called greenish brown later) and the factor for strength of string *St-st*. Fijne Tros is *BB St St*, Wagenaar *bb st st*. The crossover value computed from the F_2 material is 23.8 ± 1.27; from the backcross, 27.9 ± 2.15. All the remaining factors are inherited independently. *(Author's summary)* G00

11145 RUBAIHAYO, P.R. **Interrelationship among some yield characters and the productivity of mutants of three grain legumes.** *In* Evaluation of seed protein alterations by mutation breeding. Vienna, Austria. International Atomic Energy Agency, 1976. pp.179-184. Engl., Sum. Engl., 6 Refs.

Phaseolus vulgaris. **Mutation. Seed. Yields. Productivity. Cultivars. Yield components. Protein content. Statistical analysis.**

The effect of γ -ray-irradiation dosage and environmental conditions on yield component correlations was studied on french beans, white-seeded dry beans and soybeans. It was found that in general radiation dosage had no significant effects on these factors. Differences in the relationships in different generations were attributed to the environmental conditions under which the plants were grown during different generations. *(Author's summary)* G00

0761

24139 SALADIN G., F. 1984. Desarrollo, evaluación y utilización del germoplasma en República Dominicana. (Bean germplasm development, evaluation, and utilization in the Dominican Republic). In Reunión de Trabajo sobre Ensayos Internacionales de Fríjol, 1a., Cali, Colombia, 1984. Trabajos presentados. Cali, Centro Internacional de Agricultura Tropical. pp.211-220. Span.

Phaseolus vulgaris. Germplasm. Seed color. Cultivars. Resistance. Xanthomonas phaseoli. Uromyces phaseoli. Bean golden mosaic virus. Adaptation. Transfer of technology. Plant introductions. Snap beans. Dominican Republic.

Aspects of the breeding, evaluation, and utilization of beans in Dominican Republic, where 56.6% of the dry red mottled bean production occurs in a small-farming system with difficult access to technology transfer and adoption, are presented. Other production constraints are adverse climatic conditions, cropping systems that contribute to soil erosion and deforestation, lack of zonation of red and black type bean production, limited credit, and low quality seed. The bean breeding strategy is summarized. Lists are presented of red mottled, black, and white materials selected for resistance to either Xanthomonas phaseoli, Uromyces phaseoli, BGMV, or all, and for other improved characteristics (improved nodulation capacity). Superior native lines and new germplasm for commercial release are indicated. Emphasis will be placed on developing type II red mottled beans with multiple disease resistance for small farmers. (Summary by EDITEC) G00

0762

3084 STEVENS, M.A. **Chemistry and genetics of snap bean (*Phaseolus vulgaris* L.) flavor.** Ph.D. Thesis. Corvallis, Oregon State University, 1967. 137p. Engl., Sum. Engl., 101 Refs., Illus.

Phaseolus vulgaris. **Palatability. Processing. Crossbreeding. Cultivars. Pods. Seed. Analysis. Backcrossing. Inheritance.**

The objective of this study was to identify the volatile compounds in french beans, to ascertain which compounds are responsible for the large differences in flavor between varieties and to study the inheritance of these compounds. Low-temp, low-pressure distillation and direct liquid-liquid extraction were used to isolate the compounds from canned french bean liquor. Mass spectrometry in conjunction with a capillary column-equipped gas chromatograph, coincidence of relative retention times with authentic compounds and infrared spectroscopy were used to characterize the compounds in french bean essence. Of the compounds identified, it is believed that cis-hex-3-en-1-ol, oct-1-en-3-ol, linalool, α-terpineol, pyridine and furfural are of primary importance in french bean flavor. Differences among var. are analyzed on this basis. A maturity study showed that the concentration of oct-1-en-3-ol and linalool in the pod is dramatically influenced by stage of development; the concentration is relatively high in the young pod and decreases as it matures. Quantitative differences between var. were studied using a gas-entrainment on-column trapping technique. Based on differences found, the inheritance of oct-1-en-3-ol and linalool were studied using F_1 and F_2 progeny from reciprocals of the crosses FM-1L x G-50 and FM-1L x Romano. The inheritance of the former is controlled by a single gene and that of the latter by a single additive gene. These results are discussed in detail. (*Summary by T.B.*) G00

0763

8583 SWARUP, V. and GILL, H.S. **X-ray induced mutations in french bean.** Indian Journal of Genetics and Plant Breeding 28(1):44-58. 1968. Engl., Sum. Engl., 17 Refs.

Phaseolus vulgaris. **Mutation. Irradiation. K. Seed. Germination. Cultivars. Growth. Chlorophyll. Plant anatomy. Seed coat. Seed color.**

Induced mutations observed in the M_2, M_3 and M_4 generations of plants of *Phaseolus vulgaris* Wax Podded, which had been subjected to 3 X-ray treatments, are described. The inheritance of a desirable green pod mutation was studied in the M_3 and M_4; green pod color was controlled by a

single dominant gene. The variances of some polygenic characters, including pod no. and size, no. of seeds/pod, seed yield and 100-seed wt, were increased in the M_2 progenies although the means were displaced in a negative direction. Through recurrent selection several families with more pods and seeds/plant and higher 100-seed wt were isolated in the M_4. *(Summary by Plant Breeding Abstracts)* G00

0764

6864 TOYA, D.K., FRAZIER, W.A. and BAGGETT, J.R. **Inheritance of 1-octen-3-ol concentration in frozen pods of bush snap beans,** *Phaseolus vulgaris* L. Journal of the American Society for Horticultural Science 101(3):196-198. 1976. Engl., Sum. Engl., 11 Refs.

Phaseolus vulgaris. **Inheritance. Dwarf beans. Backcrossing. Analysis.**

Inheritance of the volatile flavor component 1-octen-3-ol in OSU 58-110 x Bush Romano FM-14 was determined, using GLC with gas-entrainment, on-column trapping. The low concentration of 1-octen-3-ol, characteristic of 58-110, was dominant in the F_1, F_2 and backcrosses. The range of concentration in each parent and the F_1 was about 80 ppb. The concentration in the F_1 was nearly identical to that of the low parent. F_2 and backcross data were continuous over a wider range of concentration than the parents or F_1. A definite bimodal distribution was not apparent. *(Author's summary)* G00

0765

27059. WARREN, A. 1985. ZIMBABWE: GREEN BEANS. IN BEAN PRODUCTION IN TANZANIA, MALAWI, ZAMBIA AND ZIMBABWE. REPORT OF A BEAN INFORMATION SURVEY IN AFRICA. CALI, COLOMBIA, CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL. 1P. EN. [9 HILLSIDE, ALLCRAFT ROAD, READING, ENGLAND]

MAIN GREEN BEAN VAR. GROWN IN ZIMBABWE ARE TOP CROP, CONTENDER, SEMINOLE, AND SLENDER WHITE. MAJOR PROBLEMS [DISEASES AND PESTS] ARE MENTIONED. [CIAT].

0766

4503 ZAEHRINGER, M.V., DAVIS, K.R. and DEAN, L.L. **Persistent-green color snap beans (*Phaseolus vulgaris* L.): color related constituents and quality of cooked fresh beans.** Journal of the American Society for Horticultural Science 99(1):89-92. 1974. Engl., Sum. Engl., 21 Refs.

Phaseolus vulgaris. **Seed color. Cooking. Cultivars. Cell structure. Vitamin content. Chlorophyll.**

Evaluations of cooked fresh beans showed that the persistent green-colored (PC) cv. Custer was darker, greener and less yellow than the normal green cv. Canyon. Persistent green-colored lines XIda 71-2081 and XIda 267-4 were intermediate. Chlorophyll concentrations were higher in all PC lines than in the normal green cultivar, but the ratio of chlorophyll *a*/*b* was lower. Chlorophyll content was significantly correlated with Gardner color values and with visual color scores. No color values correlated with pheophytin or carotene content. XIda 71-2081 had the highest work-to-shear values, percentage of seed, percentage of fiber and highest panel scores for fibrousness. Whether the higher values were attributable to genetic controls or to a difference in maturity was not determined in this study. Little sloughing was observed. All cultivars had a

ıightly to moderately full, natural flavor. The PC beans were equal or superior to the normal ɡreen cultivar in all measured quality characteristics, with Custer showing the most promise. *(Author's summary)* G00

G01 Breeding, Selection and Germplasm

0767

16418 ABATE, T. 1983. Screening of haricot bean varieties against bean fly (BNF) and African bollworm (ABW)? Nursery I.- Nazret, 1982/83. Addis Ababa, Institute of Agricultural Research. Nazret Research Station. 7p. Engl.

Phaseolus vulgaris. Snap beans. Selection. Cultivars. Resistance. Heliothis armigera. Ophiomyia phaseoli. Ethiopia.

A total of 177 haricot bean lines were assessed at Melkasa, Ethiopia, for their resistance to the bean fly (Ophiomyia phaseoli) and the African bollworm (Heliothis armigera). Eighty-two lines did not show symptoms of bean fly attack. The highest no. of sympcoms was observed in Negro 150, Guerrero 9, Veracruz-10, Bountiful No. 181, CCG-B44 (P420), B-7515-1 (81), and Red Lands Autumn Crop. Lines 14, 62, 69, 107, and 118 did not present bean fly attack symptoms nor pupal populations. Line BAT 338-1C was the only line that showed no symptoms of bean fly attack, nor pupae, nor damage caused by the African bollworm. Tables are included on the degree of resistance of the tested lines to both pests, indicating % of infestation, no. of pupae/20 plants, and % pod damage by H. armigera. (Summary by F.G. Trans. by L.M.F.) G01

0768

16417 ABATE, T. 1983. Screening of haricot bean varieties against bean fly and African bollworm (Nursery II)-Nazret, Jima, Kobo, Mekele. Addis Ababa, Institute of Agricultural Research. Nazret Research Station. 3p. Engl.

Phaseolus vulgaris. Snap beans. Selection. Cultivars. Resistance. Heliothis armigera. Ophiomyia phaseoli. Ethiopia.

Thirty-five haricot bean var. were evaluated for their degree of resistance to bean fly (Ophiomyia phaseoli) and the African bollworm (Heliothis armigera) in the 1982/83 season in the provinces of Nazret, Jima, Kobo, and Mekele (Ethiopia). A randomized complete block exptl. design was used in plots of two 6-m rows with 3 replications. Av. % infestation of plants and no. of pupae/20 plants were used as criteria for the degree of resistance to O. phaseoli, whereas the % damaged pods (based on 20 plants) was used to determine resistance to H. armigera. Results from Kobo and Mekele have not been received. Infestations at Nazret and Jima were low. In Nazret var. Mexican 142, Ethiopia 10-27, Accession No. 309747, B-364 (7441-92) and EPID Sample 8 had the least % infestation, while var. Negro Mecentral, W-85 (21305-9), and Tengeru 16-01 showed higher % infestation of O. phaseoli. The % damage by H. armigera was lowest for Nazret Small 03, B-129 (21153-1), B-253 (20308-1), and ICA Lima 34, while 15-R-57, followed by IBRN-42-2, Ethiopia 10-04, and Mexican 142 showed a higher % damage. In Jima, var. B-364 (7441-1), followed by W-95-01 and W-85 (21305-9), were least attacked by the African bollworm. Tables are included on the degree of resistance in the tested var., indicating % of infestation by O. phaseoli, no. of O. phaseoli pupae/20 plants, and % pod damage by H. armigera. (Summary by F.G. Trans. by L.M.F.) G01

0769

27022 ADAMS, M.W. ; GHADERI, A. 1981. A progress report on the development of high bulk density and halo blight resistant dark red kidney bean. In Michigan State University. Agricultural Experiment Station. Saginaw Valley bean-beet research farm and related bean-beet research. East Lansing. 1981 Research Report. p.83. En.

Phaseolus vulgaris. Cultivars. Crossbreeding. Selection. Agronomic characters. USA.

The work done to recombine the desirable characteristics of bean var. Montcalm (resistant to Pseudomonas phaseolicola) and Charlevoix (high bulk density) to obtain a desirable dark red kidney bean is briefly described. A total of 150 plants with the desirable agronomic characteristics were selected and 38 F4 families were identified; these are currently under increase and field evaluation in Puerto Rico. The selected families from this nursery will be grown in preliminary yield trials in 1982 at the Montcalm research farm. (CIAT)

0770

10309 ALMEIDA, L. D'A. DE *et al.* **Competição de cultivares de feijoeiro em Mococa e Monte Alegre do Sul.** *(Competition of french bean cultivars in Mococa and Monte Alegre do Sul).* Bragantia 36(10):125-129. 1977. Port., Sum. Port.

Phaseolus vulgaris. **Cultivars. Selection. Yields. Brazil.**

Competitive trials with french bean cv. on Orto reddish-yellow podzolic soil were conducted for 4 yr in the municipalities of Mococa and Monte Alegre do Sul in order to choose the best cv. for cultivation during the "das águas" season of the Serrana de Mantiqueira region, state of São Paulo (Brazil). Cv. Carioca, Bico de Ouro, Rosinha G-2, Pintado, Chumbinho-opaco, Preto G-1 and Rico 23 were used. According to the av. of 8 expt., cv. Carioca presented a production significantly higher than the others. Pintado, Chumbinho-opaco and Rico 23 formed an intermediate group. Bico de Ouro, Preto G-1 and Rosinha G-2 had the least production. In Mococa cv. Carioca presented a production significantly higher than the rest; in Monte Alegre do Sul its production was similar to those of Rico 23 and Pintado. Cv. Carioca can be recommended for planting in this region. *(Author's summary. Trans. by L.M. F.)* G01 D05

0771

23352 BAGGET, J.R.; FRAZIER, W.A.; VARSEVELD, G.W. 1984. Oregon Trail green bean. HortScience 19(1):134. Engl., 5 Refs., Illus. [Oregon State Univ., Dept. of Horticulture, Corvallis, OR 97331, USA]

Phaseolus vulgaris. Snap beans. Cultivars. Bean common mosaic virus. Resistance. USA.

Oregon Trail is a determinate bush bean cv., typically 0.4-0.5 m tall. It matures about 75 days after early May planting in western Oregon (USA). Pod color is medium-dark green, similar to that of Blue Lake. Quality of the canned and frozen products has been quite acceptable in panel tests over several seasons. Seeds are green when immature and white when mature-dry; dry seed count is approx. 2450/kg. Oregon Trail is resistant to BCMV-type strain and New York 15 (1A) strain—and has intermediate resistance to halo blight. It is recommended primarily for home gardens but may be useful also for processing or fresh market. A description of its origin is included. [CIAT]

0772

17743 BAGGETT, J.R.; FRAZIER, W.A.; VARSEVELD, G.W. 1981. 'Oregon 17' green bean. HortScience 16(2):228-229. Engl., 1 Ref., Illus.

Phaseolus vulgaris. Snap beans. Dwarf beans. Agronomic characters. Maturation. Bean common mosaic virus. Host-plant resistance. USA.

Phaseolus vulgaris Oregon 17, derived from a cross between Oregon 1604 and 2217-29, is an early-maturing dwarf bean of Blue Lake pod type. Yields are approx. 80% of those of Oregon 1604. Oregon 17 has white seed, is of good quality, and is resistant to BCMV. It is intended for commercial processing in Oregon, USA. *(Summary by Plant Breeding Abstracts)* G01 E04

0773

17779 BAGGETT, J.R.; FRAZIER, W.A.; VARSEVELD, G.W. 1981. 'Oregon 83' green bean. HortScience 16(2):229. Engl., Illus.

Phaseolus vulgaris. Snap beans. Dwarf beans. Agronomic characters. Host-plant resistance. Bean common mosaic virus.

Phaseolus vulgaris Oregon 83, derived from a cross between (OSU 2217 x Oregon 1604) and (Oregon 58 x Bush Blue Lake 290), is a dwarf green bean which is slightly later and has a shorter, straighter pod and better growth habit than Oregon 1604. It is of good quality and is resistant to BCMV. Pods of Oregon 83 mature uniformly to the processing stage in 64-68 days from May plantings in w. Oregon, USA, where it is intended for commercial processing. *(Summary by Plant Breeding Abstracts)* G01 E04

0774

17780 BAGGETT, J.R.; FRAZIER, W.A.; VARSEVELD, G.W. 1981. 'Oregon 91' green bean. HortScience 16(2):230. Engl., 1 Ref., Illus.

Phaseolus vulgaris. Snap beans. Agronomic characters. Plant habit. Maturation. Dwarf beans. Bean common mosaic virus. Host-plant resistance. USA.

Phaseolus vulgaris Oregon 91, derived from the cross Oregon 1604 x OSU 2217-6, is slightly later in maturity and slightly less productive than Oregon 1604, but has a better growth habit and straighter pods. Oregon 91 is of good quality and is resistant to BCMV. It is a dwarf var. intended for commercial processing in w. Oregon, USA. *Summary by Plant Breeding Abstracts)* G01 E04

0775

26058. BASCUR B., G. 1985. ENFOQUE DEL PROGRAMA DE MEJORAMIENTO GENETICO DE FREJOL EN INIA. [THE APPROACH OF THE BEAN BREEDING PROGRAM AT INIA]. IN CUHSO INTERNACIONAL DE INVESTIGACION SOBRE PRODUCCION DE FREJOL [PHASEDLUS VULGARIS], SANTIAGO, CHILE, 1985. TRABAJOS PRESENTADOS. SANTIAGO, INSTITUTO DE INVESTIGACIONES AGROPECUARIAS. ESTACION EXPERIMENTAL LA PLATINA. 17P. SPAN., ILLUS. [ESTACION EXPERIMENTAL LA PLATINA, INST. DE INVESTIGACIONES AGROPECUARIAS, CASILLA 5447, SANTIAGO, CHILE]

THE APPROACH OF THE BEAN BREEDING PROGRAM AT INSTITUTO DE INVESTIGACIONES AGRDPECUARIAS [CHILE] IS OUTLINED, INCLUDING SOME GENERAL RESULTS OBTAINED BY THE PRDGRAM. THE MAIN OBJECTIVE OF THE PROGRAM IS TO INCORPORATE MULTIPLE DISEASE RESISTANCE, ESPECIALLY TO BCMV AND BYMV, INTO THE DIFFERENT BEAN TYPES CULTIVATED IN

HILE. BREEDING EFFORTS CONCENTRATE ON 4 MAJOR BEAN GROUPS: BEANS OR GREEN POD CONSUMPTION, BEANS FOR GREEN GRAIN CONSUMPTION, AND EANS FOR DRY GRAIN CONSUMPTION BOTH DOMESTICALLY AND FOR EXPORT; OR EACH GROUP, THE CHILEAN BEAN VAR. INCLUDED ARE LISTED. IMPROVED ARENTS USED IN BREEDING LOCAL VAR. AND IMPROVED VAR. RELEASED BY HE PROGRAM ARE ALSO INDICATED. GERMPLASM INTRODUCTION AND YBRIDIZATION ARE THE MAIN METHODS USED IN VAR. IMPROVEMENT. CIAT).

0776

8529 BASSETT, M. J.; SHUH, D. M. 1982. Cytoplasmic male sterility in common bean. Journal of the American Society for Horticultural Science 107(5):791-793. Engl., Sum. Engl., 4 Refs.

haseolus vulgaris. Sterility. Crossbreeding. Backcrossing. Snap beans. nheritance. Germplasm.

'he inheritance of male sterility was studied in germplasm of common bean btained from CIAT. The source was selected for plants with high pollen bortion rates (mean = 91%) and for failure to set any seed or pods by elf-pollination when grown in screened greenhouses. These male-sterile lants were crossed with the snap bean Sprite, and the resulting F_1 rogenies were all male-sterile under greenhouse conditions. The F_1 plants ere backcrossed to Sprite and the BC_1 progenies did not segregate for ale-fertile plants under field conditions. Four more backcrosses to Sprite roduced progenies that were uniformly male-sterile. It was concluded that he CIAT source of male sterility is inherited through the maternal parent nd is cytoplasmic. Nineteen commercial cv. of snap beans and dry beans ere crossed onto BC_3 plants, and none of these genotypes restored the ollen fertility in F_1 progeny. (Author's summary) G01

0777

8373 BASSET, M.J. **Inheritance of pod detachment force in snap beans,** *Phaseolus vulgaris* **L.** HortScience 11(5):471-472. 1976. Engl., Sum., Engl., 8 Refs.

Phaseolus vulgaris. **Inheritance. Pods. Backcrossing. Genes. Experiment design. Field experiments. Statistical analysis. Genetics. USA.**

Pod detachment force (PDF) in french beans was measured at fresh market maturity (sieve size 4) for the parents, F_1, F_2 and both backcrosses for the cross Harvester x Idelight. The distribution of the population means for the F_1, F_2 and backcrosses indicated strongly dominant gene effects were contributed by the Harvester parent for high PDF. A minimum of 2 dominant genes controlled PDF and narrow-sense heritability was estimated to be 61%. *(Author's summary)* G01

0778

19455 BOUWKAMP, J.C.; SUMMERS, W.L. 1982. Inheritance of resistance to temperature-drought stress in the snap bean. Journal of Heredity 73(5): 385-386. Engl., Sum. Engl., 15 Refs.

Phaseolus vulgaris. Inheritance. Resistance. Cultivars. Drought. Genes. Temperature. Yields. Seed color. Seed coat. Snap beans. Crossbreeding.

Studies were carried out under greenhouse conditions to identify stress-resistant snap beans and to determine the mode of inheritance of resistance to stress caused by high temp. (38-43°C, day time; 25°C, night) and low

moisture. It was found that resistance to stress was due to a single dominant gene in PI 297079 and 2 genes with epistatic action in PI 151062. Av. pod production/plant in the F_1 populations exceeded the appropriate midparent av. Combination of resistance from both sources did not appear to result in increased resistance. Stress resistance does not appear to be genetically linked to seed coat color. (Author's summary) G01

3568

0779

BROWN, G. B., DEAKIN, J. R., and HOFFMAN, J. C. Identification of snap bean cultivars by paper chromatography of flavonoids. Journal of the American Horticultural Society 96(4): 477-481. 1971. Engl., Sum. Engl., 5 Refs., Illus.

Phaseolus vulgaris. Leaves. Plant breeding. Analysis. Cultivars. Maturation. Laboratory experiments. Identification. USA.

Paper chromatograms of flavonoid compounds extracted from the leaves of 43 snap bean cultivars and breeding lines produced characteristic patterns which allowed all but 7 to be classified into one of 3 major categories. One of the flavonoid compounds was consistently associated with bush and not runner type plants and was thus useful for early classification of populations segregating for plant type. The high degree of similarity among cultivars for a set of characters which one might expect to be distributed at random suggests a rather narrow gene base for this crop. (Author's summary)

0780

17878 BROWN, J.W.S.; McFERSON, J.R.; BLISS, F.A.; HALL, T.C. 1982. Genetic divergence among commercial classes of Phaseolus vulgaris in relation to phaseolin pattern. HortScience 17(5):752-754. Engl., Sum. Engl., 9 Refs.

Phaseolus vulgaris. Cultivars. Phaseollin. Genetics. Snap beans.

Composition. Selection.

Screening of 107 bean cv. and plant introductions (PI) by 2-dimensional electrophoresis revealed only 3 different phaseolin patterns: Tendergreen (T), Sanilac (S), and Contender (C). The majority of the lines had either the T (25%) or S (69%) phaseolin patterns, with only 6% having the C pattern. Phaseolin pattern was not strictly associated with commercial class but most cv. with the T pattern were snap beans, while the majority of lines with the S pattern were dry beans. Furthermore, the phaseolin types of 15 cv. were associated with previous cv. groupings that were based on calculations of genetic relationships. A genetic distinction was noted between the groups of cv. containing the T and S phaseolin patterns. (Author's summary) G01

0781

29753 CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL. 1987. Bean Program. Annual Report 1986. Cali, Colombia. Working Document no.21. 318p. En., Il.

Phaseolus vulgaris. Snap beans. Germplasm. Database. Propagation. Plant breeding. Hybridizing. Resistance. Mycoses. Viroses. Bacterioses. Injurious insects. Adaptation. Yields. Photoperiod. Temperature. Drought. Nitrogen fixation. Nutritive value. Transfer of technology. Central America. Caribbean. Brazil. Peru. Mexico. Argentina. Asia. Africa. Netherlands.

The activities carried out by the CIAT Bean Program in 1986 are reported. Bean germplasm activities covered collection, multiplication and distribution, data management, genetic variability from biotechnological techniques, and variability from interspecific hybridization. Individual character improvement studies were conducted on resistance to fungal, bacterial, and viral diseases and invertebrate pests, yield potential, photoperiod and temp. adaptation, drought and acid soils tolerance, N fixation, nutritional quality, and snap beans. Genetic improvement also aimed at evaluation in uniform nurseries (bean evaluation nursery, VEF; preliminary trials, EP; and IBYAN). Agronomic practices were evaluated in on-farm trials. Regional activities were carried out in Central America, the Caribbean, Brazil, Peru, Mexican highlands, Argentina, West Asia, Andean zone, Africa (Great Lakes Region, East and Southern Africa), and the Netherlands, in the latter with the Institute for Horticultural Plant Breeding. (CIAT)

0782

2976B CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL. 1987. Genetic improvement and related activities. Improvement of individual characters. Snap beans. In_____. Bean Program. Annual Report 1986. Cali, Colombia. Working Document no.21. pp.169-170. En.

Phaseolus vulgaris. Snap beans. Plant breeding. Adaptation. Dwarf beans. Climbing beans. Resistance. Colletotrichum lindemuthianum. Uromyces phaseoli. Bean common mosaic virus. Colombia. USA. Argentina. Iran. Bulgaria. Puerto Rico.

Snap bean improvement at CIAT has been carried out collaboratively with Washington State U. since 1983, to incorporate disease resistance and tropical adaptation from the dry bean improvement programs into green beans. An international adaptation nursery of advanced snap bean lines was distributed to 14 countries in Asia, Africa, Europe, and America. The current nursery consists of 204 bush and 32 climbing lines. In collaboration with the Instituto Colombiano Agropecuario, a regional trial of 19 and 14 bush and climbing snap bean lines, resp., was distributed. All climbing lines were resistant to anthracnose, the best being HAB 208, HAB 214, HAB 232, HAB 234, HAB 235, and HAB 236. Bush lines HAB 87, HAB 141, and HAB 173 were resistant to anthracnose, rust, and BCMV. (CIAT)

0783

19811 CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL. 1983. Green bean improvement. In _____. Bean Program. Annual Report 1982. Cali, Colombia. p.121. Engl.

Also in Spanish.

Phaseolus vulgaris. Snap beans. Germplasm. Selection. Cultivars. Adaptation. Crossbreeding. Dwarf beans. Climbing beans. Plant breeding. Colombia.

During 1981-82 the CIAT germplasm bank of snap bean entries (400 lines) was evaluated in one or more environments, along with a no. of new commercial var. and breeding lines from the USA. Sixteen lines were chosen for testing in 3 locations. Parental stocks for snap bean crosses were identified. Approx. 59 crosses were made for bush snap bean improvement in 1982, and a large no. of F_2 selections were made in segregating populations. Potential parents for breeding climbing snap beans were also evaluated, and the best in the collection were: Blue Lake, G 8105, G 8776, and G 3736. Both climbing and bush snap beans have potential in certain parts of Latin America. (Summary by F.G.) G01

2818

D784

COYNE, D. P. and MATSON, R. Inheritance of pod maturity in a Phaseolus vulgaris L. variety cross. Crop Science 7(4 :398-399. 1967. Engl. Sum. Engl.

Phaseolus vulgaris. Plant development. Photoperiod. Pods. Plant breeding. Genetics.

Time of green bean pod maturity in the cross between the early-maturing day neutral 'White Seeded Tender Green' and the late-maturing photoperiodic responsive 'Bush Blue Lake 274' (94-1504) was determined primarily by a single major gene with lateness being dominant. (Author's summary)

D785

5495 DAVIS, W.D. Quantitative inheritance of growth habit in the bush bean, *Phaseolus vulgaris* L. Ph.D. Thesis. Corvallis, Oregon State University, 1973. 160p. Engl. Sum. Engl., 18 Refs., Illus.

Phaseolus vulgaris. Inheritance. Backcrossing. Plant habit. Cultivars. Crossbreeding. Genes. Field experiments. Heterosis. Yield components. Pods. USA.

There is a great demand among french bean processors for a bush-type Blue Lake var. Breeding attempts have not been successful. Although pod quality improved after 5-6 backcrosses, the desirable growth habit of the nonrecurrent parent was lost. This study examines, over a range of environments, the inheritance of growth habit and some of the morphological characters that contribute to habit in bush beans. Bush bean var. derived from backcrossing to the Blue Lake FM-1 climbing bean were more sensitive to environmental change than were true bush var. Derived bushes showed greater stem elongation and overall plant weakness under winter conditions in the greenhouse. In the field, shade imposed for a 5-day period during or just prior to the time of normally rapid stem elongation caused greater elongation in derived bushes. Late June as opposed to mid-May planting in the field increased stem elongation, no. of branches, no. of central stem internodes and reduced habit desirability in true and derived bushes. At both times of planting, derived bushes showed relatively greater stem elongation at the 2- as opposed to the 6-in. in-row plant spacing. The no. of central stem internodes increased from the earlier to the later planting but was not influenced by shade or spacing. Under winter conditions in the greenhouse the performance of the F_1 progeny from crosses among the 4 var. suggested that the 2 true bush var. contain more of the recessive alleles for growth habit, plant length, mean internode length, no. of central stem internodes, and no. of branches, measured or rated at pod maturity. A similar conclusion was reached for plant height, measured shortly prior to anthesis. Under field conditions the existence of genotype x environmental interaction, in addition to the presence of smaller parental differences, rendered the possible recessiveness of alleles in the true bush var. less evident except for growth habit and no. of internodes. Var. 836-9 and 2466 (particularly the latter) probably accounted for most of the genotype x environmental interaction. In crosses with the 2 derived bushes the expression of high pod placement (studied only the late-June field planting) in the 2 true bushes was conditioned by a preponderance of reces-

ive alleles in one (WST) and by dominant alleles in another (PG). However, in this population of 4 parental var. the net effect of the gene action conditioning the expression of pod placement, as well as growth habit and no. of central stem internodes, appeared to be largely additive in all of the environments considered. Nonadditive gene action was more important in the expression of plant length, height and mean internode length. Striking heterosis was observed in both the greenhouse and field for these 3 characters. Heterosis for no. of branches was not consistent, both with regard to parentage and to change in environment; a tendency toward heterosis existed in progeny of crosses between true and derived bush var. in the field whereas in the greenhouse this was replaced by a tendency toward negative heterosis. In the greenhouse, reciprocal differences for plant length, height and mean internode length were seen in progeny of crosses between WST and 2466. F_1 progeny of the cross WST x 2466 exhibited heterosis while F_1 progeny of the reciprocal cross closely approached the midparent. Both high pod placement and desirable growth habit were positively correlated with a greater no. of central stem internodes. Internode no. was more important than internode length in determining height of pod placement. Relatively more internode elongation occurred in low-internode-no. plants grown under environmental conditions favorable for elongation; therefore, internode no. was not always positively correlated with plant length, height or mean internode length. Pod color, classified as "wax" or green, was found to be associated with growth habit, plant length, height, internode length, no. of branches, and possibly with pod placement and no. of central stem internodes. These associations were not entirely consistent over all F_2 progenies but were somewhat more evident in crosses of PG with WST than with 836-9 or 2466, the 2 derived bushes. *(Author's summary)* G01

0786

0820 DESPRADEL, J.O. 1979. Comportamiento agronómico de seis variedades de habichuelas negras en la zona Este de la República Dominicana. (Agronomic performance of six black French bean varieties in eastern Dominican Republic). Proceedings of the Caribbean Food Crops Society 16:187-193. Span., Sum. Span., Engl., Fr.

Phaseolus vulgaris. Cultivars. Yields. Snap beans. Resistance. Uromyces phaseoli. Dominican Republic.

A comparative trial was conducted in 1976 by the Division for Agricultural Diversification of the Central Romana (Dominican Republic) to evaluate the behavior of 6 black French bean var. (V-44F, V-44P, K-7, O-0, O-1, and S-9) from Venezuela and Florida (USA). Their characteristics regarding yield quantity and quality, as well as their response to rust (Uromyces phaseoli), were determined in a 6 x 6 Latin square design on a Typic Lithic Eutrustol. Results show important differences, although not significant, in yields. Var. S-9 yielded 1166 kg/ha, which represents a 10% increase over the control var. V-44F. There were also varying levels of response of the var. to rust. Further expt. are recommended. (Author's summary) G01

0787

25379. DICKSON, M.H.; BOETTGER, M.A. 1982. SEMI-HARD SEED IN SNAP BEANS-A TOOL FOR SELECTION FOR SEED QUALITY. BEAN IMPROVEMENT COOPERATIVE. ANNUAL REPORT 25:102-103. ENGL. [NEW YORK STATE AGRICULTURAL EXPERIMENT STATION, GENEVA, NY, USA]

SCREENING FOR IMPROVED BEAN SEED QUALITY VIA SELECTING FOR SEMIHARD SEED IS BRIEFLY REPORTED. DATA ON THE SEGREGATION FOR SEMIHARD SEED IN A CROSS BETWEEN THE SEMIHARD-SEEDED LINE 887-198 AND GLASLIM AND NY 8603, WHICH DID NOT EXHIBIT THE SEMIHARD SEED

HARACTER, ARE PRESENTED. NARROW SENSE HERITABILITY WAS 18 AND 47 ERCENT, RESP. SELECTING FOR IMPROVED SEED QUALITY VIA SELECTING OR SEMIHARD SEED MAY BE EASIER THAN USING THE DROP TECHNIQUE. IT AS BEEN OBSERVED THAT THE EXCELLENT SEED COAT RESULTS IN REDUCED USCEPTIBILITY TO PYTHIUM. LINES WHICH HAVE BEEN IDENTIFIED AS EMIHARD SEED SEEM TO BE COMPLETELY FREE OF SEED DEFECTS. (CIAT).

