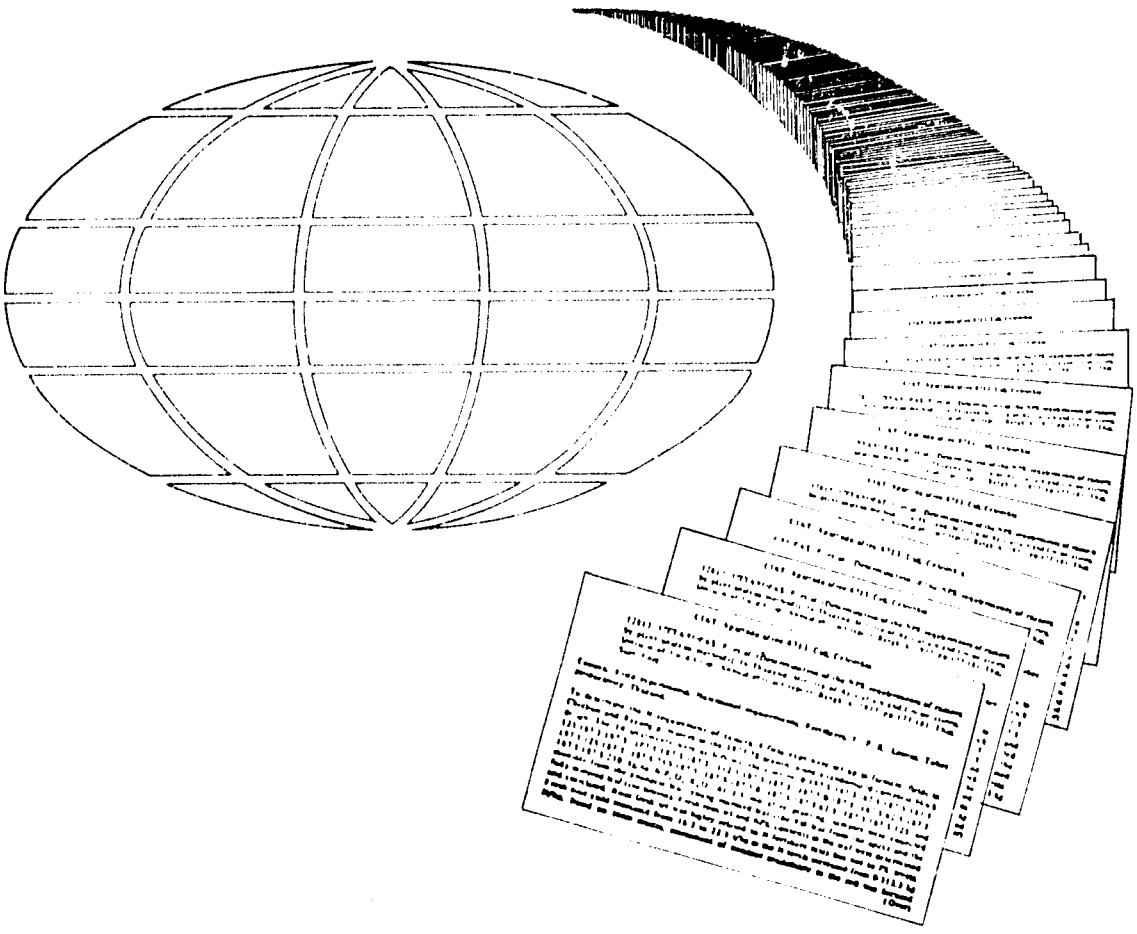
Abstracts on Field Beans

(*Phaseolus vulgaris L.*)

VOLUME V



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Abstracts on Field Beans

(*Phaseolus vulgaris L.*)

VOLUMEN V

CIAT CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL

FOREWORD

CIAT's Scientific Information Center serves as a world bank of specialized documentation in the areas of **field beans** (*Phaseolus vulgaris*) grown under tropical conditions, **cassava, tropical pastures,** and **agricultural economics in Latin America.** At the end of 1980, the collection of documents processed by the Center reached a total of 12,259 titles for the four areas, as follows: 3737 on beans, 4784 on cassava, 1293 on tropical pastures, and 2445 on agricultural economics.

In an effort to widely report on research results and ongoing activities in these fields of specialization, CIAT disseminates to interested institutions, researchers, extension agents, and others, information on processed documents on a monthly basis in the form of abstract cards. Upon request, CIAT also provides bibliographic searches on specific topics, plus photocopies of complete documents.

This volume is a compilation of those abstracts that have already been distributed to our subscribers during the year. An important characteristic that distinguishes this volume from the abstract cards is that the information contained herein is categorized into broad disciplinary fields and includes author and subject indexes which allow the user to carry out his own bibliographic searches.

It is our constant hope that the services provided by CIAT's Scientific Information Center will be a major supporting pillar for research that will contribute to ameliorate the problem of food production for the world.

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ERRATA
Page viii should read:

F01	Injurious Insects, Mites and their Control	155
G00	GENETICS AND PLANT BREEDING	162
G01	Breeding, Selection and Germplasm	169
H00	NUTRITION	174
H01	Foods and Nutritive Value	176
I00	MICROBIOLOGY	
I01	*Rhizobium* spp., Nitrogen Fixation and Nodulation	178
J00	ECONOMICS AND DEVELOPMENT	182
K00	FIELD PLOT TECHNIQUE	189
L00	GRAIN STORAGE	
L01	Stored Grain Pests	191
	AUTHOR INDEX	197
	SUBJECT INDEX	202
	LIST OF ABBREVIATIONS	217

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* Left during 1980.
** Transferred to the Tropical Pastures Program during November.

CONTENTS

	A GUIDE FOR USERS	ix
A00	BOTANY, TAXONOMY AND GEOGRAPHICAL DISTRIBUTION	1
B00	PLANT ANATOMY, MORPHOLOGY AND CYTOLOGY	3
C00	PLANT PHYSIOLOGY	6
C01	Plant Nutrition	22
C02	Plant Development	32
C03	Chemical Composition, Methodology and Analyses	40
D00	AGRONOMY	50
D01	Soil, Water, Climate and Fertilization	52
D02	Cultivation Practices: Planting, Weed Control and Harvesting	64
D03	Cultivation Systems: Intercropping, Rotational Crops	70
D04	Seed Production	82
D05	Varietal Trials	87
E00	PLANT PATHOLOGY	97
E01	General Descriptive Studies	98
E02	Bacterioses	101
E03	Mycoses	111
E04	Viroses	134
E05	Nematodes	146
E06	Physiological Disorders	148
E07	Mycoplasmoses	153
F00	PEST CONTROL AND ENTOMOLOGY	154

F01 Insectos Perjudiciales, Acaros y su Control 168

G00 GENETICA Y FITOMEJORAMIENTO 175

G01 Mejoramiento, Selección y Germoplasma 183

H00 NUTRICION 189

H01 Alimentos y Valor Nutritivo 191

I00 MICROBIOLOGIA

I01 *Rhizobium* spp. Fijación de Nitrógeno y Nodulación 193

J00 ECONOMIA Y DESARROLLO 198

K00 TECNICA EXPERIMENTAL DE CAMPO 206

L00 ALMACENAMIENTO DE GRANOS

L01 Plagas de Granos Almacenados 208

INDICE DE AUTORES 214

INDICE DE MATERIAS 219

LISTA DE ABREVIATURAS 234

A GUIDE FOR USERS

Components of a reference

Sequential number in this volume

0001

1 — 12669 BAUDET, J.C. Recherches sur la classification generique des Papilionaceae-
2 — Phaseoleae. *(Research on the generic classification of Papilionaceae-Phaseoleae).* — 3
5 — These. Ph.D. Paris, France, Université Pierre et Marie Curie, 1977. 213p. Fr., Sum. — 4
Fr., 168 Refs., Illus.
6 7

8 — *Phaseolus vulgaris.* Taxonomy. Plant anatomy. Zaire.

9 — The pantropical tribe Phaseoleae (91 genus and approx 1500 spp) was subdivided into 6 subtribes on an organographic basis. A critical study of the non-organographic postulates at a generic level including new observations on certain areas (chorology, palynology, dermology, blastography and flavone chemistry) has permitted a "choro-ecological" hypothesis to be formed that divides Phaseoleae into Glycininae, a forestal-type subtribe and Phaseolinae and Cajaninae, 2 more advanced savanna-type subtribes. The taxonomic importance of the different non-organographic characteristics is established and a group sub-division of the 3 existing subtribes is proposed. *(Author's summary. Trans. by L.M.F.)*
A00 — 10
11

1- Accession number	5- Source	9- Summary
2- Author(s)	6- Pages	10- Abstractor and/or translator
3- Original title	7- Additional notes	
4- Title translation	8- Descriptors	11- Subject categories

Note: The use of abbreviations in the abstracts has been standardized by the Information Center. A complete list of these abbreviations is included at the end of this volume.

Use of indexes

The author and subject indexes at the end of this volume were elaborated in collaboration with CIAT's Data Services Unit*. These indexes serve as guides for the user to carry out his own information searches.

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* Special acknowledgments to Ing. Jorge Augusto Porras, Section Head, Computer Services.

Author index

Here you will find the complete list in alphabetical order of the authors of the documents summarized in this volume. The four-digit numbers at the right hand side of each author correspond to the sequential numbers of appearance of the documents herein (the number centered above the abstract).

Subject index

This index presents a list of terms in alphabetical order to which the user can translate his information needs on specific topics. To facilitate his search, most of these terms or general topics cover other subjects and thus the user will find up to two more levels of specificity. The four-digit numbers under the terms correspond to the sequential number of the documents within this volume.

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A00 BOTANY, TAXONOMY AND GEOGRAPHICAL DISTRIBUTION

0001

12669 BAUDET, J.C. **Recherches sur la classification generique des Papilionaceae-Phaseoleae.** *(Research on the generic classification of Papilionaceae-Phaseoleae).* These. Ph.D. Paris, France, Université Pierre et Marie Curie, 1977. 213p. Fr., Sum. Fr., 168 Refs., Illus.

Phaseolus vulgaris. **Taxonomy. Plant anatomy. Zaire.**

The pantropical tribe Phaseoleae (91 genus and approx 1500 spp) was subdivided into 6 subtribes on an organographic basis. A critical study of the non-organographic postulates at a generic level including new observations on certain areas (chorology, palynology, dermology, blastography and flavone chemistry) has permitted a "choro-ecological" hypothesis to be formed that divides Phaseoleae into Glycininae, a forestal-type subtribe and Phaseolinae and Cajaninae, 2 more advanced savanna-type subtribes. The taxonomic importance of the different non-organographic characteristics is established and a group sub-division of the 3 existing subtribes is proposed. *(Author's summary. Trans. by L.M.F.)* A00

0002

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

0003

12661 MIRANDA C., S. **Origen de *Phaseolus vulgaris* L. (Fríjol común).** *(Origin of Phaseolus vulgaris)*. Agronomía Tropical 18(2):191-205. 1968. Span., Sum. Span., Engl., 23 Refs., Illus.

Phaseolus vulgaris. **Cultivars. Centre of origin. Plant geography. Seed color. Plant anatomy. Diseases and pathogens. Injurious insects. Mexico.**

Botanical explorations in Mexico have shown that wild var. of *Phaseolus vulgaris* are growing along the Sierra Madre Occidental; these var. have also been found in Guatemala. In both areas they are growing in an ecological transition belt ranging from 500-1800 m above sea level. The highest frequency of wild var. occurs at about 1200 m. In the 1st area cited it is possible to observe several species of the genus *Phaseolus* and a great genetic diversity in *P. vulgaris.* Besides, the oldest archeological remains of *P. vulgaris* have been found in the same area and wild var. are still growing at the sites of archeological ruins. These facts suggest that *P. vulgaris* has its center of origin at some place located in the W. Mexico-Guatemala area with an elevation of about 1200 m. *(Author's summary)* A00

0004

11136 VAZQUEZ M., E.J. **Influencia de la morfología de la raíz en la producción del fríjol común (*Phaseolus vulgaris* L.) y heredabilidad de ese factor.** (*Influence of root morphology on bean production and heritability of this factor*). Tesis Ing. Agr. San José, Universidad de Costa Rica, 1977. 68p. Span., Sum. Span., 27 Refs. Illus.

Phaseolus vulgaris. **Roots. Plant anatomy. Productivity. Field experiments. Laboratory experiments. Cultivars. Inheritance. Costa Rica.**

The influence of root type on bean productivity was investigated in greenhouse and field trials. Fifteen bean cv. were planted using a randomized block design with 6 replications. At harvest, plants with fibrous and taproots were classified and counted. Dry wt/plot and dry seed wt/plant were calculated. Only with cv. 51052 was there a significant difference in production in favor of plants with taproots. Other differences of certain magnitude amounted to 75-120%, which reflects the high degree of variability in results. On the basis of the av values of production/plant for each cv. and root type, however, a general increase of 27-31% was obtained in favor of taproots. The heritability of the taproot characteristic was not improved with the 1st selection among the 15 cv. After calculating the regression coefficient for production/plant over the % of fibrous or taproot plants, a positive unsignificant relationship was found for taproots and a negative one for fibrous roots. Studies on external factors that affect initial root growth indicated that seed position during germination modified to a certain degree, the genotypic expression of the root type. Thus the highest % of taproots was obtained when the seeds were planted horizontally with the micropyle placed downwards or sideways, and vertically with the micropyle placed upwards. The germination media, but not its sanitary condition, could be another important factor. (*Author's summary. Trans. by L.M.F.*) A00 G00

See also 0074 0426

B00 PLANT ANATOMY, MORPHOLOGY AND CYTOLOGY

0005

12372 ABRAHAO, I.O. **Distinção de cultivares de feijoeiro (*Phaseolus vulgaris* L.) pelo método de cristalização sensitiva.** *(Distinguishing dry bean cultivars by the sensitive crystallization method).* Anais da Escola Superior de Agricultura "Luiz de Queiroz" 33:329-335. 1978. Port., Sum. Port., Engl., 12 Refs., Illus.

Phaseolus vulgaris. **Cultivars. Plant anatomy. Roots. Leaves. Flowers. Seed. Nutrient solution. Laboratory experiments.**

The possibility of using plant var. as crystallization pattern modifiers was studied. Crystallization models were obtained for the roots, stems, leaves, flowers and seeds of 3 dry bean var., using nutrient solution at a concn of 0.05:0.5. Comparison of the patterns showed that the sensitivity of the method was sufficient to warrent its employment in distinguishing var., especially when using extracts. *(Author's summary)* B00

0006

4721 ADAMS, M.W., WIERSMA, J.V. and SALAZAR, J. **Differences in starch accumulation among dry bean cultivars.** Crop Science 18(1):155-157. 1978. Engl., Sum. Engl., 5 Refs., Illus.

Phaseolus vulgaris. **Roots. Stems. Starch content. Flowering. Statistical analysis. Cultivars.**

Levels and changes in the levels of starch stored in root and stem tissues of 23 bean cv. were determined in relation to seed yield. The data are tabulated. Starch in roots and stems varied significantly among the cv. and stages of plant development. Significant stage x cv. interactions occurred in both root and stem. No one pattern of change in the starch content was consistently associated with either high- or low-yielding cv. *(Summary by Horticultural Abstracts)* B00

0007

13115 BEGBIE, R. **A non-aqueous method for the subcellular fractionation of cotyledons from dormant seeds of *Phaseolus vulgaris* L.** Planta 147:103-110. 1979. Engl., Sum. Engl., 13 Refs., Illus.

Phaseolus vulgaris. **Cotyledons. Cell walls. Protein content. Starch content. Cell division. Laboratory experiments.**

A method is described for the subcellular fractionation of cotyledons from nongerminated bean seeds in nonaqueous density gradient of potassium iodide in glycerol. The major organelles (protein bodies, cell walls and starch grains) are well resolved as adjudged by morphology and protein subunit patterns of gradient zones and are remarkably stable if water is rigorously excluded. The flexibility of the system is exploited in establishing the cytoplasmic location of the oligosaccharide fraction and in the large-scale preparative isolation of the subcellular components. The composition and morphology of the subcellular components are discussed. *(Author's summary)* B00 C03

0008

12390 FISCUS, E.L. and MARKHART III, A.H. **Relationships between root system water transport properties and plant size in *Phaseolus*.** Plant Physiology 64: 770-773. 1979. Engl., Sum. Engl., 17 Refs., Illus.

Phaseolus vulgaris. **Roots. Leaf area. Nutrient solution. Age. Water absorption. Laboratory experiments. USA.**

Root system hydraulic conductivity (L_p) was measured on bean plants of different ages and sizes. Data analysis showed that L_p changed in a complex manner depending on plant size. As the plants increased in size, L_p increased initially then gradually decreased, followed by a final modest increase. Values for L_p ranged between 0.8×10^{-6} and 6.1×10^{-6} cm/sec/bar. Relationships between the root flow/unit leaf area at a pressure differential of 3 bars (QPL_3), as well as the total root system conductance (L_R), and plant size were also examined. Values for QPL_3 varied with plant size, somewhat like L_p. L_R values continuously increased with plant size at rates that depended on the growth rate of the root surface area as well as L_p. Comparison of our data with the root conductivity constant (k_r) of Taylor & Klepper (1975) showed good agreement. *(Author's summary)* B00

0009

13106 HAISSIG, B.E. **Influence of aryl esters of indole-3-acetic and indole-3-butyric acids on adventitious root primordium initiation and development.** Physiologia Plantarum 47:29-33. 1979. Engl., Sum. Engl., 10 Refs.

Phaseolus vulgaris. **Roots. Indoleacetic acid. Analysis. Enzymes. Hypocotyls. Plant physiology. USA.**

Synthetic aryl esters of IAA and IBA greatly enhanced adventitious root primordium initiation in bean cv. Top Crop and *Pinus banksiana* cuttings, resp. Bean cuttings produced 95-154% more macroscopically visible root primordia in 2 days when treated with phenyl indole-3-acetate (P-IAA), compared with an equal concn of IAA. Substantial but lesser increases occurred with 3-hydroxyphenyl indole-3-acetate (3HP-IAA). On a molar basis, either P-IAA or 3HP-IAA were 10 or more times as efficient as IAA in inducing adventitious root primordium initiation in bean cuttings. Methyl indole-3-acetate was no more effective than IAA. P-IAA produced 165 to 276% more elongated roots (2 mm or more) on the cuttings than did IAA. *(Summary by Horticultural Abstracts)* B00 C00

0010

12377 HARRISON, M.A. and KLEIN, R.M. **Role of growth regulators in initiation of secondary xylem and phloem cells.** Botanical Gazette 140(1):20-24. 1979. Engl., Sum. Engl., 30 Refs., Illus.

Phaseolus vulgaris. **Plant-growth substances. Plant vascular system. Auxins. Cotyledons. Cell structure. Leaves. Gibberellins.**

NAA in lanolin, placed on the 4th internodal stumps of decapited bean plants, replaced the stem apex in controlling the formation of secondary xylem cells but did not affect secondary phloem cell initiation. Reputedly specific antiauxins negated the response to auxin. GA or benzyladenine each could partly replace the stem apex for xylem cell formation, and GA partly replaced the stem apex for phloem cell initiation. Mixtures of auxins and GA and of auxin and benzyladenine were less effective than auxin alone in xylogenesis, but a mixture of auxin and GA synergistically stimulated phloem cell initiation. *(Author's summary)* B00

0011

13530 NEWCOMB, W. and PETERSON, R.L. **The occurrence and ontogeny of transfer cells associated with lateral roots and root nodules in Leguminosae.** Canadian Journal of Botany 57(23):2583-2602. 1979. Engl., Sum. Engl., Fr., 30 Refs., Illus.

Phaseolus vulgaris. **Roots. Plant tissues. Cultivars. Nodulation. Nitrogen fixation. Canada.**

A study is described of xylem parenchyma transfer cells in the stele of root tissue adjacent to emergent effective root nodules of pea cv. PRL-72HI-2, bean cv. Red Kidney, broad bean cv. English Broad, 2 types of ineffective pea nodules; and emergent lateral roots of peas; and also of pericycle transfer cells occurring in the 3 types of pea nodule. In both xylem parenchyma and pericycle cells wall ingrowths appeared before the onset of N-fixation. *(Summary by Horticultural Abstracts)* B00 101

0012

13109 VOLKENBURGH, E. VAN and CLELAND, R.E. **Separation of cell enlargement and division in bean leaves.** Planta 146:245-247. 1979. Engl., Sum. Engl., 16 Refs., Illus.

Phaseolus vulgaris. **Leaves. Light. Cell division. Seedlings. USA.**

A method is presented for inducing cell enlargement in intact leaves and leaf strips of *Phaseolus vulgaris* without the complication of cell division. Primary bean leaves completed cell division and stopped growing after 10 days in dim red light. Transfer to white light induced expansion (50% in 24 h) which is entirely the consequence of cell enlargement. Leaf strips from red-light-grown seedlings placed in white light and provided external solutes (10 m*M* KCl + 10 n*M* sucrose) expanded at the same rate as intact leaves in the light. This system makes possible future investigations of the mechanism of leaf cell enlargement. *(Summary by Field Crop Abstracts)* B00

See also 0066

C00 PLANT PHYSIOLOGY

0013

13536 AHARONI, N., LIEBERMAN, M. and SISLER, H.D. **Patterns of ethylene production in senescing leaves.** Plant Physiology 64(5):796-800. Engl., Sum. Engl., 27 Refs., Illus.

Phaseolus vulgaris. **Laboratory experiments. Leaves. Abscission. Analysis. Plant physiology. Defoliants.**

The primary leaves of pinto beans, which abscise readily during natural senescence, and non-abscising leaves from certain other plants were used. A decrease in the rate of ethylene production and respiration, during the slow phase of chlorophyll degradation, was observed in discs cut from mature leaves and aged in the dark but during rapid chlorophyll loss both ethylene production and respiration increased and then decreased in all 3 species. Discs from leaves senescing on the plant also showed this climacteric-like rise in ethylene production but not in respiration, which decreased continuously with leaf age. Climacteric-like patterns were also shown by the petioles of beans and tobacco, indicating that rises of ethylene and respiration are characteristic of the general process of senescence in leaves and are not restricted to the abscission process. *(Summary by Horticultural Abstracts)* C00

0014

12680 BALLESTER, A. *et al.* **Efecto de la morfactina clorflurenol sobre el contenido de pigmentos en *Phaseolus vulgaris* cv. "Contender".** *(Effect of the morphactin chlorflurenol on leaf pigment content).* Turrialba 28(2):113-115. 1978. Span., Sum. Span., Engl., 8 Refs., Illus.

Phaseolus vulgaris. **Plant-growth substances. Plant pigments. Chlorophyll. Photosynthesis. Leaves. Spain.**

The effect of the morphactin chlorflurenol (methyl-2-chloro-9-hydroxyfluorene-9-carboxylate) on the pigment content in leaves and isolated leaf disks of bean cv. Contender was studied. Both 5 and 25 ppm of morphactin accelerated the aging and/or reduced the synthesis of pigments, whereas a retardation of aging and/or the activation of pigment synthesis was observed with 50 and 100 ppm. Working with punched-out leaf disks and following treatments with 0.5, 1 and 5 ppm, a retardation of chlorophylls and carotenoid breakdown was observed in the dark. *(Author's summary)* C00

0015

12378 BERGER, R.K. and REID, P.D. **Role of polygalacturonase in bean leaf abscission.** Plant Physiology 63(6):1133-1137, 1979. Engl., Sum. Engl., 25 Refs., Illus.

Phaseolus vulgaris. **Leaves. Abscission. Enzymes. Petioles.**

Polygalacturonase isolated from leaf abscission zones of bean explants had a pH optimum between 4.5-5.0 and hydrolyzed polygalacturonisides. Activity was higher with a deesterified substrate than with an esterified pectin. No correlation between polygalacturonase

activity and abscission was observed. Activity remained virtually constant over the course of abscission in explants aged either in air or in ethylene. The enzyme was primarily localized in the abscission zone, however, indicating a possible involvement in the abscission process. A theoretical model that could explain the relationship between polygalacturonase and bean leaf abscission is discussed. *(Summary by Horticultural Abstracts)* C00

0016

13110 BEVAN, M. and NORTHCOTE, D.H. **The interaction of auxin and cytokinin in the induction of phenylalanine ammonia-lyase in suspension cultures of *Phaseolus vulgaris*.** Planta 147:77-81. 1979. Engl., Sum. Engl., 14 Refs., Illus.

Phaseolus vulgaris. Enzymes. Auxins. Cytokinins. Tissue culture. Inhibitors. Laboratory experiments. Plant physiology.

The dependence of phenylalanine ammonia-lyase (PAL) induction in bean suspension cultures on the concn of NAA and kinetin was studied, and the timing of the effect of each hormone was determined. NAA was required at an optimal concn of 1 mg/*l* 2 days prior to the increase in PAL activity. Kinetin caused a rapid stimulation of the rate of PAL induction and the total amount of PAL induced in a concn range of 0.1-0.5 mg/*l* when it was supplied to the cells immediately prior to the expected rise in PAL activity. The inhibitory effect of 2 mg/*l* NAA on PAL induction was overcome by an increased concn of kinetin. *(Author's summary)* C00

0017

13544 BOLLINI, R. and CHRISPEELS, M.J. **The rough endoplasmic reticulum is the site of reserve-protein synthesis in developing *Phaseolus vulgaris* cotyledons.** Planta 146:487-501. 1979. Engl., Sum. Engl., 40 Refs., Illus.

Phaseolus vulgaris. Laboratory experiments. Cotyledons. Proteins. Physiology. USA.

Cotyledons of *P. vulgaris* were incubated with radioactive amino acids at different stages of seed development. The proteins were fractionated by ion-exchange chromatography, sucrose gradients, and sodium dodecylsulfate (SDS) polyacrylamide gel electrophoresis. From 16 to 28 days after flowering ca. 40% of the incorporated radioactivity was associated with the polypeptides of vicilin and 10% with those of phytohaemagglutinin. Polysomes were isolated from developing cotyledons 20-25 days after flowering and free polysomes were separated from membrane-bound polysomes. Aurintricarboxylic acid, an inhibitor of initiation in cell-free translation systems, did not inhibit the incorporation of amino acids into in vitro synthesized proteins, indicating that synthesis was limited to the completion of already initiated polypeptides. Autofluorography of SDS-polyacrylamide gels, showed that the 2 classes of polysomes made 2 different sets of polypeptides and that there was little overlap between these 2 sets. Four polypeptides similar in size to the 4 polypeptides of vicilin were made by membrane-bound polysomes and not by free polysomes. Antibodies specific for vicilin bound to those 4 polypeptides. Free polysomes made only polypeptides which did not bind to antibodies specific for vicilin. Antibodies against phytohaemagglutinin did not bind to any of the in vitro synthesized polypeptides. The membranes to which the polysomes were bound were characterized on sucrose gradients and by electron microscopy. Polysomes recovered from membranes which banded on top of 35 and 50% sucrose synthesized the vicilin polypeptides most rapidly. These membrane fractions were rich in vesicles of rough endoplasmic reticulum (ER). The ER marker-enzyme NADH-cytochrome-c reductase banded with an av density of 1.18 g/cm^3 (40% w/w sucrose) on continuous gradients. These experiments demonstrated that the ER was the site of vicilin synthesis in developing bean cotyledons. Quantitative determinations of several ER parameters (RNA and lipid-phosphate content, NADH-cytochrome-c-reductase activity) showed that expansion of the cotyledons was accompanied by a 4- to 6-fold increase in ER. *(Summary by Field Crop Abtracts)* C00

0018

13510 BROWN JUNIOR, F.A. **Dynamic biomagnetism associates bean seeds.** Experientia 35(4):468-470. 1979. Engl., Sum. Engl., 19 Refs., Illus.

Phaseolus vulgaris. **Seed. Water absorption. Timing. Laboratory experiments. Plant physiology.**

Water uptake by bean seeds over 4 h in 4 adjacent Faraday cages and in 4 similar, but mumetal-lined, Faraday cages disclosed comparable interactional patterns among both cage types. An inverted relationship over time between the 2 cage types was probably due to geomagnetic attenuation. *(Author's summary)* C00

0019

13511 BROWN JUNIOR, F.A. **Experimental alteration of biomagnetic interactions among bean seeds.** Experientia 35(4):466-468. 1979. Engl., Sum. Engl., 12 Refs., Illus.

Phaseolus vulgaris. **Water absorption. Seed. Laboratory experiments. Plant physiology.**

The relative rates of water absorption by bean seeds distributed as 4 pairs of samples around the edge of circular wooden tables was studied. Various exptl series included stationary tables, clockwise (CW) and counterclockwise (CCW) horizontally rotating tables, and stationary tables on which a 18 cm horizontal alnico bar magnet was rotated CW or CCW at the centre of the table level with the seeds. Biomagnetic interaction patterns between seeds on a table differed according to the rotation (CW and CCW) or non-rotation (controls). *(Summary by Crop Physiology Abstracts)* C00

0020

12367 CARMI, A. and KOLLER, D. **Regulation of photosynthetic activity in the primary leaves of bean *(Phaseolus vulgaris* L.) by materials moving in the water-conducting system.** Plant Physiology 64:285-288. 1979. Engl., Sum. Engl., 24 Refs., Illus.

Phaseolus vulgaris. **Photosynthesis. Leaves. Transpiration. N. P. Leaf area. Chlorophyll.**

Endogenous factors that determine the photosynthetic capacity of the leaf were studied in the fully expanded, primary leaves of young seedlings of bean cv. Bulgarian. Following removal of the shoot above the primary leaf node and excision of all axillary buds, the primary leaves increased in area and thickness, in chlorophyll content, in levels of soluble protein and in the specific activity of ribulose-1.5-bisphosphate carboxylase. Plants in which phloem continuity was disrupted by heat-girdling of the stem, between the shoot above the primary leaf node and the organs below, did not exhibit similar increases, whereas the shoot above the girdle continued to grow for several days. Plants in which all developing trifoliate leaves were excised as soon as they became macroscopic exhibited an increase in their photosynthetic activity, area and thickness, while their main stem and (leafless) branches made considerable growth. Transpiration from the primary leaves was the same in decapitated plants as in the heat-girdled ones, although in the latter it accounted for only about 30% of total transpiration. The photosynthetic capacity of the primary leaves is not controlled by source/sink relationship of photosynthates, but rather by the pattern of distribution of factors carried from the roots to the leaves in the transpiration stream. *(Author's summary)* C00

0021

13133 CRUMP, J.A. and MURRAY, D.R. **Proteolysis in cotyledon cells of *Phaseolus vulgaris* L.: changes in multiple hydrolase activities following germination.** Australian Journal of Plant Physiology 6:467-474. 1979. Engl., Sum. Engl., 32 Refs., Illus.

Phaseolus vulgaris. **Cotyledons. Enzymes. Plant physiology.**

Changes in activity of several hydrolytic enzymes were measured in extracts prepared from the cotyledons following germination of seeds of bean cv. Hawkesbury Wonder. Aminopeptidase AP2 (phenanthroline-sensitive leucyl β-naphthylamidase), *N*-carbobenzoxy-L-tyrosine-*p*-nitrophenol ester (*N*-CBZ-L-Tyr-*p*NP) hydrolase, *N*-benzoyl-L-tyrosineethyl ester (BTEE) hydrolase and acid phosphatase all increased in activity/cotyledon, reaching max values after 4, 6, 10 and 10 days, resp. By comparison, aminopeptidase AP1 (phenanthroline-insensitive leucyl β-naphthylamidase) showed max activity after 2 days and declined immediately. α-*N*-benzoyl-D,L-arginine-*p*-nitroanilide hydrolase activity was maintained at a max value between days 2 and 10 before declining. Differences in max activity/cotyledon, initial presence or absence, and timing of both increase and decrease of *N*-CBZ-L-Tyr-*p*NP and BTEE hydrolase activities suggest that at least 2 enzymes contribute to these activities, and that neither activity indicates the presence of a chymotrypsin-like endopeptidase. *(Author's summary)* C00

0022

13531 DAVIES, H.M. and DELMER, D.P. **Seed reserve-protein glycosylation in an in vitro preparation from developing cotyledons of *Phaseolus vulgaris.*** Planta 146: 513-520. 1979. Engl., Sum. Engl., 21 Refs., Illus.

Phaseolus vulgaris. **Cotyledons. Seed. Protein content. Phytohemagglutinin. Plant physiology.**

A particulate preparation from developing cotyledons of *P. vulgaris* was incubated with uridine-5'-diphospho-N-acetyl-D-glucosamine and by polyacrylamide gel electrophoretic analysis it was shown that the labelled N-acetyl glucosamine (GlcNAc) was incorporated into the principal reserve protein of the cotyledons, vicilin and also into phytohaemagglutinin. Some of the labelled product also reacted with antiserum to vicilin from mature seeds. In contrast it was not possible to detect the incorporation of labelled mannose from guanosine-5'-diphospho-D-mannose into either of these proteins by gel-electrophoretic analysis of the mannose-labelled products, but a low incorporation of mannose into material which reacted with antiserum to vicilin was observed. The predominant glycosylation reaction in vitro was therefore probably a transfer of GlcNAc alone, rather than in combination with mannose as preformed oligosaccharide. *(Author's summary)* C00

0023

4668 DAVIS, S.D. and McCREE, K.J. **Photosynthetic rate and diffusion conductance as a function of age in leaves of bean plants.** Crop Science 18(2):280-282. 1978. Engl., Sum. Engl., 17 Refs., Illus.

Phaseolus vulgaris. **Leaves. CO_2. Photosynthesis. Dwarf beans. Climatic requirements. Leaf area.**

Bush beans were grown under constant environmental conditions. Simultaneous measurements of CO_2 exchange rates (CER) and H_2O diffusion conductances were made on individual leaves throughout all stages of leaf and plant development. Both CER and leaf conductance declined with leaf age. The decline in conductance was not sufficient to explain the decline in the CER. There was a proportionate decline in the internal photosynthetic capacities of the leaves. Since the CO_2 concn in the substomatal cavity was almost constant, and the external conditions were kept constant, the decline in conductance was either due to a real decrease in the abilities of the stomata to stay open or a compensating adjustment of stomata by a CO_2 feedback process. (*Summary by Horticultural Abstracts*) C00

0024

11966 ENDRESS, A.G., KITASAKO, J.T. and TAYLOR, O.C. **Reversible fine structural alterations of Pinto bean chloroplasts following treatments with hydrogen chloride gas.** Botanical Gazette 140(1):11-19. 1979. Engl., Sum. Engl., 27 Refs., Illus.

Phaseolus vulgaris. **HCl. Chloroplasts. Leaves. Plant injuries. Cell structure.**

Primary leaf tissue from beans, 8, 12 or 16 days postseeding, was sampled at intervals upt o 24 h following 20-min treatments with 6.0-54.2 mg m^{-3} gaseous HCl. The purposes of the study were to characterize chloroplast fine structure throughout the 24-h response period and to identify reversible chloroplast alterations. Most samples taken immediately after termination of HCl treatment had plasmolyzed mesophyll cells containing chloroplasts with (1) crystals in the stroma, (2) swollen frets and terminal granal compartments, (3) accumulated deposits of electron-dense material between envelope membranes, (4) envelope disruptions and (5) increased stroma granulation. As the interval between HCl treatment and sampling lengthened, many chloroplasts gradually recovered normal appearance while a few became entirely disrupted. The apparent relative frequencies of normal and moribund chloroplasts 24 h after fumigation were dependent on HCl concn. The no. of cloroplasts with crystals increased with increasing HCl concn; these crystals disappeared within 4 h following the 21.1 mg HCl m^{-3} treatment. Estimates of sectional area obtained from micrograph measurements indicated that chloroplasts enlarged following HCl treatment and that at concn < 25 mg m^{-3}, chloroplast length preferentially increased. Although 12-day-old leaves are known to be most sensitive to HCl, no qualitative differences in chloroplast responses between the different ages were discerned. Differences were quantitative: 12-day-old leaves showed more frequent totally disrupted chloroplasts at each HCl concn. The results indicated that stroma crystal formation, granal compartment swelling and chloroplast enlargement were reversible responses to HCl treatment. A limited no. of breaks in chloroplast envelope may also be repaired. Chloroplasts with frequent disruptions of the envelope and extensive deposits of electron-dense material within the envelope underwent further degenerative changes. (*Author's summary*) C00

0025

12657 ESCALANTE E., J.A.S. **Efecto del sombreado artificial sobre el rendimiento y sus componentes en fríjol (*Phaseolus vulgaris* L.) var. Michoacán 12-A-3.** *(Effect of shading on yield and its components in bean var. Michoacán 12-A-3).* Tésis Mag. Sc. Chapingo, México, Colegio de Postgraduados, 1980. 34p. Span., Sum. Span., 64 Refs., Illus.