819

0788

ICKSON, M. H. Diallel analysis of seven economic characters in snap beans. Crop Science 7(3):121-124. 1967. Engl. Sum. Engl. 12 Refs. Illus.

haseolus vulgaris. Plant breeding. Genetics. Cultivars. Pods. Seeds. lant development. Laboratory experiments. Productivity. Flowering.

even varieties of snap beans (Phaseolus vulgaris L.)('Wade', 'Earligreen', 'Earlwax', 'Streamliner', 'Harvest King', 'Slendergreen', and 'Tendercrop') and all ossible F_2's among them were evaluated. Number of seeds per plant, number of eeds in the best five pods, length of pod, number of pods per plant, days to lowering, plant height, and width were determined. Additive genetic variance as predominant in the first five traits, but not for plant height and width. od number also showed some dominance, with recessive genes contributing to igh pod number. Inheritance of seed number per plant and per pod resulted in nteractions where Tendercrop and Streamliner were included, but without these wo varieties a simple additive, system is apparent. Pod length was under additive genetic control without dominance. Days to flowering was additive, but ver-dominance was expressed for earliness. The data indicate which parents ould be the best for the characters studied, with Earligreen and Slendergreen ppearing to be superior. (Author's summary)

0789

991 DICKSON, M.H.; KATTI, J.J. 1966. Breeding for halo blight and virus resistance in snap beans. Farm Research 32(3):4-5. Engl., Illus.

haseolus vulgaris. Cultivars. Crossbreeding. Resistance. Pseudomonas haseolicola. Bean yellow mosaic virus. Snap beans. USA.

reeding for resistance to halo blight (Pseudomonas phaseolicola) and BYMV n snap bean carried out in Wisconsin, USA, included crossbreeding several aterials that differed in their degree of resistance. P.I. 181954 has howed better tolerance to halo blight in the field and greenhouse than .I. 150414; it also appears to be resistant to BYMV. Resistance is ontrolled by a single recessive gene and segregation is observed in rossbreeding. A table is included on segregation for resistance to halo light and BYMV. (Summary by EDITEC. Trans. by L.M.F.) G01

0790

376 EL-SHAFFIE, B.E.; BIELY, T.E.; BENNET, C.; KHAIRY, N.M.A. 1978. Snap bean variety trial. In Ed-Damer, Sudan. Hudeiba Research Station. Annual Report 1966-1967. Ed-Damer. p.57. Engl.

haseolus vulgaris. Cultivars. Snap beans. Yields. Resistance. Fusarium. rowth. Leaf curly virus. Sudan.

ials were conducted at Shambat to test introduced and local snap bean r. and evaluate their performance in the province of Khartoum, Sudan. haracters such as yield, disease resistance, and quality were observed. yptian Black, Beladi, and White Bean gave the highest yields, 3.15, 3.13, nd 2.63 t/feddan (1 feddan = 0.42 ha) resp., and were tolerant to Fusarium lt, and mosaic and leaf curl viruses. (Summary by L.M.F.) G01

0791

3071 EL SHAMY, M.R.; NASSAR, S.H.; ATTIA, M.S. 1972. Amal (Giza 3) a new variety of snap white seeded bean resistant to common mosaic virus. Agricultural Research Review 50:93-107. Engl., Sum. Engl., 10 Refs.

haseolus vulgaris. Snap beans. Cultivars. Bean common mosaic virus. esistance. Selection. Crossbreeding. Maturation. Dry matter. Egypt.

he development of the dual purpose crossbred kidney bean var. Giza 3 is escribed in detail. Parental var. were Swiss Blanc, used for more than 30 r in Egypt for dry seed production, and Contender, introduced to this ountry in 1955 for green bean production and viral resistance. (Extracted rom author's summary) G01

0792

8006 FRAZIER, W.A. *et al* Testing for combined resistance to certain diseases in snap beans. Proceedings of the American Society for Horticultural Science 78:308-309 1961. Engl

haseolus vulgaris Diseases and pathogens. Inheritance. Host-plant resistance. Plant breeding. aboratory experiments.

detailed explanation is given of an efficient technique for greenhouse testing that appears ssible for isolating promising breeding material with combined resistance to several important nch bean diseases (*Summary by T.M.*) G01 E00

02

0793

OUSSIOS, G. Genetic diversity and agricultural potential in Phaseolus vulgaris L. Experimental Agriculture 6:129-141. 1970. Engl., Sum. Engl. 5 Refs.

aseolus vulgaris. Plant breeding. Inheritance. Morphology. Cultivars.

assess the potentialities of Ph. vulgaris for haricot type bean production in itan, a large collection of types was surveyed. One hundred varieties, mostly but t exclusively bush types, were grown both in the green house and in the field. Cha ters of agronomic importance were evaluated. The morphological basis of the dif- rence between the climbing and the bush habit was shown to be the interaction be- een two character contrasts, indeterminate versus determinate vegetative growth, a ng versus short internodes. The four classes resulting from this interaction were dentified and are described. Flowering habit, pod type and seed size were surveye ong the bush beans, wide var' ion in day length sensitivity in flowering was show d it is clear that day length neutral types can easily be selected. Among the de- rminate dwarfs, pods are either leathery or fleshy. Leathery types dry out readil d do not dehisce freely in the field, and are therefore agronomically desirable in y bean production. Fleshy pods are used for culinary purposes. The indeterminate sh types included in this survey have parchmented pods, which tend to dehisce when y, and hence are subject to crop loss in the field. A wide range of seed size and

seed color is available for selection according to requirement. Two small variety als yielded evidence that Colombian determinate bush types grow and crop satisfac- ily within the limits of the growing season in eastern England. From two spacing als, optimum within-row spacing was deduced. (Author's summary)

0794

266 GRAFTON, F.F.; WYATT, J.E.; WEISER, G.C. 1983. Genetics of a virescent foliage mutant in beans. Journal of Heredity 74(5):385. Engl., Sum. Engl., 8 Refs. [North Dakota State Univ., Fargo, ND 58105, USA]

aseolus vulgaris. Inheritance. Snap beans. Mutation. Backcrossing. lorophyll. Genes. USA.

The inheritance of another chlorophyll deficient mutant observed in a dry edible bean breeding line and the genetic relationship of this mutant to that studied by Wyatt (1981) were determined. A foliage color mutant in a dry edible bean breeding line was controlled by 1 recessive gene. The mutant exhibited a virescent characteristic under some environmental conditions. Crosses of the virescent and a previously described pale-foliage mutant indicate that the 2 genes are independent. The gene symbol vir_f is proposed for the virescent foliage mutant, which may be useful in genetic or physiological studies in beans. (Author's summary) G01

0795

15818 HAGEDORN, D.J.; RAND, R.E. 1980. Wisconsin (RRR) 46 snap bean breeding line. HortScience 15(4):529-530. Engl., 2 Refs., Illus.

Phaseolus vulgaris. Snap beans. Germplasm. Cultivars. Host-plant resistance. Agronomic characters. *Pythium*. *Rhizoctonia solani*. *Fusarium solani phaseoli*. USA.

A new breeding line of bush snap bean designated Wisconsin (RRR) 46 has been released with high level resistance to the root rot disease complex (*Pythium* spp., *Fusarium solani* p. *phaseoli*, and *Rhizoctonia solani*). Its origin and agronomic characteristics are described. Av. yields estimated for 1977 and 1978 were 25,473 kg/ha for the new line vs. 2450 kg/ha for the susceptible control. (*Summary by F.G. Trans. by L.M.F.*) G01 E03

0796

27755. HARTMANN, R.W. 1986. RELEASE OF POAMOHO POLE SNAP BEAN. BEAN IMPROVEMENT COOPERATIVE. ANNUAL REPORT 29:135. EN. [UNIV. OF HAWAII, HONOLULU, HI, USA]

HE HAWAII INSTITUTE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES USA] ANNOUNCED THE INTRODUCTION OF POAMOHO POLE BEAN ORIGINATING ROM CROSSES INVOLVING P.I. 289572, MANOA WONDER, E8207, AND P.I. 35426. IT IS A VIGOROUSBEAN THAT PRODUCES LONG, STRAIGHT, WHITE-EEDED, FLAT PODS OF THE TYPE PREFERRED BY HAWAIIAN CONSUMERS. THIS AR. IS RESISTANT TO ROOT KNOT NEMATODES AND THERE ARE SOME NDICATIONS THAT IT IS ALSO TOLERANT TO RHIZOCTONIA. [CIAT].

0797

391 HASSAN, M.S.; EL-FAHAL, A.; FAGER, S.E. 1979. Snap bean variety trial. In Ed-Damer, Sudan. Hudeiba Research Station. Annual Report 1971-1972. Ed-Damer. p.123. Engl.

aseolus vulgaris. Snap beans. Cultivars. Yields. Sudan.

n snap bean var., White Bean, Beladi Selected, Contender, Buschanhnen ena, Extender, Resist Asgrow Valentine, Bountiful, Tender Crop, Tender cen Imp, and Wade, were tested at the Hudeiba Research Station at Shendi udan), yielding, resp., 6.5, 5.9, 3.6, 3.3, 3.3, 3.1, 2.6, 2.4, 2.1, and 2 t/feddan (1 feddan = 0.42 ha). Differences in yield were highly gnificant. (Summary by F.G. Trans. by L.M.F.) G01

0798

997 KILTY, J.W. ; MULLINS, C.A. 1985. Evaluation of selected snap bean ltivars for resistance to rust. Tennessee Farm and Home Science no.136:6-
En. [Dept. Entomology & Plant Pathology, Univ. Tennessee, Knoxville, TN 901, USA]

haseolus vulgaris. Snap beans. Cultivars. Resistance. Plant breeding. romyces phaseoli. USA.

nap bean lines and cv. were evaluated at Plateau Expt. Station near rossville [Tennessee, USA] for resistence to rust during 1982-84. Those ated as highly resistant were Nep-2 in 1982, Aurora, Early Bird, and Nep-2 n 1983, and Early Bird and Sunkist in 1984. [CIAT]

0799

0017 INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1982. Legumineuses: Haricot (Phaseolus vulgaris L.). (Legumes: haricot beans). In _____. Compte rendu des travaux du Département Production Végétale. Exercise 1981. Rubona. pp.4-9. Fr. [B.P. 138, Butare, Rwanda]

haseolus vulgaris. Cultivars. Germplasm. Selection. Yields. Snap beans. limbing beans. Colletotrichum lindemuthianum. Bean common mosaic virus. scochyta. Isariopsis griseola. Ophiomyia phaseoli. Agrotis. Rwanda.

n 1981, 160 rurally planted var. and 9 foreign var. were included to omplete a total of 524 var. in the germplasm bank of the Institut des ciences Agronómiques du Rwanda. In screening dwarf var. in Rubona, 10 ar. showed better performance than the check Bataaf in season A (e.g., Ni 55, Ni 572, IRW8), and Tostado performed best in season B. Var. Actoran, ostado, and M. Jaune (season A) and Actoran, Richmond nandos (outyielding he check during both growing seasons), and Baron (season B) were utstanding at Rwerere. Actoran was also outstanding at Karama after ornel, which occupied the 1st place (season A); during season B only Raido rado outyielded the check (var. 1/2). Seven snap bean var. outyielded axa during the 1st season; however, no var. outyielded the check during he 2nd. The weekly treatment with mancozeb increased dwarf bean yields in werere by 60% (season A) and by 39% (season B). Twenty-three semiclimbing can var. outyielded Kicaro during season A a 39 var., during season B, mong which were Caru 27, Gikara, Ikinimba Blanc, Nsuzumirurushako, and uhondo. The treatment increased semiclimbing bean yields by 48% (season) and by 17% (season B). Among the best var. are Sabres a rames (season) and Nyiramushahi (season B) in Rubona; Gisenyi (A) and Urunyumba (B) in werere, and Urunyumba (A) and 7211 (B) in Karama. In a comparative var. rial with 14 dwarf bean var., Actoran, var. 11, and Mutiki 2 gave the ighest yields (121, 117, and 111% over the yield of check Bataaf, resp.). ther outstanding var. were Tostado, Nsuzumirurushako, and Rwerere II, the atter 2 yielding 145 and 134% over the check. Wood stakes were better han maize stumps. Stakes (50 cm) increased climbing bean yields by 40%; owever, the use of 1-m-long stakes is recommended. Several diseases were eported: anthracnose (Colletotrichum lindemuthianum), BCMV, Ascochyta leaf nd pod spot, and angular leaf spot (Isariopsis griseola). The bean fly Melanagromyza phaseoli) and Agrotis sp. were also reported. (Summary by DITEC. Trans. by L.M.F.) G01

0800

6932. ISSA, E. 1985. RESISTENCIA VARIETAL EN FEIJOEIRO, PHASEOLUS VULGARIS L., A QUEIMA CINZENTA DA HASTE CAUSADA POR MACROPHOMINA PHASEOLI [MAUBL.]. [VARIETAL RESISTANCE OF FRENCH BEAN TO ASHY STEM BLIGHT CAUSED BY MACROPHOMINA PHASEOLI]. BIOLOGICO 51[5]:125-127. PT. SUM. EN., 6 REF. [SECAO DE DOENCAS DAS PLANTAS ALIMENTICIAS BASICAS E OLERICOLAS, INST. BIOLOGICO CAMPINAS, SP, BRASIL]

IEVEN FRENCH BEAN VAR. (AYSO, CARIOCA, CATU, AROANA 80, CARIOCA 80, ICRUNA 80, AND AETE 3) AND 2 BREEDING POPULATIONS (RH COLLECTION ND RH BLACK), THESE ALREADY SELECTED FOR GENERAL DISEASE IESISTANCE, WERE STUDIED TO DETERMINE THEIR RESISTANCE TO ASHY STEM ILIGHT (MACROPHOMINA PHASEOLI) AT 20 DAYS AFTER SOWING IN SAO 'AULO, BRAZIL. SEEDS WERE SELECTED AND TREATED WITH SOLUTION OF ;ODIUM HYPOCHLORIDE, AND THEN INOCULATED WITH A SPORE SUSPENSION OF I. PHASEOLI. MORUNA 80 WAS THE MOST RESISTANT. (CIAT).

0801

26594. JOSHI, B.D.; MEHRA, K.L. 1984. PATH ANALYSIS OF PRODUCTIVITY IN FRENCH BEAN. PROGRESSIVE HORTICULTURE 16(1-2):78-84. ENGL., SUM. ENGL., 7 REFS. (NATIONAL BUREAU OF PLANT GENETIC RESOURCES REGIONAL STATION, PHAGLI, SHIMLA 171 021, INDIA)

IFTY FRENCH BEAN VAR. WERE STUDIED FOR CORRELATION AND PATH NALYSIS FOR SOME PRODUCTIVITY COMPONENTS. NO. OF PODS, 100-SEED T., AND DAYS TO MATURITY ARE THE HIGHEST DIRECT COMPONENTS FOR HICH SELECTION CAN BE EFFECTIVE. EXCEPT FOR 100-SEED WT., THESE HARACTERS ALSO HAVE HIGH AND SIGNIFICANT CORRELATION WITH SEED IELD. SINCE LATE MATURITY BEYOND CERTAIN LIMITS IS NOT DESIRABLE, REATER EMPHASIS SHOULD BE PLACED ON NO. OF PODS/PLANT IN SELECTION OR YIELD. (AS).

0802

25890. JOSHI, B.D.; MEHRA, K.L. 1983. GENETIC VARIABILITY IN FRENCH BEAN (PHASEOLUS VULGARIS L.). PROGRESSIVE HORTICULTURE 15(1-2):109-111. ENGL. SUM. ENGL., 5 REFS. (NATIONAL BUREAU OF PLANT GENETIC RESOURCES, REGIONAL STATION, PHIAGLI, SIMLA 171 021, INDIA)

IFORMATION IS PRESENTED ON GENOTYPIC AND PHENOTYPIC COEFFICIENTS = VARIATION, HERITABILITY, AND GENETIC ADVANCE FOR SEED :ELD/PLANT AND 10 RELATED CHARACTERS, BASED ON AN ANALYSIS OF DATA IOM 42 GEOGRAPHICALLY OIVEHSE FRENCH BEAN GENOTYPES. HERITABILITY ITIMATES AND EXPECTED GENETIC ADVANCE WERE HIGH FOR 100-SEED WT., .ANT HEIGHT, POD NO./PLANT, POD LENGTH, AND SEED YIELD/PLANT; :LECTION BASED ON THESE TRAITS IS RECOMMENDED. (PLANT BREEDING STRACTS).

0803

18097 LEAL, N.R.; HAMAD, L.A.; BLISS, F. 1982. Avaliação dos progenitores e linhas avançadas de melhoramento de feijão-de-vagem de crescimento determinado. *(Evaluation of parents and advanced breeding lines of bush type snap beans).* Pesquisa Agropecuária Brasileira 17(2):225-231. Port., Sum. Port., Engl., 11 Refs.

Phaseolus vulgaris. Snap beans. Dwarf beans. Crossbreeding. Cultivars. Plant breeding. Brazil.

Ninety-five snap bean breeding lines from 5 parents crossed in a diallel mating design were studied. The parental cv. were Green Isle (GI), Tempo (T), Bush Blue Lake 274 (BBL), Gala Green (GG), and Cascade (CAS). The parental evaluation was based on progeny performance. GI was the best parent for no. of lines which exceeded the best parent mean in no. of pods/plant. BBL was the best parent for pod wt./plant, individual pod wt., pod length, and no. of lines exceeding the best parent. CAS progenies showed the largest variability for pod wt./plant, while GG ranked 1st based on total no. of standard deviations units over the midparent for this trait. T had the lowest incidence of interlocular cavitation based on parental mean, progeny mean, no. of lines that exceeded the best parent, no. of deviations over midparents and also the best progenies for ovule no./pod. Thirteen lines exceeded the best parent yield in g plant in at least 10%. Line 1 from GG x CAS showed the best yield exceeding the best parent by 40%. *(Author's summary)* G01

0804

21532 MACARTNEY, J.C. 1966. The selection of haricot bean varieties suitable for canning. East African Agricultural and Forestry Journal 32(2):214-219. Engl., Sum. Engl., 7 Refs., Illus.

Phaseolus vulgaris. Snap beans. Selection. Cultivars. Canned beans. Resistance. Uromyces phaseoli. Seed characters. Agronomic characters. Yields. Tanzania.

A program was initiated in 1959 at the Northern Research Centre (Tengeru, Arusha, Tanzania) aimed to select haricot bean var. to meet commercial canning requirements. (Seed should soak 100% when left in tap water for 18 h, and have suitable size, shape and flavor for canning.) Introductions of var. acceptable for canning were made from USA, Central and South America, Ethiopia, Kenya, Uganda, Tanzania, Japan, Belgium, France, Puerto Rico, and Australia. Observations were made on resistance to 6 rust (Uromyces phaseoli) races, soakability trends (soil, climate and storage effects), seed quality (size, color, purity, MC, and soaking limits), and agronomic factors. Tangeru no. 8 was highly resistant to all bean rust races. Tangeru no. 8, 22, and 46 were representative of the 3 soakability trends. Tangeru no. 8, 9, 15, and 16 with av. yields of 2289, 2227, 1654, and 1366 kg/ha were finally recommended for canning. Oversized bean var. no. 8, 14, and 19 have a market in the grocery trade. (Summary by T.F.) G01

0805

17899 MACARTNEY, J.C. 1962?. The haricot bean; brief summary of work carried out by the Northern Regional Research Centre, Tengeru, 1959-61. Tengeru, Tanzania, Northern Regional Research Centre. 4p. Engl.

Phaseolus vulgaris. Snap beans. Germplasm. Cultivars. Uromyces phaseoli. Resistance. Seed characters. Tanzania.

Research at the Northern Regional Research Centre, Tengeru, Tanzania, began with the collection of var. (seed samples from different departments all over the world were received), differing in size, shape, and quality, and planting time (rainfed and under irrigated conditions). Var. were planted in a series of rust nurseries for field testing. In the Arusha-Tengeru area 29 var. were completely resistant to rust (Uromyces phaseoli); in the Olmolog-Moshi area 12 var. were rust resistant and it was established that a 2nd rust race was virulent. All var. were subjected to soaking tests at harvest and after storage for varying periods under differing conditions of temp. and humidity. Seed hardness was found to be a genetic character; when var. are heterozygous for the gene for soakability, physiological

conditions of temp. and humidity existing during crop growth and storage can adversely affect the % soakability. Yields of 7 var. ranging from 1219 to 2904 lb/ac are given. (Summary by F.G. Trans. by L.M.F.) G01

0806

18002 MACARTNEY, J.C. 1961?. Haricot beans. Tengeru, Tanzania, Northern Regional Research Centre. 2p. Engl.

Phaseolus vulgaris. Snap beans. Seed. Canned beans. Cultivars. Selection. Tanzania.

A brief historical review of the seed industry of snap bean in Tanzania, Africa, is given. In 1959 a work program was initiated to produce a bean var. suitable for the export canning market with the following requirements: resistant to rust, seed should be soaked 100% when left in water for 16 h, suitable size, shape, and flavor for canning, and agronomic characters (maturity not longer than 120 days, an erect bush type, non-shattering during drying, ability to resist splitting during threshing, and yield). In 1964 2 rust-resistant var. (Tengeru No. 8 and No. 16) were released for commercial growing. (Summary by F.G. Trans. by L.M.F.) G01

0807

25372. MATTUSCH, P.; GERLAGH, M.; ESTER, A.; SPIKMAN, G. 1982. SCREENING OF SNAP BEAN CULTIVARS FOR RESISTANCE TO SCLEROTINIA SCLEROTIORUM. BEAN IMPROVEMENT COOPERATIVE. ANNUAL REPORT 25:48-50. ENGL. 4 REFS. [FEDERAL BIOLOGICAL RESEARCH CENTRE, VEGETABLE PROTECTION INST., MARKTWEG 60, 5030 HRTH-FISCHENICH, FEDERAL REPUBLIC OF GERMANY]

TWENTY-THREE SNAP BEAN CV. WERE TESTED FOR RESISTANCE TO SCLEROTINIA SCLEROTIORUM IN GERMANY AND THE NETHERLANDS IN 1980 AND 1981. IT WAS CLEAR THAT THE REACTION OF DIFFERENT CV. WAS QUITE STABLE ACROSS LOCATIONS AND IN TIME. AMONG THE RESISTANT CV. WAS CHARLEVOIX WHICH SHOWED PHYSIOLOGICAL RESISTANCE AND ARCHITECTURAL ESCAPE MECHANISMS. [CIAT].

0808

18522 NATARAJAN, S.; ARUMUGAM, R. 1981. Selection indices in French beans (Phaseolus vulgaris L.). South Indian Horticulture 29(2):122-123. Engl., 5 refs.

Phaseolus vulgaris. Snap beans. Cultivars. Agronomic characters. Yields. Selection. India.

Twenty diverse French bean were examined at the Horticultural Research Station, Kodaikanal, Tamil Nadu (India) to determine the degree of association of characters with yield. No. of pods/plant, no. of branches/plant, pod length, no. and wt. of seeds/pod, plant height, and pod diameter together accounted for 87% of total variation in green pod yield. The 1st 5 characters made the biggest contributions with no. of pods/plant exerting the max. influence. (Summary by Plant Breeding Abstracts) G01

0809

12294 THE NATIONAL Bean Programme in Uganda. Uganda. 5p. 1983. Engl.

Paper presented at the Workshop to Develop a Collaborative Project for Bean Research in Eastern Africa, Cali, Colombia, 1983.

Phaseolus vulgaris. Snap beans. Cultivars. Maturation. Yields. Resistance. Uromyces phaseoli. Agricultural projects. Fertilizers. N. P. Agricultural lime. Intercropping. Zea mays. Viroses. Uganda.

Bean research needs in Uganda are briefly analyzed regarding the areas of breeding, agronomy, pathology, entomology, and nutrition. An inventory of research work carried out by the National Bean Program in Uganda is made. A table with data on no. of days to maturity, yield (kg/ha), and diseases recorded for the var. K_{130}, K_{113}, K_{112}, K_{119}, K_{121}, K_{116}, and K_{20} is included. A breeding program of haricot and dry beans for resistance to rust (Uromyces phaseoli) has been undertaken. The effect of N, P, and lime on beans in monoculture and in association with maize and cotton is being studied. Existing resources (personnel and infrastructure) are listed. A regional center for beans and cowpeas should be formed in Uganda to monitor the progress and achievements of national research programs. (Summary by F.G. Trans. by L.M.F.) GOI

0810

21763 NAVALE, P.A.; PATIL, M.M. 1982. Genotypic variation and character association in French bean. Journal of Maharashtra Agricultural Universities 7(3):267-268. Engl., 4 Refs. [College of Agriculture, Pune 411 005, India]

Phaseolus vulgaris. Snap beans. Cultivars. Inheritance. Yield components. Yields. Genetics. Maturation. India.

The variation and heritability of several yield characters were studied in 16 samples of local bean types (Rajmah) collected in western Maharashtra, India. Five randomly selected plants were observed; the no. of pods/plant and the no. of seeds/pod varied considerably (5-24 and 2.99-5.89, resp.). The wt. of 100 seeds (16.2-37.7 g) made a direct contribution to yield. Grain yield/plant varied from 3.6 to 21.3 g, the highest yield corresponding to Jampa Improved due to its higher no. of pods and of seeds/pod. Genotypic factors had a greater effect than environmental factors considering the high heritability of characters such as grain yield, no. of pods and of grains/plant, period of maturity, and plant height. Correlation studies highlighted the importance of the association between days to flowering, no. of pods and of seeds, and period of maturity in the development of improved var. (Summary by I.B. Trans. by L.M.F.) GOI

0811

20631. OCKENDON, D.J.; CURRAH, L.; ROBINSON, H.T. 1983. BEAN. IN NATIONAL VEGETABLE RESEARCH STATION. ANNUAL REPORT 1982. WELLESBOURNE, SCOTLAND. P.52. ENGL. [WELLESBOURNE WARWICK CV35 9EF, SCOTLAND]

THE ADVANCES OF WORK TO TRANSFER RESISTANCE TO PSEUDOMONAS PHASEOLICOLA FROM FRENCH BEANS TO PHASEOLUS COCCINEUS, AND THE 2 APPROACHES THAT HAVE BEEN ADOPTED TO PRODUCE A DWARF P. COCCINEUS WITH GOOD GROWTH HABIT ARE BRIEFLY REPORTED. [CIAT].

0812

6248 PARK, H. G. and DAVIS, D. W. **Inheritance of interlocular cavitation in a six-parent dialled cross in snap beans** (*Phaseolus vulgaris* L.). Journal of the American Society for Horticultural Science 10(2):184-189. 1976. Engl., Sum. Engl., 14 Refs., Illus.

Phaseolus vulgaris. **Inheritance. Crossbreeding. Seeds. Pods. Genotypes. Genes.**

The inheritance of interlocular cavitation (IC), characterized by rupture of the soft, parenchymatous endocarp tissue between the seed locules in developing french bean pods, was studied using 6 parental cultivars, all 30 possible F_1 progenies grown in the greenhouse, and the 30 F_2 families grown at various planting dates at 2 field locations. IC appeared to be a highly heritable character, conditioned by a predominantly additive polygenic system with partial dominance for resistance. Reciprocal effects were negligible. Neither epistasis nor transgressive segregation was detected. Order of susceptibility among genotypes was maintained over the wide range of environments. Genotype x environment interaction was significant but was relatively small compared to total genetic variability. Association between greenhouse-grown F_1 and field-grown F_2 plants was high for degree of IC, suggesting that F_1 performance might be informative in choosing superior crosses. Breeding progress appears to be feasible in a program designed to utilize the large amount of additive genetic variance. *(Author's summary)* G01

0813

28691 PRASAD, N.B. ; RAM, H.H. 1985. Note on selection for pods per plant in the F2 generation of three crosses in French-bean [Phaseolus vulgaris L.]. Legume Research 8(1):57-58. En., 5 Ref. [Dept. of Plant Breeding, G.B. Pant Univ. of Agriculture & Technology, Pantnagar, India]

Phaseolus vulgaris. Snap beans. Crossbreeding. Selection. Inheritance. Pods. India.

The effectiveness of F2 plant selection for pods/plant in 3 crosses of French bean was investigated. Three F2 (Contender x Big Bend Red, UPF-488 x Big Bend Red, and UPF-191 x Big Bend Red) were grown in winter. Three hundred individual F2 plants were scored in each cross for no. of pods/plant. Five percent (15 plants/cross) of the F2 plants were selected for high no. of pods/plant. Fifteen random F2 plants were also taken from each cross. These F3 progenies and 2 parental lines from each cross were evaluated in 1981. The differences in families and progenies within a family were significant, showing that selection for pods/plant in F2 of these 3 crosses of French bean was ineffective. This could be due to a greater effect of environment on this character, apparent by the low estimate of heritability. It is suggested that bulk population breeding would be a more effective method in breeding for a larger no. of pods/plant in the populations derived from these crosses. (CIAT)

0814

15205 RELEASE OF snap bean germplasm line 78BP-3. Bean Improvement Cooperative Annual Report 23:127-128. 1980. Engl.

Phaseolus vulgaris. Cultivars. Germplasm. Plant breeding. Plant anatomy. Yields. Trade.

Line 78BP-3 is an F_4 bulk out of Contata x 70BC-1490; the 1st is resistant to BCMV, BYMV, and anthracnose and the 2nd to the curly top virus. Plants are short (52 cm tall x 52 cm wide) and upright with medium sized leaves, short pods (8-11 cm), slim, round, and fairly smooth. In spite of its small pods, av. yields are 4-7 t/ha; it has a firm texture for canning, good flavor, and tends to form seeds in older pods. The wt. of 100 seeds is 18.1 g (2500 seeds/lb). Plant characteristics (high yields, good canning quality, and disease resistance) make it attractive for the producer. *(Summary by C.P.G. Trans. by L.M.F.)* G01

0815

*REUNION TECNICA NACIONAL DE POROTO, 1, TUCUMAN, 1982. Reunion Tecnica Nacional de Poroto, 1, Tucuman, 1982. Argentina, Estacion Experimental Agro-Industrial Obispo Colombres. Publicacion Miscelanea no.74. 116p.

0816

*RICCI, J.R. 1983. Programa de mejoramiento genetico de poroto (Phaseolus vulgaris) en la EEAOC. In Reunion Tecnica Nacional de Poroto, 1, Tucuman, 1982. Argentina, Estacion Experimental, Publicacion Miscelanea no.74. pp.67-85.

0817

22528. ROOS, E.E. 1984. GENETIC SHIFTS IN MIXED BEAN POPULATIONS. 2. EFFECTS OF REGENERATION. CROP SCIENCE 24(4):711-715. ENGL., SUM. ENGL., 21 REFS., ILLUS. (UNITED STATES DEPT. OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, NATIONAL SEED STORAGE LAB., FORT COLLINS, CO 80523, USA)

SEEDS OF MIXED AND PURE LINE POPULATIONS OF 8 SNAP BEAN CV. WERE ARTIFICIALLY AGED AND GROWN IN THE FIELD TO DETERMINE POTENTIAL GENETIC SHIFTS IN THE POPULATIONS. AFTER 3 CYCLES OF SEED REGENERATION, THE COMPOSITION OF UNAGED POPULATIONS GRADUALLY SHIFTED IN FAVOR OF 3 CV. (BLACK VALENTINE, TENDERCROP, AND CHEROKEE WAX); ARTIFICIALLY AGING SEEDS FOR 6 WK. AT 32 DEGREES CELSIUS, 90 PERCENT RH, RESULTED IN THE TOTAL ELIMINATION OF 3 CV. (KINGHORN WAX, TENDERCROP, AND WHITE SEEDED TENDERCROP). AVERAGED OVER 3 YR, BLACK VALENTINE HAD THE HIGHEST SEED YIELD/PLANT FOLLOWED BY TENDERCROP AND CHEROKEE WAX; CV. BOUNTIFUL HAD THE LOWEST YIELD. COMPUTER SIMULATION OF THE EFFECTS OF REPEATED CYCLES OF REGENERATION OF UNAGED SEED POPULATIONS PREDICTED THAT BOUNTIFUL WOULD BE ELIMINATED FROM THE POPULATION AFTER 5 CYCLES, ASSUMING A SAMPLE SIZE OF 64 SEEDS/CYCLE. CV. KINGHORN WAX, SPARTAN ARROW, AND LANDRETH'S STRINGLESS GREEN POD WOULD BE ELIMINATED AFTER 9, 10, AND 15 CYCLES, RESP. SIMULATION OF THE COMBINED EFFECTS OF SEED AGING (TO 50 PERCENT VIABILITY) AND REGENERATION RESULTED IN A PREDICTION THAT ONLY 2 CV. (BLACK VALENTINE AND CHEROKEE WAX) WOULD SURVIVE 15 CYCLES. (AS).

0818

19895 RUBAIHAYO, P.R. 1973. The variability and correlations of some characters in the Makerere bean (Phaseolus vulgaris L.) germplasm. In Luse, R.A.; Williams, R.J., eds. IITA Workshop on Grain Legume Improvement, 1st., Ibadan, Nigeria, 1973. Proceedings. Ibadan, International Institute of Tropical Agriculture. pp.91-95. Engl., 4 Refs.

Phaseolus vulgaris. Germplasm. Snap beans. Determinate cultivars. Indeterminate cultivars. Maturation. Xanthomonas phaseoli. Yields. Uganda.

Two expt. were carried out with common bean (620 var.) and haricot bean (590 var.) to determine the amount of variability that exists in germplasm and the nature of interrelationships of some characters that have been used in selection at Kabanyolo U. Farm (Uganda). In each expt. the field was divided into 3 blocks and each block into sub-blocks. Sub-blocks were divided into single rows 3-m long and 60 cm apart (10 cm intrarow). Each maturity group of common bean was dominated by indeterminate var., whereas early maturity groups of haricot beans were dominated by determinate var. and late groups by indeterminate ones. However, there was more variability in indeterminate var. than in the determinate ones. Beans showed large variability when infected with blight (0-70%) compared with haricot bean (25-30%). Mean seed yield/plant was 12.7 and 11.5 g for common bean and haricot bean, resp., with C.V. of more than 45% in both. The variability in the characters in the different subpopulations underlines the risk of evaluating these characters on the whole population basis. Important differences between determinate and indeterminate growth habits in bean are suggested. Percentage blight had a significant negative correlation ($P < 0.01$) with each of the characters; maturity period also had a significant negative correlation with crop index in common bean ($P < 0.01$) and haricot bean ($P < 0.05$). Crop index was positively correlated ($P < 0.01$) with seed yield/plant. Partial correlation between maturity period and seed yield/plant at a fixed crop index was positively significant ($P < 0.01$). All multiple correlations were significant ($P < 0.01$). Partial and multiple correlations agreed with the relationship indicated by the simple cortelations. (Summary by EDITEC. Trans. by L.M.F.) G01

0819

13575 SALAMINI, F. and ALLAVENA, A. Greenhouse growing of dry-seed and snap bean (*Phaseolus vulgaris*): indications and prospects. Acta Horticulturae 58 271-274. 1977. Engl., Sum. Engl., 2 Refs.

Phaseolus vulgaris. Mutation. Growth. Agronomic characters. Yields. Dry matter. Photosynthesis. Italy.

Studies were made of growth and cropping of a small-leaved glossy mutant of cv. Royal Red, compared with normal plants of the same cv. Pod and DM yields were lower in the mutant, but the ratios pod:LAD and DM:LAD were higher, indicating greater photosynthetic efficiency. *(Summary by Horticultural Abstracts.* G01

0820

21380 SALIH, S.H. 1979. Haricot beans (fasulia). In Ed-Damer, Sudan. Hudeiba Research Station. Annual Report 1974-1975. Ed-Damer. pp.47-49. Engl.

Phaseolus vulgaris. Cultivars. Snap beans. Yield components. Seed production. Technology evaluation. Sudan.

Two var. trials were conducted at Hudeiba Research Station (Sudan) in 1979: one for snap beans and the other for curly top resistant selections. Significative differences were found in all characters tested, except no. of seeds/pod, in a trial which included 9 snap bean cv. replicated 5 times. Yields ranged between 38.8-332.2 kg/feddan (1 feddar = 0.42 ha) for cv. HRS 422 and HRS 435, resp. Low yields were partly attributed to poor soils. A significative correlation was found between yield and no. of pods/plant; 1000-seed wt. and no. of days to flowering were negatively and significatively correlated at the 1% level. Significative differences were

found in all characters except for yield and no. of pods/plant when 9 curly top resistant selections were tested with RO/2/1 and Red Mexican. Yields ranged from 318 to 518 kg/feddan; pods/plant from 5.8 to 8.6; seeds/pod from 3.3 to 4.9; 1000 seed wt. from 217 to 312 g; days to flowering from 38 to 48; and days to maturity from 89 to 96. Thirty-one navy bean collections were propagated in a large area to obtain seed for future preliminary yield trials. (Summary by I.B.) G01

3613

0821

SHEA, P.F., GABELMAN, W.H. and GERLOFF, G.C. The inheritance of efficiency in potassium utilization in snap beans, (Phaseolus vulgaris L.) Proceedings of the American Society for Horticultural Science 91:286-293. 1967. Engl. Sum. Engl. 16 Refs. Illus.

Phaseolus vulgaris. Plant nutrition. Minerals. K. Nutritional requeriments. Cultivars. Plant breeding. Inheritance.

Strains of snap beans efficient and inefficient with respect to K utilization were selected by screening diverse source material in nutrient solutions containing 5 ppm K. Reciprocal F_1 progenies from crosses between efficient and inefficient strains discounted any maternal effects associated with cytoplasmic factors or variations in seed size between the parental strains. Segregation data for F_1, F_2 and backcross progenies supported a single gene difference between inefficient strains 38 (Mexico) and 63 (Canada), and an efficient strains 66 (Germany). The gene k_e was proposed to designate the efficiency locus; thus the efficient genotypes are homozygous recessive k_ek_e. Complete dominance occurs at this locus. Differential response to low K nutrition appears to be associated with efficiency in K utilization rather than in K uptake. The significance of these findings is discussed with respect to gene action and application to crop production. (Author's summary).

0822

13183 SIDDIQUE, M.A. and GOODWIN, P.B. Maturation temperature influences on seed quality and resistance to mechanical injury of some snap bean genotypes. Journal of the American Society for Horticultural Science 105(2):235-238. 1980. Engl., Sum. Engl., 13 Refs., Illus.

Phaseolus vulgaris. Temperature. Maturation. Mechanical damage. Host-plant resistance. Seed characters. Plant injuries. Genotypes. Australia.

Of 10 bean genotypes studied, all produced better quality seeds at low maturation temp. Resistance to mechanical injury was also max in low temp matured seeds. In general, the color-seeded genotypes unlike the white-seeded genotypes, tolerated a wide range of maturation temp. However, var.'Spartan Arrow', which has colored, large seeds was susceptible to mechanical injury at all maturation temp, and the white-seeded line 26W showed tolerance at all temp. It is possible to breed white-seeded lines showing improved tolerance to high seed maturation temp. *(Author's summary)* G01

0823

25367. SILBERNAGEL, M.J. 1982. RELEASE OF SNAP BEAN CV. BLUE MOUNTAIN. BEAN IMPROVEMENT COOPERATIVE. ANNUAL REPORT 25:31-32. ENGL. [UNITED STATES DEPT. OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, P.O. BOX 30, PROSSER, WA 99350, USA]

THE MAIN CHARACTERISTICS OF THE SNAP BEAN CV. BLUE MOUNTAIN, TO BE RELEASED SOON FOR COMMERCIAL PRODUCTION, ARE BRIEFLY DESCRIBED. CHARACTERISTICS OF ITS PARENTS ARE ALSO GIVEN. BLUE MOUNTAIN IS RESISTANT TO BCMV [DOMINANT "I" GENE] AND CURLY TOP VIRUS. DATA ON PLANT ARCHITECTURE, YIELDS [9.9-14.8 T/HA], CROPPING CYCLE, AND OTHERS ARE PROVIDED. THE CV. IS SUITABLE FOR CANNING AND FREEZING. [CIAT].

0824

18527 SILVA, G.H.; HARTMANN, R.W. 1982. Inheritance of resistance to Rhizoctonia solani Kuhn in snap beans (Phaseolus vulgaris L.). Journal of the American Society for Horticultural Science 107(4):653-657. Engl., Sum. Engl., 7 Refs., Illus.

Phaseolus vulgaris. Inheritance. Resistance. Rhizoctonia solani. Snap beans. Genes

F_3 progeny tests were used to confirm individual F_2 plant Rhizoctonia resistance classifications determined from greenhouse inoculations of bean seedlings. F_2 segregations within individual disease classes mostly agreed with the hypothesis that genetic control of resistance to Rhizoctonia is controlled by 3 pairs of genes acting equally and additively. Partially resistant families postulated to be homozygous for 2 pairs of genes for resistance were recovered in the segregating generations in the frequencies expected. (Author's summary) G01

0825

26535. SILVA, G.H.; HARTMANN, R.W. 1979. PRELIMINARY INVESTIGATIONS ON INHERITANCE OF RESISTANCE TO RHIZOCTONIA SOLANI IN SNAP BEANS [PHASEOLUS VULGARIS L.]. PROCEEDINGS OF THE TROPICAL REGION, AMERICAN SOCIETY FOR HORTICULTURAL SCIENCE 23:228-233. ENGL., SUM. ENGL., 14 REFS.

THE INHERITANCE OF RESISTANCE TO RHIZOCTONIA SOLANI IN SNAP BEANS WAS STUDIED USING CROSSES BETWEEN 3 SUSCEPTIBLE CV. [HARVESTER, HAWAIIAN WONDER, AND MANOA WONDER] AND 4 RESISTANT LINES [PI 165426, PI 226895, CORNELL 2114-12, AND B 4096]. DISEASE RATINGS WERE MADE IN THE GREENHOUSE IN ARTIFICIALLY INFECTED BEDS. DISEASE INFECTION WAS RATED ON A SCALE OF 1 [RESISTANT] TO 5 [SUSCEPTIBLE],

BASED ON THE SIZE AND DEPTH OF LESIONS ON 2-WK.-OLD SEEDLINGS. RATINGS FOR THE SUSCEPTIBLE PARENTS RANGED FROM 3.93 TO 4.88 AND FOR RESISTANT PARENTS FROM 1.08 TO 1.69. AV. DISEASE INFECTION RATINGS FOR THE F1S WERE INTERMEDIATE BETWEEN THE PARENTS, WHILE F2 PROGENY SEGREGATED INTO ALL 5 CLASSES. CONCLUSIONS MADE SO FAR ARE THAT THE PARENT B 4096 IS STILL SEGREGATING FOR RESISTANCE, THE PARENT MANOA WONDER CARRIES SOME RESISTANCE COMPARED WITH HARVESTER AND HAWAIIAN WONDER, AND THE RESISTANCE IS QUANTITATIVELY INHERITED, BUT THE NO. OF PAIRS OF GENES INVOLVED IS SMALL, PERHAPS 3. [AS].

D826

27487. SINGH, A.K.; SAINI, S.S. 1983. HETEROSIS AND COMBINING ABILITY STUDIES IN FRENCH BEAN. SABRAO JOURNAL 15(1):17-22. EN. SUM. EN., 5 REF. [DEPT. OF VEGETABLE CROPS & FLORICULTURE, HIMACHAL PRADESH AGRICULTURAL UNIV., SOLAN, H.P., INDIA]

SEVEN FRENCH BEAN LINES OF POLE AND BUSH TYPES WERE EVALUATED IN A DIALLEL CROSS FOR GENERAL COMBINING ABILITY, SPECIFIC COMBINING ABILITY, AND PERCENTAGE OF HETEROSIS FOR YIELD, NO. OF PODS/PLANT, AND POD DIAMETER IN THEFIELD IN SOLAN, INDIA. THE GENERAL COMBINING ABILITY AND SPECIFIC COMBINING ABILITY MEAN SQUARES WERE HIGHLY SIGNIFICANT. MEAN SQUARES OF GENERAL COMBINING ABILITY EFFECTS WERE HIGHER THAN THOSE OF SPECIFIC COMBINING ABILITY EFFECTS FOR NO. OF PODS/PLANT AND POD DIAMETER, INDICATING A DOMINANCE OF ADDITIVE GENE EFFECTS, THE CONTRARY BEING TRUE FOR SEED YIELD. HETEROSIS WAS OBSERVED FOR YIELD AND NO. OF PODS/PLANT IN MOST CASES. FOR PODDIAMETER IT WAS HIGHLY SIGNIFICANT IN ALL COMBINATIONS. CROP IMPROVEMENT BY HYBRID SEED PRODUCTION USING MALE STERILE FACTORS OR BY CONVENTIONAL SELECTION METHODS FOR SELF-POLLINATED CROPS USING SELECTED CROSSES IS SUGGESTED. [AS].

D827

23893 SINGH, A.K.; SAINI, S.S. 1982. A note on combining ability in French bean (Phaseolus vulgaris L.). Haryana Journal of Horticultural Science 11(3-4):270-273. Engl., 4 Refs.

Phaseolus vulgaris. Snap beans. Hybrids. Cultivars. Crossbreeding. Selection. Yields. Yield components. Protein content. India.

The combining ability in a 7 x 7 diallel cross of French beans was studied. Plant height, pod length, pod diameter, pods/plant, seeds/pod, 100 seed wt., seed yield/plant, and protein content were measured. Analysis of variance showed significant differences in the progeny and hybrids for all the characters, except pod diameter in hybrids. Both the general and specific combining ability variances were highly significant for all the characters, suggesting the involvement of both types of gene actions. However, in general, the general combining ability variances were higher in

magnitude than the specific combining ability for all the characters except protein content. This indicates the importance of non-additive gene action. Out of 21 crosses, the best specific combinations were PLB x Premier for pod length and protein content, PLB x EC 10016 for plant height and seed yield/plant, Premier x EC 10016 for plant height, and EC 10016 x Local for seeds/pod, seed yield/plant, and protein content. The results demonstrated that favorable additive genes are present in the parents involved in these crosses for yield and yield components and could be used for obtaining desirable genotypes through hybridization and selection breeding programs. [CIAT]

0828

*SINGH, P. 1983. El programa y estrategia de mejormaiento genetico del poroto Alubia para Argentina en el CIAT. In Reunion Tecnica Nacional de Poroto, 1, Tucuman, 1982. Tucuman, Estacion Experimentel Agro-Industrial Obispo Colombres. Publicacion Miscelanea no.74. pp.29-48.

0829

25881. STAVELY, J.R.; STEINKE, J. 1985. BARC-RUST RESISTANT-2, -3, -4, AND -5 SNAP BEAN GERMPLASM. HORTSCIENCE 20(4):779-780. ENGL. SUM. ENGL., 7 REFS., ILLUS. [PLANT PATHOLOGY LABORATORY, BELTSVILLE AGRICULTURAL RESEARCH CENTER-WEST, AGRICULTURAL RESEARCH SERVICE, UNITED STATES DEPT. OF AGRICULTURE, BELTSVILLE, MD 20705, USA]

THE WHITE-SEEDED, GREEN-PODDED BUSH SNAP BEAN GERMPLASM LINES, BARC-RUST RESISTANT (RR)-2, -3, -4, AND -5, THAT ARE THE 1ST SNAP BEANS HOMOZYGOUS FOR RESISTANCE TO ALL AVAILABLE USA RACES OF THE PATHOGEN, WERE APPROVED FOR JOINT RELEASE BY AGRICULTURAL RESEARCH SERVICE-UNITED STATES DEPARTMENT OF AGRICULTURE AND THE NEW JERSEY AGRICULTURAL EXPT. STATION IN FEB. 1984. [AS (EXTRACT)].

0830

25368. STAVELY, J.R. 1982. THE 1981 BEAN RUST NURSERIES. BEAN IMPROVEMENT COOPERATIVE. ANNUAL REPORT 25:34-35. ENGL. 2 REFS. [UNITED STATES DEPT. OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, BELTSVILLE AGRICULTURAL RESEARCH CENTER, BELTSVILLE, MD 20705, USA]

RESULTS OF THE INTERNATIONAL BEAN RUST NURSERY (IBRN) WITH 100 ENTRIES AND THE UNIFORM SNAP BEAN RUST NURSERY (URN) WITH 107 ENTRIES, FIELD-TESTED IN 1981 IN USA, ARE REPORTED. FIFTEEN IBRN LINES WERE RESISTANT TO RUST AT ALL LOCATIONS: REDLANDS GREENLEAF B, REDLANDS GREENLEAF C, CCGB 44, NEGRO JALPATAGUA, COMPUESTO CHIMALTENANGO 3, CARIOCA, V3249-13-1C, G1089-1C-1C, OLATHE, BAT 41, BAT 1155, BAC 58, A-62, A-140, AND PARANA. SEVERAL IBRN ENTRIES SHOWED DIFFERENTIAL REACTIONS AMONG THE 3 LOCATIONS (NORTH DAKOTA,

BELTSVILLE, AND SAGINAW). THE MOST RESISTANT URN ENTRIES OVER ALL LOCATIONS WERE G700, NEP-2, AND B-190. (CIAT).

0831

8005 STEVENS, M.A. and FRAZIER, W.A. **Inheritance of oct-1-en-3-ol and linalool in canned snap beans (*Phaseolus vulgaris* L.).** Proceedings of the American Society for Horticultural Science 91:274-285. 1967. Engl., Sum. Engl., 8 Refs., Illus.

Phaseolus vulgaris. **Inheritance. Analysis. Crossbreeding. Maturation. Pods. Genes.**

The inheritance of oct-1-en-3-ol and linalool in french beans was studied in F_1 and F_2 progeny from reciprocals of the crosses FM-1L x G-50 and FM-1L x Romano by a gas chromatographic technique using gas-entrainment on-column trapping. The concentration of oct-1-en-3-ol and linalool in the pod was influenced by stage of development. The concentration was relatively high in the young pod and decreased with maturity. The inheritance study indicated that (1) the concentration of oct-1-en-3-ol is simply inherited. FM-1L is dominant over both G-50 and Romano. (2) Linalool concentration appears to be simply inherited with an additive gene. The F_2 progeny of FM-1L x G-50 crosses gave a good fit to the expected 1:2:1 ratio. The F_2 progeny of FM-1L x Romano crosses fits neither a 1:2:1 ratio because of too few parental types nor a 1:14:1 ratio because of too many parental types. It is believed that the inheritance of linalool in FM-1L x Romano is also controlled by a single additive gene. The failure to obtain a fit to a classical ratio was probably due to difficulty in delineating parental types because of the maturity effect. (3) Reciprocals differed relative to distribution of oct-1-en-3-ol content. The difference was expressed as an increase in the no. of progeny with the same concentration as the maternal parent. Reciprocal differences were less apparent or absent for linalool.(*Author's summary*) G01

0832

16464 SUMMARY INFORMATION from national haricot bean variety trials. 1972. Ethiopia. 6p.

Phaseolus vulgaris. Cultivars. Snap beans. Planting. Timing. Weeding. Herbicides. Yields. Ethiopia.

Trial sites for evaluating haricot bean var. in Ethiopia in 1972 are described. For each site information is included regarding: planting date, days to maturity, location, alt., soil type, preceding crop, amount of fertilizer (kg/ha), row spacing (cm), planting method, rainfall during growth cycle. Data on yield (q/ha) of var. tested at the different sites, disease incidence of rust (Uromyces appendiculatus) and leaf spot for each var., yields obtained in planting date trials and in 2 chemical weed control trials are given. (Summary by F.G. Trans. by L.M.F.) G01

0833

22079 TANZANIA. MINISTRY OF AGRICULTURE. 1978. Beans (Phaseolus vulgaris). In _____. Grain Legume Improvement Report 1975-1976. Dar es Salaam, Tanzania. pp.62-75. Engl.

Phaseolus vulgaris. Snap beans. Cultivars. Adaptation. Yields. Insect control. Fertilizers. Selection. Plant breeding. Tanzania.

Results of grain legume improvement trials carried out in 1975-78 in Tanzania are presented. In French bean var. trials, severe attacks of

Xanthomonas phaseoli were reported in 1975-76. Cv. Naz gave the highest yields (862 kg/ha) in 1976. Cv. maturity varied between 62-70 days. In the Tanzania Bean Var. Trial (1977), cv. Monroe gave the highest yield (1457

kg/ha). Most cv. were susceptible to at least one major disease. In preliminary field trials at Lyamungu moisture stress affected the expt. In International Bean Yield and Adaptation Nursery trials, cv. P-458, P-402, P-392, and P-755 outyielded local check Canadian Wonder. A total of 300 new germplasm lines from EAAFRO (currently the Kenyan Agricultural Research Institute-KARI) were evaluated at Ilonga and 746 lines from CIAT were evaluated at Ilonga, Mbeya, and Lyamungu. From these, 125 were selected for further testing in 1978. In the Uniform Cv. Trial (1978), P311-A-L had the highest yield at Lyamungu and Gairo (2818 and 2267 kg/ha, resp.). In the Preliminary Yield Trial, 50 outstanding lines were selected. Single plant selections from 60 bean crosses from CIAT were evaluated and promising ones are being multiplied. About 90 kg of purified Canadian Wonder seed has been given to Arusha Seed Farm for multiplication. Insect control and fertilizer trials are reported (1975-77). Tables with data on all trials conducted are included. (Summary by I.B.) GC.

0834

27247. WEAVER, M.L.; TIMM, H.; SILBERNAGEL, M.J.; BURKE, D.W. 1985. POLLEN STAINING AND HIGH-TEMPERATURE TOLERANCE OF BEAN. JOURNAL OF THE AMERICAN SOCIETY FOR HORTICULTURAL SCIENCE 110(6):797-799. EN. SUM. EN., 13 REF., IL. [WESTERN REGIONAL RESEARCH CENTER, UNITED STATES DEPT. OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, ALBANY, CA 94710, USA]

VIABILITY OF POLLEN GRAINS OF ISOGENIC SIBLING PHASEOLUS VULGARIS SELECTIONS OF KNOWN TOLERANCE AND SENSITIVITY TO HIGH TEMP. WAS COMPARED WITH THAT OF A COMMON PARENT BEAN SELECTION (5BP7) AND A COWPEA CV. EXPOSURE OF NEWLY OPENED FLOWERS TO 35 OR 41 DEGREES CELSIUS REDUCED THE VIABILITY OF POLLEN GRAINS IN ALL BEAN SELECTIONS. POLLEN OF ALL SIBLING SELECTIONS WAS LESS AFFECTED BY HIGH TEMP. THAN POLLEN OF THEIR COMMON PARENT, SUGGESTING TRANSGRESSIVE SEGREGATION OF FACTORS FOR HIGH TEMP. TOLERANCE. AT 41 DEGREES CELSIUS, MOST POLLEN GRAINS WERE DESTROYED IN THE PARENT BEAN SELECTION AND THE 2 HIGH TEMP.-SENSITIVE SIBLINGS, WHEREAS 44-55 PERCENT OF THE POLLEN GRAINS APPEARED TO BE VIABLE IN THE 2 HIGH TEMP.-TOLERANT SIBLINGS. POLLEN VIABILITY OF THE HIGH TEMP.-TOLERANT COWPEA CV. WAS NOT REDUCED BY TEMP. TO 41 DEGREES CELSIUS. POLLEN STAINING INDICATED AN INTERRELATIONSHIP BETWEEN POLLEN VIABILITY AND TOLERANCE TO HIGH TEMP. STRESS AMONG THE SELECTIONS. THE TECHNIQUE DESCRIBED IS THOUGHT TO HAVE THE POTENTIAL FOR RAPID SELECTION OF HIGH TEMP.-TOLERANT GENOTYPES IN HYBRID POPULATIONS. (AS).

0835

23386 WYATT, J.E. 1984. An indehiscent anther mutant in the common bean. Journal of the American Society for Horticultural Science 109(4):484-487. Engl., Sum. Engl., 15 Refs., Illus. [United States Dept. of Agriculture, Agricultural Research Service, United States Vegetable Laboratory, 2875 Savannah Hwy., Charleston, SC 29407, USA]

Phaseolus vulgaris. Snap beans. Plant breeding. Mutation. Pollination. Cross-pollination. Self-pollination. Crossbreeding. Anthers. Buds. USA.

A mutant with indehiscent anthers (IA) was found in a snap bean line. The IA character was associated with absence of modification of the longitudinal anther suture, which resulted in nearly complete failure of anther dehiscence and self-pollination in IA plants. Pollen from IA plants was fertile, and normal pod and seed production was achieved by crushing the anthers and hand pollinating either mature buds or flowers. Conventional cross pollinations using freshly opened flowers on IA plants resulted in a low incidence of selfing. In a field planting of IA and normal plants, 94% outcrossing was measured in IA plants. (Author's summary) G01

0836

15819 WYATT, J.E.; FASSULIOTIS, G.; JOHNSON, A.W.; HOFFMAN, J.C.; DEAKIN, J.R. 1980. B4175 root-knot nematode resistant snap bean breeding line. HortScience 15(4):530. Engl., Illus.

Phaseolus vulgaris. Snap beans. Cultivars. Host-plant resistance. *Meloidogyne incognita.* Dwarf beans. USA.

B4175 is a new breeding line of bush snap bean with resistance to the root knot nematodes (*Meloidogyne incognita*). Their origin and agronomic characteristics are described. *(Summary by F.G. Trans. by L.M.F.)* G01 E05

0837

21381 YASSIN, T.E.G. 1979. Fasulia (Phaseolus vulgaris). (Beans). In Ed-Damer, Sudan. Hudeiba Research Station. Annual Report 1971-1972. Ed-Damer. pp.27-28. Engl.

Phaseolus vulgaris. Cultivars. Technology evaluation. Yields. Yield components. Adaptation. Maturation. Snap beans. Sudan.

In trials conducted at Hudeiba and Shendi (Sudan), in a randomized block design with 3 replicates, var. Red Mexican, R0/2/1, R1/13, R1/5, R1/7, R1/25, and Great Northern No. 35 presented yields of 774 and 921, 659 and 780, 669 and 767, 473 and 752, 615 and 748, 761 and 728, and 582 and 724 kg/feddan (1 feddan = 0.42 ha), resp., at both sites. Nine lines selected for curly top resistance, and R0/2/1 and Red Mexican, were grown in randomized blocks with 5 replications. Significant differences were observed in seeds/pod, seed wt., days to 50% flowering and to maturity. Recently acquired snap bean material was completely killed at the seedling stage, which may have been due to the high salt content of the plot. (Summary by I.B.) G01

H00 NUTRITION

0838

10687 BRENNER, A.M. *et al.* **Quality control standards for cooked frozen green beans held on a steam table for varying holding times.** Journal of Food Science 43:1066-1070. 1978. Engl., Sum. Engl., 33 Refs., Illus.

Phaseolus vulgaris. **Palatability. Cooking. Cultivars. Temperature. Laboratory experiments. Experiment design. Statistical analysis. Seed color. Water content. Human nutrition. Consumption.**

Two var. of whole green beans, prepared by steaming, were held on a steam table (>60°C) with portions removed at 10-min intervals up to 60 min. Dominant wavelengths and Instron

measurements for force, shear peak area and work were determined for the 7 holding periods. Var. were inherently different in color ($P < 0.01$). Holding time affected dominant wavelength ($P < 0.01$), Munsell color ($P < 0.01$), force ($P < 0.05$) and work ($P < 0.05$). Texture, color and overall acceptability were evaluated by a trained sensory panel; a consumer panel also evaluated overall acceptability. Orthogonal comparisons of sensory and objective evaluations for dominant wavelengths, force and work were linear. Acceptability scores were highest at 30-min heated holding time. Statistical analysis indicated that objective quality control standards could be defined by a range of Munsell colors or dominant wavelengths and/or force and work measurements obtained at optimum holding periods. (*Author's summary*) H00

0839

22190 CHEN, K.H.; McFEETERS, R.F.; FLEMING, H.P. 1983. Fermentation characteristics of heterolactic acid bacteria in green bean juice. Journal of Food Science 48(3):962-966. Engl., Sum. Engl., 15 Refs., Illus. [Food Fermentation Laboratory, Dept. of Food Science, North Carolina State Univ., Raleigh, NC 27650, USA]

Phaseolus vulgaris. Fermentation. Processing. Sugar content. Snap beans. USA.

Green bean juice was fermented with 10 species (14 strains) of heterofermentative and 2 homofermentative lactic acid bacteria to select organisms which might be used to carry out a complete fermentation. Lactobacillus cellobiosus was the only organism to remove all fermentable sugars from bean juice with or without 2.5% NaCl. Nine other cultures used from 75 to 95% of sugars. L. cellobiosus also produced the lowest final pH among the 14 strains. A complete analysis of major fermentation substrates and products was done for each organism. Fermentation balance calculations showed a range from 74 to 132% C recovery. These bacteria showed considerable variation in ability to degrade malic acid and to form mannitol and acetic acid. (Author's summary) H00

0840

21741 CHEN, K.-H.; McFEETERS, R.F.; FLEMING, H.P. 1983. Stability of mannitol to Lactobacillus plantarum degradation in green beans fermented with Lactobacillus cellobiosus. Journal of Food Science 48(3):972-974, 981. Engl., Sum. Engl., 13 Refs., Illus. [United States Dept. of Agriculture, P.O. Box 5578, Raleigh, NC 27650, USA]

Phaseolus vulgaris. Fermentation. pH. Snap beans. USA.

Mannitol, in fermented green bean juice, was converted to lactic acid by Lactobacillus plantarum when initial pH was raised to 3.9. However, at pH 3.5, mannitol was stable to anaerobic degradation by a 10^6 colony forming units/ml inoculum of 19 strains of L. plantarum and 4 isolated homofermentative lactobacilli. Several strains were capable of limited mannitol degradation at initial pH 3.7. Completely fermented beans were microbiologically stable for at least 6 mo. under anaerobic conditions at 27°C. It is possible that heterolactic acid-fermented vegetables are microbiologically stable provided fermentable sugars are removed and pH is lowered below 3.7. (Author's summary) H00

0841

20891 GIBRIEL, A.Y.; ASHMAWI, H.; EL-SAHRIGI, A.F.; SOLIMAN, S.A. 1976. Determination of thermal process time of Egyptian canned foods. Annals of Agricultural Science (Egypt) 5:155-161. Engl., Sum. Engl., 4 Refs., Illus.

Phaseolus vulgaris. Canned beans. Snap beans. Processing. Heat treatment. Timing. Egypt.

An expt. was conducted to determine the thermal process time required for canned products (orange, guava and mango juice; tomato concentrate; green beans; peas; okra; horse beans; and white beans) to maintain the rate of spoilage accepted by the international market. Thermocouples were used to measure the rate of heat penetration in the canned products. Retort temp. was 120°C for canned vegetables. The improved general method was used to calculate thermal process time. Calculated holding times for canned green beans on the basis of Bacillus megaterium and B. stearothermophilus resistances were 12.6 and 152 min, resp., at 115.6°C. The holding times for canned white beans were 34, 47, 23, and 27 min at 120°C. (Summary by T.F.) H00

0842

14209 JONES, A.T.; PFLUG, I.J.; BLANCHETT, R. 1980. Effect of fill weight on the F-value delivered to two styles of green beans processed in a Sterilmatic retort. Journal of Food Science 45:217-220. Engl., Sum. Engl., 3 Refs., Illus.

Phaseolus vulgaris. Snap beans. Canned beans. Cooking. Processing.

The effect of fill weight on the F-value delivered to 2 different styles of green beans heated in a FMC Sterilmatic processing continuous cooker/cooler was evaluated biologically. Four different fill wt. of each product, French-style and 1-in. cut green beans, were evaluated. All tests were carried out at least 2 times. F-values were measured using biological indicator units filled with a suspension of Bacillus stearothermophilus spores and calibrated at 121.0°C. The F(250°F)-value decreased 2-3 min. when the fill wt. in 300 x 406 cans was increased from 11.5 to 13.0 oz. (Author's summary) H00

0843

21743 MONTVILLE, T.J.; CONWAY, L.K. 1982. Oxidation-reduction potentials of canned foods and their ability to support Clostridium botulinum toxigenesis. Journal of Food Science 47(6):1879-1882. Engl., Sum. Engl., 22 Refs., Illus. [U.S. Dept. of Agriculture, Eastern Regional Research Center, Plant Science Laboratory, 600 E. Mermaid Lane, Philadelphia, PA 19118, USA]

Phaseolus vulgaris. Canned beans. Snap beans. Inoculation. Clostridium botulinum. Toxins. USA.

Oxidation-reduction potentials (Eh) of canned foods ranged from -18 to -438 mV. Foods packed in glass had higher redox potentials than those packed in cans. Only 4 out of 26 products tested reached positive redox values after exposure to air for 24 h at 4°C. Each product was inoculated with a suspension containing 10^5 heat shocked (80°C, 10 min) spores of Clostridium botulinum. Inoculated containers of mushrooms, whole corn, cream corn, asparagus, beef gravy, kidney beans, green beans, cream of mushroom soup, cheddar cheese soup, and lima beans supported toxin production by C. botulinum; potatoes and beets did not. (Author's summary) H00

0844

22276 PRESTAMO, G.; FUSTER, C. 1981. Influencia de diferentes tratamientos térmicos en la conservación de judías verdes congeladas. Cambios en la textura y actividad enzimática. (Influence of different heat treatments on the conservation of frozen green beans. Changes in texture and enzymatic activity). Alimentaria no.123:69,71-73. Span., Sum.