Phaseolus vulgaris. **Shade. Yield components. Yields. Flowering. Leaf area. Photosynthesis. Climatic requierements. Light. Pest control. Mexico.**

A study was conducted from 1977-78 to determine the effect of artificial shading on yield and its components in bean var. Michoacán 12-A-3 (short-vine type). Shading (76, 50 and 0%) was applied at the beginning, middle and end of the flowering period. The duration of the flowering period was about 42 days both yr. The no. of seeded pods/plant and the no. of normal seeds/pod were significantly affected by shading, but not the no. of normal seeds/plant, seed size (av dry wt/seed) and yield. Yield (seed dry wt with 10% MC)/plant was not affected by shading since the yield components showed a compensating mechanism among themselves, in such a way that the increase in one caused a reduction in another, thus producing equal yields as a consequence. In 1978 other parameters were evaluated, such as LAI, leaf area duration, NAR and CGR; these were not affected by shading. The total DM accumulation/plant was not altered by shading; instead the HI was higher for the shaded plants than the control. HI was estimated in 2 ways: one, taking into account only the dry wt of the plant at harvest time and the other, the dry wt of the plant at harvest time + the dry wt of the fallen organs. The latter was found to show greater correlation with bean yield/plant. To establish the relationship between bean yield and its components, it was found that the no. of seeds/plant was the most correlated character in var. Michoacán 12-A-3. *(Author's summary. Trans. by L.M.F.)* C00

0026

11923 FONG, F. **Phospholipid metabolism in bean leaves (*Phaseolus vulgaris*).** Ph.D. Thesis. Riverside, University of California, 1975. 184p. Engl., Sum. Engl., 180 Refs., Illus.

Phaseolus vulgaris. **Leaves. Ozone. Chloroplasts. Metabolism. Photosynthesis. Plant injuries. Air pollution. Analysis. USA.**

The oxidative effects of ozone have been suggested to be the basis for its biological toxicity. Whether or not its phytotoxic effects are from the oxidation of membrane components or water-soluble constituents is unresolved. Several studies have shown changes in membrane permeability following ozone treatment of red blood cells, isolated spinach chloroplasts, unicellular algae and whole leaves. This dissertation was concerned with the effects of ozone on compositional, synthetic and degradative changes within the polar lipids, which are one of the major components of biological membranes. Eight- and 15-day-old primary leaves of bean var. Pinto were used. Exposure of the 15-day-old leaves to 0.3 ppm ozone for 1 h (threshold dose) resulted in visible injury, speckling of the adaxial leaf surface within 24-36 h after treatment. Exposure of the leaves to 0.5 ppm ozone for 1 h (severe dose) resulted in large necrotic areas throughout the leaf within 24-36 h after treatment. Similar treatment of the 8-day-old leaves with a threshold dose of ozone resulted in no visible injury. Polar lipid metabolism was monitored through 1-^{14}C-acetate labeling of the fatty acid moieties. In 15-day-old leaves, threshold ozone doses did not cause an inhibition of de novo fatty acid synthesis, but the major response was a preferential inhibition of phosphatidyl choline turnover and a latent increase in phospholipase activity. With severe ozone doses, there was an inhibition of de novo fatty acid synthesis; and in addition to the polar lipid changes mentioned above, there was a lag period before radioactivity was incorporated into phosphatidyl ethanolamine and phosphatidyl glycerol and an increase in galactolipase activities. In the 8-day-old leaves threshold ozone doses caused a general increase in all phospholipid turnover and inhibition of monogalactosyl diglyceride synthesis only during the period of ozone treatment. In both 8- and 15-day-old leaves there were few changes in the mass distribution of the fatty acids of all polar lipids though some changes in the fatty acids of specific phospholipids were detected. In general an inhibition of phosphatidyl choline turnover occurred along with increased polar lipid degradation in 15-day-old leaves after ozone treatment. In 8-day-old leaves inhibition of galactolipid synthesis was only temporary and phospholipid turnover increased. This increased turnover may be important in the "repair" of ozone injury. (*Summary by Dissertation Abstracts*) C00 E06

0027

4646 GALE, J. and BOLL, W.G. **Growth of bean cells in suspension culture in the presence of NaCl and protein-stabilizing factors.** Canadian Journal of Botany 57(7):777-782. 1979. Engl., Sum. Engl., Fr., 20 Refs., Illus.

Phaseolus vulgaris. **Salinity. Growth. Cell structure. Osmotic potential. Seedlings. Cotyledons. Nutrient solution.**

Sensitivity of *Phaseolus vulgaris* to NaCl was much lower in cell suspension than in whole plant cultures. At levels of -4 bars, growth (dry wt accumulation) was decreased by about 40% during the 1st 9 days. Growth of whole plants was decreased 70% by -2 bars NaCl. There was a small but not statistically significant stimulation of cell culture growth at levels of NaCl between -0.5 and -1.0 bars. (These values are in addition to the -3.5 bars of the standard culture solution itself.) After 6 passages in saline medium, there was no evidence of increased tolerance to salt. This system was used for assaying the effect of various antioxidants, vitamins, hormones and amino acids on salt damage at the cellular level. These materials either had no effect or were toxic. (*Summary by Soils and Fertilizers Abstracts*) C00

0028

13143 HARDWICK, R.C. **Leaf abscission in varieties of *Phaseolus vulgaris* (L.) and *Glycine max* (L.) Merrill–a correlation with propensity to produce adventitious roots.** Journal of Experimental Botany 30(117):795-804. 1979. Engl., Sum. Engl., 20 Refs., Illus.

Phaseolus vulgaris, Glycine max. **Abscission. Leaves. Roots. Cultivars. Field experiments. Chlorophyll. Yields.**

In field trials of *Phaseolus vulgaris* large var. differences were observed in the rate at which the leaves abscised. Similar differences were found in the rate of decline of the chlorophyll content of excised leaf discs. A grafting expt showed that the differences in leaf abscission depended on the genotype of the scion and on that of the rootstock. Scion and stock effects of each genotype were similar, and additive. Rootstock/scion combinations which conferred enhanced leaf retention produced greater yields of seed and of seed N. When shoots of delayed-senescence genotypes of *P. vulgaris* were held in water they produced more adventitious roots than did shoots of rapid-senescence genotypes. This relationship between senescence pattern and adventitious rooting was also observed among varieties of *Glycine max*, and between isogenic lines of *G. max* differing in the leaf abscission alleles *Ab/ab*. These results are discussed in relation to current theories of leaf senescence, abscission and yield production. *(Author's summary)* C00

0029

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 studied with the exception of potassium cyclohexanecarboxylate, which lowered protein. Several growth regulators produced significant increases 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

0030

11962 HODDINOTT, J., EHRET, D.L. and GORHAM, P.R. **Rapid influences of water stress on photosynthesis and translocation in *Phaseolus vulgaris*.** Canadian Journal of Botany 57:768-776. 1979. Engl., Sum. Engl., Fr., 28 Refs., Illus.

Phaseolus vulgaris. **Water stress. Photosynthesis. Translocation. Leaves. Water content. Host-plant resistance. Osmotic potential. Plant physiology. Roots.**

A steady-state ^{14}C labeling system was used to simultaneously measure rates of photosynthesis and translocation before and after the onset of an osmotic shock to the base of rooted or rootless bean plants. In all expt the photosynthetic rate declined soon after the onset of a shock owing to rapid stomatal closure. The translocation rate, following a brief transient change, remained almost constant for several hours, indicating less sensitivity to osmotic shock than is shown by the photosynthetic rate. The transient changes in translocation rate are due to transient changes in the leaf relative water content. The direction of the transient depends on the nature of the osmoticum and the presence or absence of roots. (*Author's summary*) C00

0031

12384 JERIE, P.H., SHAARI, A.R. and HALL, M.A. **The compartmentation of ethylene in developing cotyledons of *Phaseolus vulgaris* L.** Planta 144(5):503-507. 1979. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. **Cotyledons. Plant development. Ethylene. Plant tissues. Analysis. Seed coat. Plant physiology.**

Isolated cotyledons of bean cv. Canadian Wonder accumulated $^{14}C_2H_4$ (0.7-1 *ul/l*) from air to give partition coefficients of 1 to 4, which greatly exceeded the value obtained with steam-killed cotyledons (0.05) and with water (0.11). After $^{14}C_2H_4$ treatment, 98% of the ^{14}C in the tissue remained as $^{14}C_2H_4$. The labeled ethylene accumulated by cotyledons was released only slowly (1-10% /h), either in an air stream or into toluene. Heating to 60°C for 2 h, but not freezing and thawing, caused the immediate release of $^{14}C_2H_4$ from the tissue. Propylene and vinyl chloride competitively inhibited the accumulation of $^{14}C_2H_4$. Cotyledons emanated endogenous ethylene at a very low rate; but after heating (although not freezing and thawing), 13 nl ethylene/g fresh wt. were released within a few min. It was concluded that bean cotyledons hold ethylene in a compartmented form in sufficient amount to account for at least 200 h of emanation. (*Author's summary*) C00

0032

12351 KARMOKER, J.L. and STEVENINCK, R.F.M. VAN **The effect of abscisic acid on sugar levels in seedlings of *Phaseolus vulgaris* L. cv. Redland Pionner.** Planta 146:25-30. 1979. Engl., Sum. Engl., 32 Refs., Illus.

Phaseolus vulgaris. **Plant-growth substances. Sugars. Seedlings. Roots. Translocation. Cotyledons. Leaves.**

ABA caused an increase in total-sugar and a 3-fold increase in reducing-sugar content in the roots of intact bean seedlings. The level of reducing sugars was also increased in the stem but total sugar levels remained unaffected by ABA. ABA also increased reducing-sugar content of the root in seedlings with cotyledons removed, but in this case the reducing- and total-sugar contents of the leaf were reduced. However, ABA did not affect reducing- and total-sugar levels in excised bean root systems. The observed increase in sugar content of the root of intact bean seedlings appears

to be the consequence of an ABA-induced stimulation of sugar transport from the shoot to the root. It is proposed that a relationship may exist between the effect of ABA on sugar transport and its effect on ion transport in excised root systems and in intact seedlings. (*Author's summary*) C00

0033

11964 KOEHLER, D.E. and LEWIS, L.N. **Effect of ethylene on plasma membrane density in kidney bean abscission zones.** Plant Physiology 63:677-679. 1979. Engl., Sum. Engl., 9 Refs., Illus.

Phaseolus vulgaris. **Abscission. Cell structure. Seedlings. Enzymes. Plant tissues.**

Plasma membranes from abscission zones of kidney bean seedlings were isolated on sucrose density gradients using cellulase and KCl-stimulated ATPase as marker enzymes. Following treatment of the seedling explants with 50μl/l ethylene, an increase in the buoyant density of the plasma membrane fraction from 1.165 to 1.175 g/cm^3 was observed. Such a change is consistent with the loss of lipids from the senescent cells of the abscission zone. (*Author's summary*) C00

0034

13104 KONO, Y., TAKAHASHI, M. and ASADA, K. **Superoxide dismutases from kidney bean leaves.** Plant & Cell Physiology 20(7):1229-1235. 1979. Engl., Sum. Engl., 28 Refs., Illus.

Phaseolus vulgaris. **Isozymes. Leaves. Analysis. Laboratory experiments. Plant physiology. Inhibitors. Japan.**

Three isozymes of superoxide dismutase were found in the soluble extract of kidney bean leaves. Two of them, purified to near homogeneous states, were inhibited by cyanide and by the antibody to spinach Cu, Zn-superoxide dismutase. Thus both isozymes were the Cu- and Zn-containing enzyme that has a mol wt of 32,000 and is composed of 2 subunits of equal size. Another isozyme was insensitive to cyanide and to the antibody, but was inactivated by acetone or heating. The cyanide-insensitive isozyme was not inactivated by H_2O_2 showing that this isozyme is Mn-superoxide dismutase. *(Author's summary)* C00

0035

12352 KUENEMAN, E.A., WALLACE, D.H. and LUDFORD, P.M. **Photosynthetic measurements of field-grown dry beans and their relation to selection f. . yield.** Journal of the American Society for Horticultural Sciences 104(4):480-482. 1979. Engl., Sum. Engl., 9 Refs.

Phaseolus vulgaris. **Photosynthesis. Selection. Yields.Leaves. Canopy. Cultivars. Leaf area. Spacing. USA.**

Photosynthetic rates were measured on leaves of the upper canopy of 5 dry bean cv. grown in replicated yield trials at 2 spacings in 1975 and at 1 spacing in 1976 to verify whether short-time photosynthetic rate measurements made in the field using a diffusion porometer technique were correlated with yield. A significant positive correlation ($r = 0.58$), was found between photosynthetic rate and biological yield at the close spacing (10 x 10 cm) in 1975. This relationship was not observed at the wide spacing (20 x 20 cm) in 1975 nor at the 30 x 5 cm spacing in 1976. Furthermore, photosynthetic rates were not significantly correlated with seed yield, nor were they correlated with either seed yield/day or biological yield/day in either yr or at any spacing. Thus it is unlikely that photosynthetic rates measured at one period of crop growth on a small portion of the total canopy will be a useful selection criterion in breeding programs. (*Author's summary*) C00 G01

0036

13534 LONGSTRETH, D.J. and NOBEL, P.S. **Salinity effects on leaf anatomy. Consequences for photosynthesis.** Plant Physiology 63(4):700-703. 1979. Engl., Sum. Engl., 20 Refs., Illus.

Phaseolus vulgaris. **Nutrient solution. Salinity. Leaf area. Photosynthesis. CO_2. USA.**

Increasing salinity led to substantially higher ratios of mesophyll surface area: leaf area (A^{mes}/A) for beans and cotton and a smaller increase for *Atriplex patula*, a salt-tolerant sp. The increase in internal surface for CO_2 absorption did not lead to higher CO_2 uptake rates, since the CO_2 resistance expressed on the basis of mesophyll cell wall area (r_{cell}) increased even more with salinity. The differences among spp. in the sensitivity of photosynthesis to salinity in part reflect the different A^{mes}/A and r_{cell} responses. *(Author's summary)* C00

0037

11965 MACHOWICZ, E. and WIECKOWSKI, S. **The photochemical activity of chloroplasts and subchloroplast particles isolated from etiolated bean leaves exposed to continuous light.** Journal of Experimental Botany 29(113)1383-1389. 1978. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. **Leaves. Chloroplasts. Seedlings. O. Nutrient absorption. Photosynthesis. Chlorophyll. Light. Plant physiology.**

The photochemical activity of chloroplasts and subchloroplast particles isolated from primary bean leaves between the 4th and 24th h of illumination of etiolated seedlings was studied. The photosystem I activity (oxygen uptake in the presence of MV, DCIP, ascorbate and DCMU), expressed on a unit chlorophyll basis, decreased approx 10-fold between 4 and 8 h of greening. At the same time the photosystem II activity (DCIP photoreduction in the presence of DPC) was reduced to ½. The photosystem I activity also decreased in all hitherto investigated fractions which were isolated from the digitonin-treated chloroplasts; however, at the initial phase of greening, this decrease was the most significant in the fraction containing heavy particles. After 24 h of greening, DCMU, at concn $> 10^{-10}$ M, limited the rate of ferricyanide photoreduction by isolated chloroplasts; whereas after 6 h of greening, this effect was observable even in the presence of 10^{-12} M DCMU. These results demonstrated that under those conditions both photosystems were active after 4 h of greening and PS I activity developed more rapidly than that of PS II. It also follows from the presented data that the water splitting reactions were delayed in development as compared to the other reactions investigated, and that PS II units may limit the electron flow in chloroplasts at earlier stages of leaf greening. (*Author's summary*) C00

0038

4645 MANSFIELD, D.H. *et al.* **Partial purification and some properties of a cholinesterase from bush bean (*Phaseolus vulgaris* L.) roots.** Biochemical Journal 175(3):769-777. 1978. Engl., Sum. Engl., 59 Refs., Illus.

Phaseolus vulgaris. **Roots. Dwarf beans. Analysis. Enzymes. Laboratory experiments. Proteins. Canada.**

A cholinesterase was partially purified from bush bean roots by using acridinium-based ligand affinity chromatography. The procedure gave a 78-fold increase in specific activity although at least 3 inactive contaminants remained. Enzyme activity was maximal against acetyl esters of choline and was inhibited by neostigmine. Di-isopropyl phosphorofluoridate completely inhibited activity at concn > 0.1 m*M*. Catalytic center activity was 2×10^{-4} times that of electric eel acetylcholinesterase. Cholinesterase activity appeared as a peak ($s = 4.2 \pm 0.1$ S) after isokinetic sedimentation. The Stokes radius was 4.00 nm and the apparent mol wt was 72,700 ±

1900. The smallest active and native form of the enzyme appeared to be a monomer. This contrasts with animal acetylcholinesterases, in which the smallest active and native forms are multimeric. (*Author's summary*) C00

0039

12369 MOLL, W.A.W. and WIT, B. DE. **Chlorophyllase activity in plastid membranes of bean leaves grown in darkness and in (intermittent) light.** Photosynthetica 13(2):146-154. 1979. Engl., Sum. Engl., 29 Refs., Illus.

Phaseolus vulgaris. **Light. Enzymes. Leaves. Chloroplasts. Chlorophyll. Plant physiology.**

In etiolated bean leaves the hydrolytic activity of chlorophyllase was detected from the 6th day of growth in the dark. In the material sedimented from crude extracts at 40,000 X *g* the enzyme activity was relatively high. In continuous and intermittent illumination, there was a lag phase in net protein synthesis of about 24 or 48 h, resp. During this lag phase the chlorophyllase activity distinctly changed its location; in the sedimentable fraction it diminished, whereas the nonsedimentable fraction increased in activity. The increase in activity taking place after 24 h of intermittent light was due to the greater part due to an increase in the nonsedimentable fraction. This contrasted to the results obtained with leaves grown under continuous light. Upon sucrose density gradient centrifugation etioplasts, etiochloroplasts and chloroplasts yielded several membrane fractions. All etioplasts fractions were qualitatively similar as for the relative contents of pigment, protein and chlorophyllase, except for the membrane fraction with the highest density. All membrane fractions showed similar polypeptide patterns on SDS polyacrylamide gels. Etioplast fractions were all qualitatively similar and no differences in their polypeptide patterns were observed. Chloroplasts fractions were different as for their chlorophyllase activities, pigment and protein contents, and polypeptide patterns. Chlorophyllase was mainly associated with a fraction bearing properties of photosystem I and yielded a polypeptide pattern very much like that of etiochloroplast membranes. *(Author's summary)* C00

0040

12347 MULLIGAN, D.R. and PATRICK, J.W. **Gibberellic-acid-promoted transport of assimilates in stems of *Phaseolus vulgaris* L.** Planta 145:233-238. 1979. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. **Gibberellins. Photosynthesis. Plant-growth substances. Stems. C. P. Nutrient transport. Leaves.** CO_2.

GA_3, applied as a dispersion in aqueous lanolin to the stumps of decapitated stems of bean plants, was found to promote the transfer of ^{14}C- and ^{32}P-labeled assimilates to the site of hormone application. Measurements of the component transfer processes, operating between source and sink (site of hormone application), showed that GA_3 was not acting to promote assimilate transfer by increasing the photosynthetic rate of, or the assimilate export rate from the source, nor by altering the mobilizing ability of the competing root sink. Here, it also was found that the time between GA_3 application and detection of an enhanced transport flux was independent of the length of the transport pathway. Overall, the evidence obtained indicated that GA_3 was not acting on any transfer process remote from its point of hormone application but was acting locally at this latter point. (*Author's summary*) C00

0041

13559 NESS, P.J. and WOOLHOUSE, H.W. **RNA synthesis in *Phaseolus* chloroplasts. I. Ribonucleic acid synthesis in chloroplast preparations from *Phaseolus vulgaris* L. leaves and solubilization of the RNA polymerase.** Journal of Experimental Botany 31(120):223-233. 1980. Engl., Sum. Engl., 25 Refs., Illus.

Phaseolus vulgaris. **Chloroplasts. RNA. Leaves. Photosynthesis. Enzymes.**

Chloroplast preparations from the young primary leaves of bean cv. Canadian Wonder carry out the DNA-dependent incorporation of UTP into RNA at rates between 8 and 14 pmol UTP/μg chlorophyll/h. It is estimated that 90% of the activity was localized in the chloroplasts. The incorporation proceeded for between 20-30 min at 35°C. The max rates of RNA synthesis were attained at pH 8.3, in the presence of 15 mM $MgCl_2$. Chloroplasts were also active, to a lesser extent, with 1.5 mM $MnCl_2$. The simultaneous presence of $MnCl_2$ and $MgCl_2$ resulted in inhibition of activity. Nuclear material prepared from young bean leaves incorporated UTP at a rate of ca. 12 pmol UTP/μg DNA/h. On a chloroplast (Triton-soluble) DNA basis chloroplast activity was over 40-fold that of nuclei. Methods of solubilizing chloroplast RNA polymerase were explored. Yields of over 75% were achieved, but methods suitable for one sp. were not always successful when applied to another. The highest yields of the bean enzyme were obtained using EDTA and KCl. All methods resulted in solubilization of DNA. RNA synthesis by the soluble bean enzyme proceeded for more than 40 min at 35°C. *(Author's summary)* C00

0042

13572 NOYES, R.D. **The comparative effects of sulfur dioxide on photosynthesis and translocation in bean.** Physiological Plant Pathology 16:73-79. 1980. Engl., Sum. Engl., 17 Refs., Illus.

Phaseolus vulgaris. **Inhibitors. Photosynthesis. Translocation. Leaves. Laboratory experiments. USA.**

The inhibiting effects of sulfur dioxide on photosynthesis and the rate of carbohydrate translocation in mature bean leaves were examined. Reductions of 0, 13 and 73% in net photosynthesis and 39, 44 and 69% in translocation occurred at concn of 0.1, 1.0 and 3.0 ppm sulfur dioxide, resp. The inhibition of translocation at 0.1 ppm sulfur dioxide without accompanying inhibition of net photosynthesis indicates that translocation is considerably more sensitive to sulfur dioxide damage. The mechanism of translocation inhibition at 1.0 ppm sulfur dioxide or less was demonstrated to be independent of photosynthetic inhibition. It is suggested that at higher concn significant inhibition of photosynthesis causes an additional reduction of translocation due to reduced levels of transport sugars. Autoradiograms of ^{14}C-labeled source leaves indicate that 1 mechanism of sulfur dioxide damage to translocation is the inhibition of sieve-tube loading. Inhibition of phloem translocation at common ambient levels (0.1 ppm) of sulfur dioxide is important to the overall growth and yield of sensitive agricultural crops. *(Author's summary)* C00

0043

4735 OZBUN, J.I. **Photosynthetic efficiency and crop production.** HortScience 13(6):678-679. 1978. Engl., 26 Refs.

Phaseolus vulgaris. **Photosynthesis. Inheritance. CO_2. Chlorophyll. Plant respiration. Dry matter. USA.**

The approach to research on photosynthetic efficiency is discussed with reference to its low heritability, methodology with special reference to measurement of photorespiration in *Phaseolus vulgaris*, stage of plant maturity and environmental effects. *(Summary by Field Crop Abstracts)* C00

0044

12338 PATRICK, J.W. **An assessment of auxin-promoted transport in decapitated stems and whole shoots of *Phaseolus vulgaris* L.** Planta 146:107-112. 1979. Engl., Sum. Engl., 12 Refs. Illus.

Phaseolus vulgaris. **Plant-growth substances. Shoots. C. Leaves. Photosynthesis. Stems. Auxins. Indoleacetic acid. Australia.**

^{14}C-photosynthate transfer in decapitated stems of bean plants treated with IAA appeared, as ascertained by microautoradiography, to be restricted to cells of sieve-element appearance. The IAA-induced promotion of photosynthate transport was found not to depend on any artifacts caused by the decapitation procedure. Rather, decapitation primarily served the purpose of removing photosynthate sources above the point of hormone application which otherwise suppressed the expression of the IAA effect on acropetal photosynthate transport. Furthermore, by manipulating stem levels of endogenous auxins with the inhibitor of polar auxin transport, 1-(2'-carboxyphenyl)-3-phenylpropane-1,3-dione (ACP1.55), evidence was obtained indicating that photosynthate transfer to the shoot apex depended, at least in part, on endogenous levels of auxins at site(s) remote from the apical sink (i.e., shoot apex). (*Author's summary*) C00

0045

13193 PETOLINO, J.F. and LEONE, I.A. **Saline aerosol: some effects on the physiology of *Phaseolus vulgaris*.** Phytopathology 70(3):229-232. 1980. Engl., Sum. Engl., 24 Refs.

Phaseolus vulgaris. **Plant physiology. Salinity. Leaves. N. Chlorophyll. Photosynthesis. Transpiration. Plant respiration.**

Expt were performed to determine some of the chemical and physiological changes accompanying exposure of bean plants var. Topcrop to saline aerosol. Plants were exposed to various dosages of salt (0-150 μg Cl/cm^2) when the primary leaves were approx 1/4 expanded (7-8 days old). Respiration, photosynthesis, and transpiration rates were determined after salt exposure. There was an increase in the respiration rate of salted plants as compared to the unsalted controls. Photosynthesis apparently was not affected by saline aerosol when the rate of O_2 evolution was expressed on an area or a dry wt basis; however, the rate increased when expressed on a unit chlorophyll basis. Transpiration rate decreased with exposure to saline aerosol. When the primary leaves were fully expanded (15-17 days old) they were analyzed for contents of chloride, water, total N, total chlorophyll, total free amino acids, soluble sugar, and starch. The chloride content increased linearly with increased exposure. Water content/unit area or per unit fresh wt increased upon exposure to salt although the relative turgidity of the tissue did not change. As the chloride content increased, the total N content decreased. Chlorophyll and amino acid contents increased until symptoms appeared, then they decreased. With increased exposure to salt total soluble sugar content increased, but there was no significant change in the starch content of the leaves. (*Author's summary*) C00

0046

13553 RAUSER, W.E. and SAMARAKOON, A.B. **Vein loading in seedlings of *Phaseolus vulgaris* exposed to excess cobalt, nickel, and zinc.** Plant Physiology 65 (4):578-583. 1980. Engl., Sum. Engl., 14 Refs., Illus.

Phaseolus vulgaris. **Leaves. Co. Zn. Physiology.**

Vein loading in unifoliate leaves of white bean seedlings exposed to excess Co^{2+}, Ni^{2+}, or Zn^{2+} for 1-4 days was studied by incubating leaf discs in (^{14}C)sucrose. The discs from plants exposed to metal exhibited an increased total uptake of radiosucrose but reduced vein loading. Differences between treatments due to infiltration of disc margins were eliminated by analyzing 7-mm discs cut from the center of incubated 14-mm discs. Uptake of radiosucrose was greater particularly in discs from seedlings exposed to excess Ni^{2+} and Zn^{2+}. The effect increased as exposure of the seedlings to metal increased up to 4 days. Autoradiographs showed vein loading in control leaf tissues with most of the radiosucrose accumulating in minor veins and little remaining in the mesophyll. In discs from metal-treated plants, most of the sucrose remained in the mesophyll without accumulating preferentially in the minor veins. This effect was evident within 24 h of exposure to excess metal and intensified with longer exposures to metal. The inhibition of vein loading was also evident in situ. Both the preferential accumulation of sucrose into the minor veins of control tissues and the

accumulation into mesophyll of metal exposed tissues were sensitive to 2,4-dinitrophenol and the blockage of sulfhydryl groups. It is concluded that the inhibition of vein loading contributes markedly to the observed toxicological effects of reduced photoassimilate export and of accumulation of carbohydrates in fully expanded leaves of bean seedlings exposed to excess metal ions. *(Author's summary)* C00

0047

11943 SAMARAKOON, A.B. and RAUSER, W.E. **Carbohydrate levels and photoassimilate export from leaves of *Phaseolus vulgaris* exposed to excess cobalt, nickel, and zinc.** Plant Physiology 63:1165-1169. 1979. Engl., Sum. Engl., 25 Refs., Illus.

Phaseolus vulgaris. **Leaves. Co. Ni. Zn. Toxicity. Soluble carbohydrates. C. Translocation. Photosynthesis.**

Exposure of white bean seedlings to phytotoxic burdens of Co, Ni or Zn reduced export of ^{14}C-photoassimilates from the nearly fully expanded unifoliate leaves. Little ^{14}C reached the major sink areas, the young trifoliate leaves and root tips of seedlings exposed to metal. The unifoliate leaves accumulated sucrose, reducing sugars and starch. These effects were evident within 1-2 days. *(Author's summary)* C00

0048

13550 SHANER, D.L. and LYON, J.L. **Interaction of glyphosate with aromatic amino acids on transpiration in *Phaseolus vulgaris.*** Weed Science 28(1):31-35. 1980. Engl., Sum. Engl., 10 Refs., Illus.

Phaseolus vulgaris. Herbicides. Leaves. Transpiration. Seedlings.

When glyphosate [*N*-(phosphonomethyl)glycine] was fed through the transpiration stream of excised bean "Red Kidney" shoots, it was readily absorbed and transported to the leaves where it inhibited transpiration. Max inhibition (40-50%) resulted from tissue concn of 50-3000 nmoles glyphosate/g fresh wt, while transpiration was significantly inhibited (20%) by as little as 15 nmoles/g fresh wt. A combination of 5×10^{-4} M tyrosine (Tyr) and 5×10^{-4} M phenylalanine (Phe) supplied continuously through the transpiration stream prevented the inhibition of transpiration by glyphosate during the course of 8-h expt. Tyrosine (10^{-3} M) alone delayed the transpiration response to glyphosate by 2 to 3 h but 10^{-3} M Phe alone did not affect the inhibition by glyphosate. Levels of endogenous Tyr and Phe were about 50% lower in glyphosate-treated leaves than in the controls 6 h after treatment. *(Author's summary)* C00

0049

13134 TRIPPI, V.S. and KENIS, J.D. **Regulación de la abscisión en *Phaseolus vulgaris.* I. Relación entre edad de los tejidos y respuesta a tratamientos con sacarosa, Triton X-100 y calidad de la luz.** *(Regulation of abscission of Phaseolus vulgaris. I. Relation between the age of the leaf and the response to treatments with sucrose, Triton X-100 and light quality).* Phyton 37(2):119-126. 1979. Span., Sum. Span., Engl., 14 Refs., Illus.

Phaseolus vulgaris. Abscission. Plant tissues. Soluble carbohydrates. Age. Leaves. Light.

The effect of red (R) and far-red (FR) radiation, sucrose 0.05 M and the surfactant Triton X-100 2% on abscission of bean explants was studied. It was found that the response to R and FR light is conditioned by the age of the leaf. In explants obtained from young leaves, both R and FR light inhibited abscission. In explants taken from well-developed leaves, R retarded abscission while FR stimulated it. In explants obtained from yellowing leaves, R was ineffective and FR stimulated abscission. Both sucrose 0.05 M and Triton X-100

2% stimulated abscission, especially in explants obtained from young leaves, that react to R and FR radiation as explants obtained from yellowing leaves do. Behavior of explants as a function of leaf age, ethylene production and membrane alterations is discussed. *(Author's summary)* C00

0050

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), so 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

0051

2975 VERBEEN, J.P. and DE GREEF, J.A. **Leaf development of *Phaseolus vulgaris* L. in light and in darkness.** American Journal of Botany 66(8):970-976. 1979. Engl., Sum. Engl., 19 Refs., Illus.

Phaseolus vulgaris. **Leaves. Plant development. Light. Illumination. Cell division. Growth. Seedlings.**

Development of the primary bean leaf in the dark and under continuous white light was studied for 14 days after sowing. The increase in surface area of the blade is the result of a no. of sequential processes. Both in the darkness and under illumination, leaf growth is characterized by an initial cell enlargement followed by intensive cell division. Cell division in etiolated leaves continues for one day longer than in illuminated ones but at a slower rate. Mature leaves grown under white light undergo a phase of cell enlargement after cell division has stopped. This increases their surface area up to 800 times when compared with the blade area of the embryo. This enlargement phase is almost absent in dark-grown seedlings. Consequently, the blade area of etiolated leaves is only 50 times that of the embryonic state. Thus light appears to have a dual effect on leaf development: it activates cell division and induces cell expansion. *(Author's summary)* C00

0052

13517 ZIMMERMAN, D.C. and COUDRON, C.A. **Identification of traumatin, a wound hormone, as 12-oxo-*trans*-10-dodecenoic acid.** Plant Physiology 63:536-541. 1979. Engl., Sum. Engl., 25 Refs., Illus.

Phaseolus vulgaris. **Plant growth substances. Seed. Enzymes. Plant physiology. Hypocotyls.**

12-Oxo-*trans*-10-dodecenoic acid (*trans*-10-ODA) is an oxidation product of polyunsaturated fatty acids in plant tissues. The structural similarity of *trans*-10-ODA and traumatic acid, a compound considered to be a wound hormone, suggested that *trans*-10-ODA might be a precursor of traumatic acid. Both *trans*-10-ODA and traumatic acid were active in the Wehnelt bean assay. The results were more consistent with *trans*-10-ODA than with traumatic acid. Cucumber var. National Pickling hypocotyls also showed a growth increase following treatment with *trans*-10-ODA, which suggested that *trans*-10-ODA has a more general influence on plant development than previously ascribed to traumatic acid. Runner beans var. Kentucky Wonder were analyzed for the presence of endogenous *trans*-10-ODA and traumatic acid. These are the beans from which traumatic acid was originally isolated in 1939. They contained *trans*-10-ODA but no traumatic acid. Young beans were a better source of *trans*-10-ODA than older beans and an increase in the esterified form of *trans*-10-ODA with age may have been due to a conversion of the free acid to the esterified form. The amount of endogenous *trans*-10-ODA increased when bean pod tissue was sliced and wounded. Rapid stirring and the presence of oxygen increased autooxidation of *trans*-10-ODA to traumatic acid in runner beans, which indicated that the compound identified as traumatic acid is formed by autooxidation of *trans*-10-ODA and that *trans*-10-ODA is a natural compound with growth-regulating properties. Enzyme extracts of runner beans synthesized *trans*-10-ODA from linoleic acid. No enzymic synthesis of traumatic acid was observed even when cofactors were added to the reaction mixture. This confirmed the conclusion that traumatic acid is formed by autooxidation of *trans*-10-ODA. *(Author's summary)* C00

See also 0009 0070 0155 0182 0330 0386 0426 0459 0460

0053

13542 AUSTENFELD, F.A. **Nettophotosynthese der Primär-und Folgeblätter von *Phaseolus vulgaris* L. unter dem Einfluss von Nickel, Kobalt und Chrom.** *(Effects of nickel, cobalt and chromium on net photosynthesis of primary and secondary bean leaves).* Photosynthetica 13(4):434-438. 1979. Germ., Sum. Germ., Engl., 20 Refs., Illus.

Phaseolus vulgaris. **Plant development. Nutrient solution. Co. Photosynthesis. Leaves. Mineral content. German Federal Republic.**

Bush beans were grown for 10 days in arenaceous quartz without any addition of heavy metals. During this time the primary leaves developed well. After that, the plants were transferred to nutrient solutions containing increasing concn of $NiSO_4$, $CoSO_4$, and K_2CrO_4 resp. After 3 wk the net photosynthesis (P_N) and heavy metal content of the leaves were determined by infrared gas analysis and atomic absorption spectroscopy, resp. P_N of the primary leaves was generally less inhibited than that of the secondary leaves though the primary leaves always accumulated more heavy metals than the secondary leaves did. *(Author's summary)* C01 C03

0054

9568 BALDERSTON, J.H. **Studies on the localization of sodium in tissues of bush bean (*Phaseolus vulgaris*, L.).** Ph.D. Thesis. Davis, University of California, 1976. 133p. Engl., Sum. Engl., 164 Refs., Illus.