Span., 9 Refs., Illus. [Inst. del Frío, Ciudad Universitaria, Madrid-3, España]

Phaseolus vulgaris. Snap beans. Heat treatment. Seed. Seed characters. Storage.

Samples of the green bean var. Blue Lake 274 were lab. blanched in boiling water for 1, 2, or 3 min, blanched in steam at atmospheric pressure for 5 min, or commercially blanched for 3-4 min, and compared with fresh (untreated) controls. All samples were frozen at -30°C and stored at -20°C. Tests of texture (shear strength) and peroxide value carried out at intervals up to 14 mo. showed than samples blanched in boiling water for 2-3 min had the best texture and sensory qualities after 14 mo. at -20°C. (Summary by Food Science and Technology Abstracts) H00

0845

18589 SUDDENDORF, R. F.; WRIGHT, S. K.; BOYER, K. W. 1981. Sampling procedure and determination of lead in canned foods. Journal of the Association of Official Analytical Chemists 64(3):657-660. Engl., Sum. Engl., 6 Refs., Illus.

Phaseolus vulgaris. Canned beans. Analysis. Pb. Snap beans.

A method is presented for improving within-can homogeneity and simplifying the determination of Pb in canned foods. The entire content of a canned food product is blended with 2N HNO_3 and allowed to stand 1 h; then the sample is again blended and a subsample is taken. The subsample is digested by wet ashing using nitric acid-perchloric acid or nitric acid-sulfuric acid-hydrogen peroxide. The pH of the sample is adjusted with ammonium hydroxide, and the Pb is extracted into butyl acetate as the pyrrolidinecarbodithioate complex. Pb concn. is determined by flame atomic absorption spectrometry. Recoveries of Pb ranged from 92-104% for added 100-mesh Pb particulate. Within-sample variability for green beans was reduced from 37% obtained with blending alone to 3.7% using the proposed procedure at the 3.1 micrograms/g added Pb level. Variability was 7.6% at the 0.68 microgram/g level and 16.4% at the 0.20 microgram/g level of added Pb. The use of nitric acid-sulfuric acid-hydrogen peroxide for digestion has the advantage of not forming a precipitate during the neutralization step, as occurs when nitric acid-perchloric acid is used for dissolution. (Author's summary) H00

0846

24455 VAN BUREN, J.P. 1984. Effects of salts added after cooking on the texture of canned snap beans. Journal of Food Science 49:910-912. Engl., Sum. Engl., 17 Refs., Illus. [Dept. of Food Science & Technology, Cornell Univ., Geneva, NY 14456, USA]

Phaseolus vulgaris. Pods. Na. Snap beans. Seed characters. Cooking. USA.

Soaking bean pods in NaCl solutions caused decreases in firmness and increases in Ca^{++} solubilization as the NaCl concn. increased. $CaCl_2$ soak solutions increased firmness of pods previously softened by soaking in KCl solutions. Chlorides of Na^+, K^+, Li^+, NH_4^+, and Mg^{++}, and Na acetate caused softening. LiCl caused the most softening, while $MgCl_2$ caused the greatest solubilization of Ca^{++}. Salt-induced softening was accompanied by Ca^{++} displacement. Firmness of salt-softened pods was further decreased by subsequent removal of the salt, indicating an electrostatic component as a minor factor in pod texture. (Author's summary) H00

0847

14263 WILKINSON, R.E. *et al.* Turnip green, cucumber, snapbean, and southern pea response to pesticides in intensive-cropping sequences. Journal of Agricultural and Food Chemistry 27(4):900-905. 1979. Engl., Sum. Engl., 13 Refs.

Phaseolus vulgaris. Intercropping. Fat content. Protein content. Pesticides. Toxicity. USA.

Fatty acid contents and % total N determinations were made for turnip greens, cucumber, snap beans, and southern peas grown in intensive-cropping sequences utilizing multiple pesticide applications. Relatively minor changes in fatty acid quantity and quality or % N were found. The major observation is the stability of crop quality in plants exposed to multiple pesticide applications or residues. *(Author's summary)* H00 D02

H01 Foods and Nutritive Value

0848

22945 BLUMENBERG, L.S.; SNIDER, S.; VOLLMAR, E.K. 1982. Quality of green beans and energy required for high temperature processing. Home Economics Research Journal 11(2):143-148. Engl., Sum. Engl., 25 Refs.

Phaseolus vulgaris. Canned beans. Snap beans. Dietary value. USA.

Investigations were carried out to measure and compare energy consumption and ascorbic acid retention when green beans were canned at 15 lb/in^{2}g for 15 min and at 10 lb/in^{2}g for 43 min compared with the USDA recommended procedures (10 lb/in^{2}g for 20 min). Processing beans at 10 lb/in^{2}g for 43 min required significantly more energy than the other 2 treatments. No significant differences were noted among the 3 treatments in ascorbic acid retention (determined by 2,4-dinitro-phenyl hydrazine method) and in eating quality (indicated by triangle sensory tests or Warner-Bratzler shear values). (Summary by Food Science and Technology Abstracts) H01

0849

16086 BROWN, J.W., BEISS, L.A. and HALL, T.C. Microheterogeneity of globulin-1 storage protein from French bean with isoelectrofocusing. Plant Physiology 66:838-840. 1980. Engl., Sum. Engl., 11 Refs., Illus.

Phaseolus vulgaris. Snap bean. Seed. Proteins. Biochemistry. Analysis.

The major storage protein fraction, globulin-1 protein, of French bean was analyzed by 2-dimensional electrophoresis. The protein pattern suggested a more complex system for globulin-1 protein than the model of 3 polypeptides, α, β, and γ, differing in mol. wt. Isoelectrofocusing analyses of the individual proteins showed that each exhibited charge microheterogeneity over a similar pH range. Isoelectrofocusing banding patterns may help to understand the relationships between the globulin-1 polypeptide subunits. *(Author's summary)* H01

0850

14398 BUESCHER, R.W. and ADAMS, K. Influence of packaging and storage on quality of pre-snipped and cut snap beans. Arkansas Farm Research 28(4):14. 1979. Engl.

Phaseolus vulgaris. Canned beans. Storage. Nutritive value. CO_2. O. Deterioration.

Snap beans (var. Early Galatin) were washed, sized, snipped (destemmed) and cut into 3.8 cm lengths before storage for 0, 7 or 14 days at 7°C in (a) open pans, (b) perforated polyethylene (PE) bags, (c) sealed PE bags or (d) as (c) but with internal atmosphere adjusted to 35% CO_2/20% O_2. Atmospheric composition was measured in all packages. In (a) it was similar to the ambient air; in (b) CO_2 levels increased and O_2

declined slightly, a trend which was more marked in (c), where CO_2 levels reached 17% and O_2 dropped to 6% after 14 days; in (d), CO_2 levels dropped to 24% and O_2 to 5% after 14 days. Packaging had a significant effect on quality as measured by wt. loss, shear press values, pH, titratable acidity, colour difference meter 'a' - value and sensory scores. Package (c) provided the best conditions for 14 days holding of prepared snap beans. *(Summary by Food Science and Technology Abstracts)* H01

0851

14254 BUESCHER, R.W. and DOHERTY, J.H. Carbon dioxide inhibits phaseollin accumulation and improves quality of frozen snap beans. Arkansas Farm Research 27(3):11. 1978. Engl.

Phaseolus vulgaris. CO_2. Phaseollin. Phytoalexins. Digestibility. Dietary value.

Initial phaseollin content of broken bean pods was 2.9 µg/g fresh wt. and after exposure for 24 h at 27°C to air or to air containing 30% CO_2 was 29.7 and 6.2 µg/g fresh wt., resp. Exposure for 12 h to CO_2 enriched air gave intermediate results. Broken-end discolouration followed a similar trend. *(Summary by Field Crop Abstracts)* H01

0852

14208 COLLINS, J.L. Quality of canned and frozen snap beans grown in Tennessee. Tennessee Farm and Home Science 110:12-14. 1979. Engl., 4 Refs.

Phaseolus vulgaris. Canned beans. Nutritive value. Food technology.

Freshly harvested snap beans of 25 var. had an av. of 14.2% waste (snips, soil, skins, leaves), 6.9% pod sieve size 1, 82.4% pod sieve size 2 and 10.7% pod sieve size 3, and Hunter L (lightness), a (greenness) and b (yellowness) values of 41.5, 9.1 and 16.1, resp. Beans of pod sieve size 2 were either canned or frozen. Canned beans were prepared by blanching in water at 170°F for 3 min, filling size 303 cans with 295 g beans, covering beans with boiling water and adding 1 teaspoon salt/can. The cans were sealed and processed at 240°F for 20 min; after processing the cans were cooled in tap water, dried and stored for 6 mo. before evaluation. Frozen beans were prepared by blanching in 190°F water for 3 min, cooling in water, freezing on a tray in an air blast freezer at -20°F, filling into 300 g bags and held at 0°F for 6 mo. before evaluation. Results of evaluation of colour, firmness, epidermal sloughing and appearance of frozen and canned beans after 6 mo. storage are tabulated. Av. values for the 25 var. of canned and frozen beans were resp. Hunter L values 32.6 and 30.1, 'a' values 0.5 and 11.9 and 'b' values 15.5 and 14.2, and panel score for appearance, 2.5 and 2.7 (1 = poor; 4 = excellent). Av. epidermal sloughing value (mm) and av. firmness (kg force) for canned beans were 3.7 and 5.3, resp. *(Summary by Food Science and Technology Abstracts)* H01

0853

19960 DAVIS, D.R.; STRIEGLER, C.L. 1982. Effect of pre-processing variables and omission of salt on quality characteristics of canned snap beans. Arkansas Farm Research 31(4):3. Engl.

Phaseolus vulgaris. Snap beans. Canned beans. Heat treatment. Seed characters. Processing. USA.

Snap bean var. Gallatin Valley was classified into 3 sieve sizes; it was mechanically snipped into 1.5" pieces and blanched at 185°F for 4 min. The snap beans were then cooled in cold water (50°F) for several min, or filled hot in 303 x 406 "E" enamel cans (6 oz/can) and covered with boiling water. Salt at 2% was either added or excluded and the cans either exhausted in live steam for 8 min or not exhausted. After sealing, the cans were processed for 21 min at 242°F, cooled and stored at room temp. Samples were examined at 3 days, and at 8, 12 and 16 mo. of storage. None of the

treatments showed a significant effect on the green color; salt omission had no effect on either the wt. or the color of the processed snap beans. However, samples with no salt showed increased firmness and significantly less sloughing than salted snap beans. These results indicate that exhausting snap beans should be avoided unless required to obtain satisfactory vacuum in the cans. (Summary by EDITEC) H01

0854

16745 DAVIS, D.R.; COCKRELL, C.W. 1978. Factors affecting internal can pitting in canned snap beans. Arkansas Farm Research 27(6):7. Engl.

Phaseolus vulgaris. Snap beans. Canned beans. Storage. Temperature.

Snap bean cv. Early Gallatin was canned using commercial procedures in tin cans in order to determine the components responsible for can pitting and methods of preventing it. Sample cans were stored at room temp. or at 38°C and examined periodically over a 16-mo. storage period. The tin coating wt., can vacuum, and storage temp. all had a pronounced effect on pitting severity. Heavier tin-plate cans (1/2 lb) had significantly less pitting than those with a lighter tin plate (1/4 lb) at all storage periods and at both temp. Twenty percent of the cans stored at room temp. were perforated after 16 mo. There were no significant differences in pitting severity between high and low vacuum treatments when cans were stored at 38°C, but at room temp. at 10 mo. storage the difference in severity of pitting was highly significant for low-vacuum samples. This difference was not apparent at 16 mo. The incidence of can pitting increased with storage time at both temp. (Summary by EDITEC. Trans. by L.M.F.) H01

0855

13546 ELKINS, E.R. Nutrient content of raw and canned green beans, peaches, and sweet potatoes. Food Technology 33:66-70. 1979. Engl., 6 Refs.

Phaseolus vulgaris. Canned beans. Nutritive value. Vitamin content. Mineral content. Composition. Analysis.

Nutrient characteristics of green beans, clingstone peaches and sweet potatoes were studied 0, 6, 12 and 18 mo. after heat processing and storage. All 3 products showed excellent retention of riboflavin, niacin and carotene during heat processing and storage. Ascorbic acid was lost by oxidation at canning and by nonoxidative reaction with storage, whereas the primary loss of thiamin was at processing. Slight losses of carotene may occur and carotene was partly isomerized during processing, the isomers containing less vitamin A activity than the original *all-trans-β*-carotene. Blanching of green beans leached water-soluble minerals but there may also be mineral uptake from blanching water and canning brine. Peaches and sweet potatoes only showed increases in Fe from canning and peaches plated out Cu on the bare tinplate of the can. *(Summary by Nutrition Abstracts and Reviews)* H01

0856

21069 GEBRE WOLD, A.A. 1976. Results of feeding trials with crop residues in Ethiopia. Ethiopia, Institute of Agricultural Research, Annual Research Seminar no.6. pp.98-106. Engl.

Phaseolus vulgaris. Snap beans. Animal nutrition. Diets. Nutritive value. Ethiopia.

Several crops residues were evaluated in feeding trials in Ethiopia in 1975. A finishing expt. lasting 100 days was conducted at Adami Tulu with 4 groups of 10 native cattle/group. Crop residues were haricot bean haulms, corn stover, teff straw, and corn cobs, each comprising 50% of the ration. Other ingredients were: molasses, noug cake, bone meal/meat meal mix, and salt (20, 25, 4, and 1%, resp., for the haricot bean haulms diet). Values

for animal performance were as follows: av. initial wt., 193 kg; av. final wt., 243 kg; av. daily gain, 505 g; av. feed intake/day, 7.4 kg; kg feed intake/kg livewt. gain, 14.7. Highest daily gain was obtained with corn cobs (541 g). Highest feed consumption was observed among animals having the highest rate of gain, which also were the most efficient convertors of feed consumed. Only small differences were observed in the % of fat, edible meat, and bone. Boran steers were fed with sisal residue supplemented with haricot bean haulms, sunflower cake, and minerals in a pilot study to determine the food value of sisal both in the fresh state and after ensiling; likewise, an observation trial was conduced in Sidamo Province to determine the quality of silage made from coffee pulp and a mixture consisting of coffee pulp, corn stover, and haricot bean haulms. (Summary by I.B.) H01

0857

20651 GONZALEZ, A.R.; SISTRUNK, W.A. 1982. Snap bean studies, 1981. Fayetteville, University of Arkansas. Agricultural Experiment Station Mimeograph Series 299. 14p. Engl.

Phaseolus vulgaris. Snap beans. Cultivars. Processing. Climate requirements. Cultivation. Yields. Growth. Canned beans. Harvesting. Timing. Seed characters. Fibre content. USA.

Studies were carried out for several years on the quality attributes for processing snap bean cv. Gallatin Valley 50, NZ-385, BBL-92, Flo, Peak, Pirate, H-285, Blue Mountain, USDA-711, Epoch, Empress, and Paymaster. Climatic conditions and cultural practices carried out during the spring and fall cropping seasons at the Main Expt. Station in Fayetteville, AR, USA, are described. Parameters measured for the different cv. included days to harvest, yield, pod length, vegetative growth, canning characteristics such as % seed, fiber, shear resistance, and organoleptic evaluations for both cropping seasons. NZ-385 and Epoch produced thin pods whereas Pirate and Kentucky Wonder produced thick pods. Yields ranged between 6.7-14.8 t/ha in the spring and between 6.9-17.3 t/ha in fall. All cv. produced pods with low fiber % in both seasons; the small differences observed between cv. had no effect on the overall quality. (Summary by EDITEC) H01

0858

15415 GONZALEZ, A.R. and WILLIAMS, J.W. Effect of water stress on quality of raw and processed snap beans. Arkansas Farm Research 27(6):3. 1978. Engl.

Phaseolus vulgaris. Water requirements. Drought. Plant development. Pods. Maturation. Harvesting. Yields.

Studies were carried out with the bean cv. Early Gallatin, Gallatin Valley 50, and Cascade. Water stress during pod development did not affect harvest time and pod length but decreased yields and pod wt. The 3 cv. reacted similarly to water stress. *(Summary by Horticultural Abstracts)* H01

0859

21737 GUZMAN V., J.S.; REYES D., C.L. 1981. Control de calidad en arveja (Pisum sativum L.) y poroto verde (Phaseolus vulgaris L.) appertizados. (Quality control of canned peas and snap beans). Tesis Ing.Agr. Santiago, Universidad de Chile. 197p. Span., Sum. Span., Engl., 51 Refs.

Phaseolus vulgaris. Canned beans. Seed characters. Snap beans. Chile.

A quality control was carried out on canned peas and snap beans marketed in the metropolitan area of Chile. French and split type beans from 5

industries were analyzed. The international norms from FAO-WHO and the quality norms from the Instituto Nacional de Normalización were used for the technological, microbiological, and sensory analyses. Pea and bean samples were taken from supermarkets and subjected to the following analyses: labeling, physical characteristics, can dimension and capacity, seal evaluation, metallic elements, brine, clearness of brine, pH, total titratable acidity, total and alcohol-insoluble solids, color, texture, and defects. Quality characteristics such as appearance, color, texture, aroma, sweetness, saltiness, flavor, and acceptability were sensorily evaluated. A sterility control using 2 incubation temp. (35 and 52°C) was carried out in the microbiological study. The analyzed cans were of poor quality since they differed greatly in the fulfillment of the requirements of the different quality norms and in relation to those specified in the labels. Alterations in microbiological quality were only found in split type bean samples. (Author's summary) H01

0860

18705 KOZUP, J.; SISTRUNK, W.A. 1982. Quality attributes of fermented and acidified green beans. Journal of Food Science 47(3):1001-1005. Engl., Sum. Engl., 21 Refs.

Phaseolus vulgaris. Snap beans. Canned beans. Nutritive value. Palatability.

A study was conducted with 2 styles and 4 blanch methods on green beans acidified with 1 of 4 organic acids or fermented. The beans were compared with conventional canned beans for selected quality attributes. Analyses showed that acidified and fermented beans were acceptable in color, firmness, and flavor regardless of style, blanch, or storage. The acidified and fermented beans were much firmer with less sloughing than conventional canned beans. Minor differences were noted in nutritive value of the beans. Panel ratings for flavor of acidified beans were not significantly different from those for conventional canned beans except in fermented beans. Flavor differences in fermented beans were probably caused by flavor volatiles produced by the bacteria. Acidified and fermented beans should be suitable for many types of dishes. (Author's summary) H01

0861

24296 LAURENT, L. 1983. Incidence du traitement thermique sur les teneurs en glucides assimilables et en fibres alimentaires de certains legumes (céleris, carottes, haricots verts). [Incidence of heat treatment on available carbohydrates and dietary fiber content from some vegetables (celery, carrots, green beans)]. Medecine et Nutrition 19(2):87-93. Fr., Sum. Fr., Engl., 12 Refs., Illus. [Centre de Recherches Foch. 45, rue des Saints-Peres 75006, Paris, France]

Phaseolus vulgaris. Snap beans. Cooking. Dietary value. Carbohydrate content. Fibre content. Canned beans. France.

Studies were conducted to evaluate effects of cooking and canning on concn. of carbohydrates and fiber constituents in celery, carrots, and green beans. Tables of data are given for row, boiled, and canned samples, including DM, soluble sugars, fiber, and fiber constituents. Data for frozen green beans are also given. Cooking or canning reduced the soluble sugars content of celery and carrots but had little effect on fiber content. Slow cooking reduced soluble sugar and fiber contents of green beans; pectins are probably the fiber fraction degraded during cooking. Canned and frozen green beans had slightly lower DM, soluble sugar and starch contents than slow-cooked fresh samples. Fiber content was lower in canned than in frozen green beans, as a result of pectin degradation during heat treatment. (Summary by Food Science and Technology Abstracts) H01

0862

22248 LEEDS, A.R.; KHUMALO, T.D.; NDABA, N.G.; LINCOLN, D. 1982. Haricot beans, transit time and stool weight. Journal of Plant Foods 4(1):33-41. Engl., Sum. Engl., 10 Refs., Illus. [Dept. of Nutrition, Queen Elizabeth College, London W8 7AH, England]

Phaseolus vulgaris. Human nutrition. Diets. Snap beans. Digestibility. United Kingdom.

A preliminary investigation of some of the gastrointestinal effects of a bean diet was undertaken. Eight women substituted some vegetables and meat in their usual diet with 230 g haricot beans for 14 days, preceded and followed by 10 days of their usual diet. Whole gut transit time and daily fecal output were studied, and records were kept of defecation frequency and abdominal symptoms throughout the study. Diet records were kept for he 1st 24 days. Dietary fiber intake increased from 22 to 49 g, defecation frequency from 0.97 to 1.18/day, and daily fecal output from 115 ± 15 to 150 ± 14 g/day, when the bean diet was taken. Five subjects noted no symptoms other than an increase in flatulence, but 3 suffered some abdominal discomfort. The transit studies were inconclusive, but there was evidence of a marked effect of the menstrual period on marker retention. The increase of fecal output was less than expected on the basis of an assumed pentose content of the beans, and results suggest that the major proportion of patients fed diets containing very large quantities of beans will suffer no side effects other than flatulence. (Author's summary) H01

0863

16087 MA, Y., BLISS, F.A. and HALL, T.C. Peptide mapping reveals considerable sequence homology among the three polypeptide subunits of G1 storage protein from French bean seed. Plant Physiology 66:897-902. 1980. Engl., Sum. Engl., 20 Refs., Illus.

Phaseolus vulgaris. Seed. Proteins. Protein content. Analysis. Enzymes. Snap bean.

The major storage protein, G1 globulin, of bean cv. Tendergreen seeds was subjected to limited proteolysis with trypsin, chymotrypsin, papain, proteinase K, and protease V8 and to cleavage with cyanogen bromide and 2-(2-nitrophenylsulfanyl)-3-methyl-3'bromoindolenine. Mapping of peptides separated from each of the 3 G1 subunits by polyacrylamide gel electrophoresis revealed that many proteolytic cleavage sites were present at similar positions on the subunits. Evidence was adduced that the G1 subunits are homologous in amino acid sequence for about 61% of their length. The remaining region (possibly COOH-terminal) of the subunits appears to be heterologous, with the α subunit bearing an additional met. residue. *(Author's summary)* H01

0864

22681 MASSEY JUNIOR, L.M. 1983. Nutritive quality of long-distance shipped green beans for processing. Journal of Food Science 48(5): 1564-1565. Engl., 8 Refs. [Dept. of Food Science & Technology, New York State Agricultural Experiment Station, Cornell Univ., Geneva, NY 14456, USA]

Phaseolus vulgaris. Seed. Storage. Nutritive value. Vitamin content. Snap beans. USA.

Vitamin A and C contents of bulk raw snap beans shipped from sources up to 12 h distant were measured and compared with those from local sources. Significant but small differences were found among vitamin contents of beans from different locations, but similar season-to-season variations were also found. Much of this variation could be attributed to cultural practices. No correlation was found between vitamin contents and position of beans in the load, or temp. of the load (near ambient). It is concluded that the retention of these 2 vitamins (ascorbic acid and beta carotene)

following long distance shipping is at least as great as retention of other quality factors. (Author's summary) H01

0865

16402 SENESI, E., CRIVELLI, G. and BERTOLO, G. Recherches sur le comportement des legumes a la congelation rapide. V. Aptitudes variétales de petits pois et haricots verts. *(Research on quick freezing of vegetables. V. Suitability of pea and French bean varieties).* Revue Generale du Froid 69(3):163-165. 1978. Fr., 2 Refs., Illus.

Phaseolus vulgaris. Storage. Temperature. Adaptation. Cultivars. Snap bean.

Forty-seven pea and 51 French bean var. were examined for changes during quick freezing (10 and 20 min resp. in forced-air tunnels at -35°C) and 6 mo. of cold storage at -20°C in polyethylene bags. The results of sensory evaluations of the top 3 pea var. and top 7 bean var. are shown in tables (overall evaluations 65.7-74.6 points). The main defects were broken skins and color changes in peas, loss of consistency (wilting), and detached epidermis in beans. The bean var. most suitable for quick freezing are: Lit 551, Rofin, Rubicon, Silver, and Ulysse. *(Summary by Food Science and Technology Abstracts)* H01

0866

22195 WYATT, C.J.; RONAN, K. 1983. Effects of processing on the sodium: potassium and calcium:phosphorus content in foods. Journal of Agricultural and Food Chemistry 31(2):415-420. Engl., Sum. Engl., 19 Refs., Illus. [Dept. of Food Science & Technology, Oregon State Univ., Corvallis, OR 97331, USA]

Phaseolus vulgaris. Snap beans. Processing. Na. K. Ca. P. Canned beans. Storage. USA.

The effects of processing of Na:K and Ca:P ratios in peanuts, wheat, tuna, canned green beans, whole kernel and cream-style corn, carrots, peaches, frozen green beans, corn, broccoli, cauliflower, and French fried potatoes were studied. Samples of vegetables were collected over a 2 yr processing season in Oregon, Washington, Idaho, and California (USA). Minerals were determined in samples taken at various stages during processing. Processing had a significant effect on the Na and K content in canned green beans. The mean values showed there was no significant effect of blanching the raw green beans on Na and K content; however, there was a significant effect due to retorting. The addition of salt brine as the cooking liquid resulted in a noticeable increase in the Na content of the canned item. P content of green beans was also affected. In frozen green beans, processing did not affect Na, K, and P contents. (Summary by L.M.F.) H01

100 MICROBIOLOGY

101 Rhizobium spp., Nitrogen Fixation and Nodulation

0867

21787 BIROT, A.M.; TRINCHANT, J.C.; RIGAUD, J. 1983. Nitrogen fixation in French-bean nodules in relation to ageing: role of bacteroids. Physiologie Végétale 21(4):715-722. Engl., Sum. Engl., Fr., 27 Refs., Illus. [Laboratoire de Biologie Végétale, Faculté des Sciences et des Technologies, Parc Valrose, 06034 Nice Cedex, France]

Phaseolus vulgaris. Nitrogen fixation. Snap beans. Developmental stages. Rhizobium phaseoli. Nodulation. Nitrogen-fixing bacteria.

N fixation (C_2H_2 reduction) was determined for French bean nodulated roots, isolated bacteroids, and corresponding cell-free extracts of nitrogenase at

different stages of legume development. The responsibility of each symbiotic partner for the decline of activity occurring with senescence was investigated and is discussed. N fixation declined with age from plant flowering to seed maturation. Bacteroids (Rhizobium) isolated from the corresponding nodules exhibited an activity which was less affected by aging. However, a 0.040 atm pO_2 required for optimal C_2H_2 reduction by bacteroids isolated from young nodules, strongly limited activity of those prepared from older nodules. Bacteroid respiration was also significantly lowered, both with glucose and succinate as energy-yielding substrates, when nodule age increased. In contrast, crude nitrogenase extracts prepared from these same batches of bacteroids and containing the same level of protein, exhibited specific activities which increased with aging. Bacteroids exerted an efficient protection of their nitrogenase and the host cell appeared mainly responsible for the decline in N fixation occurring after the full bloom period. (Author's summary) 101

0868

29106 CAMPBELL, W.F. ; WAGENET, R.J.; RODRIGUEZ, R.R. 1986. Salinity, water management and fertility interactions on yield and nitrogen fixation in snap-beans. Irrigation Science 7(3):195-204. En., Sum. En., 32 Ref., Il. [Plant Science Dept., USU, Logan, UT 84322-4820, USA]

Phaseolus vulgaris. Snap beans. Irrigation. Fertilizers. N. P. K. Yield components. Acetylene reduction. Salinity. Yields. Rhizobium. Rhizosphere. USA.

Greenhouse expt. were designed to determine whether irrigation (3 levels in 3 frequencies) and fertilizer supplements (2 and 3 N and P levels, resp.) could reduce the adverse effects of soluble salts on yield and N fixation in snap bean cv. Early Gallatin inoculated with Rhizobium phaseoli. Yield components, percent plant N, and acetylene reduction were reduced significantly as salinity and the interval between water applications increased. Fertilizer application had no effect on any plant component. Two- and three-way interactions confirmed the strong effects of the individual variables of salinity and irrigation frequency. Increasing irrigation frequency increased yield at all of the water salinities studied. Application of N, P, and K fertilizers helped maintain yields at low to moderate levels of soil salinity, but not at high salt levels. Snap bean plants harvested at seed maturity, however, did not show a significantly substantial benefit of fertilizer for Rhizobium in the stressed rhizosphere. (AS)

0869

27202. HEMANTARANJAN, A.; GARG, O.K. 1986. INTRODUCTION OF NITROGEN-FIXING NODULES THROUGH IRON AND ZINC FERTILIZATION IN THE NONNODULE-FORMING FRENCH BEAN (PHASEOLUS VULGARIS L.). JOURNAL OF PLANT NUTRITION 9(3-7):281-288. EN. SUM. EN., 19 REF. (DEPT. OF PLANT PHYSIOLOGY, INST. OF AGRICULTURAL SCIENCES, BANARAS HINDU UNIV., VARANASI-221005, INDIA)

GREENHOUSE EXPT. WERE CONDUCTED TO STUDY THE EFFECTS OF FE (FERROUS SULFATE) AND ZN (ZINC SULFATE) ON NODULATION AND N2 FIXATION IN FRENCH BEANS. INORGANIC TREATMENTS WERE ADDED TO THE SOIL BUT NO EXOGENOUS SUPPLEMENT OF RHIZOBIUM WAS ADDED. FE ALONE AT A CONCN. OF 5 OR 10 MG/KG SOIL OR IN COMBINATION WITH THE SAME CONCN. OF ZN ENHANCED NODULATION. AT 5 MG FE AND ZN/KG SOIL, MAX. NODULATION AND LEGHEMOGLOBIN WERE NOTED. ENHANCED IN VIVO N2 FIXATION WAS ALSO NOTED WHEN EITHER FE OR ZN (ALONE OR IN COMBINATION) WERE ADDED AT CONCN. OF 5 OR 10 MG/KG SOIL. THESE EXPT. SHOWED THAT FE COULD CREATE A CONDITION CONDUCIVE TO THE FORMATION OF N2-FIXING NODULES IN FRENCH BEAN. SYNERGISTIC EFFECTS OF ZN IN THESE PROCESSES COULD NOT BE RULED OUT. (AS).

D870

21392 ISHAG, H.M. 1977. Haricot beans. In Ed-Damer, Sudan. Hudeiba Research Station. Annual Report 1970-1971. Ed-Damer. pp.11-12. Engl.

Phaseolus vulgaris. Snap beans. Seeds. Inoculation. Rhizobium. Fertilizers. N. Growth. Yields. Nodulation. Sudan.

Seeds of haricot bean var. RO 2/1 were inoculated with local strains of rhizobia designated as S (Sudanese strain). Treatments were: control, N, Rhizobium, and Rhizobium + N. A randomized block design was used with 4 replicates. Six-wk.-old plants showed no effect of inoculation but after 12 wk., growth of root and shoot increased as a result of the inoculation. Highest yield was obtained with the combination of Rhizobium and N (8% more than control). (Summary by T.F.) 101

D971

21524 KHACHANI, M. 1981. Contribution a l'etude de la response du haricot vert a l'inoculation. (Study on the response of green beans to inoculation). These Ing.Agr. Rabat, Morocco, Institut Agronomique et Veterinaire Hassan 2. Memoire (3eme cycle agronomie). 116p. Fr., Sum. Fr., Engl., Ar., 60 Refs., Illus.

Phaseolus vulgaris. Rhizobium phaseoli. Inoculation. Strains. Snap beans. Growth. Dry matter. Yields. Nitrogen fixation. Nodulation. Fertilizers. N. Cultivars. Morocco.

Expt. were conducted under field and growth chamber conditions at Gurich Exptl. Station and the Dept. of Soil Sciences of the Institut Agronomique et Veterinaire Hassan 2 (Morocco) to study the effect of inoculating Phaseolus vulgaris with different strains of Rhizobium phaseoli. Under field conditions, inoculation with a mixture of 3 different Rhizobium strains (CIAT 5[illegible], 4[illegible], and 0[illegible]) significantly improved plant growth (size and DM). Yield of the inoculated plant was also increased approx. 5[illegible]% over the control; however, yields did not reach the level obtained by 100 U of N. Under growth chamber conditions, there was a significant difference between the strains of Rhizobium in their ability to fix N with the different var. Strains Lorrain No. 3 and CIAT 0[illegible]6 gave the best results. When 100 U of N was applied per hectare plant nodulation was significantly reduced. (Author's summary) 101

0872

13176 LEAL, N.R., MENDONÇA, C.A. DE and DOBEREINER J. **Influencia da inoculação de *Rhizobium phaseoli* na produtividade de feijão-de-vagem (*Phaseolus vulgaris*). *(Influence of Rhizobium phaseoli inoculation on snap bean productivity)*** Lavoura 77:8-9. 1974. Port.

Phaseolus vulgaris. Rhizobium phaseoli. Nodulation. N. P. K. Fertilizers. Productivity. Brazil.

The results are presented of a trial conducted in Papucaia (Brazil) to determine the effectiveness of *Rhizobium* inoculation in snap bean cultivation. A Latin square design was used with 5 replications in 11.2 m² plots. Treatments were: (a) control; (b) PK (90 + 21 = 111 g/m); (c) NPK (30 + 90 + 21 = 141 g/m) + saltpeter; (d) IPK (90 + 21 = 111 g/m) + saltpeter; and (e) IPK (90 + 21 = 111 g/m), utilizing Chile saltpeter, simple superphosphate and K chlorate as sources of N, P and K, resp. The inoculum (I) was applied at 100 g/30 kg of seed. Treatments (c) and (d) received 2 applications of saltpeter, each one of 7.5 g/linear m. Av. productions were 7974, 8870, 9172, 9422 and 9394 kg/ha for treatments (a), (b), (c) (d) and (e), resp. Treatments (c), (d) and (e) showed significant differences in production. Treatment (e) nodules were greater in no. and seed size in comparison to treatment (d) Results are presented in table form. *(Summary by C.P.G. Trans. by L.M.F.* Jul D01

0873

25653. PLADYS, D.; RIGAUD, J. 1985. SENESCENCE IN FRENCH-BEAN NODULES: OCCURRENCE OF DIFFERENT PROTEOLYTIC ACTIVITIES. PHYSIOLOGIA PLANTARUM 63(1):43-48. ENGL. SUM. ENGL., 22 REFS., ILLUS. [LABORATOIRE DE BIOLOGIE VEGETALE, FACULTE DES SCIENCES ET DES TECHNIQUES, PARC VALROSE, F-06034, NICE CEDEX, FRANCE]

A DECLINE IN NITROGENASE ACTIVITY [ACETYLENE REDUCTION] OF NODULES OF PHASEOLUS VULGARIS CV. CONTANDER WAS CORRELATED WITH A DECREASE IN THEIR SOLUBLE PROTEIN CONTENT INCLUDING LEGHEMOGLOBIN. AT THE SAME TIME, 2 DISTINCT PROTEOLYTIC ACTIVITIES AGAINST LEGHEMOGLOBIN WITH ACIDIC AND ALKALINE PH OPTIMA WERE DETECTED. THE CORRESPONDING PROTEASES WERE PURIFIED APPROX. 30-FOLD BY AMMONIUM SULPHATE PRECIPITATION, GEL FILTRATION, AND HYDROXYAPATITE CHROMATOGRAPHY. BOTH THE ACIDIC [PH OPTIMUM 3.5] AND THE ALKALINE [PH OPTIMUM 8.0] PROTEASES WERE THIOL ENZYMES. THEY WERE CHARACTERISTIC OF SENESCING NODULES, WHEREAS ONLY AN ACIDIC SERINE PROTEASE WAS PRESENT IN FUNCTIONAL NODULES. [AS].

0874

4196 PUPPO, A. and RIGAUD, J. **Cytokinins and morphological aspects of french-bean roots in the presence of *Rhizobium*.** Physiologia Plantarum 42:202-206. 1978. Engl., Sum. Engl., 25 Refs., Illus.

Phaseolus vulgaris. Rhizobium phaseoli. Cytokinins. Roots. Enzymes. **Analysis. Indoleacetic acid. Culture media.**

Typical abnormalities were observed on french bean roots when cultivated in the presence of *Rhizobium phaseoli* under hydroponic conditions. Substantial quantities of cytokinins were detected in the plant culture medium and their concentration remained high until the 9th day after inoculation, when the 1st nodules appeared. The presence of both partners, plant and bacteria,

was required for this synthesis. Exogenous cytokinin production was responsible for morphological alterations of the roots observed before nodulation. (*Summary by Field Crop Abstracts*) I01

0875

17900 RENNIE, R.J.; KEMP, G.A. 1983. Dinitrogen fixation in *Phaseolus vulgaris* at low temperatures: interaction of temperature, growth stage, and time of inoculation. Canadian Journal of Botany 60(8):1423-1427. Engl., Sum. Engl., Fr., 17 Refs., Illus.

Phaseolus vulgaris. Snap beans. Cultivars. Developmental stages. Inoculation. Temperature. *Rhizobium phaseoli*. Nodulation. Nitrogen fixation.

Nodulation and N_2 fixation have not been reported in beans below a temp. of 13°C but, in southern Alberta, Canada, temp. at planting may be as low as 10°C. Two var. of snap beans, Aurora and Kentwood, were inoculated at 3 growth stages (seeding, primary leaf horizontal, or 1st trifoliate leaf open) and grown at 10, 12, 14, or 16°C. Nodulation and acetylene (C_2H_2) reduction occurred in both var. at temp. as low as 10°C. At the lower temp. cold adaptability of the plant for early root growth determined the ability for nodulation and N_2 fixation. At higher temp. plant growth stage was a determining factor. Aurora was superior to Kentwood at 10°C in nodulation, DM, N yield, and N_2 fixation because of its tolerance to low temp. during early root growth. Inoculation with *Rhizobium phaseoli* at more advanced plant growth stages decreased the time for nodulation at all 4 temp. but resulted in higher yield and more N_2 fixation in Aurora only at 14 and 16°C. At 10°C, inoculation at seeding was more effective than at the other 2 growth stages for both var. Thus plant growth stages and growth temp. both determined the ability of a bean var. to support N_2 fixation at various low temp. (*Author's summary*) I01

0876

19090 ROBERT, F.M.; SCHMIDT, E.L. 1983. Population changes and persistence of Rhizobium phaseoli in soil and rhizospheres. Applied and Environmental Microbiology 45(2):550-556. Engl., Sum. Engl., 23 Refs., Illus.

Phaseolus vulgaris. Rhizobium phaseoli. Snap beans. Cultivars. Fallowing. Inoculation. Rhizosphere.

The impact of legume cultivation on the establishment and persistence of an inoculant strain of Rhizobium phaseoli and its ability to compete with a resident population of R. phaseoli for nodule occupancy was examined utilizing strain-specific fluorescent antibodies. The soil (Hubbard loamy sand) was inoculated homogeneously with 5 x 10^5 cells/g of soil and confined in plastic cylinders kept in field plots. Inoculated and uninoculated cylinders were either left fallow or planted to 2 seeds of legumes. Two hosts, navy bean cv. Seafarer and snap bean cv. Picker, as well as a nonhost, soybean cv. Wilkin, were used. Inoculant Viking 1 was highly stimulated in all 3 rhizospheres sampled at 6 (flowering), 10 (pod fill), and 17 (decay) wk. and in the following spring, whereas counts in fallow soil decreased rapidly. Although the overwintering population remained highest in the vicinity of decaying host roots, Viking 1 persisted, even in fallow soil, to produce abundant nodulation of host plants the following spring. Viking 1 was an excellent competitor for nodulation sites on the roots of the hosts; it thoroughly surpassed the resident population of R. phaseoli, occupying virtually 100% of the nodules under inoculated conditions in all expt. (Author's summary) I01

0877

19054 SUNDSTROM, F.J.; NEAL, J.L.; MORSE, R.D.; BENDER, D.A. 1983. The effect of delayed inoculation on nitrogen fixation by Phaseolus vulgaris L. grown in minesoil. Communications in Soil Science and Plant Analysis 14(1):15-27. Engl., Sum. Engl., 22 Refs., Illus.

Phaseolus vulgaris. Inoculation. Nitrogen fixation. Snap beans. Fertilizers. N. Rhizobium phaseoli.

The influence of delayed inoculation on $N_2(C_2H_2)$-fixation by snap bean cv. Stokes Improved Tendergreen grown in minesoil is described. Fertilizer treatments included were 0, 25, 50, and 100 kg N/ha applied at 21 days or at seeding. A peat culture of Rhizobium phaseoli was inoculated at 21 days or at seeding. Nitrogenase activity was determined by reduction of C_2H_2 to C_2H_4 at 7, 21, 35, and 49 days. Nitrogenase activity was related to N fertilizer rate and treatment sequence. Addition of 25 kg N/ha significantly stimulated $N_2(C_2H_2)$-fixation while greater rates of N fertilizer decreased the rate of $N_2(C_2H_2)$-fixation. Results suggest that addition of 25 kg N/ha at time of seeding, followed by inoculation with R. phaseoli after legume growth has been established (21 days) results in an initial greater amount of $N_2(C_2H_2)$-fixation. (Author's summary) I01

0878

22147 SUNDSTROM, F.; MORSE, R.; NEAL, J. 1981. Legume inoculation following seedling establishment in mine soils. In Graves, D.H., ed. Symposium on Surface Mining Hydrology, Sedimentology and Reclamation. Lexington, Kentucky, 1981. Proceedings. Lexington, University of Kentucky. pp.13-19. Engl., Sum. Engl., 23 Refs., Illus. [Dept. of Horticulture, Louisiana State Univ., Baton Rouge, LA 70803, USA]

Phaseolus vulgaris. Inoculation. Timing. Nodulation. Growth. Nitrogen fixation. Snap beans. Fertilizers. N. Rhizobium phaseoli. USA.

The effects of delaying application of legume inoculum and/or N fertilizer on N_2 fixation and nodule growth were studied in minesoil collected from Wise County, Virginia, USA. Snap beans were sown in minesoil-filled pots placed in growth chambers and in the field. Fertilizer (NH_4NO_3) treatments of 0, 25, 50, and 100 kg N/ha were applied at 21 days or at planting. Inoculated treatments were treated with a peat culture of several strains of Rhizobium phaseoli at 21 days or at planting. Plant and nodule growth were determined at harvest, 49 days. Nitrogenase activity, as determined by the reduction of acetylene (C_2H_2) to ethylene (C_2H_4), was measured at 7, 21, 35, and 49 days in growth chamber treatments and at 49 days in field treatments. The highest amount of nodule mass and N_2 fixed occurred at 25 kg N/ha. An inorganic supply of 25 kg N/ha was sufficient to develop initial vigorous legume growth, but after 21 days apparently the soil N level was nearly exhausted. Consequently, inoculation with rhizobia at this time stimulated nitrogenase activity more than the conventional method of inoculating at seeding. This enhanced N_2 fixation is attributed to the nearly abiotic condition of the minesoil used, which offered little indigenous rhizobial competition or microbial antagonism. It is assumed that the delayed-inoculated plants did not compete with nodulating bacteria for photosynthates during early stages of plant growth and therefore were more vigorous and capable of supporting subsequent nodulation and N_2 fixation than plants inoculated at seeding. (Author's summary) I01

0879

23142 SURYANARAYANA, V.; KUMAR, J.P. 1981. Rhizobium inoculation in combination with nitrogen and phosphorus on French bean. Vegetable Science 8(2):130-134. Engl., Sum. Engl., 8 Refs. [Agricultural Research Station, Ambajipeta-533214, East Godavari Dt., Andhra Pradesh, India]

Phaseolus vulgaris. Snap beans. Rhizobium phaseoli. Inoculation. Fertilizers. N. P. Flowering. Yields. Yield components. India.

In 1980, a field expt. was conducted to study the effect of Rhizobium inoculation, in combination with N and P, on growth and yield of French bean at Agricultural College Farm, Rajendranagar, India. N, P, and Rhizobium inoculation significantly increased plant height, no. of leaves/plant, no. of branches, no. of fully opened flowers, pod length, test wt. of seeds, and yield of fresh pods. The interaction between N and P was significant regarding no. of leaves at 15 days after sowing and no. of branches and flowers at 45 days. The interaction between N and Rhizobium inoculation significantly increased plant height, pod length, and no. of seeds/pod and thus, yield. Though the interaction between P and Rhizobium significantly increased plant height and no. of flowers/plant, yield was not significantly increased. Regarding yield, the treatment combination of 20 kg N + 100 kg P/ha + Rhizobium inoculation ($N_1P_2R_1$) was the best, and the same trend was also seen regarding pod length and test wt. of seeds. (Author's summary) 101

0880

21960 TRINCHANT, J.C.; BIROT, A.M.; DENIS, M.; RIGAUD, J. 1983. C_2H_2 reduction, oxygen uptake and cytochrome c reduction by bacteroids isolated from French-bean nodules. Archives of Microbiology 134(3): 182-186. Engl., Sum. Engl., 26 Refs., Illus. [Laboratoire de Biologie Végétale, Faculté des Sciences et des Techniques, Parc Valrose, F-06034 Nice Cedex, France]

Phaseolus vulgaris. Snap beans. Rhizobium phaseoli. O. Nodulation.

Low concn. of dissolved O_2 (3 micromolar) induced a significant C_2H_2 reduction by bacteroids isolated from French bean cv. Contender plants inoculated with Rhizobium phaseoli strain 9-6. This activity, determined with or without glucose, declined with increasing O_2 concn. in spite of the generation of a substantial level of ATP. Under these conditions, cytochrome (cyt) c, studied by a rapid spectrometry method on whole cells, appeared more than 80% oxidized. An active C_2H_2 reduction always corresponded to a high level of cyt c reduction observed with glucose, at low O_2 tensions only, and with succinate for a larger range of pO_2 (partial pressure of O_2) values. Inability of glucose to support C_2H_2 reduction activity for higher O_2 tensions was due to a limiting electron allocation to nitrogenase in relation with the poor level of reduced cyt c observed in these conditions. (Author's summary) 101

0881

17377 TRINCHANT, J.C.; RIGAUD, J. 1981. Acetylene reduction and respiration of bacteroids isolated from French-beans receiving nitrate. Physiologia Plantarum 53(4):511-517. Engl., Sum. Engl., 24 Refs., Illus.

Phaseolus vulgaris. Rhizobium phaseoli. Strains. Nodules. Acetylene reduction. Enzymes. O. Culture media. N. Fertilizers. Roots. Nodulation. Laboratory experiments.

The competition between combined N and N fixation in legumes was studied after a 24 h exposure of nodulated French beans to nitrate. Acetylene reduction by bacteroids was significantly inhibited, and even nitrogenase extracted from nitrate-treated plant nodules showed reduced activity. Sensitivity to nitrate was directly related to nodule age and also increased with increasing O_2 tensions in the bacteroid incubations with or without a gas phase; it was particularly marked when glucose was used in place of succinate as energy-yielding substrate. Bacteroid respiration was also depressed by nitrate treatment of the plants, leading to diminished acetylene reduction, and this effect increased with increasing

O_2 concn. Added oxyleghemoglobin partly restored O_2 consumption and acetylene reduction by bacteroid suspensions. *(Author's summary)* 101 D01

0882

20899 VENCATASAMY, D.R.; TERALLY, M.A. 1980. Application of biological nitrogen fixation in Mauritius. 1. Preliminary investigations on the effect of Rhizobium inoculation of the "haricot" bean. Revue Agricola et Sucriere de l'Ile Maurice 59(3):107-114. Engl., Sum. Engl., Fr., 12 Refs.

Phaseolus vulgaris. Snap beans. Inoculation. Rhizobium phaseoli. Strains. Growth. Yields. Mineral content. N. Nodulation. Pods. Mauritius.

The isolation of 4 effective strains of Rhizobium phaseoli (F4, Re4, RCF3608, and CC511) from Mauritius soil and their inoculation on the haricot bean is described as well as techniques for screening and testing of these strains. (Author's summary) 101

0882

27460. WASFI, M.; PRIOUL, J.L. 1986. A COMPARISON OF INHIBITION OF FRENCH-BEAN AND SOYBEAN NITROGEN FIXATION BY NITRATE, 1 PERCENT OXYGEN OR DIRECT ASSIMILATE DEPRIVATION. PHYSIOLOGIA PLANTARUM 66(3):481-490. EN. SUM. EN., 27 REF., IL. [STRUCTURE ET METABOLISME DES PLANTES, BAT. 430, UNIV. DE PARIS-SUD, F- 91405, ORSAY CEDEX, FRANCE]

INHIBITION BY NO3(-) OF ACETYLENE REDUCTION IN BEAN CV. CONTENDER AND SOYBEAN WAS MEASURED PARALLEL WITH NODULE CARBOHYDRATE AND NITRATE METABOLISM. IN BEAN, THE ONSET OF INHIBITION OF C2H2 REDUCTION (6 H) COINCIDED WITH DECREASED IMPORT OF ASSIMILATES AND A LOWERING OF CARBOHYDRATEPOOLS (SUCROSE, GLUCOSE, AND STARCH). NITRATE REDUCTASE ACTIVITY WAS INDUCED IN ALL PLANT ORGANS AFTER 3 H, BUT NO NITRITE WAS DETECTED IN THE NODULES. THE NITRATE-INDUCED INHIBITION OF NITROGENASE WAS COMPARED WITH THE INHIBITION OBSERVED WITH LOW O AROUND THE ROOTS (1 PERCENT O2) OR WITH DIRECTASSIMILATE DEPRIVATION (GIRDLING OR DECAPITATION). SOYBEAN AND BEAN APPEARED EQUALLY SENSITIVE TO THESE TREATMENTS REGARDING ACETYLENE REDUCTION. THE RESULTS ARE DISCUSSED IN RELATION TO THE CURRENT HYPOTHESES EXPLAINING NITRATE-INDUCED INHIBITION OF DINITROGEN FIXATION: ASSIMILATE DEPRIVATION OR NITRITE POISONING. PRESENT DATA ARE IN FAVOR OF THE 1ST FOR BEAN AND OF THE 2ND FOR SOYBEAN. [AS (EXTRACT)].

J00 ECONOMICS AND DEVELOPMENT

0884

22505. BOUET, A. 1980. CONTRIBUTION A L'ETUDE DU HARICOT VERT; FACTEURS TECHNICO-ECONOMIQUES DE LA PRODUCTION: MEMOIRE. [A CONTRIBUTION TO THE STUDY OF SNAP BEAN PRODUCTION; TECHNICAL-

ECONOMIC PRODUCTION FACTORS; PROCEEDINGS). FRANCE, ECOLE NATIONALE SUPERIEURE AGRONOMIQUE DE MONTPELLIER. 88P. FR. 14 REF., IL.

A SURVEY WAS CARRIED OUT BY THE CENTRE TECHNIQUE DU GENIE RURAL DES EAUX ET DES FORETS IN PROVENCE (ECOLE NATIONALE SUPERIEURE AGRONOMIQUE DE MONTPELLIER), AS PART OF A MORE GENERAL STUDY ON PULSE PRODUCTION IN FRANCE, TO DETERMINE THE CAUSES OF THE DECREASING POST-WAR PRODUCTION OF SNAP BEANS FOR FRESH CONSUMPTION. AN OVERVIEW IS PRESENTED ON THE ECONOMIC ASPECTS OF PRODUCTION, INCLUDING STATISTICAL AND GEOGRAPHICAL DATA. THE VEGETATIVE CYCLEOF THE BEAN PLANT AND THE OBJECTIVES OF VAR. SELECTION ARE DESCRIBED. THE MAIN PRODUCTION REGIONS (90 PERCENT OF TOTAL PRODUCTION) ARE BRETAGNE, PICARDIE, SOME NORTHERN LOCALITIES, AQUITAINE, PROVENCE, SOME CENTRAL PROVINCES, PAYS DE LOIRE, AND A FEW SITES IN THE PARISIAN AREA. NATIONAL CONSUMPTION REACHES 3 KG/CAPITA/YR. INFORMATION IS GIVEN ON EEC PARTICIPATION, IMPORTS AND EXPORTS, AND QUALITY STANDARDS AND CLASSIFICATION.FIRST RESULTS ARE PRESENTED FOR 59 PRODUCTION PLOTS (MARSH AND FIELD CROPS) SURVEYED IN THE FOLLOWING LOCALITES: LOT-ET GARONNE, MAINE-ET-LOIRE, ILE-DE- FRANCE, AND THE SW. THE FAMERS' PROBLEMS AND MOTIVATIONS ARE ANALYZED AS WELLAS THE CROPPING TECHNIQUES USED, TIME SCHEDULES, AND COMMERCIALIZATION CHANNELS. EMPHASIS IS GIVEN TO THE HARVEST DIFFICULTIES MET BY FARMERS IN LOT-ET-GARONNE AND TO MARKET ORGANIZATION IN LOIRE. IT IS CONCLUDED THAT THE FUTURE OF THIS PRODUCT DEPENDS LARGELY ON A BETTER ORGANIZATION OF PRODUCTIONSCHEDULES, PARTICULARLY REGARDING LABOR SHORTAGES, FLOWERING CYCLES OF VAR., IRRIGATION, AND FERTILIZATION. (CIAT).

0885

27471. FEDERACION NACIONAL DE CAFETEROS DE COLOMBIA. 1985. HABICHUELA. (SNAP BEANS). IN ———. PRODUCTOS AGRICOLAS PERECEDEROS: BASES DE ANALISIS, PROYECCIONES 1986. BOGOTA, DEPARTAMENTO DE MERCADEO. SERIES DE PRECIOS 1964- 1985. BOLETIN NO.14. PP.107-110. ES. IL.

SNAP BEAN WHOLESALE PRICES IN MARKETS OF BOGOTA, CALI, AND MEDELLIN (COLOMBIA) DURING 1984 AND 1985 ARE COMPARED; FORECASTS FOR 1986 ARE GIVEN. (CIAT).

0886

22344 FEDERACION NACIONAL DE CAFETEROS DE COLOMBIA. PROGRAMA DE DESARROLLO Y DIVERSIFICACION DE ZONAS CAFETERAS. 1983. Habichuela. (Snap beans). In _____. Productos agrícolas perecederos: bases de análisis, proyecciones 1984. Bogotá, Departamento de Mercadeo. Series de Precios 1979-1983. Boletín no.12. pp.183-190. Span., Illus.

Phaseolus vulgaris. Snap beans. Economics. Prices. Marketing. Statistical data. Colombia.

Monthly wholesale prices paid for snap beans in 3 main cities of Colombia (Bogotá, Cali, and Medellín) from 1979 to 1983 are analyzed, including projections for 1984. Fluctuations are shown in graphics and tables. [CIAT]

0887

28844 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS. 1973. String beans. FAO Production Yearbook 27:161. En., Fr., Es.

Phaseolus vulgaris. Snap beans. Production. Yields. Statistical data. USA. Argentina. Chile. Peru. Venezuela. Turkey. France.

Data are included on area harvested (ha), yield (kg/ha), and production (MT) of snap beans for the world, North America (USA), South America (Argentina, Chile, Peru, and Venezuela), Asia (Turkey), and Europe (France) during the period 1961-65 and for each year of the period 1971-73. [CIAT]

0888

28842 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS. 1972. String beans. FAO Production Yearbook 26:141. En., Fr., Es.

Phaseolus vulgaris. Snap beans. Production. Yields. Statistical data. USA. Argentina. Chile. Peru. Venezuela. Turkey. France.

Data are included on area harvested (ha), yield (kg/ha), and production (MT) of snap beans for the world, North America (USA), South America (Argentina, Chile, Peru, and Venezuela), Asia (Turkey), and Europe (France) during the period 1961-65 and for each year of the period 1970-72. [CIAT]

0889

28839 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS. 1971. Green beans. FAO Production Yearbook 25:140-143. En., Fr.

Phaseolus vulgaris. Snap beans. Production. Yields. Statistical data. Africa. America. Asia. Europe. Oceania.

Data are included on area (ha), production (MT), and yield (kg/ha) of snap beans for different countries and continents during the periods 1948-52 and 1961-65 and for each year of the period 1966-70. [CIAT]

0890

28837 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS. 1970. Green beans. FAO Production Yearbook 24:139-142. En., Fr.

Phaseolus vulgaris. Snap beans. Production. Yields. Statistical data.

Africa. America. Asia. Europe. Oceania.

Data are included on area harvested (ha), production (MT), and yield (kg/ha) of snap beans for different countries and continents during the periods 1948-52 and 1961-65 and for each year of the period 1965-69. (CIAT)

0891

28835 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS. 1969. Green beans. FAO Production Yearbook 23:140-143. En., Fr.

Phaseolus vulgaris. Snap beans. Production. Yields. Statistical data. Africa. America. Asia. Europe. Oceania.

Data are included on area harvested (ha), production (MT), and yield (kg/ha) of snap beans for different countries and continents during the periods 1948-52 and 1952-56 and for each year of the period 1964-60. (CIAT)

0892

28833 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS. 1968. Green beans. FAO Production Yearbook 22:138-141. En., Fr.

Phaseolus vulgaris. Snap beans. Production. Yields. Statistical data. Africa. America. Asia. Europe. Oceania.

Data are included on area (ha), yield (kg/ha), and production (MT) of snap beans for different countries and continents during the periods 1948-52 and 1952-56 and for each year of the period 1963-67. (CIAT)

0893

29663 MBATIA, D.L.E. 1985. Financial analysis of production of French beans in Kenya (Phaseolus vulgaris). Acta Horticulturae no.158:449-456. En., Sum. En. [Dept. of Agricultural Economics, Univ. of Nairobi, Kenya]

Phaseolus vulgaris. Snap beans. Costs. Trade. Income. Labor. Kenya.

Production costs of French beans were analyzed, and the financial gain for Kenyan small farmers was assessed. French beans are grown mainly for export, from Nov. to April. The costs of the inputs such as fertilizers, seed, labor for land preparation and harvesting were estimated. Some of the small farmers had direct access to the export markets but the majority of them had to sell to the exporters. A good majority of the farmers estimated a profit of about 25 percent but considered employment it provides for them and the rural people a very important benefit. (AS (extract))

0894

6537 ORGANIZACION DE LAS NACIONES UNIDAS PARA LA AGRICULTURA Y LA ALIMENTACION. **Diversificación y aumento de la producción agrícola en el Valle del Cibao. República Dominicana: producción de habichuela.** (*Diversification and increment of agricultural production in the Valle del Cibao, Dominican Republic: bean production*). Santiago, Rep. Dominicana. AGP:DP/DOM/69/509. Informe Técnico 18. 1974. 50p. Span., Sum. Span., 6 Refs., Illus.

Phaseolus vulgaris. **Production. Economics. Plant breeding. Cultivars. Selection. Yield components. Protein content. Climatic requirements. Soil requirements. Fertilizers. Irrigation. Disease control. Insect control. Dominican Republic.**

A summary is presented of research conducted on improvement of bean var., ecological requirements, cultural practices (dates and methods of planting, seed inoculation, weed control, fertilization and irrigation), pest and disease control, harvesting and production costs. The var. ICA-Guali, C-16 and VF-1 yield 11-14% more than Pompadour. The line Cibao 202 has good yields and good characteristics for canning. Jamapa with black seeds yields 17% more than the local Negra and could be used for export. Seed inoculation gave no significant yield increase. Recommendations on NPK rates are given for different regions. Effective, economical control of rust is possible with the fungicide Plantvax. The best insecticides for controlling the larvae of *Trichoplusia ni* were Azodrin 5, Thiodan and Sevin. (*Summary by F.G. Trans. by L.M.F.*) J00

0895

29187 SHEWFELT, R.L. ; RESURRECCION, A.V.A.; JORDAN, J.L.; HURST, W.C. 1986. Quality characteristics of fresh snap beans in different price categories . Journal of Food Quality 9(2):77-88. En., Sum. En., 21 Ref., Il. [Dept. of Food Science, Univ. of Georgia Experiment Station, GA 30212, USA]

Phaseolus vulgaris. Snap beans. Storage. Prices. Organoleptic properties. Marketing. Seed characters. USA.

Snap beans were collected from 9 lots at 5 wholesale warehouses over a 2-day period. The lots were separated into 3 groups based on wholesale price — high, intermediate, and low. Lots were analyzed for quality by chemical, physical, and sensory methods to determine those quality factors most closely associated with the price of fresh beans at the wholesale level. Textural properties differentiated between beans in low and intermediate price groups. Appearance factors were more important than texture in distinguishing between beans of the high and intermediate price groups. (AS)

0896

27046. WARREN, A. 1985. TANZANIA: SEED BEANS FOR EXPORT (GREEN BEAN VARIETIES FOR EUROPE). IN BEAN PRODUCTION IN TANZANIA, MALAWI, ZAMBIA AND ZIMBABWE. REPORT OF A BEAN INFORMATION SURVEY IN AFRICA. CALI, COLOMBIA, CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL. 2P. EN. (9 HILLSIDE, ALLCRAFT ROAD, READING, ENGLAND)

PRODUCTION PROSPECTS AND CONSTRAINTS OF BEAN CULTIVATION IN TANZANIA ARE DISCUSSED. BRIEF INFORMATION IS ALSO PRESENTED OF INPUTS AND PRICES, LAND PREPARATION, INSECTS (MAINLY HELIOTHIS SPP.), DISEASES, AND YIELDS. (CIAT).

L00 GRAIN STORAGE

0897

28022 ASTIER-DUMAS, M.; GARGOMINY, N.; LAURENT, B. 1985. Evolution de la teneur en vitamine C, en minéraux et en fibres dans des haricots verts appertisés et dans des haricots verts surgelés. (Evolution of vitamin C, mineral and fiber content in canned or deep-frozen green beans). Médicine et Nutrition 21(4):273-276. Fr., Sum. Fr., En., Il. [Centre de Recherches Foch, 45, rue des Saints-Peres, 75006 Paris, France]

Phaseolus vulgaris. Snap beans. Canned beans. Vitamin content. Mineral content. Ca. Mg. Na. K. Zn. Fiber content. Storage. France.

Green beans stored for 9 mo., preserved by freezing or canning, showed a lower level of vitamin C. The stable K content during storage allowed the possible variations in vitamin C content to be distinguished in the subsamples, as opposed to real losses during storage. Fiber content did not vary with the length of the storage. (AS)

0898

22643 ATWA, A.A.; EL-SHIEKH, T.H.A.; DESSOUKY, S.M. 1980. Effect of some chemicals and different packing methods on green beans. 1. Store under cold storage conditions. Agricultural Research Review (Egypt) 58(3): 169-182. Engl., Sum. Engl., Ar., 19 Refs.

Phaseolus vulgaris. Storage. Packaging. Snap beans. Egypt.

Different chemical treatments and packing methods were tried on similar pods of snap bean cv. Giza 3 of the autumn planting of 1976 and 1977. The chemical treatments were dipping in IAA (500 ppm), coating with flavorseal wax, flavorseal + thiabendazole, washing with tap water, and unwashed pods (control). Packing methods included packing in nonperforated or perforated polyethylene sacks, and unpacked pods as control. All treatments were placed in carton boxes which were kept under cold storage conditions (5°C and 85% RH) for 24 days, and thereafter held under room conditions for studying the shelf life. Results showed that in general the wt. loss increased with prolonged storage period contrary to the total carbohydrates, chlorophyll, and sugars, which decreased. Coating with flavorseal wax led to decreased wt. loss, chlorophyll content, and total sugars. The unpacked pods showed the highest loss in wt. and destruction of chlorophyll and lower values in both sugars and carbohydrates. After transference to room temp., the IAA-treated pods kept their quality the longest (8 days) compared with the rest of treatments. Packed pods had a longer shelf life at room temp. than the unpacked or perforated polyethylene packages. (Author's summary) L00

0899

22129 ATWA, A.A.; EL-SHIEKH, T.M.A.; DESSOUKY, S.M. 1980. Some factors affecting green bean storage. 2. Under normal conditions. Agricultural Research Review (Egypt) 58(3):183-193. Engl., Sum. Engl., Ar., 22 Refs.

Phaseolus vulgaris. Pods. Storage. Chemical control. Snap beans. Carbohydrate content. Sugar content. Packaging. Seed characters. Egypt.

Sorted pods of bean cv. Giza 3, grown at Bahteem Research Farm (Egypt) during the late summer seasons of 1976 and 1977, were sampled to test the effect of different chemical treatments and packing methods on shelf life. Chemical treatments were: dipping in IAA (500 ppm), coating with flavorseal alone or with thiabendazole, washing with tap water, in addition to unwashed pods as control. Packing methods were comprised of nonperforated polyethylene sacks, perforated ones, or unpacked pods as control. All treatments were placed in carton boxes and were kept thereafter for 12 days under normal conditions (15-22°C and 50-80% RH in 1976, and 16-22.5°C and 50-75% RH in 1977). Inspection was done every 3 days. Results showed that coating with flavorseal wax or flavorseal + thiabendazole reduced the fresh wt. loss, but raised the decay % contrary to IAA which raised the fresh wt. loss and decreased the decay %. The lowest wt. loss % and highest chlorophyll concn. were obtained in nonperforated sacks. Packing in polyethylene sacks either perforated or nonperforated led to high decay.

IAA and flavorseal delayed the destruction of chlorophyll. The highest total sugar and total carbohydrate contents were obtained by flavorseal wax + thiabendazole. However, with prolongation of storage, chlorophyll concn., total carbohydrates, and total sugars decreased. (Author's summary) L00

0900

23640 BASEL, R.M. 1983. Technical note: the improvement of green colour of green beans by acidified bulk storage. Journal of Food Technology 18(6):797-799. Engl., 1 Ref. [Dept. of Horticulture, 2001 Fyffe Court, Ohio State Univ., Columbus, OH 43210, USA]

Phaseolus vulgaris. Snap beans. Storage. Canned beans. Seed color. USA.