Phaseolus vulgaris. **Na. Plant tissues. Dwarf beans. Seedlings. Leaves. Roots. Hypocotyls. Salinity. Plant vascular system. USA.**

Bush beans were grown in various concn of NaCl and $NaNO_3$. It was found that more Na from $NaNO_3$ than from NaCl is translocated to their leaves and stems. Roots did not evince a difference in Na content; however, a study of root tip surfaces did show that the anion of the Na salt had an effect. Nitrate and sulfate salt treatments caused stubby swollen roots with flaky, coarse root cap structure, while chloride and control treatments resulted in normal slender roots with little coarse root cap structure. Salt treatments were the apparent cause of unilateral secondary root initiation. Electron microprobe analysis of epicotyl transection tissues confirmed the whole plant distribution: Na from $NaNO_3$ was in largest amounts in all tissues. Most Na was observed in xylem parenchyma, xylem vessels, cambium and phloem tissues. Pyroantimonate was used as a Na-precipitant, and the distribution of Sb tended to follow Na localization. Contrary to whole plant results, Na from NaCl was greater than from $NaNO_3$ in root xylem vessels as shown by microprobe analysis. Transmission electron microscope analysis of the microprobe material, showed that electron-dense precipitates, Sb salts of Na, were localized in intercellular spaces in root and epicotyl tissues. Intracellularly, Sb precipitates were regularly found in immature xylem vessel lumens as a coating of electron-dense material around starch grains, on secondary wall thickenings and in hydrolyzed wall, perforation plate, areas. High concn of $NaNO_3$, but not NaCl, resulted in Sb precipitates in xylem parenchyma. These results

support the hypothesis that in bush beans, Na is sequestered in parenchyma cells, especially from $NaNO_3$, which are adjacent to the vascular tissue, and that Na cycles basipetally in the xylem, acropetally in the phloem after the manner of K in *Hordeum*. Na is thought to function as a countercation for the reduction of nitrate in the leaves, and to maintain the ion charge balance for malate synthesized in the leaves and transported to the roots. (*Summary by Dissertation Abstracts*) C01

0055

12313 ELIZONDO, J. and AGUIRRE B., G. **Factibilidad económica de la aplicación de inoculante en la producción de frijol (*Phaseolus vulgaris* L.) a diferentes niveles de nitrógeno aplicado al suelo en Cadereyta Jiménez, N.L.** (*Economic feasibility of bean seed inoculation at different levels of nitrogen application in Nuevo León, México*). Instituto Tecnológico de Monterrey. Informe de investigación no. 15, 1975/76. Monterrey, México, División de Ciencias Agropecuarias y Marítimas, 1977. pp.19-20. Span.

Phaseolus vulgaris. **N. Fertilizers. Inoculation. Yields. Mexico.**

In field trials at Cadereyta Jiménez, Nuevo León (Mexico), bean cv. Delicias 71 was given 0, 18, 36 or 54 kg N/ha, with or without seed inoculation. A significant interaction between N and inoculation was found. The best treatment (36 kg N/ha with inoculation) increased no. of pods/plant by 88% compared with the untreated control. CP yield was significantly increased. It was concluded that inoculation was economical. (*Summary by Soils and Fertilizers Abstracts*) C01

0056

6389 FROTA, J.N.E. and TUCKER, T.C. **Salt and water stress influences nitrogen metabolism in red kidney beans.** Soil Science Society of America Journal 42(5):743-746. 1978. Engl., Sum. Engl., 27 Refs.

Phaseolus vulgaris. **Water stress. Salinity. N. Metabolism. Proteins. Nutrient solution. Amino acids. Growth chamber experiments. Plant nutrition. Ammonium sulphate. Nitrate.**

In growth chamber trials bean seedlings were grown under NaCl stress, water stress (carbowax) or in a normal nutrient solution. The ^{15}N in NO_3, α-amino acids, total soluble-N and protein-N in plant shoots were analyzed after the plants received $(^{15}NH_4)_2SO_4$ and $K^{15}NO_3$ in nutrient solution for 6, 12, 24 or 48 h. NaCl and carbowax treatments resulted in equal accumulations of NO_3, NH_4 and free α-amino acids in shoots. Protein synthesis was significantly reduced in the shoots when the plants were subjected to NaCl salinity and carbowax with either source of N, but the inhibition was severer under salt stress than water stress. (*Summary by Field Crop Abstracts*) C01 C03

0057

13119 GIORDANO, P.M., MAYS, D.A. and BEHEL JUNIOR, A.D. **Soil temperature effects on uptake of cadmium and zinc by vegetables grown on sludge-amended soil.** Journal of Environmental Quality 8(2):233-236. 1979. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. **Zn. Cd. Soil temperature. Nutrient absorption. Field experiments. Analysis. Composition. Yields. Growth.**

In a field expt 224 t/ha digested sewage sludge was added in the fall of 1974 to the soil (Sango sil, Glossic Fragiudult) and a var. of vegetables, including lettuce, tomatoes, squash, beans and broccoli, planted for the next 3 seasons. Electric resistance cables placed 30 cm deep and 30 cm apart provided 10W heating capacity/1000 cm^2, sufficient to maintain

temp differentials of about 6, 8 or 11°C above ambient soil temp to a max of 27°. In the fall of the 2nd cropping season half of each plot received lime. Soil heating increased the Cd and Zn contents of the edible parts of many of the vegetables but the increase was only significant with broccoli. Liming reduced the Cd and Zn contents but this may have been due to better plant growth. *(Summary by Horticultural Abstracts)* C01 C02

0058

12342 GUTIERREZ, L.E., CROCOMO, O.J. and BASSO, L.C. **Efeito da deficiencia de potássio sobre alguns aspectos metabólicos em feijoeiro** (*Phaseolus vulgaris* L.). (*Effect of potassium deficiency on bean metabolism*). Revista de Agricultura 53(4):209-216. 1978. Port., Sum. Port., Engl., 20 Refs.

Phaseolus vulgaris. **K. Mineral deficiencies. Chlorophyll. Proteins. Dry matter. Cultivars. Nitrate. Nutrient solution. Plant nutrition. Brazil.**

Bean cv. Goiano Precoce and Carioca, were grown in complete and K-deficient nutrient solutions. K-deficient leaves were lower in protein, chlorophyll and total wt, but were higher in reducing sugars and dry wt. Goiano Precoce showed an increase in NO_3 reductase activity and Carioca, a decrease. The symptoms of K deficiency resembled those of NH_3 toxicity in other plants. (*Summary by Horticultural Abstracts*) C01

0059

13507 HIROCE, R. and MASCARENHAS, H.A.A. Decréscimo do teor de nutrientes na matéria seca, em relação à idade de algumas plantas cultivadas. *(Decrease in the nutrient content of dry matter in relation to the age of some cultivated plants).* Bragantia 36:XIX-XXII. 1977. Port., Sum. Port., 7 Refs.

Phaseolus vulgaris. **Dry matter. Mineral content. Age. N. P. K. Ca. Mg. Leaves. Branching. Growth. Nutrient absorption.**

This investigation on various crops including rice, potatoes, beans, wheat and soybeans was based on published data. Correlation coefficients were calculated between concn of nutrients in DM and the % of DM in fresh matter. In general, the concn of N, P and K in DM decreased with age and were negatively correlated with the % of DM in fresh matter, whereas contents of Ca and Mg were positively correlated. It is suggested that the decrease in the concn of N, P and K in DM with plant age could be due to a dilution effect because of an increase in DM content and also to translocation of the elements to the reproductive parts, and a decrease in absorption of the nutrients. *(Summary by Field Crop Abstracts)* C01 C03

0060

12623 HOWELER, R.H. Desórdenes nutricionales. *(Nutritional disorders). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.341-362. Span., 64 Res., Illus.

Also in English.

Phaseolus vulgaris. **pH. B. Ca. Cu. Fe. Mg. Mn. N. P. K. S. Zn. Mineral deficiencies. Toxicity. Plant nutrition. Nutritional requirements. Soil analysis.**

Different nutritional deficiencies or toxicities may limit bean development and yield. N and P deficiencies are the most frequent, although deficiency of minor elements and Al/Mn toxicity can reduce yields considerably. Nutritional problems are usually diagnosed by soil and plant tissue analyses and the observation of symptoms produced by nutritional

disorders. Optimum pH for bean production varies between 6.5-7.5; within these limits, the majority of the plant nutrients have their max availability. Color illustrations are given of the symptoms of plant deficiencies and toxicities. *(Summary by J.E.Z. Trans. by L.M.F.)* C01 D01

0061

11944 JACOBY, B. **Sodium recirculation and loss from** *Phaseolus vulgaris* **L.** Annals of Botany 43:741-744. 1979. Engl., Sum. Engl., 19 Refs.

Phaseolus vulgaris. **Na. Translocation. Roots. Stems. Salinity.**

In a split-root expt, ^{22}Na was supplied to bean roots emerging from the stem, 2.5 cm above the main roots. Sodium exported from these upper roots was translocated a short distance upward in the stem and downward to the main roots. Most of the ^{22}Na arriving in the main roots was lost to the medium. Sodium loss from roots into KCl or NaCl was similar and not affected by oligomycin. These results confirm a previous hypothesis regarding the mechanism of sodium exclusion from the tops of sodium-nonaccumulator plants. *(Author's summary)* C01

0062

12319 KHAN, A. **Cause of chlorosis of dryland beans at the San Juan basin of Colorado.** Ph.D. Thesis. Fort Collins, Colorado State University, 1977. 110p. Engl., Sum. Engl., 72 Refs., Illus.

Phaseolus vulgaris. **Chlorosis. Bean root rots. Yields. P. Zn. Fe. Cu. Mn. K. S. Ca. Mg. Na. Cl. Mineral content. Moisture content. Soil analysis. Statistical analysis. Leaves. Flowers. Pods. Soil requirements. USA.**

Dryland Pinto beans (San Juan select var.) is one of the most important crops in the San Juan Basin of Colorado. Chlorosis and root rot are 2 major problems responsible for decreased yield. To determine cause of chlorosis and variations in yield, research was conducted on farmers' fields to: (1) compare chlorotic with the adjacent green plants with respect to yield, root rot, soil factors and plant composition, (2) develop regression models using yield as the dependent variable and significant soil or plant factors as independent variables, and (3) test the findings obtained from the comparison of chlorotic and green plants and the regression models. Paired plots, one chlorotic and other relatively green, were selected on 18 farms during 1975-76. Yield, root rot, soil factors and plant composition were measured. Measured soil factors were bulk density, weekly moisture, texture, lime, OM, pH, extractable nutrients (P, K, Fe, Zn, Mn, Cu and NO_3-N), and electrical conductivity. Plant tissues were analyzed for P, Zn, Fe, Cu, Mn, K, S, Ca, Mg, Na, Cl and NO_3-N. Green plots outyielded chlorotic plots on all sites. Root rot index and soil moisture content were significantly higher in chlorotic plots. P and P/Zn ratio in the tissue were significantly higher in chlorotic leaf samples, irrespective of the stage of sampling. The Zn content of green leaf samples was significantly higher than that of chlorotic leaf samples at the 1% level of probability for prebloom and at the 10% level for postbloom stage in 1975. None of the soil factors correlated with yield; however, 72% of the variation in yield was associated with P/Zn ratio in the tissue, root rot and their interactions. To test the hypothesis, that Zn spray would increase yield,chlorotic plots selected in 1976 were divided into 2 subplots. One of the subplots was sprayed with 1% zinc sulfate solution. Zn spray turned chlorotic plants green and increased yields by 8-92%. Yields of chlorotic plots were not generally increased to a level equal to that of green plots. The differences in yields between chlorotic plots sprayed with Zn and green plots were attributed to root rot. It was speculated that higher moisture content of the soil in chlorotic plots was responsible for higher P availability in these plots which caused P-induced Zn deficiency. *(Summary by Dissertation Abstracts)* C01

0063

11917 LUCAS, R.E. and KNEZEK, B.D. **Climatic and soil conditions promoting micronutrient deficiencies in plants.** *In* Micronutrients in agriculture. Madison, Wisconsin, Soil Science Society of America, Inc., 1972. pp.265-288. Engl., Sum. Engl., 29 Refs., Illus.

Phaseolus vulgaris. **B. Cu. Fe. Mn. Mo. Zn. Plant nutrition. Mineral deficiencies. pH. Soil temperature. Soil water. Light.**

The need for micronutrients in plant nutrition was investigated on the basis of edaphoclimatic conditions promoting deficiencies. Factors affecting crop response such as soil reserves, the effects of soil pH, soil moisture and aeration, soil microorganisms and root exudate, soil temp and light and nutrient interactions are discussed in relation to B, Cu, Mn, Mo, Fe and Zn. *(Summary by L.M.F.)* C01

0064

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

0065

12678 MAGALHÃES, A.A. DE and MILLAR, A.A. **Efeito do déficit de água no período reprodutivo sobre a produção do feijão.** *(Effect of water stress during the reproductive period on bean production).* Pesquisa Agropecuária Brasileira 13(2): 55-60. 1978. Port., Sum. Port., Engl., 20 Refs., Illus.

Phaseolus vulgaris. **Water stress. Plant reproduction. Production. Yields. Irrigation. Drought. Field experiments. Statistical analysis. Brazil.**

The drought tolerance of bean cv. IPA-74-19 when submitted to different water stress periods during the reproduction phase was studied at the Bebedouro Expt Station, EMBRAPA, Petrolina-PE, Brazil, using a randomized complete block design with 9 treatments and 3 replications. In all the treatments, irrigation was maintained at an optimum level before and after the water stress period. At harvest, grain yield, no. of pods/plant, and no. of seeds/pod were determined. For seed yield, a significant difference was found between treatments at the 0.01 level. For pods/plant and seeds/pod data, significant differences were found between treatments at the 0.05 and 0.01 levels, resp. A yield reduction of 20% was observed when the crop was kept 14 days without irrigation. After 17 and 20 days without irrigation, yield reductions of 38 and 52% , resp., were observed. After 20 days yield reduction remained constant until 29 days of water stress. Using the period of greatest

response to water stress, it is possible to obtain the relationship between relative yield and soil matrix potential, which is important in defining the operational level for irrigation management. *(Author's summary)* C01 D01

0066

13563 O'TOOLE, J. *et al.* **Effect of potassium nutrition on leaf anatomy and net photosynthesis of *Phaseolus vulgaris* L.** New Phytologist 84:623-630. 1980. Engl., Sum. Engl., 27 Refs., Illus.

Phaseolus vulgaris. **Cultivars. Nutrient solution. Plant nutrition. K. Leaves. Photosynthesis. USA.**

Low levels of K nutrition resulted in a decrease in dry wt of leaves, stems and roots of 2 contrasting bean cv., Michelite (M-62) and Redkote (RK). A decrease in cell size and compaction of cells/unit area, resulting in decreased leaf thickness, and degradation of chloroplasts, and loss of cell wall integrity accompanied the decrease in % K of leaf tissue. Net photosynthesis rate decreased below a threshold level of ca. 1% K in the leaf tissue with corresponding nutrient solution levels of between 1-2 and 0-3 meq K/*l*. Below this critical level, both stomatal and mesophyll diffusion resistances to CO_2 increased markedly. Var. differences for these responses suggest differences in efficient utilization of the element rather than differential ability to absorb K. *(Author's summary)* C01 B00

0067

4653 PAGANO, S.N. **Eliminación de potasio con relación al tiempo de inmersión foliar en *Phaseolus vulgaris* L.** (*Loss of potassium in relation to time of immersion of bean leaves*). Phyton 37(1):35-39. 1979. Span., Sum. Span., Engl., 15 Refs., Illus.

Phaseolus vulgaris. **K. Mineral content. Temperature. Cell structure. Leaves.**

Since K ions, which participate in metabolism, cellular permeability and osmosis, can be easily leached, the relationship between immersion time and K loss was investigated. Detached bean leaves were floated up- or downwards in petri dishes with 50 ml distilled water for 10 min and then transferred to new dishes (with the same amount of water) every 10 min for a total of 140 min. The expt were carried out at 10, 25 or 30°C. Water from each dish was analyzed for leached K at each temp. The data are graphically presented. The amount of leached K varied according to immersion time, irrespective of temp or side of leaf. (*Summary by Horticultural Abstracts*) C01

0068

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 concn but were increased to a much greater extent by various treatments. (*Summary by Dissertation Abstracts*) C01

0069

11942 PETERSON, C.A. and RAUSER, W.E. **Callose deposition and photoassimilate export in *Phaseolus vulgaris* exposed to excess cobalt, nickel, and zinc.** Plant Physiology 63:1170-1174. 1979. Engl., Sum. Engl., 21 Refs., Illus.

Phaseolus vulgaris. **Seedlings. Co. Ni. Zn. C. Translocation. Petioles. Plant tissues.**

Callose accumulated on sieve plates of phloem of white bean seedlings exposed to excess Co, Ni or Zn. Callose deposits ranged in thickness and were most pronounced in midribs of unifoliate leaves and their subtending petioles; lesser deposits were found in the stems. Although translocation of ^{14}C was reduced drastically in seedlings exposed to excess metal, no correlation was found between translocated ^{14}C and the amount of callose in the petioles. It is concluded that the inhibition of phloem translocation in seedlings exposed to excess metal is due to effects other than callose deposition. (*Author's summary*) C01

0070

3675 RAINS, D.W. and FLOYD, R.A. **Influence of calcium on sodium and potassium absorption by fresh and aged bean stem slices.** Plant Physiology 46:93-98. 1970. Engl., Sum. Engl., 41 Refs., Illus.

Phaseolus vulgaris. **Ca. K. Na. Nutrient absorption. Stems. Age. Plant tissues. Plant nutrition. Plant physiology. USA.**

The influence of Ca on the aging processes of bean stem slices and on the absorption of K and Na by fresh and aged slices was studied. In the presence of Ca, fresh tissue showed a preferential Na uptake. The preference for Na over K resulted from a differential depressive effect of Ca on absorption of these 2 ions. In aged tissue Na uptake was also depressed, but K absorption was accelerated, with a net result of a much greater absorption of K than Na. The presence of Ca in the aging medium promoted the development of K-absorbing capacity as well as increase in the rate of respiration but did not influence the loss of capacity to absorb Na as tissue aged. This, along with the demonstration that protein synthesis is involved in the development of K-absorbing capacity by aging tissue, suggests that Ca may have an effect on basic physiological processes concerned with development of ion absorption by aging tissue. The influences that Ca may have on the physical and physiological aspects of ion transport are discussed. *(Author's summary)* C01 C00

0071

12686 RAMIREZ M., G.. Síntomas de deficiencia de minerales en plantas de fríjol (*Phaseolus vulgaris* L.) y sus relaciones nutritivas específicas. *(Symptoms of mineral deficiencies in bean plants and specific nutrient relationships)*. Tésis Ing. Agr. San José, Universidad de Costa Rica, 1969. 65p. Span., Sum. Span., 43 Refs., Illus.

Phaseolus vulgaris. N. P. Ca. Mg. S. Fe. Mn. B. Mineral deficiencies. Composition. Analysis. Leaves. Petioles. Plant nutrition. Costa Rica.

The nutrient condition of bean plants undergoing mineral deficiency in the substrates was studied. The petioles and leaf blades were taken as representative of the respective nutrient balance. Plant behavior was evaluated by visible deficiency symptoms, growth habits, nutrient accumulation in the mentioned parts [N-NO_3, N soluble in water (NOSW), total N soluble in water (TNSW), total N, P-PO_4, total P, K, Ca, Mg, S, Fe, Mn and B], and by the nutrient relationships estimated from analytic data (N:P:K; K/N + P; N/S; NOSW/S; K/Ca; K/Ca + Mg; Fe/Mn; oxidized N/reduced N; % of total and soluble P). K deficiency had little effect on real production (pods); Ca or N deficiency affected production inversely. There were no important visual symptoms in the diagnosis of Mn and B deficiencies. *(Author's summary. Trans. by L.M.F.)* C01

0072

13519 ROGERS, H.H., CAMPBELL, J.C. and VOLK, R.J. Nitrogen-15 dioxide uptake and incorporation by *Phaseolus vulgaris* (L.). Science 206:333-335. 1979 Engl., Sum. Engl., 12 Refs., Illus.

Phaseolus vulgaris. Nutrient absorption. N. Mineral content. Roots. Canopy. Stems.

The sorption rate and metabolic fate of NO_2, a major air pollutant, were determined for snap bean cv. Bush Blue Lake 290. Sorption was determined kinetically by chemiluminescent monitoring of $^{15}NO_2$ removal from the test atmosphere and directly by mass spectrometric analysis of N derived from the plant tissue. Some 65% of the NO_2 removed from the air was metabolized and incorporated into organic N compounds. Most of the ^{15}N was found in the tops but 3-5% was translocated to the roots. There was a linear correlation between NO_2 concn and ^{15}N accumulation, demonstrating the first-order nature of the NO_2 sorptive process. *(Summary by Horticultural Abstracts)* C01 C03

0073

13564 SAMENI, A.M. *et al.* Growth and chemical composition of dry beans as affected by soil salinity and N fertilization. Plant and Soil 54:217-222. 1980. Engl., Sum. Engl., 17 Refs., Illus.

Phaseolus vulgaris. Fertilizers. Salinity. Laboratory experiments. Growth. N. Nutrient absorption. Na. Mineral content.

The effects of 3 levels of N (0, 50 and 100 ppm) and 4 salinity regimes (0.5, 1.5, 2.5 and 3.5 mmhos/cm) on the growth and mineral composition of dry beans were investigated in a greenhouse expt. Bean plants treated with N produced more dry wt and contained higher N than the untreated check. Growth and N uptake by bean plants generally decreased with increasing irrigation water salinity at all N levels. High salinity caused severe burning of the margins of older leaves and stunting of growth. At the low salinity levels (0.5 and 1.5 mmhos/cm), N additions had no effect on growth; however, the suppressing effects of higher salinity were alleviated somewhat with N fertilization. The concn and uptake of Cl and Na increased with increasing salinity; probably the relatively high accumulations of Cl and Na were responsible for growth reductions at high salinity. *(Author's summary)* C01 C02

0074

11941 THOMAS, R.J., FELLER, U. and ERISMANN, K.H. **The effect of different inorganic nitrogen sources and plant age on the composition of bleeding sap of *Phaseolus vulgaris*.** New Phytologist 82:657-669. 1979. Engl., Sum. Engl., 26 Refs., Illus.

Phaseolus vulgaris. **Sap. N. Plant anatomy. Age. Analysis. Amino acids. Leaves. Plant vascular system.**

Composition of the bleeding sap N of beans varied with the inorganic N source fed to the plant but was not changed by a 4-fold difference in external nitrate concn. Highest sap N concn and fastest growth were observed in ammonium nitrate-grown plants. With nitrate-grown plants 60% of the total sap N was inorganic nitrate-N and 40% organic-N; whereas with ammonium-nitrate grown plants, nitrate contributed 30% to the total N and organic-N 70%. Virtually all the N in the sap of ammonium-grown plants was organic-N. Allantoic acid was the major individual reduced N compound in the bleeding sap of plants fed with nitrate, ammonium or ammonium nitrate. During the development of the plant from seedling to mature plant with ripened pods, the concn of N in the bleeding sap of nitrate-grown plants decreased sharply initially and then gradually during pod formation; it increased again when the pods had ripened. Nitrate reductase activity of leaf extracts was correlated with nitrate content of bleeding sap and was not much affected by increases in reduced N compounds in the sap. *(Author's summary)* C01 C03 A00

0075

12366 VLCEK, L.M. and GASSMAN, M.L. **Reversal of α, α-dipyridyl-induced porphyrin synthesis in etiolated and greening red kidney bean leaves.** Plant Physiology 64:393-397. 1979. Engl., Sum. Engl., 24 Refs., Illus.

Phaseolus vulgaris. **Leaves. Mg. Zn. Fe. Co. Mg. Plant physiology.**

The chemical induction of porphyrin synthesis was studied in etiolated and greening leaves of bean cv. Red Kidney. When these leaves are incubated in darkness with solutions of transition metal ion chelators such as α , α -dipyridyl, 1.10-phenanthroline, pyridine-2-aldoxime or other related aromatic heterocyclic nitrogenous bases, they synthesize large amounts of protochlorophyllide and Mg protoporphyrins, Greening leaves produce more prophyrin than do etiolated leaves under such conditions. If the leaves are then transferred to 1 mM solutions of various transition metal salts such as Fe^{2+}, Zn^{2+} or Co^{2+} (but not Mn^{2+} or Mg^{2+}), Mg protoporphyrin (monomethyl ester) synthesis immediately ceases and the pigment(s) rapidly disappear(s); protochlorophyllide synthesis gradually diminishes during 4-8 h of treatment. The loss in Mg protoporphyrin(s) can be accounted for by a simultaneous increase in protochlorophyllide in partially greened leaves but not in etiolated leaves. In the latter the decline in Mg protoporphyrin(s) initiated by the application of Zn^{2+} is retarded by low temp and anaerobiosis but not by respiratory inhibitors. Cycloheximide inhibits the loss of Mg protoporphyrin(s) but does not affect their conversion to protochlorophyllide. These results indicate that (a) greening leaves have a greater capacity to synthesize α-aminolevulinic acid than do etiolated leaves: (b) α, α-dipyridy induction of porphyrin

synthesis in etiolated and greening leaves can be blocked by application of certain transition metal salts; (c) in greening leaves the accumulated Mg protoporphyrin(s) are stoichiometrically converted to protochlorophyllide upon treatment with these salts whereas in etiolated leaves the accumulated Mg protoporphyrin(s) are labile and are not quantitatively converted to protochlorophyllide upon such treatment; (d) in etiolated leaves the accumulated Mg protoporphyrin(s) are destroyed via a light-independent, probably enzymic process which requires cytoplasmic protein synthesis. *(Author's summary)* C01

0076

11926 WALLACE, A., MUELLER, R.T. and ALEXANDER, G.V. **Influence of phosphorus on zinc, iron, manganese, and copper uptake by plants.** Soil Science 126(6):336-341. 1978. Engl., Sum. Engl., 26 Refs.

Phaseolus vulgaris. **P. Zn. Fe. Mn. Cu. Nutrient absorption. Dwarf beans. Leaves. Roots. Stems. Toxicity.**

Bush bean cv. Improved Tendergreen plants were grown in nutrient solutions at pH 4.2 or 7.2 and P concn of 10^{-5}, 10^{-4}, 10^{-3} or 10^{-2} *M* H_2PO_4 and Fe levels of 10^{-5} *M* FeEDDHA + 10^{-4} *M* $FeSO_4$ or 10^{-6} *M* FeEDDHA + 10^{-6} *M* $FeSO_4$. At high pH, increasing solution P decreased the leaf, stem and root concn of Zn, Mn and Cu; but at low pH, increasing the P resulted in more Zn, Mn and Cu. High P decreased Fe transport to leaves at low and high pH, but only at the high Fe level. *(Summary by Horticultural Abstracts)* C01

0077

13118 WALLACE, A. *et al.* **Plant uptake of bicarbonate as measured with the ^{11}C isotope.** Plant and Soil 51:431-435. 1979. Engl., Sum. Engl., 14 Refs.

Phaseolus vulgaris. CO_2. **Nutrient absorption. Tracers. Nutrient solution. Roots. Stems. Leaves. Dwarf beans. C.**

^{11}C which is cyclotron-produced by $^{14}N(P, \alpha)$ (half-life 20.1 min) was used as a tracer of bicarbonate to determine its movements from a nutrient solution through roots to stems and leaves of bean cv. Improved Tendergreen. The short time involved and the high solution pH minimized the need for use of the Henderson/Hasselbach equation for activity correction. Quantities of ^{11}C did move into roots, stems and leaves with a sharp decreasing gradient (root/stem = 14.5; stems/leaves = 11.7). More ^{11}C moved into plants with $KHCO_3$ than with $NaHCO_3$. Ammonium sulfate enhanced ^{11}C uptake and KNO_3 decreased it. This enhancement and competition indicated the possibility of some uptake of HCO_3^-. *(Author's summary)* C01

0078

13111 ZIMDAHL, R.L., McCREARY, D.T. and GWYNN, S.M. **Lead uptake by plants. The influence of lead source.** Bulletin of Environmental Contamination & Toxicology 19(4):431-435. 1978. Engl., Sum. Engl., 10 Refs.

Phaseolus vulgaris. **Pb. Nutrient absorption. Shoots. Roots. Analysis.**

Maize, spring wheat, sugar beets and beans were grown on soils containing 10-31 μg Pb/g with 100, 1000, 2000 or 5000 μg Pb/g applied in solution as sulfate or nitrate. Shoot and root samples of the crops were analyzed 30 days after emergence. For roots, significantly more Pb was taken up from the nitrate than from the sulfate in 13 of 20 cases; only in 2 cases was significantly more Pb taken up from the sulfate. For shoots, 5 cases showed significantly more Pb taken up from the nitrate and 2 from the sulfate. The levels of Pb reached in roots varied between crops; maize was the least constant in showing greater uptake from the nitrate. *(Summary by Field Crop Abstracts)* C01

See also 0122 0147 0155 0157

0079

13566 BARBOSA FILHO, M.P. **Efeitos de idade, fósforo, molibdênio e cobalto nas percentagens de NPK em diferentes partes do feijoeiro-comum (*Phaseolus vulgaris* L.).** *(Effect of the age, phosphorus, molybdenum and cobalt on NPK percentages in different parts of french bean plants).* Tese Mag. Sc. Lavras-MG, Brasil, Escola Superior de Agricultura de Lavras, 1977. 63p. Port., Sum. Port., Engl., 35 Refs., Illus.

Phaseolus vulgaris. **Field experiments. Analysis. N. P. K. Plant development. Age. Co. Mo. Leaves. Roots. Stems. Brazil.**

The influence of Mo, Co and P on the % of NPK applied to the common bean var. "Ricobaio" 1014 was studied at the Superior Agricultural School of Lavras, Minas Gerais, during 1976-77. The %s of N, P and K on various parts of the plants in different stages of development in field conditions of Dystrophic Dusky Red Latosol were analyzed. A randomized block exptl design was used with split plots of a 2^3 factorial in duplication. The plots correspond to the age of the plants and the split plots to their type of treatment. Mo % s were 0.0 and 13.0 g/ha; Co, 0.0 and 0.25 g/ha and P, 0.0 and 200 kg P_2O_5/ha. The following salts were used: ammonium heptamolybdate, cobalt sulfate and simple superphosphate. Mo and Co in solution were applied to the seeds and P was applied to the soil of the growing plants. The data used to evaluate the treatment of the plants were the % s of NPK in different parts of the plants (root, stem, leaves, husk and grains), analyzed in different stages of development. With the exception of the %s of NPK on the grain and K on the husk, the age of the plants had a significant influence on the concn of these nutrients. Generally a reduction of NPK %s was observed with the increasing age of the plants. The 2 nutrients studied, Mo and Co, had no influence on the %s of NPK of the roots. Mo caused a significant increase in the % of N and P on the leaves when applied in the absence of P. In relation to K, it was observed that Mo caused an increase on the %s statistically significant on the stems at 80 days, and on the husks independent of age. Co reduced P %s on the leaves at 60 days and increased at 40 days when applied in the absence of Mo. This % on the grains decreased at 80 days. On the husk P increased K % independent of the age of the plant. *(Author's summary)* C02

0080

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

0081

13576 GUVEN, A. and DEBIEZ, M-O. Effets de la levée de dominance apicale et des corrélations entre organes sur la croissance des bourgeons axillaires des deux premiéres feuilles de *Phaseolus vulgaris* c.v. Çali. *(Effect of removing apical dominance and of the correlations between organs on the growth of axillary buds in the youngest leaves of bean cv. Çali).* Physiologie Végétale 16(4):715-722. 1978. Fr., Sum. Fr., Engl., 5 Refs., Illus.

Phaseolus vulgaris. Seeds. Germination. Light. Growth. Buds. Inhibitors.

Germinating bean seeds were held in short (9-h) days, long (15-h) days or continuous light. Different light intensities were also compared. Seedlings were decapitated 10 days after sowing just above the 1st leaf pair. In some cases this leaf pair was removed and in further treatments the trifoliate leaves in the axillary buds were also removed. The growth of the buds in the axils of the 2 primary leaves was compared for controls and decapitated seedlings. Where the 1st leaf pair was removed growth was inhibited and it was shown that the inhibitory factor emanated from the very young trifoliate leaves, present in the axillary buds. The initial dominance of 1 axillary bud over the other was dependent on the presence of trifoliate leaves, the presence of the 1st leaf pair and a relatively low light intensity (24 W rather than 34 W/m^2). This dominance disappeared immediately the trifoliate leaves were removed. *(Summary by Plant Breeding Abstracts)* C02

0082

13129 HALTERLEIN, A.J., CLAYBERG, C.D. and TEARE, I.D. **Influence of high temperature on pollen grain viability and pollen tube growth in the styles of *Phaseolus vulgaris* L.** Journal of the American Society for Horticultural Science 105 (1):12-14. 1980. Engl., Sum. Engl., 25 Refs.

Phaseolus vulgaris. Temperature. Pollination. Cultivars. Plant development. Pods.

Four bean cv. were studied in a growth chamber expt to determine the effect of high temp stress on pollen viability and pollen tube growth in styles. Compared with an optimal growing temp (25°/20°C, day/night), stress temp (35°/20°, day/night or 35° constant) reduced the % of viable pollen for all cv., but cv. differences were apparent. Beans generally produced only small quantities of pollen under normal growing temp but much more under high temp, again with cv. differences. Finally, stress temp did not reduce the ability of pollen tubes to grow to the base of the style. Results suggest that injury to pollen at high temp (up to 35°) is not likely to hinder the ability of beans to set pods. *(Author's summary)* C02

0083

4647 HAYES, A.B. **Auxin-cytokinin effects in leaf blade hyponasty.** Botanical Gazette 139(4):385-389. 1978. Engl., Sum. Engl., 30 Refs.

Phaseolus vulgaris. **Leaves. Cytokinins. Auxins. Inhibitors. Seedlings. Growth. USA.**

The cytokinins kinetin, BA and FA (β-furylacrylic acid) reduced auxin-mediated hyponasty of the primary leaf blade of bean cv. Pinto. The inhibition of auxin-mediated hyponasty by cytokinins differed from that produced by auxin-transport inhibitors in time course, amount of inhibition and effective site of application. The growth response did not suggest polar movement of cytokinin or cytokinin inhibition of polar transport of auxin. Rather, both auxin and cytokinins mediate leaf expansion. The auxin response was rapid, geosensitive and differential, thereby affecting the planar form of the leaf blade. The cytokinin response was slow, with the greatest effect in interveinal tissue, thus promoting overall leaf expansion, counterbalancing hyponasty rather than directly inhibiting the dorsiventral auxin-transport system in the blade. (*Author's summary*) C02

0084

11961 KARMOKER, J.L. and STEVENINCK, R.F.M. VAN **The effect of abscisic acid on the uptake and distribution of ions in intact seedlings of *Phaseolus vulgaris* cv. Redland Pioneer.** Physiologia Plantarum 45:453-459. 1979. Engl., Sum. Engl., 22 Refs., Illus.

Phaseolus vulgaris. **Seedlings. Plant-growth substances. Cl. Na. Roots. Nutrient transport. Stems. Leaves. Cotyledons. Transpiration. Growth. Australia.**

ABA was found to increase the accumulation of ^{36}Cl, total Cl^-; ^{22}Na and total Na^+ in roots of intact bean seedlings. After an initial promotion, ABA inhibited long-distance transport of these ions from the root to the shoot; however, it consistently inhibited both uptake and transport of $^{42}K^+$ and total K^+ in intact bean seedlings. A promotion of net ^{36}Cl influx (Ψ_{OC}) and its accumulation in the root (Q^*_{γ}) with concomitant decrease in transport index (long-distance transport as % of total influx) showed that ABA stimulates ^{36}Cl transport at the tonoplast. It inhibited H^+ extrusion and net ^{86}Rb influx, which agrees with a cation exchange theory of K^+/Rb^+ transport. (*Author's summary*) C02

0085

13152 KAYS, S.J., WILLIAMS, J W. and DAVIS, D.R. **Harvest of dry beans in the pre-dry stage of development: effect on yield and processed product quality.** Journal of the American Society for Horticultural Science 105(1):15-17. 1980. Engl., Sum. Engl., 10 Refs., Illus.

Phaseolus vulgaris. **Harvesting. Yields. Processing. Plant development.**

The effect of time of harvest prior to complete field drying of dry bean cv. was analyzed relative to the quality of the processed product produced. Early harvest did not significantly affect yield (at 10% raw product moisture); however, it did have a significant effect on the quality of the processed product. Typically the processed dark red kidney and pinto beans were more intensely pigmented with later harvest dates, were firmer, and had fewer split seeds. The respiratory rate of the raw product was highly correlated (r = 0.993) with the raw product moisture level. Only small differences were found in the degree of pigmentation of the processed product when comparing the spring with the fall crop of pinto beans. The fall crop of pinto beans had a substantially lower incidence of split beans in the canned product. (*Author's summary*) C02

0086

13195 KRETCHMER, P.J., LAING, D.R. and JONES, P. **Estudio comparativo de *Phaseolus vulgaris* con ocho leguminosas de grano diferentes.** (*Comparative study of beans with eight different grain legumes*). Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980?. 11p. Span., Illus.