Green bean cv. Tendercrop, Stretch, and Earle were stored (a) after blanching, (b) after canning into standard tin cans under normal processing with a cover solution of 30 ml HCl/l distilled water to a final wt. of 454 g, and (c) canning of neutralized blanched green beans to determine the color of the final product. With raw blanched green beans, a dramatic visual change in color from bright green to olive green occurred upon acidification. When green beans were removed from storage, they had a dark green color with approx. the same green intensity of the canned product. After neutralization and canning, the product became lighter colored and greener than the conventionally canned product. The canned product had a typical olive green color, and after storage for 5 days the color improved statistically. Significant changes were observed in green beans during bulk storage mainly due to the shift in green color (a value) during storage and a shift in the L value (visual lightness) after canning. Although shifts in color are not as marked in the storage of conventionally canned beans, it is obvious that chemical changes occur in the pheophytins and pheophorbides. This is an important discovery because it gives the processor a method of storing green beans with better color attributes than that of conventional canned green beans. [CIAT]

0901

20898 DOWEDAR, S.A.; WALLY, M.A.; FAHMY, M.A. 1978. Effect of calcium chloride and latex treatments on keeping quality of snap bean pods during storage. Cairo, Egypt, Ains-Shams University. Faculty of Agriculture. Research Bulletin no.857. 5p. Engl., Sum. Engl., 6 Refs.

Phaseolus vulgaris. Snap beans. Storage. Pods. Egypt.

The effect of calcium chloride and latex on fruits of Egyptian snap bean var. Giza No. 3 at room temp. as well as on their storage life was studied using the following treatments: $CaCl_2$ at 3.0 and 6.0%, latex at 1.0 and

3.0%, $CaCl_2$ at 3.0% + latex at 1.0%; $CaCl_2$ at 6.0% + latex at 3.0%, and untreated fruits as control. Pods were stored for 11 days in net bags. The 2 latex treatments showed the least no. of injured fruits and the lowest % of loss in wt. No differences were observed in the chemical properties of the snap bean pods. (Author's summary) L00

0902

7103 EODA, Y.H., EL-WARAKI, A. and ZAID, M.A. Effect of dehydration, freeze-drying and packaging on the quality of green beans. Food Technology 21(1021):83-86. 1967. Engl., Sum. Engl., 13 Refs.

Phaseolus vulgaris. Packaging. Cultivars. Pods Seed. Composition. Storage.

A comparative study of the effect of processing on the chemical and organoleptic characteristics of 4 varieties of green beans was conducted. The effect of container was studied using 1 variety. Beans blanched in sodium bicarbonate solutions and then dehydrated contained more chlorophyll and less carotene and ascorbic acid than beans blanched in water or steam. However, freeze-dried beans were higher in these components and their shape and size were similar to fresh beans. Freeze-dried beans reconstituted more rapidly in either cold or hot water. Beans packed in metal containers were generally higher in quality than those packed in either polyethylene bags or paper cartons. *(Author's summary)* L00

0903

20862 LEPIGRE, M. 1965. Etude sur les possibilites d'amélioration de la conservation des haricots du Togo en milieu rural. (Study of the possibilities of improving the conservation of snap beans in rural areas of Togo). Agronomie Tropicale 20(4):388-430. Fr., Sum. Fr., Engl., Span., Illus.

Phaseolus vulgaris. Snap beans. Storage. Marketing. Pest control. Togo. Senegal. Dahomey.

In Togo, Senegal, and Dahomey, beans and cereals suffer considerable insect damage even within a short time after harvest. In Togo the main kinds of beans, including Vigna unguiculata and Phaseolus vulgaris, were studied with respect to infestation by weevils (Apion spp. and Bruchidae), storage, marketing, and traditional methods of reducing damage. Recommendations are made for temporary control measures, to be followed by the introduction of modern methods including rapid postharvest drying, air-tight storage, and the use of chemicals such as lindane and carbon tetrachloride. The organization necessary for the execution of this program is discussed as well. Notes of a visit to these countries illustrate the urgency of the problem. (Summary by Abstracts on Tropical Agriculture) L00

0904

23348 ROOS, E.E. 1984. Genetic shifts in mixed bean populations. 1. Storage effects. Crop Science 24(2):240-244. Engl., Sum. Engl., 21 Refs., Illus. [United States Dept. of Agriculture, Agricultural Research Station, National Seed Storage Laboratory, Fort Collins, CO 80523, USA]

Phaseolus vulgaris. Cultivars. Seed. Snap beans. Aging. Storage. Germination. Seed vigor. Deterioration. USA.

A mixture containing equal no. of seed of 8 snap bean cv. was prepared to determine the effects of seed aging on genetic shifts in the population. The mixture was artificially aged to simulate long-term storage using elevated storage temp. and RH/seed/MC. After seed aging, germination of each cv. was regressed on the germination of the mixture to develop a series of equations which could be used to predict relative germination of

the 8 cv. at any given level of germination for the mixture. Relative germination is defined as the ratio of the germination % of any cv. to that of the highest germinating cv. At 50% mixture germination, the relative germination of the 8 cv. ranged from 1.00 (Cherokee Wax) to 0.49 (White Seeded Tendercrop). Computer simulation of the effects of repeated cycles of aging to reduce viability of the mixture to 50% predicted that 4 of the 8 cv. would be eliminated after 11 cycles, assuming a population size of 64 seeds for each cycle. Results demonstrate the potential for loss in genetic variability within heterogeneous germplasm accessions during long-term storage. (Author's summary) L00

L01 Stored Grain Pests

0905

9722 BHATTACHARYA, A.K. and PANT, N.C. **Bioassay of trypsin inhibition from lentil (*Lens esculenta* Moench.) and french bean (*Phaseolus vulgaris* L.) on khapra beetle, *Trogoderma granarium* Everts (Coleoptera: Dermestidae).** Indian Journal of Entomology 32(1):58-67. 1970. Engl., Sum. Engl., 29 Refs.

Phaseolus vulgaris. Coleoptera. Stored grain pests. Diets. Inhibitors. Seed. Enzymes.

Efforts were made to isolate the well-known heat labile trypsin inhibitor from lentils and french beans and to bioassay it by incorporating the same in wheat flour or an artificial diet for a culture of *Trogoderma granarium*. Addition of higher levels of crude trypsin inhibitor had a deleterious effect during the developmental period. Addition of higher levels of acetone precipitate of these pulses to an artificial diet also indicated a decrease in adult emergence; therefore, the trypsin inhibitor in these pulses was partly responsible for making them unsuitable for insects. On original residue of french beans, larvae developed readily; steaming or supplementation of glucose failed to increase dietary value. This indicates that extraction of trypsin inhibior from french beans also facilitates the release of an assimilable form of carbohydrates. (*Author's summary*) L01

0906

17973 LUKANDO, N.F. 1978. Susceptibility of grain and legume crops to storage pests. In Kenya, University of Nairobi. Department of Crop Science. Technical Communication no. 21. pp.19-27. Engl., 11 Refs.

Phaseolus vulgaris. Acanthoscelides obtectus. Snap beans. Resistance. Stored grain pests. Kenya.

Susceptibility of maize, sorghum, wheat, chickpea, and haricot bean to storage pests is discussed. Regarding haricot bean, research is conducted on factors affecting its susceptibility to Acanthoscelides obtectus. According to preliminary results, it was found that var. differences exist and that for a given var., resistance is due to a no. of factors that act alone or in combination: (a) thickness of testa; (b) presence of Ca oxalate crystals in the testa, and (c) presence of alkaloids or other chemicals which repel bruchids. It was also found that the roughness of the testa increases susceptibility. (Summary by F.G. Trans. by L.M.F.) L01

M00 USES, INDUSTRIALIZATION AND PROCESSING

0907

29188 ADSULE, P.G. ; DAN, A.; SATYANARAYANA, A.; RAJENDRAN, R. 1984. Studies on the suitability for canning of new French bean [Phaseolus vulgaris] selections. Journal of Food Science and Technology 21[4]:203-205. En., Sum. En., 4 Ref. [Small Industries Service Inst., Government of India, 65/1 GST Road, Guindy, Madras-600 032, India]

Phaseolus vulgaris. Snap beans. Cultivars. Canned beans. Organoleptic properties. Storage. India.

Four selections of French beans developed at the Indian Institute of Horticultural Research [Bangalore, India] were assessed for physicochemical characteristics and suitability for canning. Selection No. 5 and 2 were found better than check var. Contender, which is reported to be the best for canning. Organoleptic score of canned French beans during storage for 12 mo. is included. [AS]

0908

27298. COLLINS, J.L.; MULLINS, C.A. 1984. TENNESSEE SNAP BEANS FOR CANNING AND FREEZING. TENNESSEE FARM AND HOME SCIENCE NO.130:11-14. EN. 7 REF. [PLATEAU EXPERIMENT STATION, UNIV. OF TENNESSEE, CROSSVILLE, TN, USA]

NINETEEN SNAP BEAN CV. GROWN AT THE PLATEAU EXPT. STATION [TENNESSEE, USA] WERE EVALUATED, 2 OF WHICH WERE WAX-TYPE AND THE REST GREEN-TYPE. SNIPPED RAW PODS WERE EXAMINED FOR COLOR AND SIEVE SIZE MEASUREMENT AND GRADED ACCORDINGLY. SOME MEDIUM-SIZE PODS WERE CANNED [BLANCHED AT 76.7 DEGREES CELSIUS/3 MIN, FILED INTO NO. 303 CANS, COVERED WITH WATER AT 95 DEGREES CELSIUS, 1 TEASPOON OF SALT WAS ADDED TO EACH CAN, CANS WERE SEALED AND PROCESSED FOR 20 MIN AT 115.6 DEGREES CELSIUS. CANS WERE STORED 6 MO. AT ROOM TEMP. SOME MEDIUM-SIZED PODS WERE FROZEN [BLANCHED AND BLAST FROZEN FOR STORAGE AT -17.8 DEGREES CELSIUS FOR 6 MO. PROCESSED BEANS WERE TESTED FOR COLOR, APPEARANCE [SHAPE, SIZE, UNIFORMITY, DEFECTS], FIRMNESS, AND AMOUNT OF EPIDERMAL SLOUGHING. RESULTS ARE TABULATED. BY BALANCING SEVERAL IMPORTANT PARAMETERS UNDER CONSIDERATION THE CV. RECOMMENDED ARE EAGLE, FLO, CHECKMATE, CAPE, AND BBL GV66. BBL GV66 IS AN EXPTL. LINE AND THE OTHERS ARE COMMERCIAL CV. [FOOD SCIENCE AND TECHNOLOGY ABSTRACTS].

0909

29123 DRAKE, S.R. ; CARMICHAEL, D.M. 1986. Frozen vegetable quality as influenced by high temperature short time [HTST] steam blanching. Journal

of Food Science 51(5):1378-1379. En., Sum. En., 8 Ref. [USDA/ARS Tree Fruit Research Laboratory, 1104 N. Western Ave., Wenatchee, WA 98801, USA]

Phaseolus vulgaris. Snap beans. Canned beans. Processing. USA.

Quality differences in processed vegetables (among them, snap beans) can be controlled with high temp. short time (HTST) steam blanching. In addition, HTST blanching required significantly less energy to blanch vegetables than water blanching. HTST-blanched vegetables displayed quality parameters distinctly different than water-blanched vegetables. Differences in quality parameters were highly dependent upon the vegetable being blanched and the pressure and time of the HTST blanch. The quality of vegetables were similar between water and HTST blanching treatments, but by controlling the pressure and time of the HTST blanch, quality characteristics could be changed to meet individual requirements. HTST-blanched snap beans had greater moisture and less soluble solids than water-blanched snap beans. They also had smaller shear values (65-85 percent) and exhibited a lighter more delicate green color. High quality frozen vegetables can be produced with HTST steam blanching but quality is dependent upon the particular vegetable and pressure and time of the HTST steam blanch. (AS)

0910

26231. GULLETT, E.A.; ROWE, D.L.; HINES, R.J. 1984. EFFECT OF MICROWAVE BLANCHING ON THE QUALITY OF FROZEN GREEN BEANS. CANADIAN INSTITUTE OF FOOD SCIENCE AND TECHNOLOGY JOURNAL 17(4):247-252. ENGL., SUM. ENGL., FR., 5 REFS. [DEPT. OF CONSUMER STUDIES, UNIV. OF GUELPH, ONTARIO N1G 2W1, CANADA]

MICROWAVE-BLANCHED GREEN BEANS WERE COMPARED WITH A 2 MIN WATER BLANCH. COLOR, TEXTURE, FLAVOR, ODOR, AND OVERALL ACCEPTABILITY WERE ASSESSED BY A TRAINED SENSORY PANEL AFTER 3 AND 6 MO. FROZEN STORAGE. ASCORBIC ACID CONTENT, COLOR (HUNTERLAB COLORIMETER), AND PEAK HEIGHT WERE DETERMINED AND THE PEROXIDASE TEST WAS CONDUCTED AFTER 0, 3, AND 6 MO. FROZEN STORAGE. LOTS OF GREEN BEANS OF 450 G WERE BLANCHED (5, 6, AND 7 MIN IN A MICROWAVE OVEN AND 2 MIN IN BOILING WATER). MICROWAVE-TREATED SAMPLES WERE SCORED FIRMER AND LESS GREEN THAN WATER-BLANCH SAMPLES. THIS WAS SUPPORTED BY COLOR AND PEAK HEIGHT MEASUREMENTS. MICROWAVE TREATMENTS OF 5 MIN AND SOME OF THOSE OF 6 MIN RESULTED IN POSITIVE PEROXIDASE TESTS. HOWEVER, THESE TREATMENTS DID NOT SCORE AS HAVING MORE OFF-FLAVOR AND OFF-ODOR THAN THE 7 MIN TREATMENTS. ALL MICROWAVE TREATMENTS

WERE SCORED AS HAVING LESS TYPICAL BEAN FLAVOR AND MORE OFF-FLAVOR AND OFF-ODOR AND LOWER OVERALL ACCEPTABILITY THAN THE WATER BLANCH. [AS].

0911

29659 KERMASHA, S. ; VAN DE VOORT, F.R.; METCHE, M. 1986. Lipase activity and fatty acid composition in stored full-fat French bean flour. Canadian Institute of Food Science and Technology Journal 19(3):92-94. En., Sum. En., Fr., 14 Ref., Il. [Dept. of Food Science & Agricultural Chemistry, Macdonald College, McGill Univ., 21111 Lakeshore Road, St. Anne de Bellevue, P.Q. H9X 1C0, Canada]

Phaseolus vulgaris. Snap beans. Bean flour. Storage. Temperature. Fatty acids. Organoleptic properties. Canada.

The production of free fatty acids due to lipase action in full-fat French bean flour may be closely related to the autoxidation of the lipid present, which has remifications in terms of organoleptic quality. Lipase activity was determined in the succulent green bean, freshly prepared mature bean flour, and flour stored for 2 yr at 4 degrees Celsius and was found to be 21, 42, and 125 x 10(-6) microequivalents acid/mg protein/min, resp. The fatty acid profile of the mature bean flour was measured following storage at -18, 4, 20, and 35 degrees Celsius. The fatty acid profile of the bean flour did not change significantly in samples stored at -18 and 4 degrees Celsius; however, obvious changes took place in the samples stored at 20 and 35 degrees Celsius with a loss of long chain and the appearance of shorter chain fatty acids. The results indicated that lipase was active in the flour, increasing in activity with storage and that temp. above 4 degrees Celsius accelerated the process of lipolysis in full fat flour significantly, even at low moisture levels. The action of lipase could therefore be a significant factor in the development of off-flavors and odors by contributing free fatty acids which in turn are more readily oxidized. [AS]

0912

26565. LOPEZ, A.; WILLIAMS, H.L. 1985. ESSENTIAL ELEMENTS AND CADMIUM AND LEAD IN FRESH, CANNED, AND FROZEN GREEN BEANS [PHASEOLUS VULGARIS L.]. JOURNAL OF FOOD SCIENCE 50(4):1152-1157. ENGL., SUM. ENGL., 22 REFS. [DEPT. OF FOOD SCIENCE & TECHNOLOGY, VIRGINIA POLYTECHNIC INST. & STATE UNIV., BLACKSBURG, VA 24061, USA]

SIXTEEN ESSENTIAL ELEMENTS, CD, AND PB WERE DETERMINED IN FRESH, CANNED, AND FROZEN GREEN BEANS. SAMPLES WERE TAKEN DURING

PROCESSING TO DETERMINE WHERE CHANGES IN ELEMENT CONTENT OCCURRED. CANNED GREEN BEANS CONTAINED LOWER CONCN. OF CA, CU, FE, MG, MN, P, K, AND ZN, BUT HAD HIGHER AMOUNTS OF CHLORIDE, NI, AND NA THAN FRESH BEANS. NO CHANGE IN SI CONCN. WAS OBSERVED. FE, P, AND K CONCN. WERE LOWER IN FROZEN THAN IN FRESH GREEN BEANS, BUT CA, NA, AND ZN WERE HIGHER. THERE WAS NO CHANGE IN CHLORIDE, CU, MG, MN, AND SI DUE TO FREEZING. ELEMENT RETENTION RANGED FROM 51 TO 100 PERCENT FOR CANNED AND FROM 73 TO 171 PERCENT FOR FROZEN GREEN BEANS. [AS].

0913

22156. PALA, M.; DEELEN, W. VAN.; STEINBUCH, E. 1983. EFFECT OF DIFFERENT PRETREATMENTS ON THE QUALITY OF DEEP FROZEN GREEN BEANS AND CARROTS. WAGENINGEN, SPRENGER INSTITUUT. REPORT NO.2227. 24P. ENGL. SUM. GERM., ENGL., 17 REFS., ILLUS.

SINCE PRETREATMENT METHODS FOR FROZEN VEGETABLES ARE OF CONSIDERABLE IMPORTANCE WITH RESPECT TO QUALITY RETENTION, CONVENTIONAL WATER- AND STEAM-BLANCHING METHODS WERE COMPARED WITH VACUUM PACKAGING, EVACUATION, AND HEAT SHOCK TREATMENTS, AS WELL AS COMBINATIONS OF VARIOUS METHODS. GREEN BEANS AND CARROTS WERE USED AS THE RAW MATERIALS. THE DIFFERENCE IN QUALITY OF THE FROZEN VEGETABLES WAS DETERMINED BY CHEMICAL AND PHYSICAL PARAMETERS: PH, DM CONTENT, TOTAL ACID CONTENT, ASCORBIC ACID CONTENT, PEROXYDASE ACTIVITY, COLOR, AND TEXTURE. RESULTS INDICATE THAT THE MAX. QUALITY RETENTION OF FROZEN GREEN BEANS WAS ACHIEVED BY THE EVACUATION AND HEAT SHOCK TREATMENTS. [AS].

0914

22517. PEREIRA, E.C.; NORWIG, J.; THOMPSON, D.R. 1984. GREEN BEAN AND ASPARAGUS BLANCHING DATA. TRANSACTIONS OF THE AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS 27(2):624-628. ENGL. SUM. ENGL., 26 REFS., ILLUS.

EFFECTS OF BLANCHING ON ASPARAGUS AND CUT GREEN BEANS WERE DETERMINED BY MEASURING GAS REMOVAL AND RECOVERY AFTER BLANCH. CANNED BEANS WERE ALSO EXAMINED FOR CHANGES AFTER STORAGE. ALL CHANGES IN GREEN BEANS WERE NEARLY COMPLETE IN A 3-MIN BLANCH AT 82 DEGREES CELSIUS. ORGANOLEPTIC EVALUATION OF TASTE AND TEXTURE YIELDED NO SIGNIFICANT DIFFERENCES BETWEEN BEANS BLANCHED AT DIFFERENT TEMP. (32-82 DEGREES CELSIUS), AND STORED AT ROOM TEMP. OR 30 DEGREES CELSIUS FOR DIFFERENT TIMES (0-63 DAYS), THOUGH INSTRUMENTAL TESTS SHOWED LOSS OF TEXTURE AT HIGHER BLANCH AND

STORAGE TEMP., AND SIGNIFICANT LOSS OF COLOR DURING STORAGE AT BOTH TEMP. SINCE NO VARIATIONS IN SEDIMENT WERE OBSERVED, BLANCHING GREEN BEANS AT 32 DEGREES CELSIUS FOR 3 MIN OR MORE MAY BE SUFFICIENT. (FOOD SCIENCE AND TECHNOLOGY ABSTRACTS).

0915

28923 RAO, M.A. ; COOLEY, H.J.; VITALI, A.A. 1986. Thermal energy consumption for blanching and sterilization of snap beans. Journal of Food Science 51(2):378-380. En., Sum. En., 16 Ref., Il. [Dept. of Food Science & Technology, New York State Agricultural Experiment Station, Cornell Univ., Geneva, NY 14456, USA]

Phaseolus vulgaris. Canned beans. Processing. Snap beans. USA.

Steam consumption for a water blancher and a continuous pressure sterilizer was measured in a snap bean cannery. For the blancher, it ranged between 0.204-0.306 lb/lb of beans. The energy efficiency of the blancher was found to be between 26.3-52.3 percent. In a pilot scale test, the concn. of Ca, Mg, and K ions increased as the blanching water was recycled and the firmness of the beans after canning varied between 0.855-1.010 kN. Steam consumption by the continuous pressure sterilizer was related linearly to the loading rate of cans: steam consumed (lb/h) = 1075.9 + 0.073 x (cans/h). (AS)

0916

27229. RAO, M.A.; LEE, C.Y.; COOLEY, H.J. 1985. LOSS OF COLOR AND FIRMNESS DURING THERMAL PROCESSING OF CANNED SNAP BEANS. JOURNAL OF FOOD QUALITY 8(1):39-44. EN. SUM. EN., 14 REF., IL. (NEW YORK STATE AGRICULTURAL EXPERIMENT STATION, CORNELL UNIV., GENEVA, NY 14456, USA)

A STUDY WAS UNDERTAKEN TO DETERMINE THE KINETIC PARAMETERS (D AND Z) FOR THE LOSS OF COLOR AND FIRMNESS OF SNAP BEANS DURING THERMAL PROCESSING. THE D VALUE (AT 250 DEGREES FAHRENHEIT) AND THE Z VALUE FOR THE LOSS OF COLOR WERE 12.6 MIN AND 91 DEGREES FAHRENHEIT, RESP. THE D VALUE (AT 250 DEGREES FAHRENHEIT) AND THE Z VALUE FOR THE LOSS OF FIRMNESS WERE 3.4 MIN AND 106 DEGREES FAHRENHEIT, RESP. THE MAGNITUDES OF THE KINETIC PARAMETERS ARE IN THE RANGE OF VALUES REPORTED IN THE LITERATURE. (CIAT).

0917

27081. SHEWFELT, R.L.; PRUSSIA, S.E.; JORDAN, J.L.; HURST, W.C.; RESURRECCION, A.V.A. 1986. A SYSTEMS ANALYSIS OF POSTHARVEST HANDLING OF FRESH SNAP BEANS. HORTSCIENCE 21(3):470-472. EN. SUM. EN., 20 REF. (UNIV. OF GEORGIA

AGRICULTURAL EXPERIMENT STATION, DEPT. OF FOOD SCIENCE, EXPERIMENT, GA 30212, USA]

THE POSTHARVEST HANDLING SYSTEM OF FRESH MARKET SNAP BEANS OF CV. SPRITE WAS ANALYZED TO DETERMINE STEPS OF GREATEST QUALITY DETERIORATION. A DECREASE IN ASCORBIC ACID CONCN. WAS THE ONLY CONSISTENT QUALITY CHANGE NOTED BETWEEN THE ARRIVAL AT THE PACKINGHOUSE AND DEPARTURE FROM THE WHOLESALE WAREHOUSE. QUALITY DIFFERENCES IN PERCENTAGE OF FIBER, PERCENTAGE OF SEEDS, COLOR, HUE ANGLE, MOISTURE, ASCORBIC ACID, AND SENSORY TEXTURE ATTRIBUTES OBSERVED IN BEANS FROM DIFFERENT PACKINGHOUSES SUGGEST THAT CULTURAL AND HARVESTING FACTORS ARE MOST CRITICAL. SHORT MARKET SHELF-LIFE IS A MAJOR LIMITATION IN MARKETING. [AS].

0918

29163 SILVESTRI, G. ; SIVIERO, P.; ANDREOTTI, R.; TOMASICCHIO, M.; MACCHIAVELLI, L. 1984. Grado di maturazione del fagiolino in rapporto alla trasformazione industriale. [Maturity degree of green beans in relation to commercial processing]. Industria Conserve 59[2]:125-129. It., Sum. It., En.

Phaseolus vulgaris. Snap beans. Processing. Maturation. Harvest. Timing. Organoleptic properties. Palatability. Storage. Italy.

Six var. of green beans for commercial processing were harvested several times at 2-day intervals in 1982 and 1983 in order to find a parameter suitable as indicator of optimum harvesting maturity. After determination of the agronomical characteristics, the beans from each harvest were blanched, frozen, and stored for about 3 mo. at -20 degrees Celsius. At the end of the storage period they were thawed, cooked, and evaluated organoleptically. No relationship could be found between degree of maturity and organoleptic characteristics of the beans, even if there seemed to be, for 3 var., a slight preference for the pods containing 3 percent of seeds. As a matter of fact, only the least ripe beans, i.e. th ones from the 1st harvest, were judged unacceptable, whereas no significan differences were found between the beans from the other harvests. [AS]

0919

8007 STEVENS, M.A. *et al.* **Volatile components of canned snap beans (*Phaseolus vulgaris* L.).** Proceedings of the American Society for Horticultural Science 91:833-845. 1967. Engl., Sum. Engl., 16 Refs., Illus.

Phaseolus vulgaris. **Analysis. Cultivars. Palatability. Temperature. Food technology.**

Low-temperature, low-pressure distillation and direct liquid-liquid extraction were used to

isolate the volatile compounds from canned french bean liquor. Mass spectrometry in conjunction with a capillary column-equipped gas chromatograph, coincidence of relative retention times with authentic compounds, and infrared spectroscopy were used to characterize 40 compounds in french bean essence. It is believed that cis-hex-3-en-1-ol, oct-1-en-3-ol, linalool, α-terpineol, pyridine and furfural are of primary importance in canned french bean flavor and more particularly in the differences in flavor between varieties. A no. of the other compounds indentified undoubtedly contribute to the aroma of this vegetable. (*Author's summary*) M00

0920

29188 STONE, M.B. ; YOUNG, C.M. 1985. Effects of cultivars, blanching techniques, and cooking methods on quality of frozen green beans as measured by physical and sensory attributes. Journal of Food Quality 7(4):255-265. En., Sum. En., 17 Ref. [Dept. of Foods & Nutrition, Kansas State Univ., Manhattan, KS 66506, USA]

Phaseolus vulgaris. Snap beans. Cultivars. Processing. Cooking. Palatability. Organoleptic properties. USA.

Effects of cv., blanching techniques, and cooking methods on the color, texture, and sensory characteristics of frozen green beans were investigated. Provider beans were firmer than the Contender cv. following frozen storage and cooking when evaluated instrumentally and by a sensory panel. Microwave-blanched beans were harder according to Instron measurements, and sensory scores for firmness and toughness were higher than beans blanched by boiling water or steam. Green beans blanched or cooked by microwaves had grassy aromas and strong off-flavors that were not detected in those blanched or cooked by conventional methods. Microwave-cooked beans were greener and firmer than those conventionally cooked. (AS)

0921

26089. TONINI, G.; MENNITI, A.M.; MAINI, R.; RANALLI, P. 1984. SCELTA VARIETALE, EPOCA DI SEMINA E RACCOLTA DEI FAGIOLINI PER UN BUON PRODOTTO TRASFORMATO. (CHOICE OF VARIETY, SOWING AND HARVEST DATES FOR A GOOD PROCESSED PRODUCT IN DWARF BEANS). INFORMATORE AGRARIO 40(48):67-76. ITAL. 15 REFS., ILLUS.

TABULATED DATA ARE PRESENTED ON CHARACTERS INCLUDING SIZE, SHAPE, AND SEEDS:POD RATIO AT HARVEST, AND COLOR AND CONSISTENCY OF THE FROZEN PRODUCT AT 6 AND 12 MO. STORAGE AT -25 DEGREES CELSIUS OF 6, 9, AND 8 FRENCH BEAN CV. IN 1981, 1982, AND 1983, RESP., WITH DIFFERENT SOWING AND HARVEST DATES. SIMILAR DATA ARE ALSO PRESENTED ON 15 AND 11 CV. IN 1982 AND 1983, RESP., AND ON 10 CV. IN A 2ND STUDY IN 1983. BRIEF SUMMARIES OF THE PROCESSING SUITABILITY OF EACH CV. ARE PROVIDED: EURONOR, BRELAN, AUTAN,

MIRAGE, AND PV124 WERE SUITABLE FOR CANNING ONLY; BEL AMI, PROS GITANA, AND INGO WERE SUITABLE FOR BOTH CANNING AND FREEZING. [HORTICULTURAL ABSTRACTS].

0922

25883. VAN BUREN, J.P. 1983. TWO EFFECTS OF SODIUM CHLORIDE CAUSING SOFTENING OF THE TEXTURE OF CANNED SNAP BEANS. JOURNAL OF FOOD SCIENCE 48(4):1362-1363. ENGL. SUM. ENGL., 10 REFS. [DEPT. OF FOOD SCIENCE & TECHNOLOGY, CORNELL UNIV., GENEVA, NY 14456, USA]

THE EFFECT OF NACL ON THE TEXTURE OF CANNED SNAP BEANS WAS STUDIED WITH LEACHED AND NONLEACHED POOS. PECTIN AND CA SOLUBILIZATION WERE ALSO MEASURED. NACL PROMOTED SOFTENING BOTH DURING COOKING AND APART FROM COOKING. THE COOKING EFFECT WAS ACCOMPANIED BY INCREASED PECTIN SOLUBILITY. THE NONCOOKING EFFECT WAS ACCOMPANIED BY INCREASED CA SOLUBILITY. [AS].

ABBREVIATIONS AND ACRONYMS

A	Angstrom(s)
ABA	Abscisic acid
ac	Acre(s)
Afr.	Afrikaans
a.i.	Active ingredient
alt.	Altitude
AMV	Alfalfa mosaic virus
approx.	Approximate(ly)
atm.	Atmosphere
ATP	Adenosine 5'-triphosphate
av.	Average
BAP	6-Benzylaminopurine
BBMV	Broad bean mosaic virus
BCMV	Bean common mosaic virus
BGMV	Bean golden mosaic virus
BGYMV	Bean golden yellow mosaic virus
BOD	Biochemical oxigen demand
BPMV	Bean pod mottle virus
BRMV	Bean rugose mosaic virus
BSMV	Bean southern mosaic virus
BV	Biological value
BYMV	Bean yellow mosaic virus
°C	Degrees Celsius (centigrade)
ca.	About (circa)
CAMD	Cassava African mosaic disease
CMV	Cassava African mosaic virus
CBB	Cassava bacterial blight
CBSD	Cassava brown streak disease
CEC	Cation exchange capacity
CER	CO_2 exchange rate
CF	Cassava flour
CGR	Crop growth rate
CLM	Cassava leaf meal
CLV	Cassava latent virus
CM	Cassava meal
cm	Centimeter(s)
COD	Chemical oxigen demand
concn.	Concentration
CP	Crude protein
CSL	Calcium stearyl lactylate
CSW	Cassava starch wastes
C.V.	Coefficient of variation
cv.	Cultivar(s)
2,4-D	2,4-dichlorophenoxyacetic acid
DM	Dry matter
DNA	Deoxyribonucleic acid
EC	Emulsifiable concentrate
EDTA	Ethylenediaminetetraacetic acid
EEC	European Economic Community
e.g.	For example
ELISA	Enzyme-linked immunosorbent assays
EMS	Ethyl methane sulfonate
Engl.	English
EP	Preliminary Trials, CIAT
expt.	Experiment(s)
exptl.	Experimental
°F	Degrees Fahrenheit
Fr.	French
ft-ca	Foot candles (10.76 lux)
FYM	Farmyard manure
g	Gram(s)
G	Giga (109)
GA	Gibberellic acid
gal	Gallon(s)
GE	Gross energy
Germ.	German
GERs	Glucose entry rates
GLC	Gas-liquid chromatography
h	Hour(s)
ha	Hectare(s)
HCN	Hydrocyanic acid
HDP	Hydroxypropyl distarch phosphate (modified cassava starch)
HI	Harvest index
hp	Horsepower
IAA	Indoleacetic acid
IBA	Indolebutyric acid
IBYAN	International Bean Yield and Adaptation Nursery, CIAT
Illus.	Illustrated
in.	Inches
Ital.	Italian
IU	International unit
J	Joule
Jap.	Japanese
kat	Katal(amount of enzymatic activity that converts 1 mole of substrate/s)
kcal	Kilocalorie(s)
kg	Kilogram(s)
kJ	Kilojoule
km	Kilometer(s)
KNap	Potassium naphthenate
kR	Kiloroentgen(s)
l	Liter(s)
LAD	Leaf area duration
LAI	Leaf area index
lat.	Latitude
lb	Pound(s)
LD50	Mean lethal dose
LER	Land efficiency ratio

LPC	Leaf protein concentrate
lx	Lux
M	Mega
M	Molar
m	Meter(s)
Mal.	Malay
max.	Maximum
MC	Moisture content
ME	Metabolizable energy
meq	Milliequivalent(s)
met.	Methionine
mg	Milligram(s)
mho	Reciprocal ohm
min.	Minimum
min	Minute(s)
ml	Milliliter(s)
mm	Millimeter(s)
mo.	Month
mol. wt.	Molecular weight
m.p.	Melting point
NAA	Alpha-naphthalene acetic acid
NAD	Nicotinamide adenine dinucleotide
NADH	Nicotinamide adenine dinucleotide, reduced form
NAR	Net assimilation rate
NCE	Net CO_2 exchange
NE	Northeast
NER	Net energy ratio
nm	Nanometer(s) (10^{-9} m)
no.	Number(s)
NPFs	Negative production factors
NPR	Net protein ratio
NPU	Net protein utilization
NW	Northwest
OM	Organic matter
oz	Ounce(s)
p.	Page
P	Probability
Pa	Pascal(s)
PAN	Peroxyacetic nitrate
PCNB	Pentachloronitrobenzene
PDA	Potato dextrose agar
PER	Protein efficiency ratio
pH	Hydrogen ion concentration
pp.	Pages
pphm	Parts per hundred million
PPI	Pre planting incorporation
ppm	Parts per million
PSA	Potato sucrose agar
pv.	Pathovar
Ref(s).	Reference(s)
resp.	Respective(ly)
Rf	Retardation factor-chromatography
RGR	Relative growth rate
RH	Relative humidity
RNA	Ribonucleic acid
Rom.	Romanian
rpm	Revolutions per minute
Russ.	Russian
s	Second
SBM	Soybean meal
SCN	Thiocyanate
SCP	Single cell protein
SDS	Sodium dodecyl sulfate
Sk.	Slovak
sp.	Species
Span.	Spanish
spp.	Species
SSL	Sodium stearyl-2-lactylate
Sum.	Summary
t	Ton(s)
TDN	Total digestible nutrients
temp.	Temperature
TIA	Trypsin inhibitor activity
TIBA	2,3,5-Triiodobenzoic acid compound with N-methylmethanamine
TLC	Thin-layer chromatography
TMV	Tobacco mosaic virus
TSH	Thyroid-stimulating hormone
UDPG	Uridine diphosphate glucose
UMS	Unmodified cassava starch
UV	Ultraviolet
var.	Variety(ies), varietal
VEF	Bean Team Nursery, CIAT
VFA	Volatile fatty acids
vol.	Volume
VPD	Vapor pressure deficit
vpm	Volume per million
vs.	Versus
W	West, watt
wk.	Week
WP	Wettable powder
wt.	Weight
yr	Year(s)
/	Per
%	Percent(age)
>	More than, greater than
<	Less than
≤	Equal to or less than
≥	Equal to or greater than
±	Plus or minus

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BIELY, T.E.
0790

BINGHAM, G.E.
0691

BINNIE, R.C.
0070

BINNING, L.K.
0010 0252 0253 0254 0273

BIRD, J.
0641

BIROT, A.M.
0867 0880

BIUK, A.A.
0152

BLACKHURST, H.T.
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BLANCHETT, R.
0842

BLISS, F.
0803

BLISS, F.A.
0116 0117 0118 0576 0780 0849 0863

BLUM, U.
0687

BLUMENBERG, L.S.
0848

BODNAR, J.
0642

BOE, A.A.
0114 0685

BOELEMA, B.H.
0506 0507

BOEREMA, G.H.
0536

BOETTGER, M.A.
0075 0546 0692 0787

BOLDT, P.F.
0255 0256

BOLWELL. G.P.
0005

BOLWELL, G.P.
0115

BONANNO, A.R.
0153 0154 0155 0156

BOND, W.
0383 0384

BORDERS, H.I.
0537

BOSE, K.
0614

BOSE, S.K.
0613 0615 0616

BOUET, A.
0884

BOUWKAMP, J.C.
0778

BOWMAN, D.H.
0244

BOWYER, J.W.
0500 0688

BOYER, K.W.
0845

BOYLE, J.F.
0038

BRADFORD, B.N.
0064

BRADNOCK, W.T.
0091

BRANDES, D.
0004

BRATHWAITE, R.A.I.
0257

BRECKE, B.J.
0258

BREEN, P.J.
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BRENNER, A.M.
0838

BRIEN, R.M.
0636

BROOKE, R.C.
0666 0667

BROUWER, H.M.
0157

BROWN, G.B.
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BROWN, J.E.
0447

BROWN, J.W.
0849

BROWN, J.W.S.
0116 0117 0118 0780

BROWNE, T.
0122

BRUNS, V.F.
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BRYAN, H.H.
0283 0746

BRYANT, J.H.
0287

BUBENZER, G.D.
0158

BUESCHER, R.W.
0310 0689 0850 0851

BUONASSISI, A.J.
0538

BUREN, J.P. VAN
0039

BURKE, D.W.
0834

BUSADA, C.J.
0040 0159

BUSS, A.
0004

BYTH, D.E.
0076

BYUN, J.K.
0086

CAFATI K., C.
0474

CAMARGO, A.P. DE
0004

CAMPBELL, C.L.
0539 0540

CAMPBELL, R.E.
0071 0072

CAMPBELL, W.F.
0026 0084 0226 0694 0868

CANADA. AGRICULTURE CANADA, RESEARCH STATION
0260

CANADA, AGRICULTURE CANADA, RESEARCH STATION
0261

CANADA, DEPARTMENT OF AGRICULTURE
0262

CANARY, D.J.
0629

CANCEGLIERO, L.F.B.
0718

CANTELO, W.W.
0715

CANTWELL, G.E.
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CAPOOR, S.P.
0643

CARBONELL, J.V.
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CARDONA JUNIOR, E.V.
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CARMICHAEL, D.M.
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CAROLUS, R.L.
0278

CARONE, F.
0280

CARR, D.J.
0001

CARRIJO, I.V.
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CARVALHO, B.C.L. DE
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CASANOVA, A.
0366

CASH, J.N.
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CASSIDY, J.C.
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CASTRO A., M.
0476

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0781 0782 0783

CERVONE, F.
0541

CHALFANT, R.B.
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CHANCY, H.R.
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CHANT, S.R.
0646

CHAPMAN, R.B.
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CHAPMAN, R.K.
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CHILALO AGRICULTURAL DEVELOPMENT UNIT. ETHIOPIA
0266

CHILALO AGRICULTURAL DEVELOPMENT UNIT, CROP PRODUCTION DEPARTMENT. ETHIOPIA
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CHIN, H.F.
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CHINA, W.E.
0716

CHIPMAN, E.W.
0160

CHIRIBOGA V., C.E.
0477

CHOCKALINGAM, P.
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CHUNG, J.H.
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CLARK, B.E.
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CLIFFORD, P.E.
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COBB, A.C.
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COBB, W.T.
0267

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COELHO, R.G.
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COERTZE, A.F.
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COFFEY, D.L.
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CONWAY, L.K.
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COOLEY, H.J.
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COOLEY, T.N.
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COPEMAN, R.J.
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CORREA, R.T.
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COSTA, A.S.
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COSTA, C.L.
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COSTA, C.P. DA
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COSTA, J.G.C. DA
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COUTTS, R.H.A.
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COX, L.C.
0016

COX, T.I.
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COYNE, D.P.
0751 0784

COYNE, P.I.
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CRAMER, C.L.
0115

CRANE, S.
0272

CRIOLLO E., H.
0299

CRIVELLI, G.
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CROSBIE, S.H.
0273

CROSIER, D.C.
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CROSS, J.E.
0524

CROSSAN, D.F.
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CROSSMAN, D.F.
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CRUGER, G.
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CRUZ, C.
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CRUZ, J.R.
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CUBERO, J.I.
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CURRAH, L.
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D'AURIA, J.M.D.
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DABBS, D.H.
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DALE, J.E.
0164

DALY, P.
0274

DAN, A.
0907

DANIAU, P.
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DANIELLS, J.W.
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DANIELS, R.W.
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DARBY, J.F.
0312

DAVE, I.C.
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DAVIES, W.J.
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DAVIS, D.R.
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DAVIS, D.W.
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DAVIS, H.J.
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DAVIS, J.H.C.
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DAVIS, K.R.
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DAVIS, W.D.
0785

DEAKIN, J.R.
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DEAN, L.L.
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DEBOLT, J.W.
0720

DEBOST, M.
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DEBOUCK, D.G.
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DEELEN, W. VAN
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DEFRANK, J.
0276

DEMCHAK, K.T.
0217

DEMINT, R.J.
0259 0277

DENIS, M.
0880

DENNY, S.
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DEPESTRE M., T.
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DERIEUX, M.
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DESCHAMPS P., H.M.
0644

DESPRADEL, J.O.
0786

DESSERT, M.
0492

DESSOUKY, S.M.
0698 0899

DEY, P.M.
0014 0548

DEYTON, D.E.
0278

DHAR, N.
0090

DHINGRA, O.D.
0462 0544 0545 0552 0553

DIAZ F., T.M.R.
0481

DICKENS, L.E.
0508 0519 0597

DICKSON, M.H.
0075 0546 0547 0637 0692 0693 0787
0788 0789

DICKSON, T.K.
0329

DIJKSTRA, J.
0653

DIVAKAR, B.L.
0213

DIVELY, G.P.
0721

DIXON, R.A.
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DOBEREINER, J.
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DOBRZANSKI, A.
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DOHERTY, J.H.
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DOSS, B.D.
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DOWDY, R.H.
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DOWEDAR, S.A.
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DOYLE, T.J.
0612

DRAKE, S.R.
0167 0168 0467 0654 0909

DUDLEY, J.M.
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DUKE, W.B.
0258

DUKES, P.D.
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DULL, G.
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DUNCAN, H.J.
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DUNN, S.
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DUQUE, F.F.
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DURAN, L.
0279

DURANTI, A.
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DYCK, R.L.
0085 0167

EATON, G.W.
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EBRAHIM-NESBAT, F.
0509 0549

ECKENRODE, C.J.
0745

EDHARDT, W.H.
0067

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0282

EL NADI, A.H.
0170

EL SHAMY, M.R.
0791

EL-AFIFI, S.
0015

EL-FAHAL, A.
0797

EL-GHARABLY, G.A.
0043

EL-GHARABLY, G.S.
0017

EL-GIBALY, M.H.
0017

EL-GUINDY, M.A.
0704

EL-HADIDY, M.F.
0375

EL-LEBOUDI, A.
0044 0045 0169

EL-RAZEK, M.A.
0043

EL-SAHRIGI, A.F.
0841

EL-SHAFFIE, B.E.
0790

EL-SHIEKH, T.M.A.
0899

EL-SHIEKH, T.M.A.
0698

ELKINS, E.R.
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ELLAL, G.
0283

ENGSTROM, E.
0284

EPTON, H.A.S.
0521

ESHEL, Y.
0285 0389 0390

ESTER, A.
0807

EVANS, A.M.
0752

EVANS, C.E.
0166

FADAYOMI, O.
0286

FAGER, S.E.
0797

FAHMY, M.A.
0901

FAJKOWSKA, H.
0165

FANG, S.C.
0057 0187

FARKAS, D.F.
0463

FARLOW, P.J.
0076 0171

FARRANT, D.M.
0287

FASSULIOTIS, G.
0660 0661 0682 0683 0684 0836

FATING, K.B.
0575 0645

FATTAH, M.A.A.A.
0077

FAWCETT, R.S.
0253

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FEDERACION NACIONAL DE CAFETEROS DE COLOMBIA
0885

FEITOSA, C.T.
0179

FERREIRA, P.E.
0756

FERRETTI, P.A.
0217

FEUNG, C.S.
0288

FIERLINGER, P.S.
0289

FISCHER, A.
0348 0415

FISHER, A.
0290 0291 0292

FISHER, G.
0747

FISHER, G.C.
0711

FLANDERS, R.V.
0722

FLEMING, A.L.
0035 0047

FLEMING, H.P.
0119 0839 0840

FLEMING, J.W.
0046 0065 0498

FLETCHER, J.G.
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FLETCHER, R.F.
0293

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
0887 0888 0889 0890 0891 0892

FORNASIER, J.B.
0179 0486

FORSEE JUNIOR, W.T.
0312

FORSTER, R.
0294 0718

FOUILLOUX, G.
0480 0510 0529

FOY, C.D.
0047 0054 0172

FRANCO, C.M.
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FRANK, J.R.
0418 0419

FRANK, P.A.
0259 0277

FRAZIER, W.A.
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FREELAND, T.R.
0408

FREEMAN, H.
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FRIESEN, G.H.
0296

FROUSSIOS, G.
0793

FUENTES P., J.R.
0297 0298

FUSTER, C.
0844

GABELMAN, W.H.
0821

GAGE, J.F.
0078 0464

GALINDO, J.J.
0550

GALLATIN, M.H.
0183

GALVEZ, V.M.
0299

GARDINER, K.D.
0123

GARDNER, W.R.
0025

GARG, O.K.
0048 0869

GARGOMINY, N.
0897

GARLAND, J.A.
0016

GAVIN, J.C.
0303

GAY, J.D.
0551

GBAJA, I.S.
0646

GEBRE WOLD, A.A.
0856

GENUNG, W.G.
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GERBER, J.M.
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GERLAGH, M.
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GERLOFF, G.C.
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GERONIMO, J.
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GESELL, S.G.
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GHADERI, A.
0769

GHONEIM, M.F.
0017

GIBRIEL, A.Y.
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GIFFORD, C.
0697

GILL, H.S.
0763

GLAZE, N.C.
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GODWARD, M.B.E.
0068

GOKHALE, V.G.
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GOMES, J.L.L.
0552 0553

GOMES, M.M.
0753

GOMEZ C., O.
0481

GOMEZ-RODRIGUEZ, M.V.
0112

GONZALEZ A., J.
0302

GONZALEZ, A.L.
0338

GONZALEZ, A.R.
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GOODWIN, P.B.
0101 0102 0822

GORGATTI NETTO, A.
0718

GORIN, N.
0142

GOTH, R.W.
0554

GOULDEN, D.S.
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GOVINDARAJAN, V.S.
0377

GOVINDARASU, P.
0754

GRAFTON, K.F.
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GRAHAM, E.T.
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GRAY, J.C.
0018

GREENE, G.L.
0706 0725

GREENWOOD, A.D.
0585

GREIG, J.K.
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GROOTVELD, D.
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GUADALUPE, R.
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GUAZZELLI, R.J.
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GUINN, R.S.
0426

GULLETT, E.A.
0910

GUNASENA, H.P.M.
0448

GUPTA, A.K.
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GUPTA, U.C.
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GUSTAFSON, S.W.
0019

GUZMAN V., J.S.
0859

HADDAD, N.I.
0144

HAGEDORN, D.J.
0607 0669 0795

HALL, T.C.
0050 0116 0117 0118 0780 0849 0863

HAMAD, I.A.
0755 0803

HAMDAN, M.A.M.S.
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HAMILTON, R.H.
0288

HAMILTON, R.I.
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HANAFY, M.S.N.
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HANSEN, J.R.
0328

HARDWICK, R.C.
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HARGREAVES, J.A.
0020

HARRIS, G.K.
0306

HARRISON, D.E.
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HARRISON, H.
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HARTMANN, R.W.
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HARVEY, R.G.
0010 0253 0254 0273 0307

HASHIM, Z.N.
0694

HASSAN, M.S.
0482 0797

HASSELBACH, O.E.
0483

HATFIELD, H.H.
0308

HATTRUP, A.
0277

HAWTHORNE, W.L.
0244

HEATH, M.C.
0556 0557 0558 0559 0574 0621

HECK, W.W.
0687

HEGGESTAD, H.E.
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HEGWOOD, D.A.
0080

HEITEFUSS, R.
0549

HELLER, L.
0224

HEMANTARANJAN, A.
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HEMPHILL JUNIOR, D.D.
0309

HENDERSON, J.R.
0310

HENNESSEY JUNIOR, J.P.
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HERMAN, D.J.
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HERNAN, D.
0324

HERNANDEZ, T.
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HESS, K.A.
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HESSE, N.
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HEUVEL, J. VAN DEN
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HIEPKO, G.
0333

HIGGINS, E.R.
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HILE, M.M.S.
0021

HILEMAN, L.H.
0176

HILLS, W.A.
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HILTY, J.W.
0391 0565 0589 0590 0591 0629 0798

HINES, R.J.
0910

HINES, T.E.
0344 0444

HINTON, A.C.
0449

HOBBS, E.H.
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HODGES, L.
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HOEFT, R.G.
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HOFFMAN, J.C.
0007 0313 0581 0661 0682 0779 0836

HOFSTRA, G.
0695

HONMA, S.
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HOPEN, H.J.
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HOPPE, H.H.
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HORTON, R.D.
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HORVAT, R.J.
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HORVATH, D.J.
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HOUGH-GOLDSTEIN, J.A.
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HOWELL JUNIOR, J.C.
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HOWER JUNIOR, A.A.
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HOWLAND, A.K.
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HUBBELING, N.
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HUNTER, J.E.
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HURST, W.C.
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HUSSEIN, M.M.
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IAMAMOTO, T.
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ILNICKI, R.D.
0272 0315 0316 0317 0324

INFORZATO, R.
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INNES, N.L.
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INSTITUT DE RECHERCHES AGRONOMIQUES TROPICALES ET DES CULTURES VIVRIERES
0485

INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA
0450 0571 0799

INSTITUTE OF AGRICULTURAL RESEARCH. ETHIOPIA
0318

IONESCU, F.
0393

IORDANOV, D.
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IRWIN, R.D.
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ISENBERG, F.M.
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ISHAG, H.M.
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ISHIMURA, I.
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ISSA, E.
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ISSA, Y.H.
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ITO, P.J.
0289

IU, K.L.
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JACKSON, D.C.
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JACOBSEN, B.J.
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JACOBSON, J.S.
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JAGTAP, A.B.
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JANSEN, G.E.
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JARRY, M.
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JAYANTHAMMA, B.P.N.
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JEANPLONG, J.
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JORDAN, J.L.
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JOSHI, R.D.
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KAMINSKYJ, S.G.W.
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KANEMASU, ET
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KANNAN, S.
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KANTHARAJ, G.R.
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KANTZES, J.B.
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KANTZES, J.G.
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KATTAN, A.A.
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KELLY, A.D.
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KEMP, G.A.
0182 0875

KEMP, M.S.
0083

KENNARD, W.C.
0757

KENNEDY, J.M.
0412 0413

KENNEDY, M.R.
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KENNY, T.J.
0105

KENYA. MINISTRY OF AGRICULTURE
0502

KENYA. MINISTRY OF AGRICULTURE.
0487

KERESZTES, A.
0015

KERKWICK, G.O.
0018

KERMASHA, S.
0125 0911

KERR, L.B.
0084

KERR, M.W.
0134

KERR, W.E.
0465

KESWANI, C.L.
0608

KEULS, M.
0321

KHACHANI, M.
0871

KHAIRY, N.M.A.
0790

KHARE, M.N.
0575

KHARE, M.N.
0645

KHATTAT, A.R.
0742 0743

KHUMALO, T.D.
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KIMMINS, W.C.
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KISH, A.J.
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KLEIN, B.P.
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KLOP, W.
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KMIECIK, K.A.
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KOEPSELL, P.
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KOHNO, Y.
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KORE, S.S.
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KOSTEWICZ, S.R.
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KOSTOV, D.
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KOZUP, J.
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KRIZEK, D.T.
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KROGMAN, K.K.
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KROL, H.
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KRUGER, N.S.
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KUC, J.
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KULIK, M.M.
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KUMAR, J.P.
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KUNWAR, R.
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KVICALA, B.A.
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LADROR, U.
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LAFUENTE, B.
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LAMB, C.J.
0014 0115

LAMBDIN, P.L.
0729

LANG, F.
0015

LANZA, M.R.
0281

LARSON, W.E.
0055

LATHEEF, M.A.
0707

LATTERELL, J.J.
0055

LAURENT, B.
0861 0897

LAWTON, M.A.
0014

LAY, M.M.
0324

LEAKEY, C.L.A.
0503

LEAL, N.R.
0735 0753 0803 0872

LEE, C.Y.
0137 0916

LEE, E.H.
0086 0697 0698 0699

LEE, J.M.
0003 0008 0700

LEEDS, A.R.
0862

LEEFE, J.S.
0058 0188 0325 0326

LEELA, D.
0327

LEEPER, C.D.
0671

LEHMAN, S.K.
0328 0329

LEIHNER, D.E.
0332

LEITAO FILHO, H. DE F.
0004

LENZ, F.
0175

LEONARD, K.J.
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LEPIGRE, M.
0903

LEWIS, J.A.
0579 0580

LEWIS, R.J.
0059

LIBERAL, M.T.
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LICHTNER, F.T.
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LIEGEL, E.A.
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LIETH, J.H.
0023 0087

LINCOLN, D.
0862

LINDEMANN, J.
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LINDOW, S.E.
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LISBAO, R.S.
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LITTLEJOHNS, D.A.
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LITZ, R.E.
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LOADHOLT, C.B.
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LOCASCIO, S.J.
0211 0331

LOCKE, J.C.
0580

LOCKERMAN, R.H.
0373

LONGLAND, A.
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LOPEZ, A.
0912

LOPEZ, M.J.
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MACARTNEY, J.C.
0335 0804 0805 0806

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MACKAY, D.C.
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MACMILLAN JUNIOR, R.T.
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MACNAB, A.A.
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MADARRO, A.
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MANGUAL C., G.
0337 0339 0341 0342 0343

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0226 0868

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0285 0389 0390

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0208 0392 0761

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SANTOS V., J.C.
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SANTOSO, I.
0675

SAP, J.
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SHINN, J.H.
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SHOWALTER, R.K.
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SHUKLA, K.
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0030 0069 0071 0123 0135 0178 0181
0195 0219 0223 0227 0270 0279 0304
0305 0310 0313 0322 0338 0341 0342
0343 0344 0347 0366 0377 0436 0442
0454 0457 0465 0467 0470 0477 0484
0490 0493 0495 0502 0696 0857 0858
0918 0921

HEAT TREATMENT
0556 0650 0841 0844 0853

HELIOTHIS ZEA
0704 0707 0717
INSECT CONTROL
0502
RESISTANCE
0501

HEMIPTERA
0742
INSECT CONTROL
0743

HERBICIDES
0015 0099 0194 0228 0229 0231 0232
0233 0234 0236 0237 0242 0243 0244
0245 0246 0247 0248 0249 0254 0255
0256 0258 0259 0260 0261 0262 0263
0264 0265 0266 0267 0269 0273 0274
0277 0278 0281 0285 0286 0287 0288
0289 0290 0292 0294 0296 0300 0306
0307 0308 0309 0311 0314 0315 0316
0317 0318 0324 0325 0327 0328 0329
0330 0331 0332 0333 0345 0346 0349
0350 0351 0354 0355 0356 0357 0358
0359 0360 0361 0362 0364 0367 0368
0369 0370 0372 0373 0374 0375 0376
0378 0379 0380 0381 0383 0384 0385
0386 0387 0388 0389 0390 0391 0392
0393 0395 0396 0397 0398 0399 0402
0404 0407 0408 0409 0410 0411 0412
0413 0414 0415 0416 0417 0419 0420
0421 0423 0424 0425 0427 0430 0431
0434 0437 0438 0443 0444 0445 0446
0487 0587 0606 0724 0832
DISEASES AND PATHOGENS
0178 0252 0622
PLANT INJURIES
0010 0230 0302 0371 0433

HETERODERA GLYCINES
0668 0670

HETEROSIS
0785 0826

HISTORY
0335

HOMOPTERA
0297 0476 0644 0716
INSECT CONTROL
0223 0736 0741

HOST RANGE
0500 0511 0512 0515 0598 0641 0644
0653 0657 0669 0673 0688 0705

HOSTS AND PATHOGENS
0509 0511 0513 0521 0536 0554 0559
0561 0573 0587 0594 0596 0627 0638
0653 0655 0660 0661 0668

HOT WATER TREATMENTS
0119 0634

HUMAN NUTRITION
0042 0109 0838 0852 0855 0860 0862
0864

HYBRIDIZING
0063 0755 0781 0811

HYBRIDS
0063 0826 0827

HYDROLYSIS
0139

HYPOCOTYL
0014 0389 0539 0540 0548 0550 0581
0582 0583 0585 0600 0601 0602 0625
0627

ILLUMINATION
0016

INCOME
0222 0284 0447 0455 0893

INDETERMINATE CULTIVARS
0588 0818

INDIA
0009 0013 0037 0041 0048 0081 0089
0090 0093 0127 0180 0197 0213 0214
0215 0216 0221 0428 0454 0496 0531
0534 0577 0603 0609 0610 0611 0613
0615 0617 0630 0643 0676 0678 0679
0727 0733 0739 0741 0754 0801 0802
0808 0810 0813 0826 0827 0869 0879
0907

INDOLEACETIC ACID
0089 0874

INDUSTRIALIZATION
0173 0459 0469 0750

INFLORESCENCES
0092 0835

INHIBITORS
0090 0139 0141 0905
GROWTH
0108

INJURIOUS INSECTS
0148 0252 0293 0555 0718 0721 0723
0781
COLEOPTERA
0205 0217 0223 0297 0502 0707 0709
0711 0712 0713 0715 0722 0728 0731
0738 0897 0906
DIPTERA
0146 0178 0223 0501 0502 0503 0659
0709 0726 0727 0730 0732 0733 0767
0768 0799
HEMIPTERA
0742 0743
HOMOPTERA
0223 0297 0644 0716 0736 0741
LEPIDOPTERA
0501 0502 0707 0708 0709 0717 0720
0735 0738 0739 0767 0768 0799
THYSANOPTERA
0223 0739 0744

INJURIOUS MITES
0223 0734 0737
POLYPHAGOTARSONEMUS LATUS
0739

INSECT BIOLOGY
0704 0705 0708 0713 0714 0716 0717
0720 0722 0723 0731 0732 0735 0740
0743

INSECTICIDES
0013

INTEGRATED CONTROL
0706
DISEASES AND PATHOGENS
0579
INJURIOUS INSECTS
0707 0709

INTERCROPPING
0392 0450 0451 0452 0454 0456 0625
0707 0847
ZEA MAYS
0348 0447 0448 0502 0623 0809

IRAN
0782

IRON
0048 0051 0136 0869
LEAVES
0035 0036 0041 0054 0199
MINERAL DEFICIENCIES
0035 0036 0041 0043 0054
PODS
0036
ROOTS
0017 0199 0209
STEMS
0199

IRRADIATION
0009 0011 0015 0068 0087 0763

IRRIGATION
0092 0152 0153 0154 0155 0156 0158
0161 0166 0167 0168 0170 0175 0182

0185 0189 0190 0191 0192 0200 0206
0219 0220 0222 0223 0226 0227 0254
0259 0277 0282 0359 0455 0458 0463
0465 0499 0610 0680 0700 0868 0894

ISARIOPSIS GRISEOLA
0465 0799
DISEASE CONTROL
0501 0502 0503 0505
CHEMICAL CONTROL
0571
DISEASE TRANSMISSION
0616
EPIDEMIOLOGY
0578
ETIOLOGY
0615
RESISTANCE
0501
SYMPTOMATOLOGY
0501 0503 0504 0505 0578

ITALY
0280 0281 0819 0918 0921

JAPAN
0656

KENYA
0191 0483 0487 0501 0502 0893 0906

LABOR
0338 0893

LABORATORY EXPERIMENTS
0032 0039 0043 0047 0057 0059 0063
0091 0094 0095 0105 0111 0115 0119
0121 0122 0123 0126 0128 0133 0139
0183 0187 0198 0199 0203 0206 0210
0389 0460 0506 0513 0518 0535 0545
0551 0554 0555 0561 0562 0569 0581
0582 0602 0607 0634 0636 0641 0642
0652 0655 0658 0681 0725 0745 0748
0751 0779 0788 0792 0838 0881

LAND PREPARATION
0167 0194 0208 0223 0269 0623 0896

LEAF AREA
0022 0023 0025 0029 0086 0108 0155
0164 0181 0321 0400 0648 0686 0725

LEAVES
0016 0018 0024 0027 0029 0035 0042
0050 0055 0056 0061 0062 0063 0064
0067 0073 0080 0081 0094 0102 0108
0110 0133 0134 0140 0150 0152 0155
0157 0160 0164 0181 0186 0198 0199
0206 0218 0389 0500 0510 0511 0512
0513 0514 0521 0559 0564 0565 0569
0598 0605 0627 0641 0642 0649 0653
0658 0681 0686 0688 0695 0697 0697
0699 0701 0714 0751 0779
DISEASES AND PATHOGENS
0517 0522 0550 0552 0556 0558 0562
0586 0626 0639 0645 0648 0650 0652
0655
INJURIOUS INSECTS
0205 0217 0708 0721
MINERALS AND NUTRIENTS
0036 0038 0041 0044 0045 0054 0060
0169 0184 0188 0193 0194 0197

LEGAL ASPECTS
0466 0884

LEGUME CROPS
0056 0668

LEPIDOPTERA
0501 0704 0707 0708 0709 0717 0720
0725 0735 0739 0767 0768 0799
INSECT CONTROL
0502 0738

LIGHT
0016 0175 0206 0691
GROWTH
0023 0073 0108
PHOTOPERIOD
0031

LIRIOMYZA TRIFOLII
0730

LYSINE
0130

MACROPHOMINA PHASEOLI
0528 0545
DISEASE CONTROL
0501 0502 0505
EPIDEMIOLOGY
0578
ETIOLOGY
0610
RESISTANCE
0501 0610 0800
SYMPTOMATOLOGY
0501 0505 0578 0610

MAGNESIUM
0012 0024 0036 0046 0047 0061 0080
0103 0127 0151 0160 0184 0193 0198
0199 0205 0216 0218 0685 0700 0897
PLANT ASSIMILATION
0194 0217

MALAWI
0734

MALAYSIA
0595

MANGANESE
0036 0038 0045 0051 0054 0112 0113
0150 0163 0169 0183 0198 0199 0205
0209 0681 0756

MANIHOT ESCULENTA
0454 0456

MANURES
0195 0207

MARKETING
0173 0223 0227 0341 0455 0457 0469
0489 0718 0884 0886 0893 0895 0896
0903 0917

MATURATION
0053 0069 0107 0135 0171 0270 0282
0322 0377 0461 0463 0490 0728 0772
0774 0779 0791 0809 0810 0818 0822
0831 0837 0858 0918

MECHANICAL DAMAGE
0158 0313 0442 0690 0692 0693 0696
0822

MECHANIZATION
0030 0178 0304 0306 0313 0344 0347
0366 0392 0436 0700 0718

MELOIDOGYNE
0223

MELOIDOGYNE INCOGNITA
0528 0617 0623 0666 0667 0672 0677
0678 0680
NEMATODE CONTROL
CHEMICAL CONTROL
0673 0674
RESISTANCE
0660 0661 0664 0675 0676 0679 0682
0683 0684 0796 0836

MELOIDOGYNE JAVANICA
0465 0681

METABOLISM
0050 0638

METHIONINE
0130

MEXICO
0029 0476 0781

MICROBIOLOGY
0645

MICRONUTRIENTS
0017 0034 0037 0038 0041 0045 0048
0049 0051 0052 0054 0055 0059 0061
0131 0136 0169 0193 0199 0205 0209
0217 0652 0869 0897

MINERAL CONTENT
0034 0046 0051 0057 0072 0112 0113
0127 0136 0187 0195 0196 0201 0202
0216 0226 0855 0897
LEAVES
0038 0042 0061 0063 0080 0102 0157
0184 0188 0193 0205 0217 0218 0681
PODS
0061 0080 0131 0138 0882
STEMS
0061

MINERAL DEFICIENCIES
0035 0036 0041 0043 0047 0049 0054
0063 0064 0163

MINERALS AND NUTRIENTS
0037 0085 0131 0667
BORON
0034 0041 0049 0112 0113 0163 0205
0217
CALCIUM
0036 0038 0039 0046 0066 0127 0138
0184 0193 0194 0205 0216 0866 0897
COPPER
0036 0051 0112 0113 0136 0205
IRON
0017 0036 0041 0043 0048 0051 0054
0136 0209 0869
MAGNESIUM
0036 0046 0127 0184 0193 0194 0205
0216 0217 0897
MANGANESE
0036 0038 0045 0051 0054 0112 0113
0163 0169 0205 0209
MOLYBDENUM
0193