Phaseolus vulgaris. **Field experiments. Cultivars. Growth. Irrigation. Yields. Leaf area. Dry matter. Colombia.**

The growth of 9 grain legumes under irrigated conditions was analyzed at CIAT to evaluate bean efficiency in grain production. The representative genotypes of each sp. were selected from preliminary var. evaluations. The most efficient spp. in yield production/day were soybeans, cowpeas and beans whereas the pigeon pea had the highest absolute yield. LAD from emergence to physiological maturity was highly correlated with the yield, indicating that the efficiency of available leaf area (yield/LAD) was relatively similar for the 9 species. Rapid leaf area growth in beans contrasts with the slow leaf area growth in pigeon peas and superior growth in peanuts. Bean var. had one of the highest HI and the lowest production of DM of all the legumes studied. Based on this data, it was concluded that beans are extremely efficient in economic yield production as compared to other legumes. *(Author's summary. Trans. by L.M.F.)* C02

0087

11998 MARCOS FILHO, J. and PERRI JUNIOR, J. **Efeitos de tratamentos fungicidas sobre a germinação e o vigor de sementes de algodão** (*Gossypium hirsutum* L.), **arroz** (*Oryza sativa* L.) **e feijão** (*Phaseolus vulgaris* L.). (*Effect of fungicides on germination and vigor of cotton, rice and bean seed*). Solo 69(1):35-42. 1977. Port., Sum. Engl., Port., 12 Refs.

Phaseolus vulgaris. **Pesticides. Germination. Seed. Brazil.**

With regard to beans, seeds were treated with 150 g Rhodiauram (70% thiram) or 330-880 cm^3 Terra-Coat (23.2% PCNB + 5.8% ethazol)/ 100 kg seed. All treatments had a beneficial effect on seed vigor and germination, particularly at 330-440 cm^3. (*Summary by T.B.*) C02 D04

0088

11610 MORALES J., C.M. **Relación entre el tamaño de la semilla y el vigor de la misma en 20 variedades de fríjol** (*Phaseolus vulgaris* L.) **mediante el empleo del medidor de vigor MSS-110.** (*Relationship between seed size and vigor in 20 bean varieties*). Tesis Ing. Agr. Manizales, Universidad de Caldas. Facultad de Agronomía, 1979. 98p. Span., Sum. Span., 25 Refs., Illus.

Phaseolus vulgaris. **Germination. Seed characters. Cultivars. Agronomic characters. Seed color. Colombia.**

A comparison of vigor classifications (distributed in categories) as measured by the MSS-110 vigor analyzer and certain vigor indices (VIs) in the field was made using 21 bean var. with differences in seed size, shininess and shape. The seeds were hydrated until their moisture content was ≥ 35%, and testing continued until there were 120 seeds for each vigor category measured by the equipment. These seeds were then planted in a previously conditioned germinator in fields at CIAT, with = distances between furrows and = planting depth. After 19 days seedling height (SH), RGR, rate of germination and NAR were determined. The equipment operated well with regard to SH, RGR and rate of germination, but not for NAR. Significant positive correlations were found between the 1st 3 VIs and seed size; whereas the correlations between vigor categories and these same VIs presented the highest r values, which, as they were negative, established inverse relationships between the VIs and the vigor categories given by the MSS-110 equipment. Finally, independence was found between vigor classification, seed size and grouping of materials in the 1st 6 categories that the MSS-110 works with. Based on the VIs that worked best in this expt, some recommendations are presented, emphasizing possible future studies on mechanical damage, storage time and seed origin, using this equipment. (*Author's summary. Trans. by L.M.F.*) C02

0089

10673 MUIRHEAD, W.A. and WHITE, R.J.G. **Factors affecting the germination of beans (*Phaseolus vulgaris* L.).** Griffith, New South Wales, CSIRO, Division of Irrigation Research, 1978. 16p. Engl., 72 Refs.

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

Phaseolus vulgaris. **Germination. Seed characters. Climatic requirements. Cultivation. Injurious insects. Diseases and pathogens. Storage. Yields. Spacing. Cultivars. Mechanical damage. Water content. Fertilizers. Australia.**

The factors that affect bean germination are seed quality (composition, size, maturity and moisture content), environmental conditions (temp and RH), soil (physicochemical characteristics and microbiological activity), cultural practices (fertilizers, herbicides, irrigation and harvesting), insect pests and diseases, and storage. Selection is difficult because white-seeded french bean cv. are more attractive to the consumer. The production of healthy and vigorous seed requires careful management from its growth on the parent plant to its establishment in an adequate soil environment. (*Summary by F.G. Trans. by L.M.F.*) C02

0090

12691 PARDO, A.D. and SCHIFF, J.A. **Plastid and seedling development in SAN-9789 [4-chloro-5-(methylamine)-2-(α, α, α-trifluoro-*m*-tolyl)-3-(2*H*)-pyridasinone] - treated etiolated bean seedlings.** Canadian Journal of Botany 58:25-35. 1980. Engl., Sum. Engl., Fr., 44 Refs., Illus.

Phaseolus vulgaris. **Inhibitors. Carbohydrate content. Leaves. Plant development. USA.**

SAN-9789[4-chloro-5-(methylamine)-2-(α, α, α-trifluoro-*m*-tolyl)-3-(2*H*)-pyridasinone] inhibits carotenoid synthesis at the level of phytoene in beans. Although carotenoids are greatly reduced in the primary leaves, prolamellar bodies and thylakoid membranes are formed containing phototransformable protochlorophyll(ide), SAN-9789 also produces developmental effects similar to those of red light since seedlings treated in darkness are short, show plumular unhooking, formation of adventitious roots, expansion of primary leaves and full expansion of the 1st trifoliate leaf and 1st internode. The effect is not directly on phytochrome since far red light does not reverse the effect of SAN. If ABA is indeed formed from carotenoids, this may be the result of reduced levels of ABA leading to reduced ethylene production as occurs with red light. The 1st trifoliate leaf of SAN-treated plants contains practically no carotenoids (0.2%) compared with untreated 7-day-old, etiolated primary leaves yet shows normal development of etioplasts, prolamellar bodies, thylakoid membranes and phototransformable protochlorophyll(ide). In *Euglena,* lack of carotenoids stops synthesis and assembly of other membrane components; in higher plants this type of regulation does not appear to operate. *(Author's summary)* C02 C03

0091

12332 RAMALHO, M.A.P. and FERREIRA, M.M. **Comportamento de cultivares de feijão (*Phaseolus vulgaris* L.) em relação ao florescimento e vingamento das vagens.** (*Evaluation of bean cultivars in relation to flowering and flower set*). Ciência e Prática 3(1):80-84. 1979. Port., Sum. Port., Engl., 6 Refs.

Phaseolus vulgaris. **Flowering. Flours. Pods. Yields. Statistical analysis. Brazil.**

A comparison was made over a 2-yr period, of 5 bean cv. with regard to flowering and flower set in Lavras, Minas Gerais, Brazil, using a randomized complete block design with 4 replications. Pedicels of the open flowers of cv. Jalo, Rico-23, ESAL-1, Carioca and Pintado were tagged with a piece of yarn, using a different color for each count. Cv. were similar with regard to flowering, >

90% of the flowers occurring over a 10-day period. Flower set was very low (av 28%), being higher at the onset of flowering. (*Author's summary*) C02

0092

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

0093

11945 SCHIRACH-SZMIGIEL, L. VON **Alterations in endogenous levels of gibberellin-like substances during germination of *Phaseolus vulgaris* seeds.** Physiologia Plantarum 46:54-57. 1979. Engl., Sum. Engl., 13 Refs., Illus.

Phaseolus vulgaris. **Germination. Gibberellins. Seed. Analysis. Inhibition.**

The endogenous gibberellinlike substances were determined in mature dry and germinating bean seed cv. Alabaster. Methanol extracts were partitioned against ethyl acetate and butanol at neutral and acid pH. Each phase was individually chromatographed on a silica gel column. Gibberellin activity was measured with the Tan-ginbozu dwarf rice microdrop bioassay. Extracts from dry seeds showed the highest gibberellin activity, largely attributable to ethyl acetate-soluble substances. Activity was considerably reduced in extracts from seeds imbibed for 1 day. Gibberellinlike substances soluble in butanol appeared in extracts from seeds soaked for $\geq$1 day. (*Author's summary*) C02

0094

13561 SIDDIQUE, A. and GOODWIN, P.B. Seed vigour in bean (*Phaseolus vulgaris* L. cv. Apollo) as influenced by temperature and water regime during development and maturation. Journal of Experimental Botany 31(120):313-323. 1980. Engl., Sum. Engl., 10 Refs., Illus.

Phaseolus vulgaris. Laboratory experiments. Temperature. Irrigation. Seed characters. Developmental stages. Australia.

Bean plants grown in a controlled temp glasshouse at high temp (33/28, 30/25, or 27/22°C) during the period of seed development and maturation matured early and produced small seeds. The seeds were of lower vigour than those grown at 21/16 or 18/13°C. The detrimental effect of high maturation temp was observed even on plants bearing well-developed seeds (yellow, fleshy-pod stage). Seeds matured at high temp were also more susceptible to deterioration with delay in harvest, and to mechanical damage. Heavy watering of plants with seed ready to harvest caused a reduction in seed vigour. For optimum quality bean seed, it

appears essential that the seed develops and matures at cool temp, in a dry environment. *(Author's summary)* C02

0095

12679 SUGE, H. **Growth and gibberellin production in *Phaseolus vulgaris* as affected by mechanical stress.** Plant and Cell Physiology 19(8):1557-1560. 1978. Engl., Sum. Engl., 13 Refs., Illus.

Phaseolus vulgaris. **Gibberellins. Growth. Laboratory experiments. Cultivars.**

Mechanical stress produced by moderate stroking of the top of the plant for 1 min every morning for 29 days retarded growth and gibberellin production in the common bean. *(Author's summary)* C02

0096

11700 TOLLA, G.E. **Effect of post-bloom nutrient applications and recurrent selection on seed yield and seed protein in common bean (*Phaseolus vulgaris* L.).** Ph.D. Thesis. Madison, University of Wisconsin, 1978. 73p. Engl., 54 Refs.

Phaseolus vulgaris. **N. P. K. S. Leaves. Roots. Growth chamber experiments. Seed. Nutrient solution. Field experiments. Yields. Fertilizers. Proteins. Protein content. USA.**

Postbloom supplements of nutrient solution were applied to the foliage and near the root zone of 3 bean cv. The nutrient solution contained NPK and S in the approx ratio that these elements appear in bean seeds. Postbloom foliar applications of this solution did not increase either seed yield or % seed protein in 3 expt. However, postbloom root applications of the same solution increased yield significantly when the plants were grown under nutrient stress in the U. of Wisconsin Biotron and grown in the field at Hancock, Wis. Yield was not increased by postbloom root applications of nutrient solution in a biotron expt. in which plants were not under nutrient stress. Percentage seed protein was increased by applying nutrient solution to the roots in both biotron expt but not in the field expt. Three recurrent selection procedures for increasing yield and protein were performed. Two cycles of selection produced little increase in either seed yield or protein over the original population. Identification of high protein individuals within the highest yielding families during the selection phase of each cycle was compared with selection between families for both traits. The results suggest that gain/cycle may be greater using the former method. Populations were derived from recurrent selection with and without N fertilizer during the selection phase. These populations were compared with and without N fertilizer. Cycles 1 and 2 selected without N responded better (in terms of seed yield increase) to the addition of N. All seeds were inoculated with *Rhizobium* in the selection procedures and in the comparisons. *(Summary by Dissertation Abstracts)* C02

0097

12368 YOPP, J.H., COLCLASURE, G.C. and MANDAVA, N. **Effects of Brassin-complex on auxin and gibberellin mediated events in the morphogenesis of the etiolated bean hypocotyl.** Physiologia Plantarum 46:247-254. 1979. Engl., Sum. Engl., 35 Refs., Illus.

Phaseolus vulgaris. **Auxins. Indoleacetic acid. Gibberellins. Hypocotyls. Seedlings. Analysis. Cotyledons. Plant development.**

The excised, hooked bean hypocotyl was the system used to determine whether the auxin- and gibberellin-like effects of the lipoidal pollen extract, Brassin-complex (Br), were mediated through, or independent of, auxin and gibberellin. The morphogenetic events of hook opening and hypocotyl elongation in this system are regulated by auxin and gibberellin, resp. Br, like IAA, elicited a hook closure in the dark and retarded its opening in red light.

This effect was synergized by TIBA, IAA and the presence of the auxin-producing organs, the epicotyl and cotyledons. Br-elicited hook closure was inhibited by the antiauxin, PCIB. Both GA_3 and Br totally reversed the light inhibition of hypocotyl elongation. The GA_3 effect, but not the Br-elicited elongation, was overcome by Ancymidol. Hypocotyl elongation was partially inhibited by TIBA and PCIB, suggesting a possible auxin involvement also in this effect of Br. Br may elicit its growth responses through an effect on endogenous auxin levels. In this way it is different from other lipoidal growth regulators, such as the oleanimins, which require the presence of exogenous growth regulators for activity. *(Author's summary)* C02

See also 0002 0057 0073 0218 0224 0460

0098

12631 BOLOORFOROOSHAN, M. and MARKAKIS, P. **Protein supplementation of navy beans with sesame.** Journal of Food Science 44(2):390-391. 1979. Engl., Sum. Engl., 11 Refs.

Phaseolus vulgaris. **Proteins. Protein content. Diets. Laboratory animals. Analysis. Fat content. Ash content. Carbohydrate content. Amino acids.**

Feeding expt with weanling rats showed that the proteins of navy beans and sesame *(Sesamum indicum)* are mutually supplementary. Standard diets containing as the sole source of protein: beans (B); sesame (S); and mixtures of 87.5% B protein + 12.5% S protein and 75% B protein + 25% S protein and 50% B protein + 50% S protein resulted in the following PERs: 1.56, 1.19, 1.79, 2.26 and 2.30, resp., compared to 2.50 for casein. The NPR correlated almost perfectly (r =0.99) with PER. The amino acid scores by the method A/E correlated highly with both PER and NPR (r = 0.82 and 0.81, resp.). The amino acid scores by the method A/T correlated even better with PER and NPR (r = 0.96 and 0.97, resp.). *(Summary by Food Science and Technology Abstracts)* C03

0099

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

0100

13108 EGORIN, M.J. *et al.* ***Phaseolus vulgaris* isolectin binding to human erythrocytes.** Journal of Biological Chemistry 254(3):894-898. 1979. Engl., Sum. Engl., 32 Refs., Illus.

Phaseolus vulgaris. **Phytohaemagglutinins. Analysis. Human physiology. USA.**

Bean isolectins L_4, L_3E_1, L_2E_2, L_1E_3 and E_4 were isolated by affinity and ion exchange

chromatography. Pure isolectins were radiolabeled by the chloramine-T method with $Na^{125}IO_4$, and their binding to human erythrocytes was studied. A normal erythrocyte has approx 8 x 10^5 receptor sites/isolectin; however, the association constants (K_a) of binding increased from 1.1 x 10^7 M^{-1} to 3.8 x 10^8 M^{-1}, with increasing no. of E subunits/tetrameric isolectin molecule. Isolectin to erythrocyte binding reached equilibrium rapidly and was reversed by fetuin. All isolectins competed with ^{125}I-E_4 for erythrocyte binding sites, with a constant (K_1) similar to the K_a calculated for each resp. radiolabeled isolectin. When isolectin binding at 0, 4 or 8° was compared to that at 25°C, there was no reduction in the no. of binding sites/cell, but the K_a of E_4 was reduced to 3 x 10^7 M^{-1}. Fixed erythrocytes displayed similar isolectin binding characteristics. *(Author's summary)* C03

0101

12334 ELIAS, L.G., FERNANDEZ, D.G. DE and BRESSANI, R. **Possible effects of seed coat polyphenolics on the nutritional quality of bean protein.** Journal of Food Science 44(2):524-527. 1979. Engl., Sum. Engl., 29 Refs.

Phaseolus vulgaris. **Seed coat. Seed color. Tannin content. Analysis. Laboratory animals. Cooking. Protein content. Diets. Cultivars. Methionine. Digestibility. Phytohaemagglutinins. Costa Rica.**

Studies were carried out to determine the possible relationship between the seed coat color of beans and the nutritive value of its protein. Beans with white, red and black seed coats and a black-coated bean and its white mutant were chosen for the study. Hemagglutinin activity was located in the cotyledons of all samples with low activity in the seed coat. No activity was found in the cooked beans or in the cooking broth. Trypsin activity was influenced by a heat labile factor (true trypsin inhibitor) and by a heat-resistant factor (tannins). The heat labile factor or true trypsin inhibitor was higher in the cotyledons [16-18 trypsin inhibitor units (TIU)/mg sample] than in the seed coat, while the heat-resistant factor was found in highest concn in the seed coat. Red and black seed coats had a higher concn (23-31 TIU/mg sample) of the heat-resistant factor than did the white seed coat of the normal white bean and of the mutant (7-9 TIU/mg sample). Cooked beans and their broth showed TIA of the heat-resistant type. Cooked cotyledons had 5-9 TIU/mg sample. Tannin concn was high in colored seed coats (38-43 mg/g) and low in white-coated beans (1.3 mg/g) while values ranged from 3.8-5.9 mg/g in the cotyledons. A highly significant correlation (r = 0.88) was found between tannin concn in the seed coat and TIA. No correlation between these 2 components was found in the cotyledons. Samples of cooked beans supplemented with met without the cooking broth had higher protein quality values (2.9-3.3) than samples fed with the broth (1.7-2.1). Protein digestibility was lower for red (70.4%) and black beans (75.0%) fed with the broth than beans fed without the broth (78.7% and 77.9%, resp.), but the broth had no effect on the protein digestibility of white-coated beans (81.3 and 81.4%). The data suggest that seed coat color is related to the protein quality of beans. *(Author's summary)* C03 H00

0102

11924 EVANS, R.J. *et al.* **Methionine and cystine contents of bean (*Phaseolus*) seed.** Journal of Agricultural and Food Chemistry 26(5):1234-1237. 1978. Engl., Sum. Engl., 24 Refs.

Phaseolus vulgaris. **Methionine. Cystine. Seed. Proteins. N. Protein content. Analysis.**

An improved method for determining met and cystine in *Phaseolus* spp. seeds is described. In an analysis of 544 samples of *Phaseolus* seeds, met contents of air-dried seeds ranged from 0.16-0.33%, met + cystine from 0.29-0.56% and crude protein (CP) 16.1-33.9%. Met in seed proteins ranged between 0.51-1.24% and met + cystine between 1.17-2.49%. Using 198 samples of *P. vulgaris* seeds collected worldwide, a significant correlation coefficient of -0.439 was found

between protein and met and a correlation coefficient of -0.531 between protein and met + cystine. (*Summary by Plant Breeding Abstracts*) C03

0103

12341 FURR, A.K. *et al.* **Elemental content of apple, millet, and vegetables grown in pots of neutral soil amended with fly ash.** Journal of Agricultural and Food Chemistry 27(1):135-138. 1979. Engl., Sum. Engl., 22 Refs.

Phaseolus vulgaris. **B. Cu. Co. Fe. Mg. Mn. Se. Zn. Mineral content. Ash content. Analysis. Soil analysis. Soil fertility.**

In pot trials a no. of plant spp. including *Phaseolus vulgaris* cv. Long Tendergreen, *Echinochloa crus-galli* var.*frumentacea* and potato cv. Katahdin were grown in a Teel silt loam amended with coal fly ash. Analysis of plant tissues for 38 elements showed enhanced absorption of B, Cu, Co, Fe, Mg, Mn, Mo, Se and Zn associated with the fly ash amendment. The magnitude of absorption of specific elements was influenced by soil pH. (*Summary by Field Crop Abstracts*) C03 D01

0104

12391 HARGREAVES, J.A. **Investigations into the mechanism of mercuric chloride stimulated phytoalexin accumulation in *Phaseolus vulgaris* and *Pisum sativum*.** Physiological Plant Pathology 15:279-287. 1979. Engl., Sum. Engl., 17 Refs., Illus.

Phaseolus vulgaris. Pisum sativum. **Phytoalexins. Hg. Seed coat. Germination. Cotyledons. Analysis. Cell structure.**

Phaseollin and pisatin accumulated in bean and pea cotyledons, resp., after incubation at 25°C following treatment with mercuric chloride. Both the duration of treatment and concn of mercuric chloride determined max phytoalexin concn. Highest levels of both phytoalexins occurred when cell damage caused by mercuric chloride was microscopically visible. With increasing amounts of dead cells, the concn of phytoalexins decreased, and in some treatments no phytoalexins were formed even when some tissue was still alive. The accumulation of phaseollin appeared to be more closely associated with cell death than the accumulation of pisatin. Treatment of cotyledons with mercuric chloride under optimal conditions for phytoalexin formation (10^{-3} M for 30 min) led to a loss of electrolytes during the initial 12 h, and to the continuous accumulation of phytoalexins over 5 days. Exudates from mercuric chloride treated cotyledons of both species stimulated phytoalexin accumulation in cut cotyledon bioassays. The results are discussed in relation to current views on the mechanism of phytoalexin accumulation. *(Author's summary)* C03

0105

13518 HOSFIELD, G.L. and UEBERSAX, M.A. **Variability in physico-chemical properties and nutritional components of tropical and domestic dry bean germplasm.** Journal of the American Society for Horticultural Science 105(2):246-252. 1980. Engl., Sum. Engl., 22 Refs., Illus.

Phaseolus vulgaris. **Seed coat. Cultivars. Canned beans. Protein content. Ash content. Water content. Cooking. USA.**

Food-quality comparisons between tropically adapted genotypes of dry bean and accessions from domestic breeding agencies showed there is sufficient variability in important nutritional and canning traits among tropical beans to justify their use in temperate-climate breeding programs. Specifically, tropical bean germplasm may be of use to transfer stress tolerance and lodging resistance to commercially acceptable genotypes while the breeder is simultaneously breeding to maintain or improve nutritional composition and canning quality. Seed of 35 bean accessions representing plant introductions, breeding lines, and cv. were

screened for proximate chemical composition, yield, and several horticultural characters. Seventeen of these accessions, including several commercial dry bean cv., were selected for canning evaluations. Beans were adjusted to 16% moisture before soaking and processing. Soaked and processed beans were evaluated for water uptake, texture (with a Kramer Shear Press), and general canning quality. Protein content was highest in domestically adapted beans (31%) and lowest in the nonblack tropical array of genotypes (22%). Tropical beans showed a greater tendency to clump in the can after cooking. This indicates excessive breakdown of tropical beans during thermal processing. Nonsignificant correlation coefficients indicated that textural differences and soaking properties of the beans were not associated; however, textural differences were correlated with the final moisture % in processed tropically adapted beans. Several tropical genotypes were much firmer or much softer after cooking than 'Sanilac', which is considered the industry standard for making canning comparisons. Further evaluation of texture by examining Kramer Shear Press tracings showed that textural differences among genotypes could be broken down into a configuration showing a large shear force component, and a curve characterized by mostly compression. The curve types appeared to be a characteristic of the genotype rather than of seed-coat color, size of bean, or final moisture %. *(Author's summary)* C03

0106

13107 HOVE, E.I. and KING, S. **Trypsin inhibitor contents of lupin seeds and other grain legumes.** New Zealand Journal of Agricultural Research 22:41-42. 1979. Engl., Sum. Engl., 6 Refs.

Phaseolus vulgaris. **Trypsin. Inhibitors. Legume crops. Laboratory animals. Proteins. Analysis.**

Analyses for trypsin inhibitor were carried out on legume seeds previously evaluated nutritionally in rat growth studies. *Phaseolus lunatus* and 3 var. of *P. vulgaris* had 10-20 mg/g. Pinto beans had an inhibitor level of 2.0-3.5, within the range of field peas and broad beans (*Vicia faba*). Beans and peas had no detectable trypsin inhibitor after boiling in water for 1 h and freeze drying. *(Extracted from author's summary)* C03 H00

0107

13558 KATAGIRI, K. and TSUJI, H. **Increase in DNA content of primary leaves of *Phaseolus vulgaris* upon decapitation.** Journal of Experimental Botany 31(120): 209-222. 1980. Engl., Sum. Engl., 30 Refs., Illus.

Phaseolus vulgaris. **Laboratory experiments. DNA. RNA. Chlorophyll. Leaf area. Chloroplasts.**

Changes in DNA content of bean primary leaves after decapitation were investigated. When apical buds were removed at 11 days,DNA content/leaf increased by about 20%at 15 days and then decreased in parallel with the controls. The RNA and chlorophyll contents, fresh wt, and leaf area expressed on a single leaf basis changed in the same manner as the DNA content in response to decapitation. But when both apical and lateral buds were removed, all these values continued increasing during the test period. Thus, growing lateral and apical buds have the same effect on the DNA change in primary leaves as that due to ageing of the leaves. Cell no./leaf was not increased by any treatment, indicating that the observed increase in the DNA content of primary leaves is ascribable to an increase in DNA/cell. Next, the whole shoots above the nodes of primary leaves were removed at various ages. The response of primary leaves to decapitation varied according to their age. With age, they lost the ability to increase their fresh wt, area, and chlorophyll content but not their DNA and RNA contents in response to decapitation. Decapitation stimulated chloroplast replication only within the period in which chloroplasts were replicating in control leaves, but it induced chloroplast enlargement at any age. Therefore, the increase in DNA content after decapitation may be partially due to an increase in the amount of chloroplast DNA. When stems were heat-girdled above the nodes of the primary leaves, these leaves showed re-

sponses similar to but smaller than those to decapitation. The senescence of primary leaves seems to be controlled by the distribution of substances which are transported from the roots. *(Author's summary)* C03

0108

2759 LAI, C.C. and VARRIANO-MARSTON, E. **Studies on the characteristics of black bean starch.** Journal of Food Science 44(2):528-530. 1979. Engl., Sum. Engl., 8 Refs., Illus.

Phaseolus vulgaris. **Starch content. Analysis. Water content. Ash content. Mineral content. N. Yields. Cooking. USA.**

The physicochemical properties of black bean starch were studied. Isolated bean starch had a high amylose content (38%), a high gelatinization temp range (63.8-76°C) and relatively low swelling (11 units at 95°C) and solubility (18% at 95°C) patterns. These data suggest that inherent structural characteristics of the starch contributed to limited in situ starch gelanitization and swelling during cooking. *(Author's summary)* C03

0109

12350 LETHAM, D.S. *et al.* **Regulators of cell division in plant tissues. XXVII. Identification of an amino-acid conjugate of 6-benzylaminopurine formed in *Phaseolus vulgaris* seedlings.** Planta 146:71-74. 1979. Engl., Sum. Engl., 9 Refs., Illus.

Phaseolus vulgaris. **Cytokinins. Metabolism. Leaves. Seedlings. Analysis. Petioles. Plant tissues. Amino acids. Australia.**

6-[^{3}H]Benzylaminopurine was supplied through the transpiration stream to derooted bean seedlings. The principal metabolite formed was identified as β-(6-benzylaminopurin-9-yl) alanine by comparison with the synthetic compound. *(Author's summary)* C03

0110

12349 LEWIS, L.N. and KOEHLER, D.E. **Cellulase in the kidney bean seedling.** Planta 146:1-5. 1979. Engl., Sum. Engl., 20 Refs., Illus.

Phaseolus vulgaris. **Seedlings. Enzymes. Cotyledons. Stems. Leaves. Roots. Analysis. Auxins.**

Several parts of the 12-day-old seedling of bean cv. Red Kidney were surveyed for cellulase activity. The laminar abscission zone and the cotyledon were highest in total cellulase while the petiole, stem, leaf and root had lesser activity. A portion of the cellulase from each tissue was associated with a membrane fraction which equilibrated on a sucrose density gradient at a density of 1.16 g/cm^3. Fortification of the buffer with 1 M NaCl was necessary for complete extraction of cellulase from all tissues. Ethylene treatment enhanced cellulase activity in the laminar abscission zone, the petiolar pulvinus, and somewhat in the stem, but not in the petiole or the nodal region of the stem. Thus those tissues that are target tissues for ethylene action also showed ethylene-enhanced cellulase activity. *(Author's summary)* C03

0111

13520 LORD, E.M. and WEBSTER, B.D. **The stigmatic exudate of *Phaseolus vulgaris* L.** Botanical Gazette 140(3):266-271. 1979. Engl., Sum. Engl., 52 Refs., Illus.

Phaseolus vulgaris. **Laboratory experiments. Analysis. Stigma. Amino acids. Protein content.**

The stigmatic exudate of the bean cv. Light Red Kidney included lipids, amino acids,

protein, reducing acids, phenols and sugar. Alkaloids were not present. In addition to its primary role in the retention and germination of pollen, the exudate may function as a nutritive source for floral visitors, including thrips and bees, and as a protectant against desiccation of the stigma and against invasion by undesirable insects or spores. *(Author's summary)* C03

0112

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

0113

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

0114

13554 MUTSCHLER, M.A., BLISS, F.A. and HALL, T.C. **Variation in the accumulation of seed storage protein among genotypes of *Phaseolus vulgaris* (L.).** Plant Physiology 65:627-630. 1980. Engl., Sum. Engl., 25 Refs., Illus.

Phaseolus vulgaris. **Cultivars. Plant physiological processes. Proteins. Analysis. Cotyledons. USA.**

Differences in the accumulation of total seed protein and globulin-1 (G1) protein were detected among 3 inbred lines of common bean. Total protein accumulation ranged from 2.3-3.7 mg/cotyledon pair/day among lines. In all lines the dry wt and protein accumulation ceased and a loss of chlorophyll in the cotyledons occurred when the MC had fallen to 50% of fresh wt. G1 was 1st detected and rapid accumulation began 14 days after flowering in 2 lines, whereas in the cv. Endogava zurundi namame, rapid accumulation was delayed until 20 days after flowering. Rates of G1 accumulation ranged from 1.0-1.8 mg G1/cotyledon pair/day among lines. G1 accumulation ceased 6 days before the end of total protein accumulation in Sanilac. A steady rate of protein accumulation was observed in Sanilac, but pauses in the accumulation of G1 and of total protein were documented in Endogava zurundi namame. The rate of G1 accumulation preceding and following the pause in Endogava zurundi namame was 2.7 mg G1/cotyledon pair/day, nearly double that of the other lines. *(Author's summary)* C03

0115

12699 NAIVIKUL, O. and D'APPOLONIA, B.L. **Carbohydrates of legume flours compared with wheat flour. III. Nonstarchy polysaccharides.** Cereal Chemistry 56 (2):45-49. 1979. Engl., Sum. Engl., 24 Refs., Illus.

Phaseolus vulgaris. **Legume crops. Carbohydrate content. Protein content. Bean flour.**

The yield of total water extractable material and recovery of crude water-soluble nonstarchy polysaccharides (WSNP) from legume flours was higher than that obtained from hard red spring (HRS) wheat flour. The yield of amylase-treated WSNP from legume flours, however, was lower than values reported for HRS wheat flour. The yield and sugar composition of the diethylaminoethyl-cellulose fractions obtained for each purified WSNP from the various legume flours were different from those obtained for wheat flour. The navy and pinto bean WSNP were composed mainly of arabinose and some xylose, glucose and galactose. The faba bean WSNP were composed primarily of glucose. Mannose was present only in lentil WSNP that also contained the sugars, arabinose, xylose, galactose and a trace amount of glucose. The mung bean WSNP were composed of polymers containing glucose, arabinose and xylose. Paper and GLC of the various hydrolyzed legume water-insoluble nonstarchy polysaccharides (WINP) revealed that pinto and navy bean WINP were composed of the same sugars as those in WSNP, whereas faba bean, lentil and mung bean showed a different sugar composition between WINP and WSNP. Faba bean, lentil and mung bean papain-treated WINP contained primarily glucose and only trace amounts of arabinose and xylose. *(Author s summary)* C03

0116

13560 NESS, P.J. and WOOLHOUSE, H.W. **RNA synthesis in *Phaseolus* chloroplasts. II. Ribonucleic acid synthesis in chloroplasts from developing and senescing leaves.** Journal of Experimental Botany 31(120):235-245. 1980. Engl., Sum. Engl., 25 Refs., Illus.

Phaseolus vulgaris. **Leaves. Chloroplasts. RNA. Age. Chlorophyll.**

The rate of RNA synthesis in chloroplasts from the primary leaves of bean cv. Canadian Wonder was measured in vitro as plant age increased. The rate/leaf began to fall before the leaf was 70% expanded. At full expansion, activity had fallen by 70% . Chloroplast RNA synthesis/unit chlorophyll was falling before the leaf was 25% expanded. When all parts of the plant above the mature primary leaves were removed (detopping) chloroplast RNA synthesis in these leaves rose within 36 h. The rate increased to a max 3-4 days after detopping, when it was 5-10 times control values; thereafter it fell again. The chlorophyll content began to increase ca. 4 days after detopping, eventually rising by 100%. Detopping caused a 3-fold increase in the Triton X-100-soluble DNA content of chloroplast preparations, measured after 3-5 days. At that time the rate of RNA synthesis/unit Triton-soluble DNA was the same in chloroplasts from the primary leaves of intact and detopped plants. Detopping also resulted in an increase in the depth of the leaf palisade layer. The effects of detopping on chloroplasts were prevented by darkness and reduced by shading. Increased chloroplast RNA polymerase activity was also induced in the primary leaves by placing a polythene bag over intact plants, enclosing everything above these leaves. Removal of the roots from detopped plants prevented the rise in the rate of chloroplast RNA synthesis. *(Author's summary)* C03

0117

13114 PAAU, A.S., ORO, J. and COWLES, J.R. **DNA content of free living rhizobia and bacteroids of various *Rhizobium*-legume associations.** Plant Physiology 63:402-405. 1979. Engl., Sum. Engl., 24 Refs., Illus.

Phaseolus vulgaris. **DNA.** ***Rhizobium leguminosarum. Rhizobium.*** **Nodulation.**

The DNA content of bacteroids from 22 different *Rhizobium*-legume associations was

compared with that of the corresponding free-living *Rhizobium* spp. using laser flow microfluorometry. In all 18 effective associations the bacteroids had either similar or higher DNA content than the free-living rhizobia. Bacteroid populations isolated from effective white clover and lucerne nodules had an av DNA content of > 1.5-fold higher than free-living *R. trifolii* and *R. meliloti*. These populations also contained a significant no. of bacteroids with > 3-fold the DNA content of the free-living rhizobia. Populations isolated from effective nodules of winged beans *Psophocarpus tetragonolobus*, peas and mung beans had an av DNA content of 1.1- to 1.5-fold higher than free-living cowpea rhizobia and *R. leguminosarum*. Bacteroids from nodules of *Lupinus angustifolius* and *L. minaretta*, kidney beans and soybeans, however, had DNA content similar to the free-living forms. Two of the 4 associations which formed ineffective nodules contained bacteroids with lower DNA content than the free-living rhizobia. The other 2 associations contained bacteroids with slightly higher or similar DNA content to the free-living rhizobia. Nodules of the ineffective associations also did not contain leghemoglobin. *(Author's summary)* C03 101

0118

12396 PUSZTAI, A. *et al.* **Nutritional evaluation of kidney beans (*Phaseolus vulgaris*): chemical composition, lectin content and nutritional value of selected cultivars.** Journal of the Science of Food and Agriculture 30:843-848. 1979. Engl., Sum. Engl., 25 Refs., Illus.

Phaseolus vulgaris. Amino acids. N. Mineral content. Seed. Nutritive value. Laboratory animals. S. Digestibility. Phytohaemagglutinins. Electron microscopy. Cultivars.

The chemical composition, lectin content and nutritional value of selected bean cv. were determined. Mainly due to different amounts of reserve globulins deposited, seed N content varied from 3.4-5.0%. The amino acid composition and the corresponding chemical score values of 40-60, however, were similar for all the beans, with the sulfur-containing amino acids limiting. Despite similarities in composition, 11 out of the 13 cv. examined were highly toxic for rats in the raw state. These were all found to contain high concn of hemagglutinating lectins (over 10% of the total protein). On the other hand, 2 low-lectin bean var. (Pinto III and Great Northern) had no appreciable disruptive effects on the intestines and were essentially nontoxic for rats. *(Author's summary)* C03 H00

0119

12630 SGARBIERI, V.C., ANTUNES, P.L. and ALMEIDA, L.D. **Nutritional evaluation of four varieties of dry beans.** Journal of Food Science 44(5):1306-1308. 1979. Engl., Sum. Engl., 16 Refs.

Phaseolus vulgaris. Cultivars. Nutritive value. N. Amino acids. Mineral content. Analysis. Fe. Laboratory animals. Enzymes.

Data on proximate composition, distribution of nitrogenous compounds, amino acid composition, nutritional values and available Fe content are tabulated for the dry bean cv. Rico 23, Rosinha-G2, Carioca and Piratã-1. The nutritional quality of the protein was generally highest in Rico 23. *(Summary by Field Crop Abstracts)* C03 H00

0120

13509 SILVA, H.C. and LUH, B.S. **Changes in oligosaccharides and starch granules in germinating beans.** Canadian Institute of Food Science and Technology Journal 12(3):103-107. 1979. Engl., Sum. Engl., Fr., 19 Refs., Illus.

Phaseolus vulgaris. Germination. Sugars. Starch content. Cotyledons. USA.

The effect of germination on oligosaccharides and starch granules in *Vigna sinensis* and *Phaseolus vulgaris* var. Gloria was investigated. The changes in starch granules in germinating

cotyledons were viewed with a scanning electron microscope. The levels of sucrose, raffinose and stachyose in dry black eye beans were 3.0, 0.95 and 0.93%, and those in pink bean dry seeds were 1.75, 0.20 and 0.22%, resp. Raffinose and stachyose decreased while sucrose and fructose increased during germination of the beans. Sucrose content decreased after germination for 4 days. Extraction of the sugars by the soaking medium was observed. Scanning electron microscopy showed alterations affecting the surface and the entire granule of starch in cotyledons of the beans germinated for 8 days. *(Author's summary)* C03

0121

12387 SUN, S-M.S. **Isolation of physical and chemical characterization of globulins from *Phaseolus vulgaris* seed.** Ph.D. Thesis. Madison, University of Wisconsin, 1974. 134p. Engl., Sum. Engl., 60 Refs., Illus.

Phaseolus vulgaris. **Seed. Gibberellins. Amino acids. Carbohydrate content.**

Two globulin fractions, G1 and G2, obtained from french bean seed by an ascorbate-NaCl extraction procedure developed in this lab (McLeester *et al.*, 1973) were characterized in respect to the following physicochemical properties: solubility, electrophoretic profile; amino acid content, carbohydrate content, mol wt, configurational and conformational changes, and genetical control of polypeptide subunit structure. Both G1 and G2 were found to possess some properties in common. These include the requirement of salt for solubilization; a low content of the sulfur-containing amino acids met and cystine, a high level of aspartic and glutamic acids, and the presence of carbohydrate. Both fractions undergo pH-dependent dissociation and have principally random coil and β-structure, properties that have been noted for globulins from several other legume seeds. Despite the above similarities, these 2 fractions were found to differ from their equivalent globulin fractions from other legume seeds in their electrophoretic profiles, mol wt and subunit structure. Moreover, they differed from each other in regard to the following properties: the G1 globulin requires a higher salt concn than does the G2 fraction for solubilization; they have different isoelectric points (G1, 4.4-5.6; G2, 3.8); and the G1 fraction contains 2.9% sugar and 0.6% hexosamine, while the G2 fraction contains 4.9% sugar and 1.3% hexosamine. Furthermore, the G1 fraction is capable of pH-dependent reversible dissociation between tetrameric (18.2S, mol wt. 654,000) protomeric (7.1S, mol wt. 163,000), and peptide (3.0S, mol wt 44,000) configuration forms, while the G2 fraction (6.6S, mol wt 143,000) does not undergo reversible dissociation, but irreversible dissociates into its peptide components (1.6S, mol wt 16,500) at pH 13.0. The ionization of the buried tyrosine residues in G1 globulin is a time-dependent process while that in the G2 fraction is not; and the G2 fraction appears to contain more random coil and β-structure, and less α-helix than does the G1 globulin. The G1 globulin consists of 3 polypeptide subunits with mol wt 53,000, 47,000, 43,000 while the G2 appears to consist of one major polypeptide with a mol wt 32,000. A preparative SDS gel electrophoresis system was developed in this study which permitted the quantitative isolation of the subunits of G1 globulin. This procedure will also be of value for other proteins having polypeptide subunits whose mol wt differ little from each other. Differences in the polypeptide subunit structure of G1 globulin for some cv. appear to be under the control of one pair of alleles as judged by evidence from electrophoretic patterns of single-seed extracts. Substantiation of genetical differences in definitively characterized seed proteins will be of use to plant breeders in the development of nutritionally enhanced bean plants, and represent a necessary step in understanding the regulation of higher plant protein synthesis at the molecular level. *(Summary by Dissertation Abstracts)* C03

0122

4670 VARRIANO-MARSTON, E. and OMANA, E. DE **Effects of sodium salt solutions on the chemical composition and morphology of black beans (*Phaseolus vulgaris*).** Journal of Food Science 44(2):531-536. 1979. Engl., Sum. Engl., 30 Refs., Illus.

Phaseolus vulgaris. **Salinity. Plant anatomy. Analysis. Seed color. Water content. Electron microscopy. Fat content. Statistical analysis. Mineral content. Water absorption.**

The effect of Na salts on the chemistry and morphology of black beans was studied. The amount of Na in the soaking water did not significantly affect the amount of water absorbed by beans; the pH was the critical determinant. However, the Na salts affected the mineral content as well as the amount of pectic substances solubilized from the beans during soaking and cooking periods. The greatest alterations in these components occurred when beans were soaked in a solution containing 4 salts (NaCl, $NaHCO_3$, Na_2CO_3 and $Na_5P_3O_{10}$). X-ray microanalysis suggested that mechanisms of ion exchange and chelation were operative in the dissolution of the intercellular cement and the subsequent cell separation. *(Author's summary)* C03 C01

0123

4654 WAINES, J.G. **Protein contents, grain weights, and breeding potential of wild and domesticated tepary beans.** Crop Science 18(4):587-589. 1978. Engl., Sum. Engl., 18 Refs.

Phaseolus vulgaris. Phaseolus acutifolius. **Protein content. Cultivars. Seed. Yield components. Plant breeding.**

Protein contents and 1000 grain wt of wild and domesticated tepary beans (*Phaseolus acutifolius*) were compared with values for domesticated common beans (*P. vulgaris*). The wild teparies tested had significantly > mean protein values, but significantly < grain wt than the domesticated teparies. Domesticated teparies had a > range of protein values than the wild teparies. Wild and domesticated teparies had significantly < mean protein contents and much < mean grain wt than the cv. of *P. vulgaris* tested. Only in cv. of common bean were protein content and grain wt significantly negatively correlated. *(Summary by Food Science and Technology Abstracts)* C03 G00

0124

13590 WATERS JUNIOR, L. *et al.* The effect of rice-hull mulch on growth, carbohydrate content, and nitrogen fixation in *Phaseolus vulgaris* L. HortScience 15(2):138-139. Engl., Sum. Engl., 9 Refs., Illus.

Phaseolus vulgaris. **Field experiments. Mulching. Soil temperature. Soil water. Yields. Carbohydrate content. Nitrogen fixation.**

Mulching 'Puebla 152' beans with rice hulls to a depth of 4 cm reduced afternoon soil temp, soil temp fluctuation, and slowed the loss of soil moisture. These effects were greatest prior to canopy closure. Fresh wt of nodules, roots, stems, leaves, and total plant increased 50, 38, 49, 24 and 38%, resp. with mulching, but pod and final seed wt were unaffected. Mulching had little effect on the concn of soluble and insoluble carbohydrates. N_2 fixation rates (C_2H_2 reduction) were low (< 0.6 μmole/plant/h) but were as much as 3 times higher in mulched than unmulched plants. *(Author's summary)* C03

See also 0007 0053 0056 0059 0072 0074 0090 0169 0434 0451 0453 0454 0455 0473 0476

D00 AGRONOMY

0125

11137 APOLITANO S., C. **El cultivo de menestras en el Departamento de Lambayeque.** *(Legume cultivation in the state of Lambayeque).* Chiclayo, Perú. Centro Regional de Investigación Agropecuaria del Norte. Estación Experimental de Vista Florida. Manual no. 4. 1977. 55p. Span.

Phaseolus vulgaris. **Legume crops. Production. Soil preparation. Cultivation. Injurious insects. Diseases and pathogens. Yields. Planting. Spacing. Disease control. Insect control. Peru.**

Edible grain legumes or pulse crops (beans, chickpeas and peas) occupy large areas in N. Peru. These species are outstanding for their high protein content, but their yields are low. On the basis of the results of 5 yr of expt at the Estación Experimental de Vista Florida, recommendations are given on the crops in relation to planting time and densities, weed control, fertilizer application, irrigation, harvesting, production alternatives, rotational systems, utilization of var. adequate for the zone, and chemical control of the principal pests and diseases. *(Summary by J.E.Z. Trans. by L.M.F.)* D00 E01 F01

0126

2669 BULISANI, E.A., MIYASAKA, S. and ALMEIDA, L.D'A. **Instruções práticas para a cultura do feijão.** *(Practical instructions for bean cultivation).* Campinas-SP, Brasil. Instituto Agronômico de São Paulo. Boletim no. 195. 1971. 12p. Port.

Phaseolus vulgaris. **Climatic requirements. Spacing. Planting. Cultivars. Soil preparation. Fertilizers. Cultivation. Diseases and pathogens. Injurious insects. Harvesting. Storage. Brazil.**

Technical recommendations are given to increase bean production in the state of São Paulo (Brazil) in relation to climate, incorporation of OM to reduce temp variations and increase the capacity of water retention, soil preparation, planting time and distances, fertilization, cultural practices, improved var., chemical pest and disease control, harvesting and storage. *(Summary by J.E.Z. Trans. by L.M.F.)* D00

0127

12638 FERNANDEZ H., M. **El cultivo del fríjol en el estado de Chihuahua; recomendaciones generales.** *(Bean cultivation in the state of Chihuahua: general recommendations).* Ciudad de México, Centro de Investigaciones Agrícolas del Noreste. Circular CIANE no. 57. 1974. 2p., Span.

Phaseolus vulgaris. **Soil preparation. Cultivars. Spacing. Planting. Fertilizers. Injurious insects. Chemical control. Mexico.**

Recommendations are given on bean planting in 2 seasons (June 25-July 15; July 16-25) on the basis of research conducted in the Valle de Cuauhtémoc (Mexico): soil preparation, var., cultural practices and chemical control of *Empoasca fabae, Diabrotica balteata, Liriomysa* spp. and *Apion godmani.* *(Summary by J.E.Z. Trans. by L.M.F.)* D00 F01

0128

10393 GALVAN C., F. **Logros obtenidos por el Programa de Leguminosas Comestibles en el cultivo del frijol en el Campo Agrícola Experimental de Río Bravo.** (*Results of research on beans by the Edible Legume Program at the Río Bravo Experimental Station).* *In* Reunión del Departamento de Leguminosas Comestibles, Culiacán, México, 1976. Memoria. Chapingo, Instituto Nacional de Investigaciones Agrícolas, 1976. pp.116-122. Span.

Phaseolus vulgaris. **Yields. Research. Planting. Cultivars. Spacing. Adaptation. Mexico.**

In 1953, yield and adaptation trials of 10 var. were initiated at the Río Bravo Exptl Station. Experiments on fertilization, inoculants, planting methods and density, genetic improvement, evaluations of breeding lines obtained by individual plant selection, distance between rows, planting dates and yields trials have been carried out. The negative effect of excess humidity is decreased by planting on ridges between furrows. (*Summary by F.G. Trans. by L.M.F.*) D00

0129

12353 KUENEMAN, E.A. and WALLACE, D.H. **Simplified growth analysis of non-climbing dry beans at three spacings in the tropics.** Experimental Agriculture 15:273-284. 1979. Engl., Sum. Engl., 7 Refs.

Phaseolus vulgaris. **Spacing. Growth. Genotypes. Plant habit. Yields. Anthesis. Statistical analysis. Leaves.**

Growth characteristics of dry bean genotypes of determinate (Type I), indeterminate small vine (Type II) and indeterminate large vine (Type III) types were evaluated over 3 spacings and 2 growing seasons. Type I did not give increased yields in response to planting rows closer together in Trial II because there was a large decrease in HI, which did not occur for Types II and III. Accumulation of reproductive nodes prior to anthesis is important for high yields, as are biological yield, HI and leaf area. Within habit spacing combinations, factors such as flowering duration, branch, leaf and raceme no., and stem length could not be used to predict yield. (*Author's summary*) D00 D05

0130

11644 **TECNOLOGIA DE máxima producción para frijol voluble.** (*Technology for maximum production in climbing beans*). Cali, Colombia, Centro Internacional de Agricultura Tropical, 1979. 6p. Span., Illus.

Phaseolus vulgaris. **Climbing beans. Yields. Spacing. Fertilizers. Herbicides. Pest control. Colombia.**

The min factors necessary to obtain high yields are briefly described for climbing beans on the basis of expt conducted at CIAT at an alt of 1000 m, av rainfall of 1000 mm and av temp of 25°C: trellis system (vertical bamboo supports with 2 wires to hold up a polypropylene or sisal mesh); planting density of 120,000 plants/ha; methodology for soil and foliar applications of fertilizer; the use of herbicides, irrigation, pest and disease control. (*Summary by J. E. Z. Trans. by L. M. F.*) D00

See also 0191

D01 Soil, Water, Climate and Fertilization

0131

11135 ABELLAN C., E.E., VIVES F., L.A. and CHACON Z., A. **Influencia climática en la producción de biomasa y grano en frijol común** (*Phaseolus vulgaris* L.). (*Climatic influence on biomass and seed production in beans*). Alajuela, Costa Rica. Estación Experimental Agrícola Fabio Baudrit M. Boletín Técnico v. 10, no. 1, 1977. 26p. Span., Sum. Span., 38 Refs., Illus.

Phaseolus vulgaris. **Climatic requirements. Seed production. Solar radiation. Soil temperature. Rainfall data. Yields. Timing. Biomass. Costa Rica.**

In field trials carried out at the Estación Experimental Agricola Fabio Baudrit Moreno, bean cv. Jamapa was sown on 11 dates at 10-day intervals from Nov. 7, 1974 to Feb. 15, 1975 in rows 50 cm. apart. Plants were thinned to 10 cm apart and irrigated every 10 days. Highest values for biomass production of 140, 130.3 and 123.6 g/m of row followed sowings on Feb. 6, Nov. 7 and Feb. 15, resp, and highest seed yields of 59.1, 56.3 and 42 g/m of row followed sowings on Jan. 16, Dec. 17 and Dec. 27, resp; whereas the highest HI values were 53.4% for Dec. 17 and 58.8% for Jan. 16. The optimum sowing dates in terms of seed yield were those giving only intermediate biomass production. Seed yields were significantly related to energy factors in the climate. *(Summary by Field Crop Abstracts)* D01

0132

10348 BRETELER, H. and CATE, C.H.H.T. **Fate of nitrate during initial nitrate utilization by nitrogen-depleted dwarf bean.** Physiologia Plantarum 48:292-296. 1980. Engl., Sum. Engl., 27 Refs., Illus.

Phaseolus vulgaris. **Nutrient absorption. N. Laboratory experiments. Enzymes.**

The fate of nitrate and N-15 was followed during the apparent induction phase (6 h) for nitrate uptake by N-depleted dwarf bean cv. Witte Krombek. Expt were done with intact plants and with detached root systems. Qualitatively and quantitatively, xylem exudation from detached roots was a bad estimate of the export of NO_3^- or NO_3^--^{15}N from roots of intact plants. In vivo nitrate reductase activity (NRA) agreed well with in situ reduction, calculated as the difference between uptake and accumulation in whole plants, provided NRA was assayed with merely endogenous nitrate as substrate ("actual" NRA). The majority (75%) of the entering nitrate remained unmetabolized. Both nitrate reduction and accumulation occurred predominantly in the root system. Some (< 25%) of the root-reduced nitrate-N was translocated to the shoot. Nitrate uptake occurred against the concn gradient between medium and root cells, and probably against the gradient of the electrochemical potential of nitrate. Part of the energy expended for NO_3^- absorption came from the tops since decapitation and ringing at the stem base restricted nitrate uptake. *(Author's summary)* D01

0133

13175 CAIXETA, T.J. **Irrigaçao do feijoeiro.** *(Bean irrigation)*. Informe Agropecuário. 4(46):36-40. 1978. Port., 14 Refs., Illus.

Phaseolus vulgaris. **Field experiments. Irrigation. Water requirements (plant). Soil water. Brazil.**

Several methods of irrigating bean fields in the state of Minas Gerais (Brazil) and other regions with similar climate regimes are examined along with their advantages and disadvantages. The methods studied include subirrigation, irrigation by infiltration in the furrows and spray irrigation. Data are included on the management of irrigation water, quantity, no. of applications and intervals between them, which depends on the local climatic conditions, the physical and hydrological characteristics of the soil, the system used for irrigation and the bean cv. *(Summary by I.B. Trans. by L.M.F.)* D01

0134

11624 CAMERON, D.R., JONG, R. DE and CHANG, C. **Nitrogen inputs and losses in tobacco, bean and potato fields in a sandy loam watershed.** Journal of Environmental Quality 7(4):545-550. 1978. Engl., Sum. Engl., 20 Refs., Illus.

Phaseolus vulgaris. **N. Fertilizers. Mineral deficiencies. Soil analysis. Nutrient absorption. Cl.**

A 2-yr study concerned with N inputs and losses in fields in an intensively farmed sandy loam watershed was conducted in S. Ontario. Samples were taken at 0-10, 10-20, 20-30, 30-45, 45-60 and 60-75 cm depths for soil analysis, with 6 replications. Samples of root systems were collected for N analysis. The 1st yr, beans accumulated 117 kg of N/ha, of which 75% was returned to the soil. Mineral production rate of N from May-July was 0.73 and in the summer, 0.80 kg of N/ha/day/75 cm. An approx balance of N suggests an annual loss of > 13 kg/ha. *(Summary by F.G. Trans. by L.M.F.)* D01

0135

9505 CARVALHO, R.C. DE A. *et al.* **Determinação das quantidades ótimas de fertilizantes para as culturas de milho e feijão, em municípios do estado do Ceará.** *(Determination of optimal amounts of fertilizer for beans and maize in the state of Ceará).* Revista de Economia Rural 14(1):57-68. 1976. Port., 8 Refs.

Phaseolus vulgaris. **N. P. K. Fertilizers. Statistical analysis. Nutrient absorption. pH. Al. Brazil.**

Economic rates of NPK fertilization for bean (var. Pitiuba) and maize (var. Asteca) crops in different municipalities of the state of Ceará (Brazil) were determined, using urea, simple superphosphate and potassium chloride as sources. Yield functions were adjusted to these data, determining basic economic relations; other variables were pH, Al content, rainfall, soil texture and fertility. The use of fertilizers gave good results in only 2 municipalities, with considerably high rates of return. This is explained by the physicochemical conditions of the soil, which especially affects its moisture content. Consequently, the importance of determining soil moisture content is emphasized, permitting an estimation of the optimum levels of fertilization. Other factors, especially pH, can also affect the results. A repetition of the experiment, covering a > no. of municipalities and years, is recommended. *(Summary by I.B. Trans. by L.M.F.)* D01

0136

4199 DELGADO C., E. El nivel crítico del fósforo en el fríjol *(Phaseolus vulgaris* L.). *(The critical level of phosphorus in beans).* Tesis Ing. Agr. San José, Universidad de Costa Rica, 1971. 58p. Span., Sum. Span., 53 Refs., Illus.

Phaseolus vulgaris. **P. Fertilizers. Leaf area. Absorption. Soil fertility. Soil analysis. Costa Rica.**

The effect of P fertilization on beans cultivated under greenhouse conditions was studied on

3 soils (Alajuela, Nicoya and San Isidro) from regions in Costa Rica where bean cultivation is economically important. The evaluation was based on the results of a growth trial and on the correlation that exists between P accumulation in the plant and harvest (t beans/t DM/ha). The exptl soils were extensively characterized to evaluate the effect of the treatments on the basis of the physico-chemical characteristics they show. Several important correlations were studied; e.g., P levels vs. harvest and total accumulation of P in the plant; P content in the plant vs. harvest; DM production vs. harvest, etc. Among the tested fertilization levels, the addition of 120 kg P_2O_5/ha produced the highest yield on Alajuela and Nicoya soils, resp. On San Isidro soil, even the application of 240 kg P_2O_5/ha continued increasing the yield, although this was inferior in quantity compared to those obtained with the other soils. The existence of a definite critical P level was found for the bean plant: ca. 0.20% on Alajuela and Nicoya soils. This level corresponds to the normal condition of leaf blades at the moment the 1st flowers appear. On San Isidro soil, the critical level was not determined due to the unfavorable intrinsic fertility of this soil. *(Author's summary. Trans. by L.M.F.)* D01

0137

12339 ELFVING, D.C., BACHE, C.A. and LISK, D.J. **Lead content of vegetables, millet, and apple trees grown on soils amended with colored newsprint.** Journal of Agricultural and Food Chemistry 27(1):138-140. 1979. Engl., Sum. Engl., 16 Refs.

Phaseolus vulgaris. **Soil conservation practices. Pb. Toxicity.**

In pot trials over 2 yr, several plant spp. including *Phaseolus vulgaris* cv. Tendergreen, *Echinochloa crus-galli* var. *frumentacea* and potato cv. Katahdin were grown in a Mardin silt loam or a Teel silt loam in which was incorporated 10% by wt of pulverized colored magazines and newsprint. Analysis of harvested plant material indicated that small quantities of Pb may be absorbed by plant when grown on such paper-amended soils. *(Summary by Field Crop Abstracts)* D01

0138

12395 GIRALT, P., E. **Régimen de riego del cultivo del frijol negro** *(Phaseolus vulgaris). (Irrigation regime for bean).* Ciencia y Técnica en la Agricultura (Série Riego y Drenaje) 2(1):5-28. 1979. Span., Sum. Engl., Span., 15 Refs., Illus.

Phaseolus vulgaris. **Water stress. Irrigation. Plant development. Yields. Experiment design. Evapotranspiration. Flowering. Podding. Soil water. Cuba.**

The effect of plant water stress on development and yield of black bean var. Cueto 25-9 was evaluated over a 3-yr period at Alquizar, La Habana province, using a latin square design. Periods of water shortness were induced by suppressing 1-4 irrigations at different crop stages. The crop was highly sensitive to variations in soil wetness during the stages of flowering and fructification, water shortness resulting in a highly significant lowering of yield. On the other hand, the crop could be submitted to a 15-20 day dry period from total germination to 10-15 days before flowering, without significant lowering of yields. Under the conditions of this study, no irrigation from total germination on was unprofitable. Highest daily evapotranspiration values and biological coefficients occurred during the stages of flowering and fructification; the lowest values at the initial and final stages of the crop. Total evapotranspiration ranged from 360-371 mm, with a daily av of 3.27-3.47 for the 3 yr. *(Author's summary)* D01

0139

12639 GOEPFERT, C.F. and FREIRE, J.R.J. **Influência da aeração do solo e da càlagem sobre o feijoeiro** (*Phaseolus vulgaris* L.) **em três solos ácidos do Rio Grande do Sul.** *(Influence of soil aeration and liming on beans grown on three acid soils in Rio Grande do Sul).* Agronomia Sulriograndense 9(2):143-149. 1973. Port., Sum. Port., Engl., 6 Refs., Illus.

Phaseolus vulgaris. **Agricultural lime. Dry matter. Nitrogen fixation. Soil reactions. Laboratory experiments. N. Mn. Al. Mineral content. Brazil.**

In an expt with bean var. Cubano grown on 3 acid soils from Rio Grande do Sul, liming and soil aeration had a strong effect on DM yield and N content of the plants. Total N was inversely related to the proportion of Mn in the tissue. Soil Al seemed to affect Mn absorption. *(Author's summary)* D01

0140

13508 HALLENBECK, W.H. **Municipal sludge management: health aspects of crop uptake of cadmium from sludge-amended soil and recommendations for regulation.** Environmental Management 3(2):155-158. 1979. Engl., Sum. Engl., 12 Refs.

Phaseolus vulgaris. **Manures. Nutrient absorption. Pods. Analysis. Cd. Toxicity. USA.**

Lettuce, beans, carrots and tomatoes grown on plots to which the equivalent of 84 dry t sludge/ac had been applied contained 7.6, 0.9, 1.0 and 0.8 μg Cd/g dry wt, resp., compared with 0.5, 0.9, 0.3 and 0.1 μg Cd/g dry wt, resp., when no sludge had been applied. The dietary increase of Cd derived from crops grown on sludge amended soil was 179 μg/day compared with a normal intake of 33.5 μg/day. *(Summary by Horticultural Abstracts)* D01

0141

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

0142

11950 HART, J.M. **Interaction of nitrogen and plant distribution on two isogenic lines of Great Northern field beans.** Ph.D. Thesis. Lincoln, Nebraska, University of Nebraska, 1976. 69p. Engl., Sum. Engl., 44 Refs.

Phaseolus vulgaris. **Climbing beans. Dwarf beans. N. Fertilizers. Cultivars. Spacing. Leaf area. Protein content. Seed. Yields. USA.**

The effect of fertilizer N, row spacing and plant population on yield and protein content of an

indeterminate (viney) and near-isogenic determinate (bush) bean line (Nebraska no. 1 Great Northern) was studied at 2 W. Nebraska locations in 1973-74. Yield/ac was not consistently affected by fertilizer N even where the soil NO_3^--N level was < 75 lb/6 ac-ft of soil. Seed protein content was increased by addition of fertilizer N, especially where the soil NO_3^--N level was < 75 lb/6 ac-ft of soil. Yield was independent of plant population for the viney plant but not for the bush plant; > plant populations gave > yield/ac for the latter. The viney plant type outyielded the bush type at plant populations <150,000 plants/ac. A tendency existed for the 10-in. row spacing to produce the highest yields for the viney plant; for the bush plants, the 20-in. row spacing. The near-isogenic determinate line was produced to determine the effect of the 2 plant habits on yield and other performance traits. When plant population rates were high enough for the bush bean to equal the viney plant in yield, the understory of the former was very dense, creating conditions favorable for white mold disease *(Sclerotinia sclerotiorum)*. *(Author's summary)* D01

0143

11982 JONES, P. **Metodología del manejo de información agroclimática aplicada a fríjol.** *(Methodology of applying agroclimatic information to beans)*. Cali, Colombia, Centro Internacional de Agricultura Tropical, 1979. 4p. Span.

Paper presented at Curso Intensivo de Adiestramiento Posgrado en Investigación para la producción de Fríjol, 4o., Cali, Colombia, 1979.

Phaseolus vulgaris. **Climatic requirements. Latin America.**

A detailed presentation is made of the methodology to be used in order to handle agroclimatic information correctly when applied to bean cultivation in L.A. The 2 steps involve (1) the definition of bean-cultivating areas (microregions) and (2) the compilation, accumulation, recovery and interpretation of meteorological, agronomic and edaphic data. *(Summary by F.G. Trans. by L.M.F.)* D01

0144

13194 KRETCHMER, P.J., LAING, D.R. and ZULUAGA, S. **Uso del termómetro infrarrojo para la selección por tolerancia a sequía en *Phaseolus vulgaris* L.** *(Use of infrared thermometer in bean selection for drought tolerance)*. Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980?. 10p. Span., 7 Refs., Illus.

Phaseolus vulgaris. **Selection. Irrigation. Water requirements. Temperature. Host-plant resistance. Yields. Colombia.**

CIAT has conducted research to develop a method for selecting drought-tolerant genotypes. Bean var. were planted during the dry season. Irrigation was suspended at the initiation of flowering in the dry treatment and the control treatment continued to be irrigated to avoid water shortage. During the dry period, foliage temp was determined in both the dry and irrigated treatments using an infrared thermometer between 11:00 and 14:00 h each day. The differences in foliage temp (Δ T°C) were accumulated for the entire dry period (Δ T°C) and used as the stress index of each dry plot during the period. The relation between the Δ T°C and the stomatal resistance and water potential was highly correlated. This suggests that Δ T°C can be used as an index of the internal stress level in the plant. Twenty-three lines were selected as drought-tolerant using the % yield reduction on dry plots and the Δ T°C. If the accumulated differential temp would have been the only criterion used, 65% of the 23 lines would have been selected. Certain materials, mainly Type III, had a higher degree of flower abscission under drought conditions but showed a rapid yield recovery due to pod setting from secondary flowers once the stress was suspended. The date of physiological maturity was considerably delayed on dry plots with these late-maturing var. Further research on the described method is required before conclusions can be given on drought tolerance in beans. *(Author's summary. Trans. by L.M.F.)* D01 G01

0145

12327 LEGARDA, L. and FORSYTHE, W. **Soil water and aeration and red bean production. II. Effect on soil aeration.** Turrialba 28(3):175-178. 1978. Engl., Sum. Engl., Span., 15 Refs., Illus.

Phaseolus vulgaris. **Production. Dry matter. Soil water. Yields. Soils. Soil reactions. Water content. Costa Rica.**

In a greenhouse expt conducted at the Centro Agronómico Tropical de Investigación y Enseñanza in Turrialba, Costa Rica, red bean cv. 27-R was planted at distances similar to field conditions in 26-*l* pots of fumigated soil. Seed and aerial DM production were max when av soil air space in the root zone was > 25% or when the ODR at a soil depth of 5-15 cm was > 24-28 g x 10^{-8} x cm^{-2} x min^{-1} *(Author's summary)* D01

0146

4910 LOZANO, C. **Efecto de 4 volúmenes de agua y 2 frecuencias de riego en el rendimiento del fríjol.** *(Effect of 4 volumes of water and 2 irrigation frequencies on bean yields).* Avances en Investigación 7(3/4):65-78. 1977. Span., Sum. Span., 8 Refs.

Phaseolus vulgaris. **Irrigation. Cultivars. Experiment design. Statistical analysis. Yields. Peru.**

The relationships among the irrigation frequency, water vol and yield were studied in the Valle de Chincha, Peru, with bean var. Panametto Sanilac and Canario Duvex 8120. A split plot design with 4 replications was used with 14 different water vol and 2 irrigation frequencies. Irrigation frequencies of no less than 14-20 days and a water vol of 400 m^3/ha for irrigation were recommended for the zone. *(Summary by J.E.Z. Trans. by L.M.F.)* D01

0147

12695 MIRANDA, L.N. DE and LOBATO, E. **Tolerância de variedades de feijão e de trigo ao alumínio e a baixa disponibilidade de fósforo no solo.** *(Tolerance of bean and wheat varieties to aluminum and low available phosphorus in the soil).* Revista Brasileira de Ciência do Solo 2(1):44-50. 1978. Port., Sum. Port., Engl., 9 Refs., Illus.

Phaseolus vulgaris. **Cultivars. Al. P. Host-plant resistance. Agricultural lime. Fertilizers. Soil fertility. Yields. Statistical analysis. Brazil.**

To obtain more effective and economical lime and fertilizer recommendations, a field expt was conducted on a dark red Latosol in the Cerrado region. Five bean and 4 wheat var. were grown during the dry season with sprinkler irrigation at different levels of Al saturation and P availability. Yields differed among the different treatments; in order to obtain 80% of max yield for each var., there was a large variation in critical levels of Al and P. Bean var. 896 Rico Pardo and wheat var. IAC5 were the most tolerant to high Al saturation and least demanding in P. The data suggest that an adequate Ca and P fertilizer recommendation should consider the var. differences for P requirements and Al tolerance. *(Author's summary)* D01 C01

0148

13512 MIYASAKA, S. *et al.* **Efeitos da incorporação ao solo de diferentes espécies e formas de aplicação de matéria orgânica não decomposta, imediatamente antes do plantio de feijão.** *(Effects of the incorporation of different species into the soil and different ways of applying non-decomposed organic material immediately before bean planting).* Fir 8(10):22-25. 1966. Port., Sum. Port.

Phaseolus vulgaris. **Green manures. Soil water. Temperature. Nodulation. K. Leaves. Seed production. Brazil.**

The behavior of non-decomposed plant material of legumes or grasses when incorporated into the soil immediately before planting as well as its effect on beans was studied. The data obtained show that the incorporation of non-decomposed plant material into the soil produces: (1) a greater moisture retention and a reduction in temp variations although this was less effective than mulching; (2) a tendency to increase node formation on roots mainly with the incorporation of grasses although it is not directly correlated to the increase in productivity; and (3) an increase in K content in the leaves, in the development of the vegetative and root parts and in bean seed production. These effects were especially important when perennial soybean was applied, either incorporated into the soil or as mulching. *(Author's summary. Trans. by L.M.F.)* D01

0149

13191 MIYASAKA, S., ALMEIDA, L.D. DE and BULISANI, E.A. **Cultura do feijão.** *(Bean cultivation).* São Paulo, Brasil, Sindicato Nacional de Indústria de Tratores, Caminhões, Automóveis e Veículos Similares, 1972?. 48p. Port., 9 Refs., Illus.

Phaseolus vulgaris. Climatic requirements. Soil requirements. Manures. Fertilizers. Rotational crops. Irrigation. Land preparation. Weeding. Planting. Timing. Spacing. *Macrophomina phaseoli. Acanthoscelides obtectus. Zabrotes subfasciatus.* Pest control. Harvesting. Storage. Brazil.

Different aspects of bean cultivation are discussed to contribute to the improvement of crop productivity in Brazil. Agronomic practices, climatic and edaphic requirements, measures used to reduce adverse climatic effects, such as the incorporation of OM into the soil, crop rotation, irrigation, etc. are included. Among the cultural practices mentioned, soil preparation, weed control, the use of improved seed, varietal selection, harvest dates, spacing, nutrition and mineral fertilization (NPK) are included. Recommendations are given on basal and leaf fertilization, pest control (*Acanthoscelides obtectus, Zabrotes subfasciatus*), harvesting, and storage. A joint effort between production cooperatives and supermarkets is recommended along with the use of pre-cooked beans to solve storage and commercialization problems. *(Summary by I.B. Trans. by L.M.F.)* D01 D02

0150

13155 MIYASAKA, S., FREIRE, E.S. and MASCARENHAS, H.A.A. **Ensaio de adubação da soja e do feijoeiro em solo do arenito Botucatu, com vegetação de cerrado.** *(Fertilizer experiments with soybeans and dry beans on a sandy soil).* Bragantia 23(5):45-54. 1964. Port., Sum. Port., Engl., 6 Refs., Illus.

Phaseolus vulgaris. Glycine max. Fertilizers. N. P. K. Agricultural lime. Brazil.

Results are given of 2 factorial expt on a poor soil derived from the Botucatu sandstone to study the effects of 3 levels of NPK on soybean yields. The expt were located in neighboring areas, one of which was previously limed with dolomitic lime. The plots of the latter were sown with dry beans the following yr to study the residual effect of the fertilizers applied to the soybeans. The responses to N and K, as well as the interactions, were insignificant. The effect of P, however, was significant and linear for both crops. Although high in the 2 areas, this effect was much higher in the limed one. Comparing the results of the 2 expt, it was concluded that the response to lime was negligible in the absence of P but increased considerably in its presence. On the limed area soybean yield (av of the treatments with the higher level of P) reached ca. 1800 kg/ha and was similar to those obtained on fertile soils in the state of São Paulo. *(Author's summary)* D01

0151

1033 MOTA, F.S. DA *et al.* **Feijão.** *(Beans). In* — . Zoneamiento agroclimático do Rio Grande do Sul e Santa Catarina. Pelotas, Rio Grande do Sul. Empresa Brasileira de Pesquisa Agropecuaria. Circular no. 50. 1974. v.2, pp.68-71. Port., Illus.

Phaseolus vulgaris. **Climatic requirements. Temperature. Water stress. Brazil.**

By comparing the climatic requirements of beans with climatic conditions in Rio Grande do Sul (7.5% of the area sown with beans in Brazil and 11.1% of Brazil's bean production), climatic zones were delimited. Considering water deficiency and surplus and av temp, 4 types of regions were established according to their suitability for bean cultivation: preferential, tolerant, marginal and inept. Tables and maps of these regions are included. (*Summary by I.B. Trans. by L.M.F.*) D01

0152

12343 NEPTUNE, A.M.L. and MURAOKA, T. **Aplicação de uréia-N^{-15} em feijoeiro (*Phaseolus vulgaris*, L.) cultivar Carioca.** (*Application of urea $^{-15}$N in bean cv. Carioca*). Revista Brasileira de Ciencia do Solo 2(1):51-55. 1978. Port., Sum. Port., Engl., 13 Refs.

Phaseolus vulgaris. **N. Urea. Fertilizers. Soil fertility. Yields. Soil analysis. Brazil.**

The effect of different levels of urea^{-15}N, applied at planting and at different stages of growth, on N uptake, efficiency of the plant in the utilization of N fertilizer and yield was studied in bean cv. Carioca grown on an Alfisol (Textural B Terra Roxa) of medium fertility at Piracicaba, São Paulo. Up to 120 kg N/ha had no marked effect on yield, but the utilization of fertilizer N increased with increased N fertilizer levels. Uptake of N by the bean crop was more efficient when the N was applied before or at flowering rather than at planting. The efficiency of N fertilizer utilization varied from 11.24 to 35.70%. There was no effect of inoculation on nodule wt and no. with the rate of 120 kg N/ha. (*Author's summary*) D01

0153

12345 NEPTUNE, A.M.L., MURAOKA, T. and LOURENÇO, S. **Efeito de diferentes doses de nitrogênio e modos de aplicação do fertilizantes fosfatado e nitrogenado na eficiência da utilização do fósforo pelo feijoeiro (*Phaseolus vulgaris* L.).** (*Effect of different rates of nitrogen and method of applying phosphate and nitrogen fertilizers on efficiency of phosphorus utilization in beans*). Turrialba 28(3):197-202. 1978. Port., Sum. Port., Engl., 24 Refs.