NITROGEN
0036 0038 0040 0044 0045 0093 0127
0159 0163 0169 0179 0184 0188 0193
0194 0195 0196 0197 0200 0201 0202
0205 0209 0210 0214 0216 0221 0226
0365 0448 0487 0495 0502 0518 0809
0868 0869 0870 0871 0872 0877 0878
0879 0881 0882
PHOSPHORUS
0036 0038 0043 0060 0169 0180 0187
0193 0202 0226 0502
POTASSIUM
0036 0038 0044 0045 0046 0060 0127
0163 0169 0179 0184 0188 0192 0194
0195 0196 0202 0205 0209 0216 0821
0866 0868 0872 0897
ZINC
0036 0038 0041 0048 0051 0052 0112
0113 0163 0205 0209 0217 0869 0897

MOLYBDENUM
0193

MULCHING
0240 0250 0344 0449 0583 0604 0680
0710

MUTATION
0009 0748 0760 0763 0794 0819 0835

MYCOPLASMOSES
0500

MYCOSES
0005 0115 0122 0144 0178 0223 0283
0297 0335 0404 0465 0476 0491 0501
0502 0503 0504 0505 0523 0526 0528
0534 0537 0538 0539 0540 0541 0542
0548 0553 0557 0560 0566 0567 0571
0574 0575 0576 0577 0579 0580 0585
0589 0590 0591 0593 0594 0596 0597
0599 0603 0607 0609 0610 0612 0614
0615 0616 0620 0621 0623 0624 0629
0630 0631 0632 0634 0635 0738 0747
0749 0786 0790 0795 0798 0799 0800
0801 0807 0809 0824 0825 0829 0830
EPIDEMIOLOGY
0568 0572 0573 0578 0592 0613
INOCULATION
0533 0536 0549 0561 0562 0584 0608
0611 0617 0646
ISOLATION
0531 0535 0555 0561 0595
LEAVES
0550 0552 0556 0558 0586 0626 0645
PODS
0618
ROOTS
0581 0583 0622
SEED
0761 0796 0805
TEMPERATURE
0551 0781

MYLABRIS OCULATA
0223

NEMATODES
0223 0404 0465 0528 0617 0623 0664
0665 0666 0667 0669 0670 0671 0672
0675 0676 0677 0678 0679 0680 0682
0683 0709 0738 0796 0836
NEMATODE CONTROL
0663 0673 0674

NETHERLANDS
0142 0321 0536 0560 0561 0781 0807

NEW ZEALAND
0173 0651

NIGERIA
0456

NITRATE
0198

NITROGEN
0024 0056 0058 0061 0093 0094 0102
0103 0104 0166 0188 0198 0685 0687
0869 0882
FERTILIZERS
0036 0038 0044 0045 0151 0159 0160
0163 0169 0172 0177 0179 0184 0193
0195 0196 0197 0199 0200 0201 0202
0204 0205 0209 0211 0214 0216 0218
0220 0221 0226 0365 0448 0458 0487
0495 0502 0809 0869 0870 0871 0872
0877 0878 0879 0881
MINERAL DEFICIENCIES
0036 0064 0163
NUTRIENT UPTAKE
0036 0038 0040 0064 0194 0209 0210
0518
PLANT ASSIMILATION
0038 0040 0194 0202 0209 0210 0518
PROTEIN CONTENT
0012 0127
TRANSLOCATION
0159

NITROGEN FIXATION
0079 0437 0781 0867 0869 0871 0873
0875 0877 0878 0883

NITROGEN-FIXING BACTERIA
0044 0045 0867

NODULATION
0677 0687 0867 0873 0875 0880 0883
HERBICIDES
0437
MINERALS AND NUTRIENTS
0093 0195 0201 0869 0870 0871 0872
0878 0881 0882

NOXIOUS ANIMALS
0146 0148 0205 0217 0223 0252 0297
0501 0502 0555 0623 0644 0663 0665
0666 0667 0670 0672 0678 0679 0682
0683 0707 0708 0709 0711 0712 0713
0715 0716 0717 0720 0722 0726 0727
0730 0732 0733 0734 0738 0741 0742
0743 0744 0796 0836 0897

NUCLEIC ACIDS
0082 0082 0140 0140 0522 0522 0638
0757

NUTRIENT LOSS
0168

NUTRIENT SOLUTION
0015 0029 0036 0039 0040 0041 0047
0054 0056 0059 0063 0066 0112 0113
0203 0206 0587 0621

NUTRIENT TRANSPORT
0017

NUTRIENT UPTAKE
0034 0036 0038 0040 0041 0043 0046
0051 0052 0054 0055 0063 0064 0066
0067 0072 0099 0194 0203 0209 0210
0215 0217 0264 0518 0587

NUTRITIONAL REQUIREMENTS
0021 0024 0038 0044 0045 0046 0048
0049 0149 0157 0159 0163 0169 0176
0179 0180 0184 0193 0194 0195 0196
0197 0200 0201 0202 0205 0208 0213
0214 0215 0216 0217 0219 0221 0223
0225 0226 0227 0282 0365 0448 0454
0458 0465 0487 0502 0623 0809 0821
0833 0868 0870 0871 0872 0877 0878
0879 0881

NUTRITIVE VALUE
0042 0109 0131 0168 0781 0850 0852
0855 0856 0860 0864

NYSIUS NATALENSIS
0223

OPHIOMYIA PHASEOLI
0465 0503
INSECT CONTROL
0502
CHEMICAL CONTROL
0732 0733
RESISTANCE
0659 0740

ORGANOLEPTIC PROPERTIES
0895 0907 0911 0918 0920

OROSIUS ARGENTATUS
0500 0688

OSMOTIC POTENTIAL
0022 0155 0222

OSMOTIC PRESSURE
0649

OVARIES
0075

OVULES
0075 0171

OXYGEN
0085 0850 0880 0881

OZONE
AIR POLLUTION
0686 0687 0691 0695 0698 0701
PLANT INJURIES
0686 0687 0697 0698 0701

PACKAGING
0698 0899 0902 0917

PALATABILITY
0762 0838 0860 0918 0919 0920

PATHOGENICITY
0623 0624 0631

PERU
0781 0887 0888

PEST CONTROL
0223 0252 0312 0335 0499 0501 0502
0503 0519 0523 0524 0526 0538 0552
0556 0567 0568 0575 0577 0580 0589
0590 0591 0595 0599 0609 0614 0620
0629 0632 0640 0663 0664 0665 0678
0680 0727 0730 0732 0733 0737 0738
0741 0743 0744 0747 0833 0896 0903

PETIOLES
0078 0193 0203

PH
0037 0042 0047 0066 0136 0150 0172
0198 0206 0209 0210 0224 0584 0689
0702 0840
AGRICULTURAL LIME
0183 0213

PHASEOLLIN
0074 0563 0564 0635 0757 0780 0851

PHASEOLUS COCCINEUS
0079 0178 0811

PHASEOLUS LUNATUS
0172 0324

PHENOLOGY
0069

PHILIPPINES
0744

PHOSPHORUS
0017 0024 0044 0045 0057 0058 0059
0060 0061 0080 0103 0104 0127 0151
0160 0169 0172 0177 0179 0180 0184
0187 0188 0193 0195 0196 0198 0199
0204 0205 0211 0214 0216 0218 0221
0226 0458 0502 0681 0700 0809 0866
0868 0872 0879
MINERAL DEFICIENCIES
0036 0043 0047 0064 0163
NUTRIENT UPTAKE
0036 0038 0046 0064 0194 0203 0209
0210
PLANT ASSIMILATION
0038 0194 0202 0209 0210

PHOTOPERIOD
0031 0035 0088 0464 0781 0784
GROWTH
0793

PHOTOSYNTHESIS
0019 0027 0035 0094 0152 0175 0181
0190 0451 0690 0691 0819

PHYTOALEXINS
0014 0020 0074 0548 0549 0563 0564
0626 0628 0635 0757 0780 0851

PLANT AGE
0050

PLANT ANATOMY
0003 0004 0006 0007 0008 0010 0016
0017 0028 0030 0032 0041 0044 0045
0060 0068 0070 0073 0085 0092 0097
0108 0110 0125 0133 0169 0171 0189
0194 0205 0217 0303 0489 0495 0522
0548 0552 0558 0586 0639 0660 0675
0742 0763 0793 0813 0814 0834 0835
0901

PLANT ASSIMILATION
0034 0038 0040 0041 0043 0051 0062
0066 0072 0096 0164 0181 0194 0202
0209 0210 0215 0217 0327 0330 0389
0390 0446 0518

PLANT BREEDING
0004 0484 0504 0546 0581 0654 0661
0684 0750 0754 0775 0779 0782 0784
0788 0792 0793 0798 0814 0815 0816
0821 0828 0834
CROSSBREEDING
0751 0769 0776 0783 0789 0803 0813
0825 0826 0835
HYBRIDIZING
0755 0781 0811
MUTATION
0009 0794 0835
SELECTION
0752 0755 0758 0769 0783 0813 0833
0894
SELF-POLLINATION
0835

PLANT DEVELOPMENT
0023 0024 0029 0036 0037 0042 0048
0049 0053 0054 0060 0069 0073 0074
0076 0078 0079 0086 0087 0102 0108
0112 0113 0125 0135 0152 0153 0155
0164 0171 0182 0195 0197 0201 0207
0213 0224 0240 0270 0282 0322 0344
0377 0437 0464 0646 0667 0672 0677
0728 0755 0784 0788 0790 0791 0809
0810 0818 0837 0857 0858 0869 0870
0871 0878 0882 0918

PLANT FERTILITY
0075 0106 0187

PLANT HABIT
0127 0184 0185 0323 0428 0450 0488
0496 0755 0759 0774 0783 0785 0793
0799 0803 0818 0826 0836

PLANT INJURIES
0020 0026 0539 0591 0599 0617 0671
0689 0692 0697 0699 0703 0708 0721
0726 0728 0735

AIR POLLUTION
0686 0695 0698 0701
HARVESTING
0030 0310 0313 0442
HERBICIDES
0010 0230 0302 0371 0433
PHASEOLLIN
0563
TEMPERATURE
0310 0517 0822
TOXICITY
0059

PLANT NUTRITION
0028 0035 0039 0047 0051 0054 0058
0060 0061 0064 0103 0151 0160 0177
0458 0470 0652 0821

PLANT PHYSIOLOGICAL DISORDERS
0026 0059 0112 0113 0122 0158 0686
0689 0691 0694 0698 0700 0702

PLANT PHYSIOLOGICAL PROCESSES
0013 0016 0122 0155 0188 0548 0638
0666
ABSCISSION
0029 0070 0190
PHOTOSYNTHESIS
0019 0027 0035 0152 0175 0181 0190
0451 0691
PLANT ASSIMILATION
0034 0038 0040 0041 0062 0066 0072
0096 0181 0209 0217 0518
PLANT RESPIRATION
0032 0451

PLANT PIGMENTS
0015 0035 0045 0048 0086 0142 0303
0648 0794

PLANT REPRODUCTION
0106 0113 0835

PLANT RESPIRATION
0011 0012 0032 0094 0451

PLANT TISSUES
0003 0020 0042 0060 0063 0099 0196
0628
DISEASES AND PATHOGENS
0558
ENZYMES
0122 0541 0548

PLANT TOXINS
0603

PLANT VASCULAR SYSTEM
0512 0587

PLANTING
0069 0146 0163 0174 0223 0227 0280
0303 0343 0353 0372 0382 0419 0465
0482 0493 0615 0675 0832 0921
AGRICULTURAL EQUIPMENT
0347 0703
PRODUCTIVITY
0583
SPACING
0092 0167 0189 0266 0268 0269 0275
0282 0283 0298 0323 0337 0339 0365
0392 0428 0435 0436 0441 0451 0454
0499 0502 0662 0743

POD CHARACTERS
0748 0759

PODDING
0003 0019 0070 0084 0103 0189 0192
0201 0353 0742

PODS
0001 0003 0007 0008 0021 0027 0028
0029 0030 0036 0039 0044 0045 0050
0061 0067 0070 0071 0078 0080 0084
0094 0095 0103 0123 0131 0138 0151
0160 0168 0169 0170 0171 0182 0185
0186 0190 0194 0203 0204 0219 0222
0225 0271 0279 0303 0310 0313 0338
0377 0400 0403 0440 0442 0458 0461
0463 0467 0475 0484 0489 0490 0495
0496 0497 0511 0512 0513 0527 0544
0598 0619 0689 0696 0700 0748 0750
0751 0752 0762 0777 0784 0785 0788
0812 0813 0831 0846 0858 0882 0899
0901 0902
DISEASES AND PATHOGENS
0480 0586 0618
INJURIOUS INSECTS
0708 0721 0728 0742

POLLEN
0075 0076 0171 0834

POLLINATION
0076 0106
ANTHERS
0835

POLYPHAGOTARSONEMUS LATUS
0739

POTASSIUM
0024 0044 0045 0058 0060 0061 0080
0103 0104 0127 0151 0160 0169 0172

0177 0179 0184 0188 0193 0195 0196
0198 0199 0204 0205 0211 0216 0218
0225 0458 0700 0763 0821 0866 0868
0872 0897
MINERAL DEFICIENCIES
0036 0047 0063 0064 0163
NUTRIENT UPTAKE
0036 0038 0046 0063 0064 0194 0203
0209
PLANT ASSIMILATION
0038 0194 0202 0209

PREDATORS AND PARASITES
0715 0720 0723 0723 0729

PRICES
0885 0886 0895

PROCESSED PRODUCTS
0109 0124 0135 0136 0137 0167 0225
0487 0804 0841 0842 0843 0845 0848
0852 0853 0854 0857 0859 0861 0866
0897 0900 0907 0908 0909 0910 0911
0912 0914 0915 0916 0922

PROCESSING
0109 0130 0132 0137 0251 0457 0461
0463 0467 0469 0472 0689 0748 0762
0839 0841 0842 0853 0857 0866 0908
0909 0910 0912 0913 0914 0915 0916
0917 0918 0920 0921 0922

PRODUCTION
0002 0025 0057 0144 0145 0148 0223
0341 0342 0363 0457 0499 0884 0897
0888 0889 0890 0891 0892 0894

PRODUCTIVITY
0024 0036 0071 0074 0080 0143 0150
0170 0172 0182 0183 0186 0204 0211
0271 0440 0479 0543 0583 0725 0760
0788 0872

PROPAGATION
0781

PROTEIN CONTENT
0041 0116 0127 0134 0137 0213 0827
0847 0894
PODS
0050 0689
SEED
0012 0050 0135 0146 0760 0849 0863

PROTEINS
0015 0018 0082 0125 0753
AMINO ACIDS
0141
ANALYSIS
0005 0110 0117 0118 0126 0141 0849
0863

PSEUDOMONAS SYRINGAE
0513 0525
DISEASE TRANSMISSION
0511

PSEUDOMONAS SYRINGAE PV. PHASEOLICOLA
0173 0178 0465 0476 0501 0503 0504
0505 0506 0507 0508 0509 0510 0513
0521 0522 0523 0524 0525 0789 0811

PSEUDOMONAS SYRINGAE PV. SYRINGAE
0297 0501 0515 0516 0517 0518 0524

PUERTO RICO
0337 0338 0339 0340 0341 0342 0343
0493 0641 0644 0782

PYTHIUM
0622 0623

PYTHIUM APHANIDERMATUM
0579 0625
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PYTHIUM DEBARYANUM
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0547

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0601

PYTHIUM ULTIMUM
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0526 0580
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0526

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0224 0567

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0016 0134

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RHIZOBIUM
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INOCULATION
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STRAINS
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RHIZOBIUM PHASEOLI
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INOCULATION
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STRAINS
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RHIZOCTONIA SOLANI
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0227 0634
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0655
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0086

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0455 0503 0504 0809 0818

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0115 0134 0178 0178 0360 0361 0522
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0709 0725

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0371
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0218

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0656

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0109 0128 0132 0137 0168 0766 0855
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0096 0471 0587

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0568 0569 0594 0632 0634
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0465 0476 0501 0502 0503 0505 0512
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ZEA MAYS
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ZIMBABWE
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ZINC
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0052 0055 0061 0080 0112 0113 0151
0157 0163 0199 0205 0209 0217 0681
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PRELIMINARY DIRECTORY OF INSTITUTIONS AND RESEARCHERS

ARGENTINA

MILLAN G., N.I. DE
ESTACION EXPERIMENTAL AGROPECUARIA LA CONSULTA
INST. NACIONAL DE TECNOLOGIA AGROPECUARIA
C.C. 8-5567
LA CONSULTA, MENDOZA

AUSTRALIA

AITKEN, R.L.
DEPT. OF AGRICULTURE
UNIV. OF QUEENSLAND
ST. LUCIA, QLD. 4067

BANGLADESH

SIDDIQUE, M.A.
DEPT. OF HORTICULTURE
BANGLADESH AGRICULTURAL UNIV.
MYMENSINGH

BRAZIL

GOMES, J.L.L.
DEPTO. DE FITOTECNIA
UNIV. FEDERAL DE VICOSA
36.570 VICOSA-MG

INSTITUTO AGRONOMICO
CAIXA POSTAL 28
13.100 CAMPINAS-SP

ISHIMURA, I.
ESTACAO EXPERIMENTAL DE PARIQUERA-ACU
INST. AGRONOMICO
CAIXA POSTAL 28
13.100 CAMPINAS-SP

Brazil cont...

ISSA, E.
SECAO DE DOENCAS DAS PLANTAS ALIMENTICIAS BASICAS E OLERICOLAS
INST. BIOLOGICO
CAMPINAS, SP

ROCHA L., N.
EMBRAPA/PESAGRO-RIO ESTACION EXPERIMENTAL DE ITAGUAI
RODOVIA RIO-SAO PAULO-KM. 47
SEROPEDICA
ITAGUAI-RJ

VALENTIM C., I.
SEMENTES AGROCERES S.A.
CAIXA POSTAL 58
BETIM-MG

CANADA

BUONASSISI, A.J.
CROP PROTECTION BRANCH
BRITISH COLUMBIA MINISTRY OF AGRICULTURE & FOOD
17720 57TH AVENUE
SURREY, B.C. V3S 4P9

KERMASHA, S.
DEPT. OF FOOD SCIENCE & AGRICULTURAL CHEMISTRY
MCGILL UNIV.-MACDONALD CAMPUS
21111 LAKESHORE ROAD
STE ANNE DE BELLEVUE, QUEBEC H9X 1CO

MELAKEBERHAN, H.
CENTRE FOR PEST MANAGEMENT
DEPT. OF BIOLOGICAL SCIENCES
SIMON FRASER UNIV.
BURNABY
VANCOUVER, B.C. V5A 1S6

Canada cont...

STUMPF, M.A.
BOTANY DEPT.
UNIV. OF TORONTO
TORONTO, ONTARIO M5S 1A1

WAKARCHUK, D.A.
AGRICULTURE CANADA, RESEARCH STATION
6660 N.W. MARINE DRIVE
VANCOUVER, BRITISH COLUMBIA V6T 1X2

CHILE

BASCUR B., G.
ESTACION EXPERIMENTAL LA PLATINA
INST. DE INVESTIGACIONES AGROPECUARIAS
CASILLA 5447
SANTIAGO

COLOMBIA

AGUDELO, O.
ICA
APARTADO AEREO 233
PALMIRA, VALLE

ASHBY, J.
CIAT
APARTADO AEREO 6713
CALI

CARULLA F., J.
CARULLA Y CIA S.A.
CARRERA 68D No. 21-35
BOGOTA, D.E.

CASTAÑO, M.
CIAT
APARTADO AEREO 6713
CALI

Colombia cont...

CELIS, A.
UNIVERSIDAD DE CALDAS
MANIZALES

GIRARDO, E.
ICA
APARTADO AEREO 100
RIONEGRO, ANTIOQUIA

GONZALEZ, F.
CIAT-BEAN INFORMATION CENTER
APARTADO AEREO 6713
CALI

GONZALEZ, H.
FEDERACION DE CAFETEROS
BANCO CAFETERO PISO 4
MANIZALES

HINCAPIE, G.E.
UNIVERSIDAD DE CALDAS
CALLE 51 No. 17-58 URBANIZACION LAS AMERICAS
MANIZALES

JANSSEN, W.
CIAT
APARTADO AEREO 6713
CALI

KORNEGAY, J.
CIAT
APARTADO AEREO 6713
CALI

LONDOÑO, N. R. DE
CIAT
APARTADO AEREO 6713
CALI

Colombia cont...

LOPEZ S., J.
CIAT-SPECIALIZED INFORMATION CENTERS
APARTADO AEREO 6713
CALI

LUNA, C.A.
CIAT
APARTADO AEREO 6713
CALI

MONTES DE OCA, G.
CIAT
APARTADO AEREO 6713
CALI

OTOYA, M.M.
CIAT
APARTADO AEREO 6713
CALI

PACHICO, D.
CIAT
APARTADO AEREO 6713
CALI

PALACIOS, Y.
ICA
APARTADO AEREO 233
PALMIRA, VALLE

TABARES, M.E.
UNIVERSIDAD DE CALDAS
CARRERA 25 No. 13-18
MANIZALES

CYPRUS

AGRICULTURAL RESEARCH INSTITUTE
NICOSIA

ECUADOR

INIAP-ESTACION SANTA CATALINA PANAMERICANA SUR
KM. 14 APARTADO 340
QUITO

EGYPT

BARAKAT, A.
DEPT. OF BOTANY
FACULTY OF SCIENCE
AIN SHAMS UNIV.
CAIRO

ENGLAND

BOLWELL, G.P.
DEPT. OF BIOCHEMISTRY
ROYAL HOLLOWAY COLLEGE
UNIV. OF LONDON
EGHAM HILL, EGHAM, SURREY TW20 OEX

GBAJA, I.S.
DEPT. OF BIOLOGICAL SCIENCES
CHELSEA COLLEGE
UNIV. OF LONDON
HORTENSIA ROAD, LONDON SW10 0QX

HAMDAN, M.A.M.S.
DEPT. OF BIOCHEMISTRY
ROYAL HOLLOWAY COLLEGE
UNIV. OF LONDON
EGHAM HILL, EGHAM, SURREY TW20 0EX

O'CONNELL, R.J.
LONG ASHTON RESEARCH STATION
UNIV. OF BRISTOL
DEPT. OF AGRICULTURE & HORTICULTURE
LONG ASHTON, BRISTOL BS18 9AF

SLUSARENKO, A.J.
DEPT. OF PLANT BIOLOGY & GENETICS
UNIV. OF HULL
HULL HU6 7RX

England cont..

WARREN, A.
9 HILLSIDE, ALLCRAFT ROAD
READING

FIJI

MINISTRY OF AGRICULTURE FISHERIES AND FORESTS
DEPARTMENT OF AGRICULTURE
LEGALEGA RESEARCH STATION

FRANCE

ASTIER-DUMAS, M.
CENTRE DE RECHERCHES FOCH
45, RUE DES SAINTS-PERES
75006 PARIS

PLADYS, D.
LABORATOIRE DE BIOLOGIE VEGETALE
FACULTE DES SCIENCES ET DES TECHNIQUES
PARC VALROSE
F-06034, NICE CEDEX

WASFI, M.
STRUCTURE ET METABOLISME DES PLANTES
BAT. 430
UNIV. DE PARIS-SUD
F-91405, ORSAY CEDEX

GUATEMALA

AJQUEJAY, S.
ICTA
AVENIDA REFORMA, 8-60 ZONA 9 EDIFICIO
GALERIAS REFORMA
GUATEMALA

INDIA

AWASTHI, M.D.
PESTICIDE RESIDUE LABORATORY
INDIAN INST. OF HORTICULTURAL RESEARCH
BANGALORE 560 080

India cont...

CAPOOR, S.P.
7 BARROW ROAD
LAL BAGH
LUCKNOW 226 001

GARG, O.K.
DEPT. OF PLANT PHYSIOLOGY
INST. OF AGRICULTURAL SCIENCES
BANARAS HINDU UNIV.
VARANASI-221005

HEMANTARANJAN, A.
DEPT. OF PLANT PHYSIOLOGY
INST. OF AGRICULTURAL SCIENCES
BANARAS HINDU UNIV.
VARANASI-221005

INDIAN INSTITUTE OF HORTICULTURAL RESEARCH
HESSARAGHATTA
BANGALORE-562113

JAYANTHAMMA, B.P.N.
HORTICULTURAL RESEARCH STATION
G.K.V.K.
BANGALORE-560 065

MOHANDAS, S.
INDIAN INST. OF HORTICULTURAL RESEARCH
255 UPPER PALACE ORCHARDS
BANGALORE-80

PRASAD, N.B.
DEPT. OF PLANT BREEDING
G.B. PANT UNIV. OF AGRICULTURE & TECHNOLOGY
PANTNAGAR

PUNJAB AGRICULTURAL UNIVERSITY LUDHIANA
DEPARTMENT OF VEGETABLE CROPS, LANDSCAPING
AND FLORICULTURE
LUDHIANA

India cont...

TRIPATHI, K.C.
GOVT. VALLEY FRUIT RESEARCH STATION
SRINAGAR GARHWAL 246 174

TRIPATHI, S.S.
DEPT. OF AGRONOMY
G.B. PANT UNIV. OF AGRICULTURE & TECHNOLOGY
PANTNAGAR, 263 145, UP

KENYA

M'RIBU, E.
DEPT. OF CROP SCIENCE
EGERTON COLLEGE
NJORO

MBATIA, O.L.E.
DEPT. OF AGRICULTURAL ECONOMICS
UNIV. OF NAIROBI
NAIROBI

THE NETHERLANDS

HEUVEL, J. VAN DEN
WILLIE COMMELIN SCHOLTEN PHYTOPATHOLOGICAL LABORATORY
JAVALAAN 20
3742 CP BAARN

PERU

SALAZAR N., G.
ESTACION EXPERIMENTAL AGRICOLA "LA MOLINA"-INIPA
AV. LA UNIVERSIDAD S/N APARTADO 2791
LIMA

PHILIPPINES

UNIVERSITY OF THE PHILIPPINES
DILIMAN, QUEZON CITY

PUERTO RICO

BADILLO-FELICIANO, J.
AGRICULTURAL EXPERIMENT STATION
UNIV. OF PUERTO RICO
RIO PIEDRAS

REPUBLIC OF CHINA

TAICHUNG DISTRICT AGRICULTURAL IMPROVEMENT STATION
TATSUEN
CHANGHUA, TAIWAN

RWANDA

DAVIS, J.
CIAT REGIONAL BEAN PROJECT GREAT LAKES REGION-ISAR
B.P. 138, BUTARE

SAUDI-ARABIA

AL-HAZMI, A.S.
DEPT. OF PLANT PROTECTION
COLLEGE OF AGRICULTURE
P.O. BOX 2460
RIYADH 11451

SCOTLAND

POWELL, A.A.
DEPT. OF AGRICULTURE
UNIV. OF ABERDEEN
ABERDEEN AB9 1UD

SOUTH AFRICA

BOELEMA, B.H.
HORTICULTURAL RESEARCH INST.
PRIVATE BAG X293
PRETORIA 0001

VEGETABLE AND ORNAMENTAL PLANT RESEARCH INSTITUTE
PRIVATE BAG X293
PRETORIA 0001

SPAIN

NOGUERA G., V.
UNIVERSIDAD POLITECNCIA DE VALENCIA
CAMINO DE VERA
14 VALENCIA - 22

SRI LANKA

WAHAB, M.N.J.
REGIONAL AGRICULTURAL RESEARCH CENTER
BANDARAWELA

THAILAND

KASETSART UNIVERSITY
RESEARCH AND DEVELOPMENT INSTITUTE
P.O. BOX 4-170
BANGKHEN BANGKOK

USA

ANDERSON, J.M.
UNITED STATES DEPT. OF AGRICULTURE
DEPTS. OF CROP SCIENCE & BOTANY
NORTH CAROLINA STATE UNIV.
3127 LIGON STREET, NC 27607

BOYLE, J.F.
DEPT. OF HORTICULTURE
PENNSYLVANIA STATE UNIV.
UNIV. PARK, 16802

BROWN, J.E.
DEPT. OF HORTICULTURE
AUBURN UNIV.
101 FUNCHES HALL
AUBURN, AL 36848

CAMPBELL, W.F.
PLANT SCIENCE DEPT.
USU
LOGAN, UT 84322-4820

USA cont...

CANTWELL, G.E.
VEGETABLE LAB.
HORTICULTURAL SCIENCE INST.
USDA/AGRICULTURAL RESEARCH SERVICE
BARC-EAST, BELTSVILLE, MD 20705

DRAKE, S.R.
USDA/AGRICULTURAL RESEARCH SERVICE
TREE FRUIT RESEARCH LABORATORY
1104 N. WESTERN AVE.
WENATCHEE, WA 98801

HARTMANN, R.W.
UNIV. OF HAWAII
HONOLULU, HAWAII

HILTY, J.W.
DEPT. ENTOMOLOGY & PLANT PATHOLOGY
UNIV. OF TENNESSEE
KNOXVILLE, TN 37901

KEEFER, R.F.
DIVISION OF PLANT & SOIL SCIENCES
WEST VIRGINIA UNIV.
BOX 6108
MORGANTOWN, WV 26506

KMIECIK, K.A.
DEPT. OF HORTICULTURE
UNIV. OF WISCONSIN
MADISON, WI 53706

LADROR, U.
DEPT. OF PLANT BIOLOGY
UNIV. OF ILLINOIS
URBANA, IL 61801

USA cont...

LEE, E.H.
PLANT STRESS LABORATORY
PLANT PHYSIOLOGY INST.
U.S. DEPT. OF AGRICULTURE
BELTSVILLE, MD 20705

LINDEMANN, J.
ADVANCED GENETIC SCIENCES, INC.
OAKLAND, CA 94608

LOPEZ, A.
DEPT. OF FOOD SCIENCE & TECHNOLOGY
VIRGINIA POLYTECHNIC INST. & STATE UNIV
BLACKSBURG, VA 24061

MASCIANICA, M.P.
BASF CORPORATION. CHEMICAL DIVISION
PARSIPPANY, NJ 07054

MELAKEBERHAM, H.
DEPT. OF NEMATOLOGY
UNIV. OF CALIFORNIA
DAVIS, CA 95616

MELTON, T.A.
DEPT. OF PLANT PATHOLOGY
UNIV. OF ILLINOIS
URBANA, IL 61801

MEREDITH, F.I.
RICHARD B. RUSSELL AGRICULTURAL RESEARCH
CENTER
USDA/AGRICULTURAL RESEARCH SERVICE
ATHENS, GA 30613

USA cont...

MULLINS, C.A.
DEPT. OF PLANT & SOIL SCIENCE
UNIV. OF TENNESSEE PLATEAU
EXPERIMENT STATION
RT. 9, BOX 363
CROSSVILLE, TN 38555

MUNDT, C.C.
DEPT. OF BOTANY & PLANT PATHOLOGY
OREGON STATE UNIV.
CORVALLIS, OR 97331-2902

NICHOLAIDES III, J.J.
NORTH CAROLINA AGRICULTURAL RESEARCH SERVICE
RALEIGH, NC 27695-7619

POMBO, G.I.
DEPT. OF HORTICULTURE
PENNSYLVANIA STATE UNIV.
UNIV. PARK, PA 16802

RAO, M.A.
NEW YORK STATE AGRICULTURAL EXPERIMENT
STATION
CORNELL UNIV.
GENEVA, NY 14456

SHEWFELT, R.L.
UNIV. OF GEORGIA AGRICULTURAL EXPERIMENT
STATION
DEPT. OF FOOD SCIENCE
EXPERIMENT, GA 30212

SILBERNAGEL, M.J.
USDA/AGRICULTURAL RESEARCH SERVICE
BOX 30
PROSSER, WA 99350

USA cont...

SMITH, C.B.
DEPT. OF HORTICULTURE
PENNSYLVANIA STATE UNIV.
UNIV. PARK, PA 16802

STAVELY, J.R.
PLANT PATHOLOGY LABORATORY
BELTSVILLE AGRICULTURAL RESEARCH CENTER-WEST
USDA/AGRICULTURAL RESEARCH SERVICE
BELTSVILLE, MD 20705

STONE, M.B.
DEPT. OF FOODS & NUTRITION
KANSAS STATE UNIV.
MANHATTAN, KS 66506

SUMNER, D.R.
DEPT. OF PLANT PATHOLOGY
UNIV. OF GEORGIA COASTAL PLAIN
EXPERIMENT STATION
TIFTON, GA 31793

TAYLOR, A.G.
DEPT. OF HORTICULTURAL SCIENCES
NEW YORK STATE AGRICULTURAL EXPERIMENT
STATION
GENEVA, NY 14456

VAN BRUGGEN, A.H.C.
DEPT. OF PLANT PATHOLOGY
CORNELL UNIV.
ITHACA, NY 14853

WEAVER, M.L.
WESTERN REGIONAL RESEARCH CENTER
USDA/AGRICULTURAL RESEARCH SERVICE
ALBANY, CA 94710

USA cont...

WEBSTER, D.
ASGROW SEED CO.
P.O. BOX 1235
TWIN FALLS, IDAHO

WEINZIERL, R.A.
EXTENSION ENTOMOLOGY
UNIV. OF ILLINOIS
172 NATURAL RESOURCES BLDG.
607 E. PEABODY DR.
CHAMPAIGN, IL 61820

WESTON, L.A.
DEPT. OF HORTICULTURE
MICHIGAN STATE UNIV.
EAST LANSING, MI 48824