Phaseolus vulgaris. **N. P. Fertilizers. Field experiments. Soil analysis. pH. Soil fertility. Statistical analysis. Yields. Brazil.**

An expt was carried out on an Ultisol in Piracicaba, São Paulo, to study the effect of different rates of N and placements of phosphate and N fertilizer on efficiency of fertilizer P utilization by bean cv. Ignaçu. Broadcast applications gave the lowest yield and lowest uptake of fertilizer P. With respect to yield and uptake of fertilizer P, best results were obtained with the application of phosphate fertilizer in the seed row, apart from the seed with a layer of soil, and at 5 cm from the seed row, at 10 cm depth. There was no interaction of N x P placement. There was a positive effect of N on yield and utilization of fertilizer P. (*Author's summary*) D01

0154

12383 NEPTUNE, A.M.L., MURAOKA, T. and STEWART, J.W.B. **Efficiency of fertilizer phosphorus utilization by common bean (*Phaseolus vulgaris* L.) cv 'Carioca', under different methods of applying phosphatic fertilizer.** Turrialba 29(1):29-34. 1979. Engl., Sum. Engl., 17 Refs., Illus.

Phaseolus vulgaris. **N. P. Fertilizers. Soil analysis. Urea. Yields. Soil requirements. Brazil.**

An expt was conducted in Textural B Terra Roxa Soil (TRE), order Alfisol, to study: (1) the efficiency of fertilizer P utilization by bean cv. Carioca under different methods of

application; (2) the influence of a small dose of starter N fertilizer on utilization of P and vice-versa; (3) the influence of P and its method of application on the utilization of starter N. The data show that different methods of applying P did not affect yield; but considering the fertilizer P utilization by the crop, the best treatment was that in which the P fertilizer was banded at 8 cm depth, 4 cm below the seed and 4 cm distance from the seed row. There was no effect of starter N fertilizer on the utilization of fertilizer P. The wt and no. of nodules were not affected by the starter N nor by the fertilizer P. *(Author's summary)* D01

0155

12399 ORMROD, D.P. **Night temperature and water effects on bean response to supplementary ammonium nitrogen.** HortScience 14(5):637-639. 1979. Engl., Sum. Engl., 4 Refs., Illus.

Phaseolus vulgaris. **Temperature. Water stress. N. Fertilizers. Plant injuries. Roots. Toxicity. Ammonium nitrate.**

Effects of day/night temp of 28°/16° and 28°/8°C, low and high water stress in the rooting medium, and several ammonium and nitrate sources on apparent ammonium toxicity in plants of Honey Gold and Spring Green french beans were evaluated in controlled environments. Apparent ammonium toxicity, in terms of visible injury and reduced plant height and wt, was generally accentuated by high water stress prior to application and to a lesser extent by cooler night temp. Spring Green was more sensitive than Honey Gold to apparent ammonium injury. At equimolar concn added $(NH_4)_2SO_4$ was generally more injurious than added NH_4NO_3. *(Author's summary)* D01 C00 C01

0156

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

0157

13105 PANDEY, D.P. and KANNAN, S. **Absorption and transport of iron in plants as influenced by the major nutrient elements.** Journal of Plant Nutrition 1(1):55-63. 1979. Engl., Sum. Engl., 10 Refs., Illus.

Phaseolus vulgaris. **Fe. N. K. Nutrient absorption. Nutrient transport. Roots. Urea. Fertilizers.**

The effects of major nutrient elements supplied as urea, $(NH_4)_2SO_4$, K_2SO_4 and KH_2PO_4 on the absorption and transport of Fe were studied in intact bean plants, and compared with the absorption patterns in excised roots. Urea and $(NH_4)_2SO_4$ generally decreased the absorption by roots and enhanced the transport to the shoot, whereas K_2SO_4 and KH_2

PO_4 both increased the absorption and reduced the transport. The absorption of Fe by excised roots was increased significantly by urea and KH_2PO_4. *(Extracted from author's summary)* D01 C01

0158

12696 PONS, A.L. Efeito da caiagem e da adubação nitrogenada em feijoeiro. *(Effect of liming and nitrogen fertilization on bean yield).* Agronomia Sulriograndense 11(2):251-257. 1975. Port., Sum. Port., Engl., 9 Refs.

Phaseolus vulgaris. N. Agricultural lime. Manures. Fertilizers. Yields. Field experiments. pH. Statistical analysis. Brazil.

In 1974 a factorial expt with dry beans was conducted in Viamão on Camaquã soil (red yellow Podzolic). Treatments were 4 levels of lime (0, 0.5, 1 and 2 times the quantity indicated to obtain pH 6.5 by modified SMP buffer) and 6 levels of N (0, 30, 60, 90, 120 and 150 kg N/ha). Statistical analysis indicated differences between means for yields due to N alone but no interaction with lime; however, lime applied alone significantly increased yields. These results showed that although N had proportionately larger yield increments, the use of lime would be more economical than N. The most economic recommendation would be the quantity of lime indicated by the modified SMP buffer, with 30 kg N/ha being slightly higher in cost. *(Author's summary)* D01

0159

11684 RAMIREZ E., E. and PALACIOS V., E. **Determinación de los niveles óptimos de humedad y fertilización en el frijol (*Phaseolus vulgaris*), en Zacatepec, Morelos.** *(Determination of optimum moisture and fertilization levels in beans grown in Zacatepec, Morelos).* Nueva Epoca no. 9:34-36. 1978. Span., Sum. Span., 7 Refs., Illus.

Phaseolus vulgaris. Water content. Fertilizers. Yields. Statistical analysis. P. N. Water requirements. Mexico.

At the exptl field of Zacatepec, Morelos (Mexico), an attempt was made to determine optimum moisture and fertilization levels that would raise bean yields to a max. To estimate optimum levels, a representative function of the production system was obtained. Input levels that increased yields to a max were: 48.78 kg P/ha with irrigation when available residual soil moisture was 45% . With N, the effect was insignificant; with K there was no response. The economic optimum for P was 33 kg/ha. *(Author's summary. Trans. by L.M.F.)* D01

0160

12640 SALADO N., L. and MEDINA, L.F. **Delimitación de zonas para el cultivo de poroto seco en la provincia de Tucumán.** *(Delimitation of areas suitable for dry bean production in the province of Tucumán, Argentina).* Tucumán, Argentina. Universidad Nacional de Tucumán. Facultad de Agronomía y Zootecnia. Miscelánea no. 58. 1977. 34p. Span., Sum. Engl., Span., 25 Refs., Illus.

Phaseolus vulgaris. Production. Ecology. Climatic requirements. Cultivars. Temperature. Photoperiod. Solar radiation. Argentina.

Regions with suitable ecologic characteristics for dry bean production in the province of Tucumán were identified on the basis of crop needs for temp, soil moisture, photoperiod and soil properties. The limiting factors of each area, as well as the most adequate sowing period, were established. *(Author's summary)* D01

0161

13513 SALASSIER, B. *et al.* **Efeito dos níveis de água no solo sôbre a produção do feijoeiro (*Phaseolus vulgaris*).** *(Effect of soil water levels on bean production).* Seiva 30(71):7-13. 1970. Port., Sum. Port., Engl., 4 Refs.

Phaseolus vulgaris. **Laboratory experiments. Irrigation. Water requirements (plant). Yields. Brazil.**

This study was conducted at the Federal University of Viçosa under greenhouse conditions to determine the effect of 3 levels of soil water on the production of edible bean Vi. selection 1013. The highest production was obtained in the treatment where irrigation began at 0.50 atm, the 2nd highest yield was obtained when irrigation began at 0.65 atm and the lowest yield when irrigation began at 0.75 atm. The av production was 21.4, 16.7 and 11.6 g/plant resp. for the above 3 water tensions. It was observed that the plants growing under the wet (0.50 atm) treatment flowered earlier. The plants showed visual symptoms of water deficiency only under the dry treatment (0.75 atm). *(Author's summary)* D01

0162

12385 SANTOS, A.B. DOS *et al.* **Resposta de feijoeiro (*Phaseolus vulgaris* L.) ao molibdênio e ao cobalto em solos de Viçosa e Paula Cândido, Minas Gerais.** *(Bean response to Mo and Co in soils from Viçosa and Paula Cândido, Minas Gerais).* Revista Ceres 26(143):92-101. 1979. Port., Sum. Port., Engl., 12 Refs., Illus.

Phaseolus vulgaris. **Mo. Co. N. Soil requirements. Soil analysis. Statistical analysis. Laboratory experiments. Yields. Brazil.**

The effect of Mo and Co on bean cv. Ricobaio 1014 was studied under greenhouse condition using 2 soils from Viçosa and one from Paula Cândido, Minas Gerais. Treatments included 3 rates of Mo (0, 8 and 16 g/ha) as Na_2MoO_4 combined with 3 rates of Co (0, 0.2 and 0.4 g/ha) as $CoCl_2$, both applied directly to the soil as a solution. Three additional treatments also included 2 rates of N (40 and 80 kg/ha) and an association of 40 kg N with the highest rates of Mo and Co. Cobalt had no effect on yield. In the soil from Paula Cândido, bean production decreased linearly with the Mo application. In one of the Viçosa soils the response to Mo was linear and positive, while in the other it was quadratic, reaching a max with 12.3 g/ha Mo. Production resulting from the association of N with Mo and Co did not differ significantly from that attained with 80 kg N, but was significantly superior to yield of the treatment with 40 kg N. *(Author's summary)* D01

0163

12370 SILVEIRA, P.M. DA and STONE, L.F. **Balanço de água na cultura do feijão em latossolo vermelhoamarelo.** (*Field water balance in beans grown on a red-yellow latosol*). Pesquisa Agropecuária Brasileira 14(2):111-115. 1979. Port., Sum. Port., Engl., 10 Refs. Illus.

Phaseolus vulgaris. **Evapotranspiration. Soil water. Transpiration. Rainfall data. Germination. Brazil.**

Field water balance in beans was studied on a clay loam red-yellow Latosol using the equation: $ETa = P - ES \pm D \pm \Delta A$. Soil water storage ($\Delta A$) calculated down to 0.60 m depth. Internal drainage (D) was estimated on the basis of Darcy's equation which describes water flux in a soil profile. Runoff (ES) was determined using runoff plots. Rainfall (P) was measured with a rain gauge. Actual evapotranspiration (ETa) was evaluated by subtraction using the above equation. Evaporation of the Classe A tank (Eo) was also measured. During the 75-day period of this study, the values of P, ES, D, ETa and Eo were 281.80, 19.30, 40.15, 220.47 and 358.07 mm of water, resp. From the above values Eo was found to be 1.3P; ETa, D and ES were 0.62, 0.11 and 0.05 Eo, resp. During the periods of germination to flowering, flowering and pod development to maturation, ETa was 3.2, 3.2 and 1.7 mm/day or 0.62, 0.77 and 0.38 Eo, resp. (*Author's summary*) D01

0164

10749 SIMAN, A. *et al.* **Effects of calcium carbonate and ammonium sulphate on manganese toxicity in an acid soil.** Australian Journal of Agricultural Research 22:201-214. 1971. Engl., Sum. Engl., 18 Refs., Illus.

Phaseolus vulgaris. **Ca. Ammonium sulphate. Mn. Agricultural lime. Toxicity. pH. Statistical analysis. Nutrient absorption. Yields. Australia.**

The effects of increasing rates of lime and ammonium sulfate on french beans were studied on an acid red basaltic soil (pH 4.5-4.8), rich in Mn, on the N coast of New South Wales. Addition of lime increased plant yield, soil pH but reduced available soil and plant Mn markedly. Applications of ≥ 2 t lime/ac corrected Mn toxicity. Ammonium sulfate applications acidified the soil, increased Mn levels in both soil and plant tissue and increased the frequency of Mn toxicity symptoms at < 2 t lime/ac. At pH 4.7-4.8 exchangeable and water-soluble Mn levels were sensitive to slight changes in reaction. Changes in pH between 5.2-6.0 caused only slight alterations in Mn levels; 2 t lime reduced the level of Mn in the soil to ca. 1/2 that in the untreated soil, whereas 3 t/ac was necessary to halve the level of Mn in plants. Close linear relationships were found between rates of lime application and pH; exchangeable and water-soluble Mn; and both water-soluble and exchangeable soil Mn and plant Mn. Hyperbolic relationships were found between lime and Mn in soil and plants and also between pH and Mn fractions. Toxic levels of Mn in soil and leaves varied seasonally and yearly, symptoms usually appearing when the Mn content of the 1st mature leaves was > 600 ppm in the winter crop. Symptoms were more closely related to high plant Mn levels than to soil Mn. Results indicate that soil and plant analyses are useful for predicting Mn toxicity in acid soils. (*Author's summary*) D01

0165

12683 WALKER, G.K. and HATFIELD, J.L. **Test of the stress-degree-day concept using multiple planting dates of red kidney beans.** Agronomy Journal 71:967-971. 1979. Engl., Sum. Engl., 10 Refs., Illus.

Phaseolus vulgaris. **Temperature. Climatic requirements. Laboratory experiments. Irrigation. Water stress. Planting. Timing. Yields. Canopy.**

Canopy temp measurements indicate crop water stress and should be related to crop yield. In this study, several planting dates and soil moisture levels were used to evaluate the stress-degree-day (SDD) concept as an indicator of crop yield. Red kidney beans were planted on 4 dates, equally spaced, during a 9-wk period from mid-May to mid-July. Beans were hand-planted in 20 x 5 m field plots on a silt loam with 76-cm row spacing at 165,000/ha. Five irrigation treatments within each planting date provided a wide range of soil moisture conditions. The driest treatment in each planting didn't receive additional water after germination, while the wettest was continually well-supplied with water. Moisture extraction in all treatments was measured to 180 cm 3 times/wk with the neutron scattering technique. Canopy temp were measured with an infrared thermometer each day throughout the growing season ca. 1 h after solar noon. SDDs were calculated for each treatment by using air temp recorded next to the plot area. Linear regression demonstrated that seed yields were strongly dependent on the accumulation of stress-degree-days from flowering to maturity ($r^2 = 0.82$), indicating the importance of the postvegetative stage to final yield. Inclusion of the SDD summation from emergence to flowering as a 2nd independent variable did not significantly improve the regression ($r^2 = 0.83$). Individual regression lines for each planting were not significantly different ($P = 0.05$), demonstrating that the yield-SDD relationship was stable over a wide range of planting dates. Total water use was negatively correlated with SDDs summed from flowering to maturity ($r = -0.83$), verifying the potential for using the SDD concept in water management. The data also confirm that the SDD concept is a valid representation of the effect of moisture stress on yield, and point to the potential for using remotely determined canopy temp in estimating yields over large areas. *(Author's summary)* D01

See also 0060 0064 0065 0103 0202 0218 0242 0462

D02 Cultivation Practices: Planting, Weed Control and Harvesting

0166

12309 BROUWER, H.M. **Fast green test in *Phaseolus vulgaris*.** Australian Seed Science Newsletter no. 4:71-74. 1978. Engl.

Phaseolus vulgaris. **Seed coat. Harvesting. Mechanical damage. Cultivars. Germination. Australia.**

The "fast green test" on bean seed consists of staining beans with a malachite green solution (16 mg/80 ml of water) for accurate detection of seed coat damage, indicated by darker green stained areas or lines along hairline cracks. In a trial conducted with 27 bean seed lines, 2700 individual seeds were examined. The test resulted in improved detection of damage. Slurried beans had a considerably higher incidence of seed coat damage. Increasing damage decreased germination, particularly with white-seeded beans which are more susceptible to mechanical damage. *(Summary by L.M.F.)* D02

0167

13120 CARVALHO, N.M. and OLIVEIRA, O.F. **Efeito da posição da semente na semeadura sobre a emergencia do feijão (*Phaseolus vulgaris* L.).** *(Effect of seed position at sowing on emergence of bean plants).* Científica 6(3):349-353. 1978. Port., Sum. Port., Engl., 5 Refs., Illus.

Phaseolus vulgaris. **Seed. Emergence. Seedlings. Planting. Field experiments. Brazil.**

Bean seeds were sown with the hilum down or up, flat on one side or with the hypocotyl axis up or down. Seeds with the hilum down were the 1st to emerge (5.16 days) and also had the highest emergence rate (80.26%). Data for the other variants are tabulated. *(Summary by Horticultural Abstracts)* D02

0168

13556 CHAGAS, D. and DHINGRA, O.D. **Effect of timing of weed control on the incidence of seedborne fungi in dry bean seeds.** Fitopatologia Brasileira 4:423-426. 1979. Engl., Sum. Engl., Port., 5 Refs.

Phaseolus vulgaris. **Field experiments. Weeding. Timing. Seeds.** *Rhizoctonia solani.* **Mycoses.** *Fusarium semitectum.* **Brazil.**

Dry bean cv. "Carioquinha" was planted in 5 x 4.8 m plots in a randomized complete block design. Weeds were either not controlled or controlled by hand weeding regularly at 15-day intervals, or only once, at 35 days (before flowering), 50 days (pods 2-3 cm) or 65 days (seed fill) after planting. *Bidens pilosa, Brassica juncea, Raphanus parviflora* and *Digitaria sanguinalis* were the most common weeds. RH was 10-20% higher in plots with weeds than in plots without weeds. The av % of seeds infected with *Fusarium semitectum* was 5.6% in plots where weeds were controlled regularly and 12, 10, 21 or 32% when weeds were controlled only once at 35, 50, or 65 days after planting or not controlled at all, resp. The % of seeds infected with *Phomopsis* sp. was not affected by weeds. The % of seeds infected with *Rhi-*

zoctonia solani was significantly higher if weeds were not controlled than when weeds were controlled at least once at or before seed fill stage. *(Author's summary)* D02

0169

13549 DAVIS, D.R., BLACK, K.R. and NELSON, T.S. **The effect of early harvesting on amino acid composition and biological value of canned Pinto and Kidney beans.** Nutrition Reports International 20(3):281-290. 1979. Engl., Sum. Engl., 16 Refs., Illus.

Phaseolus vulgaris. **Harvesting. Timing. Amino acids. Nutritive value. Canned beans. Analysis. Protein content. Water content. Laboratory animals.**

The variation of protein content and BV of pinto and kidney beans as affected by early harvest dates was studied. The mature beans were harvested 1 wk apart for 4 wk, water blanched, and processed. Harvest dates had little effect on protein quality of pinto and kidney beans. Kidney beans had a higher protein content than pinto beans and both had only minor variations in CP between harvest dates. Significant differences in levels were only observed in met and aspartic acid between harvest dates. The bean quality was evaluated by feeding male rats levels of both beans and casein to supply 10% protein. The addition of 0.4% DL methionine to both pinto and kidney bean diets resulted in a significant increase in wt gain, feed efficiency, and PER, parameters which were similar to those obtained for rats fed casein. *(Summary by Food Science and Technology Abstracts)* D02 C03

0170

12653 EMPRESA BRASILEIRA DE ASSISTÊNCIA TECNICA E EXTENSÃO RURAL. **Sistemas de produção para feijão: Parintins, Manacapuru, Coarí, Itacoatiara, Tefé, Manaus, Careiro.** *(Bean production systems).* Manaus-AM, Brasil. Sistemas de Produção. Boletim no. 18. 1976. 16p. Port., Illus.

Phaseolus vulgaris. **Land preparation. Spacing. Planting. Cultivation. Harvesting. Storage. Disease control. Brazil.**

In 1976 researchers, farmers and extension agents met to develop production systems that would increase bean yields in the state of Amazonas (Brazil). These systems were analyzed for small tenant farmers that use family labor and whose cultivated areas were 3-5 ha, with no drying, processing and storage infrastructures. Some have access to credit; their yields are between 500-1000 kg/ha. Operations that make-up the systems are: selection of area, land preparation, planting time and density, phytosanitary practices, harvesting, and storage. Technical coefficients of production/ha are included in table form. *(Summary by J.E.Z. Trans. by L.M.F.)* D02

0171

13198 EMPRESA DE ASSISTÊNCIA TECNICA E EXTENSÃO RURAL DO ESTADO DE ALAGOAS. **Sistema de produção para feijão isolado e consorciado com milho, revisados e atualizados.** *(Production systems of beans in monoculture and intercropped with maize).* Maceió, Brasil. Serie Sistemas de Produção. Boletim no. 185. 1980. Port., Illus.

Phaseolus vulgaris. **Land preparation. Intercropping. Fertilizers. Planting. Spacing. Timing. Weeding. Harvesting. Threshing. Storage. Brazil.**

Recommendations made by a representative group of extension agents, researchers and producers are given on the best way of cultivating beans in monoculture or intercropped with maize in the state of Alagoas, Brazil. Production systems were defined according to the region. For each system recommendations are given on operations of soil preparation and conservation, fertilization, planting (time, cv., and density), cultural practices (weed control and phytosanitary practices) and the harvesting, threshing, storage and conservation

of the product. Tables are also included on the technical coefficients for both systems. *(Summary by I.B. Trans. by L.M.F.)* D02 D03

0172

12344 FORSTER, R. and ALVES, A. **Como controlar as ervas daninhas.** (*Weed control*). Granja 31(326):39-75. 1975. Port.

Phaseolus vulgaris. **Weeding. Herbicides. Weeds. Brazil.**

Brief information is given on the use of herbicides with different crops, among them beans. Technical information was gathered from various research centers in Brazil and also provided by producers and technical assistants. Rates and time of application, weeds controlled and the way herbicides react are presented in table form. (*Summary by J.E.Z. Trans. by L.M.F.*) D02

0173

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

0174

2650 GOMEZ A., C. and PIEDRAHITA C., W. **Control de malezas en frijol.** (*Weed control in beans*). Coagro no. 9:8. 1976. Span.

Phaseolus vulgaris. **Weeds. Weeding. Cultural control. Herbicides. Colombia.**

Weeds in bean crops cause losses between 15-88%, depending on the environmental conditions and the existing population. Losses are caused by competition among crops for light, nutrients and CO_2. A list is given of the weeds that are economically important for the crop, with their scientific and common names and the herbicides that control them. (*Summary by J.E.Z. Trans. by L.M.F.*) D02

0175

11157 HAMMERTON, J.L. **Herbicide screening trials in vegetables (1971-73).** Kingston, Jamaica, University of the West Indies, 1973. 8p. Engl., Sum. Engl., 10 Refs.

Phaseolus vulgaris. **Weeds. Herbicides. Field experiments. Jamaica.**

Preliminary screening trials (pot and field trials) were conducted in Jamaica to test 31 new and exptl herbicides for crop tolerance in 11 vegetable crops, including beans. Principal weed species included *Eleusine indica, Digitaria* spp., *Echinochloa colonum, Amaranthus* spp., *Cleome ciliata, Parthenium hysterophorus, Portulaca oleracea, Phyllantus amarus* and *Commelina elegans.* Two application rates were tested: 0.75 and 1.5 times the suggested rates. Of the herbicides tested, alachlor (Lasso), butachlor (Machete), carbetamide (Legurame), methabenzthiazuron (Tribunil), terbutryn (Igran) and Amex (N-sec-butyl 1-4-tert-butyl 1-2, 6 dinitro aniline) proved promising and were safe in both preemergence and posterior weed control in beans. (*Summary by L.M.F.*) D02

0176

10675 JONES, R.H. **Mechanical harvesting of bean seed.** Dubbo, New South Wales, Yates Seeds, 1978. 5p. Engl., 10 Refs.

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

Phaseolus vulgaris. **Harvesting. Seed characters. Climatic requirements. Mechanization. Threshing. Water content.**

Some of the factors that affect seed quality are analyzed such as cultural practices in harvesting and seed management, seed physiological maturity, environmental conditions (temp fluctuations and RH) and the seed moisture content during threshing. (*Summary by F.G. Trans. by L.M.F.*) D02

0177

13525 LABRADA, R. **Evaluación de herbicidas y tratamientos combinados para el combate de malas hierbas en fríjol.** *(Evaluation of herbicides and combined weed control treatments in beans).* Agrotecnia de Cuba 10(1):73-81. 1978. Span., Sum. Span., Engl., 5 Refs.

Phaseolus vulgaris. Field experiments. Herbicides. Weeding. Cuba.

Three trials were conducted during 1973-76 on dwarf bean var. Cueto 25-9. Different herbicides were tested: trifluralin, dinitroamine, dinitramine + chlorobromuron, fluchloralin, Olitref and nitralin in pre-sowing treatments mechanically incorporated into the soil: alachlor, linuron, alachlor + linuron, D C P A, D C P A + metobromuron and fluorodifen pre-emergence, and the split treatments of trifluralin, dinitramine and fluchloralin (pre-sowing) followed metobromuron (pre-emergence). The results indicate good weed control and crop yield effects of dinitramine (0.25 kg/ha), fluchloralin (1.1 kg/ha) similar to the trifluralin (0.96 kg/ha) effectivity, as well as the split treatments of these herbicides and metobromuron. Dinitramine (0.25 kg/ha)-metobromuron (0.5 kg/ha) appeared to be an outstanding treatment with the highest bean yields, without affecting the protein content of the grain. *(Author's summary)* D02

0178

13524 LABRADA, R. and GARCIA, F. **Período crítico de competencia de malas hierbas en fríjol (*Phaseolus vulgaris* L.).** *(Critical period of weed competition in beans).* Agrotecnia de Cuba 10(1):67-72. 1978. Span., Sum. Span., Engl., 5 Refs., Illus.

Phaseolus vulgaris. Field experiments. Weeds. Weeding. Cuba.

The critical period of weed competition in dwarf bean, var. Cueto 25-9 is studied, which consisted in periods of up to 60 days weeded and then left unweeded,as well as left unweeded in identical periods and then weeded; hand weeded and unweeded controls for the whole cycle of beans were also included. The results obtained showed that this critical period equals 50 days in those conditions in which the study was carried out. Different aspects of the competition crop-weeds are analized and discussed. *(Author's summary)* D02

0179

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

0180

10652 McMAHON, P.J. **Seed planting equipment.** Glenfield, New South Wales, Department of Agriculture. Agricultural Engineering Centre, 1978. 6p. Engl., 3 Refs.

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

Phaseolus vulgaris. **Planting. Agricultural equipment. Mechanization. Seed. Mechanical damage. Australia.**

"Precision" and plate planters are compared. There are 4 precision planters in Australia: International Harvesters' Cylo (USA); White Plant/Aire (USA); Horwood Bagshaws' Technohac (Israel) and John Shearers' Nodet Gougis Pneumasen (France). Their operating procedures, advantages and disadvantages are discussed. Their efficiency is limited by a correct set up, the operator, vertical load on the wheel, the inertia of the drive system, soil type and moisture content. They should not be used for high-speed planting. (*Summary by F.G. Trans. by L.M.F.*) D02

0181

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

0182

12335 OORSCHOT, J.L.P. VAN and LEEUWEN, P.H. VAN **Photosynthetic inhibition in *Phaseolus vulgaris*. II. The influence of light on herbicidal action.** Weed Research 14(2):81-86. 1974. Engl., Sum. Engl., Fr., Germ., 14 Refs., Illus.

Phaseolus vulgaris. **Herbicides. Photosynthesis. Illumination. Chlorosis. Transpiration. Light.**

The influence of pre- and post-treatment illumination on the herbicidal effect produced in bean cv. Berna by simeton, diuron, diquat and ioxynil was examined. The increased effect noted at lower pre- and higher post-treatment levels of illumination was correlated with increased

inhibition of net photosynthesis. This increased effect is ascribed to enhanced photo-oxidation. (*Author's summary*) D02 C00

0183

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

0184

13121 SCOLARI, D.D.G. and YOUNG, D.L. Avaliação agronômica e econômica de sistemas de controle de ervas daninhas no Agreste Pernambucano. *(Agro-economic evaluation of weed control systems in Pernambuco).* Pesquisas Agropecuárias Brasileiras 12:187-196. 1977. Port., Sum. Port., Engl., 12 Refs., Illus.

Phaseolus vulgaris. Zea mays. **Weeds. Weeding. Herbicides. Integrated control. Intercropping. Costs. Brazil.**

Two identical expt were conducted in 1974 at Caruaru, Pernambuco to assess the effectiveness and profitability in maize and beans of 12 different weed control systems: manual, mechanical, chemical and integrated. Yields from unweeded controls averaged 5 and 26% of the yields obtained for maize and beans, resp., with overall weed control. Partial control systems (mechanical cultivation in the interrow only, or herbicides only within the rows) gave an av of 64 and 46%, resp., of the yields obtained with overall weed control. Differences in yield between systems giving the same level of control were not significant, indicating that the methods of weeding were equally effective. At 1974 prices, the most cost-effective treatment for maize grown alone was simazine at 1.5 kg/ha preemergence with a cost/benefit ratio of 6.03. If only one manual or mechanical weeding, instead of 2, gave adequate control however, this would be the most economical. For beans alone the most cost-effective treatment consisted of 2 cultivations with an animal-drawn implement plus hoeing in the rows (cost/benefit ratio 3.4). Evidence from other sources, however, suggested that the wider row spacing needed for animal traction led to reduced yields; if cultivators were precluded on that account, traditional hoeing remained the most cost-effective treatment. *(Summary by Weed Abstracts)* D02 D03

0185

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

See also 0149

D03 Cultivation Systems: Intercropping, Rotational Crops

0186

3609 CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL. **Beans and maize: important examples for multiple cropping.** Cali, Colombia. Series AE-1. 1976. pp.1-3. Engl., Illus.

Phaseolus vulgaris. Zea mays. **Intercropping. Plant habit. Germplasm. Yields. Herbicides. Colombia.**

Due to the importance of beans and maize in the diets of L.A. people, CIAT is attempting to stabilize yields of beans grown in monoculture at 4 t/ha and in association with maize at 2 t under various ecological conditions with limited inputs. The program includes the evaluation and development of new germplasm, agronomic studies of genotype x environmental interactions. Factors such as times for sowing, management of moisture (irrigation), fertilization, evaluation of location-specific technology, soil management and economic evaluations should be analyzed locally. Preliminary results show that intercropped beans and maize can be used at optimum monoculture densities when there are no factors limiting to production. Combinations of several herbicides are more effective and economical than high levels of one herbicide. *(Summary by L.M.F.)* D03

0187

11978 DAVIS, J.H,C. **Interacciones de genotipos por sistema de cultivo en fríjol y maíz.** *(Genotypic interactions in bean and maize cropping systems).* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1979. 21p. Span., Illus.

Paper presented at Curso Intensivo de Adiestramiento Posgrado en Investigación para la Producción de Fríjol, 4o., Cali, Colombia, 1979.

Phaseolus vulgaris. Zea mays. **Intercropping. Cultivars. Genotypes. Plant habit. Yields. Statistical analysis. Colombia.**

The results are presented of 3 expt conducted at CIAT to improve var. destined for use in multiple-cropping systems: (1) evaluation of bean var. (bush and climbing) in 2 cropping systems, monoculture and in association with maize; (2) evaluation of 20 maize genotypes in monoculture and in association with 2 bean types (habits II and IV); and (3) evaluation of 3 maize and 10 climbing bean genotypes. It is concluded that there are certain genotypic combinations of maize and beans that are better but that are not necessarily the best for monoculture. Nevertheless, evidence indicates that when certain simple plant characteristics are taken into account for both maize and beans, better combinations can be predicted. *(Summary by F.G. Trans. by L.M.F.)* D03

0188

2870 DAVIS, J. **Mejoramiento de fríjoles volubles para sistemas de asociación con maíz.** *(Improvement of climbing bean varieties for associations with maize).* Cali, Colombia. Centro Internacional de Agricultura Tropical. Seminario Interno Serie SE-14-78. 1978. 7p. Span.

Phaseolus vulgaris. **Climbing beans.** *Zea mays.* **Intercropping. Cultivars. Plant breeding. Yields. Selection. Colombia.**

The objectives and methodology of breeding climbing beans were examined in a field of intensive competition with maize. Climbing bean var. can be divided into 3 categories: type 4b, a vigorous climber, more than 2 m high, little branching and pod bearing on the upper part of the plant; 4a, climber 1.5-2.0 m high with little branching and pod bearing along the whole length of the plant; type 3b, a facultative climber less than 1.5 m high with little branching and pod bearing on the lower part of the plant. Type 4b is the best for associations with tall maize; type 4a for relay systems with maize and in monoculture when there is a strong support and 3b, in case of a low or poor support. Monoculture is the best system of individual selection. A strategy for selecting climbing beans is given along with the yields of 10 var. of climbing beans in monoculture and in association with 3 var. of maize. *(Summary by L.M.F.)* D03

0189

12635 DAVIS, J., GARCIA, S. and TEJADA, G. **Selección en generaciones tempranas de fríjoles volubles en asociación con maíz.** *(Selection, in early generations, of climbing beans in association with maize).* Cali, Colombia, 1980. 16p. Span., 4 Refs., Illus.

Paper presented at Reunión Anual del Programa Cooperativo Centroamericano para el Mejoramiento de Cultivos Alimenticios, 26a., Guatemala, 1980.

Phaseolus vulgaris. Zea mays. **Intercropping. Experiment design. Field experiments. Selection. Yields. Genotypes. Cultivars. Plant habit. Colombia.**

Studies were conducted at CIAT to test a new methodology (1) to improve F_3 yields through the use of a hierarchical exptl design (a 9 x 9 lattice with 3 replications, with lines grouped according to the design, without taking into account the family of origin) and (2) to select beans in association with maize in search for a greater complementation between the 2 crops. Analysis of yield data was 1st done on the basis of mean family yields (main plots) and afterwards on those of individual lines. A good correlation exists between the yields of bean families in the F_3 and their corresponding yields in the following generation. The advantage of this method over more traditional ones is that it is possible to eliminate entire families of limited potential already in the F_3. The best lines are always found in the best families. The efficiency of the methodology is greater when families with more than one line are always used since the exptl error decreased as the no. of lines/family increased. This methodology is also good for evaluating the productivity of beans in association with maize. There are bean genotypes that combine better with maize; these desirable genotypes can already be detected in the F_3 generation. *(Summary by J.E.Z. Trans. by L.M.F.)* D03

0190

11661 DIAS, B.C. **Alguns indices bioeconômicos associados as combinações multiculturais; feijão (*Phaseolus vulgaris* L.), milho (*Zea mays* L.) e batata doce (*Ipomoea batatas* (L.) Lam.).** *(Bioeconomic indices of multiple crops: beans, maize and sweet potatoes).* Tese Mag. Sc. Turrialba, Costa Rica. Centro Agronómico Tropical de Investigación y Enseñanza, 1974. 111p. Port., Sum. Port., Engl., Span., 27 Refs., Illus.

Phaseolus vulgaris. Zea mays. **Intercropping. Protein content. Carbohydrate content. Economics. Statistical analysis. Yields. Costa Rica.**

The effects of bean (B), maize (M) and sweet potatoes (SP) crop combinations and levels of applied technology on the production of grains, tubers, proteins, carbohydrates and income were studied at the Centro Agronómico Tropical de Investigación y Enseñanza, Turrialba, Costa Rica. Eight treatments (32 subtreatments) were selected from the 54 treatments (216 subtreatments) of

the main expt established by the Dept. of Tropical Crops and Soils at CATIE, entitled "Development of Food Crop Production Systems". These treatments represented the different production systems under study, from the control (no food crop) through the monocropping systems to the association of 2-3 crops, distributed in sequence or overlapped in variable degrees. The subtreatments represented increasing levels of applied technology. The three food crops were tested in the mono-, bi- and tricultural systems against the control in an 8 x 4 factorial design with 2 replications. Results showed that the crop association affected yield, protein and carbohydrate production; increased income; gave better weed control; and reduced expenses for materials and manual labor. The most profitable associations were B + SP and M + SP with a net cost benefit ratio of 1:1.28 for the former and 1:1.23 for the latter. Highest yields were obtained from M + SP (4.2 t/ha DM) and B + M + SP (4.04 t/ha DM). B + M + SP was the best producer of edible protein (0.43 t/ha), and M + SP was the best producer of edible carbohydrate (3.68 t/ha). In the control, where African star grass (*Cynodon plectostachyus*) and natural vegetation were included as pastures in the subtreatments, the pastures were more efficient in biomass production (41.6 t/ha DM) than the single or associated food crops. SP produced better in association, and because of its spreading vine habit, protected the soils better and controlled weed development effectively. Yield and income from B and M were higher when the 2 were associated than in monoculture. SP increased yield and income when associated with B or M but was inferior to SP monoculture when associated simultaneously with B + M. Crop associations saved time and space, and the degree of technology applied in this study affected neither yield nor income. (*Author's summary*) D03

0191

12647 EMPRESA BRASILEIRA DE ASSISTÊNCIA TECNICA E EXTENSÃO RURAL. **Sistemas de produção para milho e feijão: Raposo-municipio de Itaperuna-RJ.** *(Maize and bean production systems).* Raposo, Itaperuna-RJ, Brasil. Série Sistemas de Produção. Circular no. 78. 1977. 22p. Port.

Phaseolus vulgaris. Zea mays. **Intercropping. Technological packages. Cultivation. Production. Soil preparation. pH. Soil conservation. Planting. Weeding. Pest control. Harvesting. Storage. Costs. Brazil.**

Three technological packages were developed by researchers, producers and extension workers for maize/bean associations for the states of Rio de Janeiro and Minas Gerais. The producers are characterized by their technological level and the yields obtained. Cultural practices and technical recommendations are given for good production (soil preparation and conservation, cultural practices, pest and disease control, harvesting, storage and commercialization). Production costs/ha are given in table form. *(Summary by J.E.Z. Trans. by L.M.F.)* D03 J00 D00

0192

12651 EMPRESA BRASILEIRA DE PESQUISA AGROPECUARIA. **Sistemas de produção para milho e feijão; Paraná: Região do Norte Pioneiro.** *(Production systems for maize/bean associations in Paraná).* Santo Antônio da Platina-MG, Brasil. Série Sistemas de Produção. Boletim no. 23. 1977. 65p. Port., Illus.

Phaseolus vulgaris. Zea mays. **Intercropping. Mechanization. Cultivation. pH. Technology evaluation. Technological package. Planting. Cultivars. Pest control. Harvesting. Storage. Soil conservation. Brazil.**

The technology existing in the Norte de Pioneiro region of Brazil was evaluated for the following production systems: maize in monoculture with machine/manual and animal/manual traction; beans in monoculture with machine/manual traction; and beans and maize in association. For each system, a description of the farmer and technical recommendations are given on soil conservation, correction of acidity, soil preparation, planting, cultural

practices, weed, disease and pest control, harvesting, storage, production costs/ha when cultivation is mechanized or with animal traction. *(Summary by J.E.Z. Trans. by L.M.F.)* D03 J00

0193

11654 FARDIM, F. **Influência de sistemas de consorciação na produtividade e outras características agronômicas do milho e do feijão.** (*Influence of intercropping system on productivity and other agronomic characteristics of maize and beans*). Tese Mag. Sc. Lavras-MG, Brasil, Escola Superior de Agricultura, 1977 61p. Port., Sum. Port., Engl., 16 Refs.

Phaseolus vulgaris. Zea mays. **Intercropping. Yields. Statistical analysis. Production. Yield components. Field experiments. Brazil.**

In order to define the best system for interplanting beans and maize, the performance of 4 maize cv.of varying height, planted alone or cropped with beans, was studied using different methods. Three expt were planted at 3 sites in S. Minas Gerais using randomized split blocks with maize var. in the main plots; the subplots consisting of 4 methods of interplanting and subsubplots comparing intercropping vs. monoculture, with 4 replications. Tall maize cv. were more productive than short ones, and there was no influence of maize cv. height on bean yield. Bean yield/plant was higher in treatments using smaller no. of plants/unit area, while bean yield/unit area was highest in treatments with the highest no. of plants/unit area. Combined statistical analysis of the 3 expt showed no effect of interplanting method on maize yield while bean yield was increased in methods 2 and 3. At Lavras, all interplanting methods reduced maize yield while in Caldas only method 4 reduced maize yield. At Baependi, there was no effect of interplanting on maize yield. The combined statistical analysis indicated that interplanting did not affect maize production thus giving higher yields (maize + bean)/unit area than maize monoculture. (*Author's summary*) D03

0194

4821 FRANCIS, C.A. *et al.* **Genotype x environment interactions in bush bean cultivars in monoculture and associated with maize.** Crop Science 18(2):237-242. 1978. Engl., Sum. Engl., 14 Refs., Illus.

Phaseolus vulgaris. Zea mays. **Intercropping. Dwarf beans. Cultivars. Selection. Genotypes. Genetics. Yields. Statistical analysis. Colombia.**

Interactions of bush bean genotypes with planting system and cropping season were evaluated at CIAT (1000 m elevation) in Colombia. The objective was to determine whether selection in monoculture can result in genetic progress for yield in complex multiple-cropping systems. Nonclimbing bush bean cv. (including both determinate and indeterminate plant types) were tested in monoculture and in association with maize in 3 seasons. Significant correlations of bean yields were obtained for these cv. grown in monoculture and in association. Higher yields and greater absolute differences among cv. in monoculture favor this system as most efficient for early-generation genotype selection and yield testing. Late-generation yield evaluation of promising lines may be necessary in more than one system to evaluate adaptation to a wider range of cropping systems. Season x cv. interaction in either system could complicate selection and rapid elimination of large no. of progeny in a breeding program. Early-generation selection for yield must be practiced with care and most decisions on promising families delayed until replicated trial data are available from 2-3 generations in one or several locations in one season. (*Author's summary*) D03 G00

0195

12628 GARCIA B., C.M. **Comparación de sistemas de siembra en la asociación maíz-fríjol en El Salvador.** *(Comparison of planting systems in bean/maize associations in El Salvador).* Agricultura en El Salvador 17(2):7-15. 1978. Span., Sum. Span., Illus.

Phaseolus vulgaris. Zea mays. **Intercropping. Cultivars. Yields. Climbing beans. Statistical analysis. Economics. El Salvador.**

Studies were conducted to determine the best planting system for climbing and semiclimbing beans associated with maize. Four systems were studied: S1 - double rows of maize at 1.40 m, 4 rows of beans in this space (climbing var.), 3 rows of beans (semiclimbing var.); S2 - double rows of maize at 1.40 m, 2 rows of beans in this space (climbing var.), single rows of maize at 1.00 m/one of beans; S3 - single rows of maize at 1.00 m, a row of beans on both sides; S4 - single rows of maize at 1.00 m, a row of beans in the same row. For both types of beans, S3 was the system by which the best bean yields were obtained, followed by S1. Yields of maize associated with climbing var. did not decrease as compared to monoculture; the contrary occurred when associated with semiclimbing var. Gross economic profits similar to those of beans in monoculture and in associations were obtained using the best systems; these exceeded the profits obtained by maize in monoculture. It is possible to produce 2 bean harvests during the rainy season, obtaining a > bean production and a > income. *(Author's summary. Trans. by L.M.F.)* D03

0196

11976 GARCIA M., S. **Principios básicos de la asociación de cultivos.** *(Basic principles of crop association).* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1979. 13p. Span., 9 Refs.

Paper presented at Curso Intensivo de Adiestramiento Posgrado en Investigación para la Produccion de Frijol, 4o., Cali, Colombia, 1979.

Phaseolus vulgaris. Zea mays. **Intercropping. Climbing beans. Plant physiology. Cultivation. Colombia.**

The advantages of associating crops are discussed on the basis of a bibliographic review and statistical data. Concepts are included on the important terms of associated cropping systems: multiple cropping, intercropping, mixed cropping, strip cropping, double cropping, relay cropping, monoculture, cropping patterns, cropping systems, cropping index and intensive cropping. Some examples of bean associations, mainly with maize, are analyzed. The fundamental principles of the association are listed: agronomic, physiological, genetic, pathological, entomological, economic, nutritional and cultural factors. Nevertheless, it is concluded that the production of each crop or system should be evaluated at the farm level to determine the effectiveness of the research process. *(Summary by F.G. Trans. by L.M.F.)* D03

0197

12633 GARCIA, S. and DAVIS, J. **Sistemas de siembra de maíz y fríjol en asociación.** *(Planting systems for maize/bean associations).* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. 12p. Span., 4 Refs., Illus.

Paper presented at Reunión Anual del Programa Cooperativo Centroamericano para el Mejoramiento de Cultivos Alimenticios, 26th., Guatemala, 1980.

Phaseolus vulgaris. Zea mays. **Intercropping. Planting. Cultivars. Spacing. Yields. Plant habit. Colombia.**

Maize and climbing beans as associated crops prevail in the highlands of L.A. in traditional systems with low populations and manual planting (in rows and pocket drilling). Two trials were established to compare the systems, testing bean densities from 4-12 plants/m^2 and

3-12 plants/m², with the same maize population and simultaneous planting. Five bean genotypes with different aggressiveness for climbing were tested with one maize genotype (Suwan-1). Row planting was superior in both trials for both crop yields, but the difference was insignificant with a bean density of 8 plants/m². This density was considered optimum when the yields of both crops were taken into account. Both the planting system and bean var. had an important effect on the lodging of maize. There was less lodging for pocket drilling than in rows and at a greater bean density due to the better anchoring of the roots. The effect of bean var. on maize yields was closely related to the lodging of the stem caused by bean aggressiveness: max effect with the most aggressive beans (type IV b) and min effect with the weaker climbing beans (type III b). Therefore, maize genotypes for association should have strong stems to resist lodging. *(Author's summary. Trans. by L.M.F.)* D03

0198

11493 GERODETTI B., M. **Efectos de la poda y laboreo del suelo sobre el crecimiento y rendimiento de yuca (*Manihot esculenta* Crantz), asociada con maiz (*Zea mays* L.) y vainita (*Phaseolus vulgaris* L.).** (*Effects of pruning and land preparation on growth and yield of cassava in association with maize and french beans*). Tesis Mag. Sc. Turrialba, Costa Rica, Universidad de Costa Rica-Centro Agronómico Tropical de Investigación y Enseñanza, 1979. 93p Span., Sum. Engl., Span., 99 Refs., Illus.

Phaseolus vulgaris. Zea mays. **Cassava. Intercropping. Growth. Yields. Herbicides. Planting. Weeding. Field experiments. Harvesting. Production. Economics. Biomass. Costa Rica.**

An expt was conducted on an Inceptisol, Typic Distropepts, with normal drainage at Turrialba, Costa Rica to evaluate growth, production and quality of cassava var. Valencia, maize var. Tuxpeño PBC7 and french bean var. Kentucky Wonder under different agronomic treatments. A randomized complete block design with 5 replications was used to compare spatial arrangement, soil preparation (ridging, on the flat), pruning (0, intermediate, heavy) of cassava and weed control (6 mo after planting cassava, herbicides or manual). Beans were planted in all treatments during the 2nd cycle, 172 days after planting cassava, and pruning was done 8 days later. Heavy pruning reduced total cassava yield by 10% and the portion of commercial roots, 25%; there was no significant difference in yields at intermediate levels. When planted simultaneously, the cassava/maize association reduced total production of cassava by 40%; this association and pruning decreased starch content of the commercially usable roots as well. Heavy pruning increased total bean pod production 25% but lowered their quality. Planting without ridging favored increased yield of cassava and beans, while maize yield was not affected. Herbon (DNPB) at a rate of 5 *l*/ha permitted crop yields similar to those obtained with hand weeding. Weed growth was favored by pruning and the cassava/maize association. Greatest total biomass was recorded for the cassava/maize association, but this association had the lowest economic value. (*Author's summary*) D03

0199

11987 HART, R.D. **The design and evaluation of a bean, corn, and manioc polyculture cropping system for the humid tropics.** Ph.D. Thesis. Gainesville, University of Florida. 1974. 160p. Engl., Sum. Engl., 204 Refs., Illus.

Phaseolus vulgaris. Zea mays. **Cassava. Intercropping. Biomass. Cultivation systems. Yields. Field experiments. Experiment design. Fertilizers. Weeding. Planting. Harvesting. Soil analysis. Soil fertility. USA.**

When more than one species of crop plant populations are planted within sufficient spatial proximity to result in interspecific competition, the resulting polyculture cropping system has characteristic properties that can be identified and considered in the design of other polyculture cropping systems. A polyculture cropping system was designed by considering general

characteristics of biomass compartmentalization during natural succession. The succession polyculture cropping system was evaluated in expt at Turrialba, Costa Rica. The expt were designed to allow an investigation of the characteristic properties of polyculture cropping systems by computer simulation. Beans (B), maize (M) and cassava (C) were planted separately in 3 monoculture systems, and together in 3 polyculture systems. The polyculture systems consisted of a succession polyculture in which B, M and C were all planted at the same time and harvested after 9, 18, and 36 wk, resp, a reverse polyculture in which C was planted alone and then interplanted with M after 18 wk and B after 27 wk, and all crops harvested after 36 wk, and an intensive polyculture in which 4 B crops, 2 M crops, and 1 C crop were all interplanted during a 36 wk period. Four treatments consisting of the factorial product of 2 fertilizer treatments (0 and an initial application of 227, 169 and 40 kg NPK/ha, resp) and 2 weeding treatments (no-weeding and weeding every 6 wk) were applied to the 3 mono- and 3 polyculture systems and a natural vegetation cropping system that consisted of the invading weeds. A higher yield and economic return was obtained from the polyculture systems than from any of the monoculture systems. A higher net economic return was obtained from the succession polyculture than from the other polyculture systems. Analysis of the results suggested that weed control and modification of the M and C architecture were important factors which contributed to the high yield from the polyculture cropping system. The dynamics of the interspecific competition within the succession polyculture were investigated by analog computer simulation of an energy flow model. After a validation procedure in which the biomass dynamics predicted by the model were compared with data collected in the field, a series of fertilizer and insect predation experiments were simulated. The computer simulations were used to consider the properties of polyculture systems with different levels of interspecific competition. The results of the expt and computer simulation suggested that, in general, the level of interspecific competition within a polyculture was inversely related to risk. In polycultures with high interspecific competition a decline in yield of one crop resulted in an increase in yield of another. Total polyculture yield was at a max at some point between zero interspecific competition and a point at which interspecific competition was equal to intraspecific competition. The general properties of polyculture systems which became apparent in the evaluation of the succession polyculture system can be used as a guideline in the design of other polyculture systems. (*Extracted from Summary by Dissertation Abstracts*) D03

0200

11769 INSTITUTO INTERAMERICANO DE CIENCIAS AGRICOLAS. DEPARTAMENTOS DE CULTIVOS Y SUELOS TROPICALES. **Sistemas de producción agrícola probados en el CATIE, Turrialba: Aspectos agronómicos y económicos.** (*Agro-economic aspects of crop production systems tested at CATIE, Turrialba*). *In* Reunión anual del Programa Cooperativo Centroamericano para el mejoramiento de Cultivos Alimenticios, 12a., San José, Costa Rica, 1976. Trabajos presentados. San José, Ministerio de Agricultura, 1976. pp.K1-K11. Span.

Phaseolus vulgaris **Cassava. Cultivation. Proteins. Economics. Income. Cultivars. Spacing. Climatic requirements. Yields. Cultivation systems. Costa Rica.**

A summary is presented of the results obtained from Nov. 74-Oct. 75 in the evaluation of 24 production systems of beans, maize, cassava and sweet potatoes in different spatial and chronological arrangements. A randomized block design was used with 4 replications; there was min use of insecticides, and all cultural practices were done by hand. Bean yields varied from 0.009-1.3 t/ha/yr and cassava yields, 6.3-23.6 t/ha/yr. The systems producing the most energy had cassava and sweet potatoes in their composition. Systems with a relatively high % protein energy (9.5-12.7%) had beans and maize. Beans are considered to be one of the principal contributors of income in these systems even though they present < production vol than the other crops. Cassava is considered a more stable (performance and productionwise) and less risky crop. *(Summary by L.M.F.)* D03 J00

0201

13297 LACHARME, F.J. **Estudio de absorción de nutrimentos en un agrosistema de producción de fríjol (*Phaseolus vulgaris* L.), maíz (*Zea mays* L.) y yuca (*Manihot esculenta* Crantz).** Tesis Mag. Sc. Turrialba, Costa Rica, Instituto Interamericano de Ciencias Agrícolas de la OEA. Centro Tropical de Enseñanza e Investigación. Departamento de Cultivos y Suelos Tropicales, 1976. 90p. Span., Sum. Span., Engl., 46 Refs., Illus.

Phaseolus vulgaris. **Field experiments. Intercropping. Nutritional requirements. Fertilizers. N. P. S. K. Yields. Costa Rica.**

A 3 crop subsystem was studied as a part of the Central Experiment of the Tropical Crops and Soils Dept., located in the exptl area of the Tropical Agricultural Research and Training Center (CATIE) in Turrialba, Costa Rica, in soils of the series Instituto Clay, normal phase, of the order Inceptisol and subgroup Typic Dystropepts. The objectives were to chemically characterize the plot soils and to detect changes in nutrient absorption in different stages of the physiological development of the crops and their effects on production. The subsystem included beans (var. Jamapa), maize (var. Eladio Hernández) and cassava (var. Valencia), in a spatial arrangement, using a 2 x 2 x 2 factorial design with 8 treatments and 32 subtreatments, and permitted all crop combinations possible, both monocrops and the 2 or 3 crop associations. According to the chemical characteristics, the soils are acid, with medium to high OM contents, medium N, high K, low Ca, Mg, S and P, and low base %s. The highest nutrient requirements of crops was between 25-75 days. The need was cassava > maize > beans. Cassava and maize are outstanding biomass producers and soil nutrient extractors. Fertilizer efficiency was K > N > P > S. According to the Equivalent Land Use Index, the polycultural systems were more efficient in yield and biomass production than monocrops. *(Author's summary)* D03 D01

0202

10322 LAING, D.R. **Competencia de los sistemas de cultivos asociados de maíz-fríjol.** (*Competition in maize/bean associations*). Cali, Colombia, Centro Internacional de Agricultura Tropical, 1978. 17p. Span., 9 Refs., Illus.

Paper presented at Reunión de Maiceros de la Zona Andina, 8a., y Reunión Latinoamericana de Maíz, 1a., Lima, Perú, 1978.

Phaseolus vulgaris. Zea mays. **Intercropping. Climbing beans. Selection. Cultivars. Yields. Economics. Colombia.**

Results obtained in expt at CIAT are analyzed 20 maize hybrids were planted in 4 replications for 2 seasons, in monoculture and in association with bean genotypes P566 and P589, Types II and IV (bush and climbing). In monoculture, Tropical White Mix gave the > yield in both seasons (7.26 and 8.08 t/ha). A significant decrease was observed in maize yield for the majority of the varieties associated with Type IV beans in both seasons. The 1st season, the yield of the majority of the maize samples decreased when associated with Type II beans, whereas in the 2nd season there were significant increases. The net profit/ha was determined taking into account yield, current market prices and production costs; it is concluded that the maize/bean association is more profitable than monoculture. A negative correlation was found in both seasons (-0.89 and -0.70) between the yields of associated maize/beans (Type II); consequently, yields of a high-yielding maize var. associated with beans (Type II) tends to decrease. A short maize var (ICA-H210) and a Type IV bean (P589) were planted; compared to monocultures, great decreases in yields (44.5 and 50.5% for maize and beans, resp.) were observed. (*Summary by F.G. Trans. by I.M.F.*) D03

0203

12371 LARIOS, J.F. **Uso de energía en los sistemas de cultivo de maíz y fríjol en El Salvador.** *(Use of energy in maize/bean systems in El Salvador).* Turrialba 29(2): 129-138. 1979. Span., Sum. Span., Engl., 25 Refs., Illus.

Phaseolus vulgaris. Zea mays. **Intercropping. Energy sources. Cultivation systems. Yields. El Salvador.**

Information is provided on the efficiency in the use of energy of 18 maize/bean cropping systems in El Salvador. Determining the energetic value of the inputs and activities of each crop (cultural energy) in relation to total energetic yield as well as the digestible energy, notable differences among the cropping systems were found with regard to efficient use of cultural energy. As the supply of cultural energy increased, the total and digestible energy also increased. The digestible energy yielded less in beans (9500 Mcal/ha/yr). The digestible energy yield decreased when cultural energy exceeded 1100 Mcal/ha/yr. The index of energetic efficiency (digestible energy/cultural energy = Y) in function of cultural energy (= X in Mcal/ha/yr) followed a negative exponential model ($Y = 6540\ X^{-0.876}$). The max energetic efficiency corresponded to the associated crop systems. In the best case (hybrid maize + beans, lowest use of inputs), for each calorie of cultural energy 21.9 calories were obtained, with 1016 Mcal/ha/yr. The protein yield/Mcal of cultural energy followed a similar trend, with a max of 824 g of protein/Mcal invested in a system of maize associated with beans and with a min of 80 g in monocrop with a high use of inputs. It is possible to improve the energetic efficiency in the production of grains in El Salvador by improving and stimulating the adoption of those systems and technologies that consume less energy and that produce higher yields. *(Author's summary)* D03

0204

13522 LIMA, G.R. DE A. and MAFRA, R.C. Utilização do milho (*Zea maiz* L.) como "tutor" para feijão (*Phaseolus vulgaris* L.) do tipo "volúvel" em um sistema consorciado de produção. *(Utilization of maize as a support for climbing beans in an associated production system).* Pesquisa Agropecuária Pernambucana 3(2):134-140. 1979. Port., Sum. Port., Engl., 5 Refs., Illus.

Phaseolus vulgaris. Zea mays. **Intercropping. Yields. Climbing beans. Production. Spacing. Planting. Brazil.**

Two expt on climbing beans intercropped with maize were carried out in the Central "Agreste" region of the state of Pernambuco. They were installed in lithosol which presents an irregular topography. Bean population no. ranged from 50,000 - 266,666 plants/ha. Maize was utilized as a support, tested at a density of 33,333 and 50,000 plants/ha. It was demonstrated that maize was much more competitive than beans since the bean yield was reduced in half. This effect was only observed when maize was reduced to 33,333 plants/ha. In general, intercropping systems contributed to increase the total land productivity. *(Author's summary)* D03

0205

12314 LUGO R., R. and LARA H., H. **Estudio de la asociación maíz-leguminosas bajo condiciones de riego.** *(Study of maize legume associations under irrigated conditions).* Araure, Venezuela, Comité de Fomento Regional del Maíz. 1977. 13p. Span., Sum. Span., 7 Refs., Illus.

Paper presented at Jornadas Agronómicas, 9a., Maracay, Venezuela, 1977.

Phaseolus vulgaris. Zea mays. **Intercropping. Field experiments. Experiment design. Yields. Income. Costs. Venezuela.**

A randomized block design was used to evaluate different maize (M) bean (B) associations on an Aquic Fluentic Ustropepts soil, series Algodonal, in the state of Portuquesa (Venezuela) to determine which system gave > profitability and land use. Treatments included bean var. Tuy and Tacarigua maize hybrid Baraure in monoculture, M planted 10 and 20 days after B, and simultaneous planting. It is concluded that monoculture gave > yields than associations. Although > yields were obtained in monoculture, > net incom were obtained with B + M,

except in the treatment where M was planted 20 days after B, which presented problems in planting and certain cultural practices. (*Summary by F.G. Trans. by L.M.F.*) D03

0206

11967 MAFRA, R.C. *et al.* **O consórcio de sorgo e milho com os feijões de arranca e macassar no nordeste do Brasil.** (*Sorghum and maize in association with beans and cowpeas in northeastern Brazil*). Pesquisa Agropecuária Pernambucana 3(1):93-104. Port., Sum. Port., Engl., 14 Refs.

Phaseolus vulgaris. Zea mays. Vigna unguiculata. **Intercropping. Field experiments. Productivity. Yields. Brazil.**

A study on intercropping of 2 cereals, maize and sorghum, with 2 legumes, cowpeas and beans, in 2 different ecological zones of the states of Pernambuco and Alagoas pointed out that maize could be replaced by sorghum in the intercropping system maize + beans without detriment to bean yield. This replacement would promote yield stability because sorghum is less affected by the weather than maize. (*Author's summary*) D03

0207

13289 MORENO, R.A. and MENESES, R. Rendimiento de algunas leguminosas intercultivadas al final del ciclo de vida de la yuca (*Manihot esculenta* Crantz). (*Yields of some legumes intercropped with cassava at the end of its growth cycle*). Turrialba, Costa Rica, Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), 1980. 5p. Span., Sum. Span., 1 Ref., Illus.

Paper presented at XXVI Reunión Anual del PCCMCA, Guatemala, 1980.

Phaseolus vulgaris. Intercropping. Yields. Cultivar Costa Rica.

In Turrialba, cowpeas (*Vigna unguiculata*), lima beans (*Phaseolus lunatus*) and 2 var. of common beans (*Phaseolus vulgaris*), one climbing and the other, bush type, were intercropped with cassava var. Valenca, 240 days after cassava planting. Cowpea and lima bean yields decreased 33 and 35% compared to the resp. monocultures. The bush var., Turrialba-4, showed 17% yield reduction due to the competence by cassava while the climbing var. CATIE-1 showed a 14% increase in yield compared to its resp. monoculture. Cassava, both in monoculture and in association with beans, showed similar yields (25.4 and 25.6 t/ha, resp.). (*Extracted from author's summary. Trans. by L.M.F.*) D03

0208

11150 SANABRIA DE MOJICA, E. **Producción de biomasa, nutrición mineral y absorción de agua en la asociación fríjol-maíz cultivada en solución nutritiva.** (*Biomass production, mineral nutrition and water absorption in a maize/bean association grown in nutrient solution*). Tésis Mag. Sc. Turrialba, Costa Rica, Instituto Interamericano de Ciencias Agrícolas de la OEA. Centro Tropical de Enseñanza e Investigación. Departamento de Cultivos y Suelos Tropicales, 1975. 80p. Span., Sum. Engl., Span., 37 Refs., Illus.

Phaseolus vulgaris. Zea mays. **Intercropping. Plant nutrition. Water absorption. Temperature. Nutrient solution. Laboratory experiments. Yields. Leaf area. N. P. K. Ca. Mg. S. Shade. Costa Rica.**

The association of maize/beans is widely used among small farmers in tropical regions. In spite of this, basic information on the physiology of these crops in association is very limited and variable, mainly because the results depend a great deal on the predominant environmental conditions during the permanence of the system in the field. Therefore, the objectives of this study were to determine the characteristics of biomass production, mineral

nutrition and water absorption during the life cycle of maize and beans cultivated in nutrient solution in association and clone. A local var. of maize and bean var. Jamapa were grown under greenhouse conditions in a Hoagland-type nutrient solution. The association was beneficial to the beans, increasing their biomass production, root dry wt and yield, as compared with the nonassociated plants. The partial shading of the beans led to an increase in their leaf area. In the case of maize, the association had no influence on the characteristics studied. It is concluded that if mineral nutrition and water are optimum in the field, bean plants associated with maize would produce more biomass and yield than those grown alone since the condition of partial shade imposed by maize favors the beans. The 1st peak of nutrient and water absorption by maize and bean plants occurred at approx 50 days of age; a 2nd high peak occurred at 90 days in maize. These peaks of greater absorption should be considered in programming the application of fertilizer and water. *(Extracted from author's summary)* D03

0209

11977 TEJADA G., DAVIS, J. and GARCIA, S. Factores agronómicos en la asociación fríjol-maíz. *(Agronomic factors in bean/maize associations)*. Cali, Colombia, Centro Internacional de Agricultura Tropical, 1979. 26p. Span., 6 Refs., Illus.

Paper presented at Curso Intensivo de Adiestramiento Posgrado en Investigación para la Producción de Fríjol, 4o., Cali, Colombia, 1979.

Phaseolus vulgaris. Zea mays. **Intercropping. Agronomic characters. Spacing. Planting. Stakes. Plant habit. Fertilizers. Yields. Herbicides. Weeding. Colombia.**

The methodology used and the results obtained are discussed for an investigation conducted at CIAT on agronomic factors of maize-bean associations: planting method, density and date, stakes used, fertilization and cultural practices. It was concluded that if high technological levels are used, there are no differences in bean yields with the different planting methods. Climbing beans give increased yields up to 120,000 plants/ha and bush beans up to 240,000 plants/ha in monoculture and in association. The optimum planting date for beans and maize under CIAT conditions, is generally simultaneous for habits II, III and IV; for growth habit I, beans should be planted 5 days before maize. Bush beans in association yield 30% less and climbing beans, 50% less than in monoculture. Maize height is sufficient to be used as stakes in climbing bean production. *(Summary by F.G. Trans. by L.M.F.)* D03

0210

11653 VICTOR, J.A. Drenaje superficial en un cultivo de maíz y fríjol asociados, por diferentes tamaños de camellones hechos a mano. (*Bean/maize associations on different-sized, manually formed beds with surface drainage*). Tesis Mag. Sc. Turrialba, Universidad de Costa Rica-Centro Agronómico Tropical de Investigación y Enseñanza, 1976. 107p. Span., Sum. Span., Engl., Fr., 137 Refs., Illus.

Phaseolus vulgaris. Zea mays. **Intercropping. Drainage. Yields. Soil preparation. Cultivation. Soil reactions. Economics. Statistical analysis. Agronomic characters. Costa Rica.**

Yield of maize var. Tuxpeño 1 and bean var. Turrialba 4 grown in association on manually built cambered beds was evaluated at the Centro Agronómico Tropical de Investigación y Enseñanza in Turrialba, Costa Rica. An economical study was made of the costs/benefits of beds of different widths. Plots were established on places where crops always suffered from flooding; the soil was an Inceptisol typic dystropept, belonging to the Instituto clay series. All cultural practices were manual, and beds were constructed without topographical instruments. There were 40,000 maize and 100,000 bean plants/ha. A randomized block exptl design was used with 7 treatments (bed widths, 1, 2, 3, 4, 5 and 6 m; control, without a bed) and 4 replications. Some physicochemical soil characteristics were measured and the oxygen diffusion rate determined during 3 stages of growth. Results showed that the cambered bed increased bean yields up to 40%; no significant

differences were observed for maize. The 2- and 3-m beds produced the max additional returns with a cost/benefit ratio of 1:7. A high negative correlation (r = -0.93) between bean and maize yield was observed. A lateral movement of N towards the edges of the beds was also noted. (*Author's summary*) D03

See also 0184 0231 0233 0472

D04 Seed Production

0211

13552 CUNHA, J.M. **Seleção cromática de sementes de feijão (*Phaseolus vulgaris* L.) e seus efeitos na produção.** *(Chromatic selection of bean seeds and its effect on production).* Summa Phytopathologica 5(1, 2):101-105. Port., Sum. Port., Engl., 4 Refs.

Phaseolus vulgaris. **Seeds. Selection. Seed color. Seed production. Brazil.**

The effect of bean seed selection on sanitary control and productivity was evaluated by comparing manual and mechanical selection using an electronic selector SELETRON,which uses a chromatic selection system; it eliminates all seeds that have a wrong color. The seeds obtained by SELETRON selection and those previously treated with defensive substances are also compared. *(Author's summary)* D04

0212

12634 DESCHODT, C.C. and STRIJDOM, B.W. **Growing disease-free bean plants from seeds from a sample contaminated with bacterial pathogens.** Phytophylactica 11:187-189. 1979. Engl., Sum. Engl., Fr., Afr., 13 Refs., Illus.

Phaseolus vulgaris. Phaseolus coccineus. **Seed. Diseases and pathogens. Seedlings. Bacterioses. Africa.**

A description is given of a technique used in South Africa to grow disease-free bean plants *(Phaseolus vulgaris* and *P. coccineus)* from seeds of a sample containing both healthy seeds and seeds infected with bacterial pathogens. The same technique was used to determine the % of contaminated seeds present in a batch of seed. *(Author's summary)* D04 E02

0213

10672 DICKSON, M.H. **Breeding for superior seed quality in beans.** Geneva, New York. Nysaes, 1978. 3p. Engl., 5 Refs.

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

Phaseolus vulgaris. **Seed coat. Cotyledons. Seed characters. Plant breeding. Selection. Host-plant resistance. Mechanical damage. Cotyledon cracking. Pods. Cultivars. Threshing. USA.**

Bean seeds are delicate; any impact can cause damage to the seed coat, cotyledons or embryo. When selecting seeds for quality improvement, resistance to mechanical damage (MD) is taken into account. MD can occur in drought conditions, threshing, or in any of the stages of seed processing through to planting of the next crop. Factors that influence resistance to MD are susceptibility to cotyledon cracking, tightness of adhesion between seed coat and cotyledon, porous seed coat and pod structure. A simple screening test is described. (*Summary by F.G. Trans. by L.M.F.*) D04

0214

10671 EDWARDS, E.T. **Plant variety protection and its implications for growers and merchants.** Chatswood, New South Wales, Yates Seeds Ltd., 1978. 11p. Engl.

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

Phaseolus vulgaris. **Seed. Cultivars. Legislation. Australia.**

A historical review on protective legislation of plant var. is included. Registration of cv. is on the basis that the cv. be new, different, uniform and stable. Two legislation systems exist: the American (USA) and the one from Great Britain and other European countries. This measure increases the no. of registered var. of vegetables and tropical grasses. Merchants are obligated to register new var. and pay rights. Prices are also higher for farmers. An example of registering a cv. in both systems and their costs are given. *(Summary by F.G. Trans. by L.M.F.)* D04

0215

12620 ELLIS, M.A. and GALVEZ, G.E. **Patología de la semilla.** *(Seed pathology). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.301-314. Span., 47 Refs., Illus.

Also in English.

Phaseolus vulgaris. **Seed transmission. Storage. Seed. Disease control. Chemical control.** *Colletotrichum lindemuthianum. Xanthomonas phaseoli. Corynebacterium flaccumfaciens.* **Bean common mosaic virus. Seed production.**

Seeds provide an efficient method for disseminating pathogenic organisms to different locations; more than 50% of the major bean diseases are seed borne. Mechanical damage, which may occur during harvesting, threshing and/or planting, can affect seed viability, germination and contamination by microorganisms. Seed pathogens can be controlled with protectant fungicides that penetrate the seed coat but not the cotyledons. Systemic fungicides, which penetrate that seed coat and cotyledons, provide some degree of control. The date of harvest is very important in the production of high-quality, pathogen-free seed. Leaving plants for prolonged periods in the field after plant maturity increases the % of seed infection by fungi and decreases the % of seed germination. Various species of bacteria and viruses are seed borne, but no treatment controls them satisfactorily. The seed-borne and seed-contaminating organisms associated with dry beans are given in table form. Color illustrations are given. *(Author's summary. Trans. by L.M.F.)* D04 E00

0216

11972 FULCO, W. DA S. *et al.* **Análise sanitária em sementes de três cultivares de feijão (*Phaseolus vulgaris* L.) procedentes de dois municipios do Rio Grande do Sul.** (*Testing seed from three bean cultivars from Rio Grande do Sul for the presence of fungi*). Agronomia Sulriograndense 13(2):361-367. 1977. Port., Sum. Port., Engl., 10 Refs.

Phaseolus vulgaris. **Seed transmission. Disease transmission. Mycoses.** *Fusarium solani. Rhizoctonia solani.* **Cultivars. Brazil.**

The blotter methods was used to determine the presence of internally seed-borne fungi in bean cv. Rio Tibagi, Guateian 6662 and Maquiné from the exptl station at Aguas Belas-Viamão and in Rio Tibagi, Costa Rica and 51052 from the exptl station at Osório (Rio Grande do Sul, Brazil). The commonest pathogens were *Fusarium* sp. and *Phytophthora* sp. in cv. Maquiné, and *Rhizoctonia* sp., *Colletotrichum* sp. and *Diaporthe* sp. on cv. Rio Tibagi (Osório). (*Summary by T.B.*) D04 E03

0217

11130 GIRALDO Z., M. **Influencia del tamaño de la semilla certificada de soya, maíz y fríjol, en el vigor y germinación.** *(Influence of size of certified soybean, maize and bean seed on vigor and germination). In* Tegucigalpa, Honduras. Secretaría de Recursos Naturales. Memoria. Tegucigalpa, 1977. pp.111-124. Span., Sum. Span., Illus.

Phaseolus vulgaris. **Seed. Germination. Cultivars. Seedlings. Seed characters. Colombia.**

In an expt at the Caja Agraria in Palmira (Colombia) the influence of the size of certified soybean, maize and bean seed on vigor and germination was measured. Data were collected on germination %, vigor index and av height of seedlings. Although there were no significant differences in germination %s, > germination occurred in large seeds (100, 99, 98 % for soybean, maize and beans, resp.). Greatest vigor in beans was obtained with the medium-sized seed (18.26), slightly > than the large (18.08) and small (17.26) seeds. The large seeds produced taller seedlings; with regard to beans, seedlings reached a height of 27 cm on the av with large seeds and 19.5 cm with small seeds. Large seeds have > germination, > vigor index and > plant height; this difference is more noticeable in legumes (soybean and beans) than in Gramineae (maize). (*Summary by F.G. Trans. by L.M.F.*) D04 D01

0218

11957 HSU, F.C. **A developmental analysis of seed size in common bean.** Crop Science 19:226-230. 1979. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. **Seed characters. Seed. Analysis. Cultivars. Plant development.**

A comparative development analysis of seed size (length, wt and vol) was made between 2 bean cv.: the large-seeded Taylor's Horticultural and the small-seeded P.I. 226895. From anthesis to day 20 the seed of Taylor's Horticultural is smaller than that of P.I. 226895; this relationship is reversed from day 20 to maturation. This pattern of relative size relationship is manifested by the whole seed and by both major seed components (embryo and seed coat). (*Author's summary*) D04 C02

0219

11949 LASCA, C.C. **Estudos sobre a flora fúngica de sementes de feijão** *(Phaseolus vulgaris* L.). *(Studies on the mycoflora of bean seeds in Brazil).* Biológico 44(6):125-134. 1978. Port., Sum. Port., Engl., 10 Refs.

Phaseolus vulgaris. **Seed transmission. Mycoses. Laboratory experiments. Cultivars. Seeds. Brazil.**

The following fungi were found on bean seeds in Brazil: *Alternaria* sp., *Botryodiplodia theobromae, Colletotrichum dematium, C. graminicola, C. lindemuthianum, Diaporthe phaseolorum* var. *sojae, Fusarium equisetti, F. moniliforme, F. oxysporum, F. semitectum, F. solani, Macrophomina phaseolina, Myrothecium* sp., *Pestalotia* sp., *Phoma* sp., *Rhizoctonia solani* and *Verticillium* sp. The blotter method, agar plating and growth tests were used to detect the presence of these organisms. Agar plating gave > samples infected by *M. phaseolina, D. phaseolorum* var. *sojae* and *R. solani* than the blotter method. *Fusarium* spp. appeared more frequently in the blotter test. Typical symptoms of scab *(Elsinoe phaseoli* f. sp. *vulgare)* observed in the growth test may indicate the occurrence of this disease in Brazil and seed transmission of its causal agent. Systematic low infection in seed samples from São Paulo, where there is a seed certification program, indicates that proper technical procedures for cultivating seed crops, as well as disease control, are important factors in the obtention of healthy seed. *(Author's summary)* D04 E03

0220

10674 O'REILLY, M. **Bean seed storage.** St. Ives, New South Wales, Malcolm O'Reilly and Associates, 1978. 8p. Engl., 16 Refs.

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

Phaseolus vulgaris. **Seed. Storage. Germination. Water content. Legume crops. Temperature. Australia.**

A review is given of the factors affecting vigor and germination power of seeds in storage: moisture content, temp, RH of the storage atmosphere. Seed quality depends on the state of maturity on the parent plant and mechanical injury during harvesting. Three levels of storage conditions are included. (*Summary by F.G. Trans. by L.M.F.*) D04 L00

0221

13139 PIMENTEL, M. DE L. and MIRANDA, P. **Qualidade física das sementes de feijão** *Phaseolus vulgaris* L. e *Vigna unguiculata* L. **Walp no estado de Pernambuco.** *(The physical quality of bean and cowpea seed in the state of Pernambuco).* Pesquisa Agropecuária Pernambucana 2(1):28-36. 1978. Port., Sum. Port., Engl., 5 Refs.

Phaseolus vulgaris. **Seed. Selection. Planting. Cultivars. Seed production. Brazil.**

A survey was made in different localities of the state of Pernambuco of the condition of bean and cowpea seed before planting to obtain information as to the physical quality of the seed and other characteristics. A questionnaire on seed appraisal was also submitted to small farmers. Results indicated that the seed used for planting is generally from the small farmer's own fields and sometimes from the open-air market. This seed is of unknown origin and not usually selected. They lack vigor, have a high MC and show signs of rot. *(Author's summary)* D04

0222

10661 SAMIRUDIN, M. and GOODWIN, P.B. **Estimating seed quality in bean** (*Phaseolus vulgaris* L.). Sydney, New South Wales, Department of Agronomy and Horticultural Science, 1978. 4p. Engl.

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

Phaseolus vulgaris. **Seed characters. Plant respiration. Growth. Laboratory experiments. Seedlings. Water content. Australia.**

Six methods for measuring seed quality are analyzed: tetrazolium tests; correlations between the respiration rate of seeds in the early hours of germination and growth rates of the seedlings; conductivity of ions released by seeds after a period of imbibition; measurement of the conductivity of individual seeds after a short period of imbibition (30-60 min); laboratory germination; glasshouse evaluation. None of the 6 tests meets the prime requirement of predicting field performance. (*Summary by F.G. Trans. by L.M.F.*) D04

0223

10682 SHEA, P.F. **Processing requirements for dry beans.** Melbourne, Victoria, Australia, Campbell's Soup Pty. Limited, 1978. 2p. Engl.

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

Phaseolus vulgaris. **Processing. Cultivars. Seed characters. Water content. Cotyledon cracking. Seed color. Australia.**

Processing requirements for dry beans are discussed: var. (variation in shape); seed size (uniformity); moisture content of the canned product; defects (seed color and damage); chemical

residues (assure intervals in crop production between applications of registered herbicides and pesticides). (*Summary by F.G. Trans. by L.M.F.*) D04

0224

13505 STANWOOD, P.C. and ROOS, E.E. **Seed storage of several horticultural species in liquid nitrogen (-196°C).** HortScience 14(5):628-630. 1979. Engl., Sum. Engl., 12 Refs.

Phaseolus vulgaris. Seed. N. Germination. Germplasm. Storage.

Seeds of 14 vegetable and 2 flower species were placed in paper envelopes and submerged in liquid nitrogen (-196°C) for periods up to 180 days with no adverse effects on the % of germination. Further tests with *Phaseolus vulgaris*, lettuce and peas also indicated no reduction in germination % or vigour after seed exposure to -196°. Liquid N offers promise as a medium for long-term storage of seed germplasm. *(Author's summary)* D04 C02

0225

13567 VIEIRA, M. DAS G.G.C. **Avaliação da qualidade das sementes de arroz (*Oryza sativa* L.) milho (*Zea mays* L.) e feijão (*Phaseolus vulgaris* L.) semeadas pelos agricultores de alguns municípios do Estado de Minas Gerais.** *(Evaluation of the quality of rice, maize and bean seeds planted by farmers in the state of Minas Gerais).* Tese Mag. Sc. Lavras-MG, Brasil, Escola Superior de Agricultura de Lavras, 1977. 47p. Port., Sum. Port., Engl., 25 Refs., Illus.

Phaseolus vulgaris. Field experiments. Seeds. Storage. Seed characters. Germination. Brazil.

A survey was conducted on the seed quality of rice, maize and beans used by cultivators in some districts of the state of Minas Gerais (Brazil). Twenty-eight properties were chosen to evaluate rice seed, 41 for maize and 43 for beans from Sept. 15-Oct. 15th, 1975. While collecting the samples, information was obtained on seed origin, age, type of storage and the threshing process used. Quality analysis of the seeds was conducted in order to determine purity, germination and vigor. Under the conditions used in this study, it was found that the maize seed purchased by the majority of the cultivators (68.29%) is improved since the use of their own seeds is not widespread. However in the case of rice and beans, the majority of the cultivators used their own products for sowing. Most of the rice, maize and bean seeds showed > 90% physical purity but the rice samples, in general, had a greater amount of red rice. The standard germination test revealed a satisfactory quality for rice and maize seed; 67.85 and 60.98% of these seeds resp. showed a germination > 85.1%. The majority of the bean samples (92.73%) showed a standard germination < 70% as none of them obtained a germination > 80.1%. Regarding vigor (accelerate ageing test), 32.15% of the samples of rice seed, 73.17% of the maize seed and 39.91% of the bean seed showed a standard germination of 0.0-10.0%, 30.1-60.0% and 0.0-5.0%, resp. after premature ageing. *(Author's summary)* D04

See also 0087 0301 0389

D05 Varietal Trials

0226

12316 ABURTO, S. and FLORES, F.J. **Ensayo comparativo de 16 variedades y 3 líneas de fríjol (*Phaseolus vulgaris* L.).** (*Comparative trial with 16 cultivars and 3 lines of beans).* *In* Instituto Tecnológico de Monterrey. Informe de investigación no. 15, 1975/76. Monterrey, México, División de Ciencias Agropecuarias y Marítimas, 1977. pp.36-38. Span.

Phaseolus vulgaris. **Cultivars. Yields. Agronomic characters. Mexico.**

In a field trial with 15 bean cv. and lines at Nuevo León, yields adjusted for covariance ranged from 0.53 t/ha for P.A.L.E.U. 19-3M to 1.98 t for Delicias 71 and 2.03 t for Canario Garbancillo. In a trial with 4 cv. from Tamaulipas, adjusted yields ranged from 0.65 t/ha for Cuba 23-3 to 1.56 t/ha for Agrarista and 1.72 t for a selection from Agrarista. (*Summary by Field Crop Abstracts*) D05

0227

12682 BENVENUTI, G., CASTILLO, C.A. and RESABALA, J.S. **Resultado de los ensayos sobre el cultivo de frejol (*Phaseolus vulgaris* L.) realizados en el Valle del Rio Portoviejo-Manabi.(Febrero de 1974-Diciembre de 1975).** *(Evaluation of bean cultivars in Manabí, Ecuador).* Quito, Ecuador, Ministerio de Agricultura y Ganadería. Serie Cultivos Tropicales Didáctica. Documento de Trabajo no. 4. 1976. 90p. Span., Illus.

Phaseolus vulgaris. **Cultivars. Adaptation. Introduction. Cultivation. Soil preparation. Planting. Harvesting. Pest control. Production. Ecuador.**

In Ecuador trials were conducted from 1974-75, on the introduction, adaptation and competition of 27 bean var. Parallel to these trials, several seed-multiplication trials were conducted on a semicommercial and commercial level; at the same time seeds were produced for demonstrations and field days on crop management (preparation, planting, cultural practices, pest and disease control, and harvest). It was thus possiblé to observe the behavior of cultivated var. The seed was also analyzed for protein content and nutritive elements. The botanical, production and bromatological characteristics are given in table form for dry and french bean var. *(Summary by J.E.Z. Trans. by L.M.F.)* D05

0228

13127 CANDAL-NETO, J.F. and VIEIRA, C. **Comportamento de cultivares de feijão (*Phaseolus vulgaris* L.) no sul do estado do Espírito Santo.** *(Evaluation of bean cultivars in southern Espírito Santo).* Revista Ceres 26(144):189-204. 1979. Port., Sum. Port., Engl., 14 Refs., Illus.

Phaseolus vulgaris. **Cultivars. Yields. Seed production. Host-plant resistance. Diseases and pathogens. Brazil.**

Bean yield trials were carried out in S. Espírito Santo, Brazil. Data were taken on seed production and disease resistance. The following cv. were tested: Cuva 168-N, Rio Tibagi,

Tayhu, Tambó, Preto 120, Venezuela 350, Ricobaio 1014, Manteigão Fosco 11, Preto Uberabinha, Ricopardo 896, Manteigão 977, Costa Rica, Preto 143, Cornell 49-242, 4 M, Col. 126-N, Moruna, Cubano Brilhoso, Carioca, Rosinha, Guateian, Aroana, Vagem Roxa, Paina and Porto Alegre. Two cv. stood out: Ricopardo 896 (brown seed) and Rio Tibagi (black). They were the most productive, showed disease resistance and a good response to improving environmental conditions. They can be recommended for planting in this area. *(Author's summary)* D05

0229

4680 CHOWDHURY, A.T.M.S.U. and FARUQUE, A.H.M. **Pinto, a new variety of bean for Bangladesh.** Bangladesh Horticulture 1(1):37-38. 1973. Engl., 4 Refs.

Phaseolus vulgaris. **Cultivars. Yields. Adaptation. Agronomic characters. Asia.**

Bean var. Pinto was planted at the Bangladesh Agricultural U. to observe its agronomic characters and determine the possibilities of introducing this var. into the region. A morphological and botanical description is given, along with its principal uses and yield (1529 lb/ac). *(Summary by F.G. Trans. by L.M.F.)* D05

0230

13150 DIAZ C., H. *et al.* **Producción de fríjol en siembras tempranas.** *(Bean production in early seedings).* Ciencias de la Agricultura no. 4:167-171. 1979. Span., Sum. Span., Engl., 10 Refs.

Phaseolus vulgaris. **Production. Planting. Yields. Cultivars. Cuba.**

From 1974-77, the behavior of black bean cv. Cuba C-25-9 was evaluated in early seedings. The economic yield (100 g/m^2) exceeded the national rate (60 g/m^2), but it was less than that obtained in Nov. seedings (175 g/m^2). Water economy of Sept. seedings in relation to those in Nov. was about 2,650 m^3/ha. Damage caused by rust (*Uromyces phaseoli* var. *typica*) was minor. The use of the cover crop *Pennisetum glaucum* was effective for weed control. *(Author's summary)* D05

0231

12645 EMPRESA BRASILEIRA DE PESQUISA AGROPECUARIA. **Sistemas de produção para milho e feijão: região nordeste da Bahia.** *(Bean and maize production systems for Northeastern Bahia).* Caldas de Cipó-BA, Brasil. Circular no. 94. 1976. 19p. Port., Illus.

Phaseolus vulgaris. Zea mays. **Intercropping. Yields. Fertilizers. Planting. Cultivation. Pest control. Harvesting. Storage. Technological package. Brazil.**

In 1976 researchers, farmers and extension workers met in the NE region of Bahia (Brazil) to elaborate a technological package that would allow a yield increase for farmers with a low technological level but capable of adopting new techniques. They cultivate beans in association with maize and have:(1) areas > 20 ha and with yields of 540 kg of beans/ha and 720 kg of maize/ha; (2) areas < 20 ha and with yields of 600 kg each of beans and maize/ha. For each system, the operations and technical recommendations are given for land selection, soil preparation, planting time and density, seed and phytosanitary treatments, harvesting, storage and commercialization. Technical coefficients of the production systems/ha are given in table form. *(Summary by J.E.Z. Trans. by L.M.F.)* D05 D03 J00

0232

12646 EMPRESA BRASILEIRA DE ASSISTENCIA TECNICA E EXTENSÃO RURAL. **Sistema de produção para feijão/milho: Barreiras/BA.** *(Bean production systems).* Barreiras-BA, Brasil. Série Sistemas de Produção. Boletim no. 51. 1976. 32p. Port., Illus.

Phaseolus vulgaris. **Production. Soil preparation. Planting. Cultivars. Storage. Harvesting. Technological package. Brazil.**

The Empresa Brasileira de Pesquisa Agropecuária has promoted meetings among researchers, producers and extension workers to improve the efficiency of the production systems currently adopted by farmers for bean/maize associations in the state of Bahia. Three technological packages were developed for farmers (10-15 ha, < 10 ha and medium areas of 0.4 ha), along with cultural practices and technical recommendations for good production (land choice, soil preparation, planting, cultural practices, pest and disease control, harvesting, storage and commercialization). Production costs/ha are given in table form. *(Summary by J.E.Z. Trans. by L.M.F.)* D05 J00

0233

12652 EMPRESA BRASILEIRA DE PESQUISA AGROPECUARIA. **Sistemas de produção para a cultura do feijão.** *(Production systems for growing beans in Alagoas, Brazil).* Santana do Ipanema-AL, Brasil. Circular no. 84. 1975. 20p. Port.

Phaseolus vulgaris. Zea mays. **Intercropping. Production. Yields. Soil preparation. Fertilizers. Cultivation. Planting. Harvesting. Technological package. Brazil.**

In 1975 farmers, researchers and technical assistants met to develop production systems for bean growers with a low level of technology but receptive to the introduction of new techniques: (1) monoculture in areas of 15-20 ha with yields of 600-650 kg/ha and possibilities of credit; (2) in association with maize in 20 ha areas with yields of 900 kg of beans/ha and 600 kg of maize/ha; and (3) associated with maize in areas < 20 ha. Operations and technical recommendations included in each system are soil preparation, planting, cultural practices, phytosanitary treatments, harvesting, storage and commercialization. *(Summary by J.E.Z. Trans. by L.M.F.)* D05 D03 J00

0234

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

0235

13128 GOMEZ C., O., DIAZ F., T.M.R. and DEPESTRE M., T. **Evaluación de variedades de habichuela** *(Phaseolus vulgaris). (Evaluation of french bean varietics).* 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

0236

13142 HARDWICK, R.C., HARDAKER, J.M. and INNES, N.L. **Yields and components of yield of dry beans (*Phaseolus vulgaris* L.) in the United Kingdom.** Journal of Agricultural Sciences 90:291-297. 1978. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. **Yields. Yield components. Cultivars. Spacing. Planting. United Kingdom.**

Exotic accessions of *Phaseolus vulgaris* selected for seedling cold tolerance in a test in controlled environments were grown in a field expt at Wellesbourne in 1974. Yields of up to 4.7 t/ha at a density of 34 plants/m^2 were obtained. In 1975, 6 selected accessions were grown at 21 plants/m^2 at 6 different sites. Mean site yields ranged from 1-3.1 t/ha. All 6 accessions had better emergence and higher yields than 2 commercial cv. used as controls. The genotype x site interactions for yield and yield components were small. The variation in yield between accessions (2.0-2.5 t/ha) was smaller than the variation in yield between sites. Variation in yield components tended to be additive between sites, and compensatory between accessions. There was a negative correlation between CP content and yield across accessions; the correlation between protein content and yield across sites was not significant. Accessions differed significantly in the amount of green leaf still attached to plants at harvest. This variation was not related to maturity as judged by MC of the seed. There was a negative correlation across accessions between the wt of leaf/plant at harvest and HI. *(Author's summary)* D05

0237

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

0238

11639 INSTITUTO DE CIENCIA Y TECNOLOGIA AGRICOLAS. GUATEMALA. **Guía para la producción de frijol.** (*Bean production manual*). Guatemala, 1974. 8p. Span.

Phaseolus vulgaris. **Cultivars. Fertilizers. N. Mineral deficiencies. P. Guatemala.**

Recommendations are given for improving extremely low bean yields in Guatemala using improved var. Negro Jalpatagua, Cuilapa-72, Ipala-72, and Jamapa (2 t/ha) and San Pedro Pinula-72 (2.6 t/ha); planting season and density (monoculture or intercropping); NPK fertilization according to soil fertility; weed control (manual, mechanized, chemical); pest control (*Empoasca* sp., *Diabrotica* sp., whiteflies and *Apion godmani*). *(Summary by F.G. Trans. by L.M.F.)* D05

0239

12642 INSTITUTO DE INVESTIGACIONES AGROPECUARIAS. ESTACION EXPERIMENTAL QUILAMAPU. CHILE. **Cultivo del poroto en la zona Centro Sur.** *(Bean cultivation in the South Central zone of Chile).* Chillán, Boletín Técnico no. 9(6qu). 1977. 51p. Span., Illus.

Phaseolus vulgaris. **Cultivars. Adaptation. Plant habit. Spacing. Yields. Fertilizers. N. P. S. Irrigation. Weeding. Viroses. Mycoses. Bacterioses. Injurious insects. Harvesting. Chile.**

Chile occupies one of the 1st places in av bean yields (1100 kg/ha), compared with the av world yield of 450 kg/ha. This high yield is due to the ecological conditions of the country, but these can be improved by using cultivated var. and adequate cultural practices. Recommendations are given for a good crop and high yields: origin and geographical distribution of the plant, its nutritive value, agronomic characteristics, soil preparation, planting times and distances, adaptation of var. for local consumption and export, crop rotation, cultural practices, pest and disease control, and harvesting. *(Summary by J.E.Z. Trans. by L.M.F.)* D05

0240

11959 KUENEMAN, E.A. *et al.* **Effect of plant arrangements and densities on yields of dry beans.** Agronomy Journal 71:419-424. 1979. Engl., Sum. Engl., 3 Refs., Illus.

Phaseolus vulgaris. **Spacing. Cultivars. Planting. N. Yields. Genotypes. USA.**

Dry beans are commonly sown in wide rows (75-90 cm) because many of the mechanical planters and plant types in use were designed or adjusted for maize culture. New developments in herbicides and prospects of more flexible harvesting machinery being marketed warrant investigations to determine yield responses of dry beans to plant spacings. Eleven field expt were conducted with different dry bean genotypes in New York State from 1966-77 to determine effects of plant arrangements and densities on yields on soils of type Glosso boric hapludalfs, Dystic flurentic entrochrepts or Typic dystrochrepts. Between-row spacing effects were evaluated in 9 expt;narrow rows conditioned significantly higher (7-48%) yields in 7 of the 9 expt. At a given density, plants in more equidistant arrangements significantly outyielded those in more rectangular arrangements. For example, plants spaced at 25 x 25 cm yielded more than those at 76 x 8 cm by 13%; plants spaced at 20 x 20 cm yielded more than those at 76 x 5 cm by 12%; and yields averaged across 5 genotypes at 30 x 10 cm were 48% greater than those at 60 x 5 cm. Results of an on-farm trial indicated that difficulty in harvesting beans grown in narrow rows is a major constraint to farmers' adoption of narrow-row culture. Suggestions for further research include: (1) modification of bean pullers or direct harvesters to accommodate beans grown in narrow rows; (2) determination of the yield advantage associated with alternating between several narrow rows and a wide row to enable passage of a tractor through the field for the purpose of cultivating, spraying and harvesting; (3) selection of bean cv. that will maximize the yield advantage of narrow-row culture. (*Author's summary*) D05

0241

5272 LEOROY, W.H. **Differential response among bean varieties *(Phaseolus vulgaris* L.) to nitrogen and phosphorus.** Mag. Sc. Thesis. East Lansing, Michigan State University, 1970. 91p. Engl., Sum. Engl., 43 Refs., Illus.

Phaseolus vulgaris. **N. P. Cultivars. Field experiments. Laboratory experiments. Fertilizers. Yield components. Yields. Ca. Mg. Statistical analysis. USA.**

A series of greenhouse, field and hydroponic expt were designed to study how increments of N and P affected bean yield and its different components, in addition to var. differences in response to these mineral nutrients. At the greenhouse level a fertilizer increment increased yield (W) and all its components when measured over all var. No. of pods/plant (X) increased more than no. of seeds/pod (Y) and seed wt (Z). Var. differed in their yield capacity at a low- and high-fertility level, indicating differences in efficient use of the substrate. Var. also responded differentially to added fertilizer for W, X, Y and Z; response values were normally distributed, with W and X showing more diversity than Y and Z. Response to added fertilizer could not be predicted from knowledge of the values prior to the addition. High yielders and producers of X under high-fertility conditions were usually high responders for the same characters. Yield response was accomplished through different combinations of response in X, Y and Z. Response, or lack of it, was not specific to either the improved or unimproved var. In the field, the effect of N over all varieties was greater than that for P; differential response was more prevalent for P than for N. Var. demonstrated differences in optimum P levels and differed in tolerance to sub- and supra-optimal levels of P. Hydroponic results showed that var. differed in accumulating P, K, Ca and Mg; plant parts did so as well. Varying the P level in the substrate affected concn of P, as well as K, in the tissue. Var. responded differentially to P levels with respect to K and Ca concn. Plant parts responded differentially to P levels with respect to P, K, Ca and Mg concn. It is inferred that bean var. have unique genetic properties that regulate the response patterns. The diversity of the response pattern to P levels, if these patterns are indeed genetically determined characteristic of the var. and not some artifact, suggests a degree of genetically regulated fitness to mineral balances. Since each of the bean var. is a component of the ecological system in which it evolved, diversity with respect to patterns of response must reflect a natural diversity of the soils with respect to levels and balance of minerals, which is to be expected since highly variable topographical and climatic conditions, as well as other factors affecting soil formation exist. *(Author's summary)* D05 D01

0242

12348 MONTERO R., R.A., *et al.* **Comportamento de cultivares de feijão (*Phaseolus vulgaris* L.) na Zona da Mata de Minas Gerais.** (*Evaluation of bean cultivars in Zona da Mata, Minas Gerais*). Revista Ceres 26(147):495-512. 1979. Port., Sum. Port., Engl., 15 Refs

Phaseolus vulgaris. **Yields. Cultivars. Plant habit. Field experiments. Diseases and pathogens. Brazil.**

Twenty-two dry bean performance trials were carried out in both planting seasons (rainy and dry) at 10 sites in the Zona da Mata, state of Minas Gerais, Brazil. The 12 cv. were Manteigão Fosco 11, Rico 23, Caraota 260, Compuesto Negro Chimaltenango, Ricopardo 896, S-182-N, Vi. 1010, Ricobaio 1014, Carioca, Costa Rica, Venezuela 1056 and Vermelho Rajado 1162. The same cv. were compared at Viçosa in 8 simulated environments (4 levels of fertilization x 2 planting seasons). Disease resistance, yielding ability and the adaptation of each cv. were studied. The black beans S-182-N, Costa Rica and Venezuela 1056 were outstanding; the last was the most responsive to environmental improvement. Among the nonblack beans, cv. Vi. 1010 was the best. (*Author's summary*) D05

0243

12328 NUÑEZ G., S. Avances en la investigación de fríjol y soya en los Valles Centrales de Chiapas. *(Progress report of research on beans and soybeans in the central valleys of Chiapas).* Tésis Ing. Agr. Guadalajara, México, Universidad de Guadalajara. Escuela de Agricultura, 1976. 70p. Span., Sum. Span., 31 Refs.

Phaseolus vulgaris. Glycine max. **Cultivars. Yields. Injurious insects. Statistical analysis. Planting. Mexico.**

Research conducted on beans and soybeans in the central valleys of Chiapas (Mexico) contributed valuable information with reference to the technologies that should be applied to increase unitary yields. It was shown that domestic bean var. have a yield potential difficult to exceed, even though Jamapa has better agronomic characteristics. Bean and soybean var. demonstrate their potential when planted from June 1-July 16. Observations were made on pest *(Diabrotica balteata, Empoasca fabae, Bemisia tabaci)* and disease incidence, the viral diseases being the most serious, although there is also rust, angular leaf spot and Chaetoseptoria leaf spot. *(Author's summary. Trans. by L.M.F.)* D05 J00

0244

10387 PACHECO, A.C. **Indicação de cultivares de feijão para o estado de Santa Catarina safra 1978-1979.** (*Evaluation of bean cultivars for the state of Santa Catarina*). Florianópolis, Brasil, Empresa Catarinense de Pesquisa Agropecuária. Indicação de Pesquisa no. 26. 1978. 8p. Port., 1 Ref., Illus.

Phaseolus vulgaris. **Cultivars. Statistical analysis. Yields. Agronomic characters. Brazil.**

Results are given of 4-yr regional trials evaluating 5 bean cv. for the state of Santa Catarina, Brazil. Incidence of *Colletotrichum lindemuthianum, Xanthomonas phaseoli* and *Uromyces phaseoli* was observed; the principal pest was *Diabrotica speciosa.* Black-seeded Rio Tabagi, Turrialba 4, Rico 23 and Costa Rica yielded an av of 1708-1785 kg/ha; brown-seeded, light-striped Carioca, 1893 kg/ha. (*Summary by T.B.*) D05

0245

12333 RAMALHO, M.A.P., ANDRADE, L.A. DE B. and TEIXEIRA, N.C.S. **Correlações genéticas e fenotípicas entre caracteres do feijão** (*Phaseolus vulgaris* **L.**). (*Genetic ana phenotypic correlations among different characters in beans*). Ciência e Prática 3(1).63-70. 1979. Port., Sum. Port., Engl., 11 Refs.

Phaseolus vulgaris. **Yield components. Cultivars. Yields. Statistical analysis. Genetics. Inheritance. Brazil.**

Genetic and phenotypic correlation estimates were made between components of yield and cultural yield, as well as other parameters, for progeny of bean cv. Paraná and Pintado. In general all phenotypic and genetic correlations between no. of pods/plant (X), no. of seeds/pod (Y) and wt of 100 seeds (Z) and yield/plant (W) were high. Correlations between XY, XZ and YZ were different for the 2 populations, being generally high and positive for progeny of Pintado. (*Author's summary*) D05 G00

0246

11948 RAO, M.A. **Energy use for the production of rice, beans, maize, and soya beans in São Paulo, Brazil.** Tropical Agriculture (Trinidad) 56(3):277-283. 1979. Engl., Sum. Engl., 12 Refs.

Phaseolus vulgaris. **Yields. Energy sources. Fertilizers. Agricultural equipment. Mechanization. Brazil.**

Energy use in the production of rice, beans and maize was determined for different cultural practices in the state of São Paulo. With regard to beans, yields were 300 kg higher during the dry season and energy/kg beans was lower than during the wet season. When only animal energy was used, fertilizers and machinery accounted for 70% of the total energy used (2157 kcal/kg);

whereas the use of a tractor increased the % to 84 (3189 kcal/kg). It is concluded that the use of a tractor is not justified as yields were not increased by this type of cultivation. (*Summary by T.B.*) D05

0247

12373 RIOS B., M.J. **ICA Viboral: una nueva variedad de fríjol.** *(ICA Viboral: a new bean variety).* Medellín, Instituto Colombiano Agropecuario, 1979?. 5p. Span., Illus.

Phaseolus vulgaris. **Cultivars. Climbing beans. Flowering. Maturation. Adaptation. Planting. Intercropping. Colombia.**

The red climbing bean var. Cargamanto ICA Viboral, developed in Colombia, is described; it is apt for areas with cold to moderate climates, between 2000-2400 m above sea level, with a 138-day life cycle and a long flowering period which causes a non-uniform maturity. It is moderately resistant to rust, anthracnose and angular leaf spot and tolerant to the majority of the bean insect pests. It is recommended for association systems with maize. *(Summary by J.E.Z. Trans. by L.M.F.)* D05

0248

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

0249

12603 ROMERO J., P. **El cultivo del fríjol** *(Phaseolus vulgaris,* L.). *(Bean cultivation).* Bogotá, Colombia. Instituto Colombiano de Reforma Agraria. Boletín Técnico no. 41:19-22. 1979. Span., Sum. Span.

Phaseolus vulgaris. **Cultivars. Dwarf beans. Cultivation. Yields. Costs. Income. Colombia.**

Some characteristics of the bean cultivation program (1-5 ha plots) to be carried out on 6 farms in the state of Sucre (Colombia) are described; bush var. ICA-PALMIRA will be used. A brief explanation is given of adequate cultural practices, production costs and possibilities of financing. *(Summary by F.G. Trans. by L.M.F.)* D05

0250

12641 SALVIOLI, R.A. and BOGGIATTO, A.J. **Variedades de poroto para "Chaucha" ensayadas en el año 1961.** *(French bean varieties evaluated in 1961).* Tucumán, Argentina. Universidad Nacional de Tucumán. Facultad de Agronomía y Zootecnia. Miscelánea no. 14. 1964. pp.11-16. Span., Sum. Span., 3 Refs., Illus.

Phaseolus vulgaris. **Cultivars. Adaptation. Yields. Statistical analysis. Argentina.**

Six french bean var. were evaluated for yield and quality. The results obtained for early harvesting and total yields were analyzed. For early-maturing var., the 2 progeny from

Bountiful were better than Negra Francesa and Tendergreen. Negra Francesa exceeded the rest in total yields, but its product was of poor quality. In relation to both yield and quality, the outstanding var. were, in descending order, Balin de Albenga, Bountiful (introduced), Bountiful (local), Tendergreen and Cordobesa. *(Author's summary. Trans. by L.M.F.)* D05

0251

12330 SANTOS, J.B. DOS, SANTA CECILIA, F.C. and RAMALHO, M.A.P. **Comportamento de algumas cultivares de feijão (*Phaseolus vulgaris* L.) na região sudoeste de Minas Gerais período 1974-1977.** (*Evaluation of bean cultivars in southwestern Minas Gerais from 1974-77*). Ciência e Prática 3(1):23-28. 1979. Port., Sum. Port., Engl., 5 Refs.

Phaseolus vulgaris. **Cultivars. Yields. Seed color. Adaptation. Brazil.**

In a 4-yr evaluation of bean cv. in SW Minas Gerais, Rico-23 and Costa Rica 1031 (black seeded), Carioca and Vi 1011 (cream-beige seeds), and FSAL-1 (brown-maroon seeds) were outstanding and can be recommended to replace local var. The black-seeded var., however, have low acceptability in the region. (*Author's summary*) D05

0252

12700 URBINA, J.T. **Variedades de frejoles recomendadas para la zona Centro Sur.** *(Bean cultivars for the south central zone of Chile).* Investigación y Progreso Agrícola 9(1):56-58. 1977. Span., Illus.

Phaseolus vulgaris. **Cultivars. Yields. Spacing. Bean yellow mosaic virus. Seed characters. Host-plant resistance. Chile.**

The principal factors that limit bean yields in the south central zone of Chile are listed: use of noncertified seed, the incidence of BYMV and deficiencies in irrigation and weed control. The best var., cultural practices (planting distance, quantity of seed, growth period) and some observations on yields and uses are included in table form. *(Summary by F.G. Trans. by L.M.F.)* D05 I 04

0253

12658 VILHORDO, B.W. and MULLER, L. **Caracterização botánica de algumas cultivares de feijão** *(Phaseolus vulgaris* **L.) pertencentes aos oito grupos comerciais.** *(Botanical characterization of bean cultivars from eight commercial groups).* Porto Alegre-RS, Brasil. Instituto de Pesquisas Agronômicas. Boletim Técnico no. 4. 1979. 73p. Port., Sum. Port., Engl., 29 Refs.

Phaseolus vulgaris. **Cultivars. Agronomic characters. Plant habit. Flowers. Podding. Seedlings. Brazil.**

The 43 bean cv. pertaining to the 8 commercial groups established for Brasil (Amarelo, Bico-de-Ouro, Manteigão, Mulatinho, Pardo, Preto, Rosinha and Roxinho) were characterized at the Osorio Expt Station (Maquiné) in the municipality of Osorio, Rio Grande do Sul. The parameters used included characters of the seedling, stem, growth habit, flower and inflorescence, infructescence, pods, seeds and phenology. *(Author's summary)* D05

0254

8936 VOYSEST V., O. **Metodología y análisis de resultados de los primeros ensayos de Viveros Internacionales de Rendimiento y Adaptación del Fríjol, IBYAN.** (*Methodology and analysis of the results of the first International Bean Yield and Adaptation Nurseries, IBYAN*). Cali, Colombia, Centro Internacional de Agricultura Tropical. Serie Seminarios Internos. SE-12-77. 1977. 14p. Span., Sum. Span.

Phaseolus vulgaris. **Cultivars. Adaptation. Yields. Statistical analysis. Climatic requirements.**

A summary of the characteristics of the 1st international trials and the results of the 1st expts are given. The 1976 IBYAN trial consisted of 20 CIAT var. + 5 local var. Ninety expts were distributed among 30 countries. Exptl procedures were uniform and the collaborators were instructed to use common cultural practices whenever possible. An analysis of variance was conducted for each of the variables at each locality. The var. presenting the highest yields was P758, with an av of 3700 and 3200 kg/ha in Chile and Japan, resp. In general, the yields obtained in temperate zones were higher than those of tropical zones. Black-seeded var. produced the highest yields. In temperate zones, late flowering was observed. The shortest periods from planting time to physiological maturity were registered in tropical areas with high temp (34°C max, 24°C min). (*Summary by I B. Trans. by L.M.F.*) D05

See also 0129

E00 PLANT PATHOLOGY

0255

12315 ENFERMEDADES Y PLAGAS del frijol en México. (*Diseases and pests of beans in Mexico*). Análisis de la Agricultura Sinaloense 16(105):467-491. 1977. Span.

Phaseolus vulgaris. Colletotrichum lindemuthianum. Uromyces phaseoli. Sclerotinia sclerotiorum. Isariopsis griseola. Pseudomonas phaseolicola. Xanthomonas phaseoli. Corynebacterium flaccumfaciens. **Bean root rots. Bean common mosaic virus. Bean yellow mosaic virus. Curly top virus.** *Empoasca. Epilachna varivestis. Diabrotica balteata. Apion godmani.* **Diptera. Nematodes. Stored grain pests. Insect control. Disease control. Host-plant resistance. Cultivars. Virus transmission. Vectors. Epiphytology. Insect biology. Chemical control. Biological control. Cultural control. Mexico.**

About 2 million ha are planted to beans in Mexico. Pests and diseases are important factors limiting to production. Data are given on geographic distribution, climatic conditions favoring disease development, disease symptoms, insect habits and biology, type of damage caused, and control measures including recommended rates of insecticides, biological control and resistant var. for the following: (1) diseases - anthracnose, rust, Rhizoctonia and Fusarium roots rots, Chaetoseptoria leaf spot, white mold, web blight, angular leaf spot, powdery mildew, halo blight, BCMV, BYMV, curly top virus; (2) nematodes - *Meloidogyne* sp.; and (3) insects - leafhoppers, Mexican bean beetle, whiteflies (*Trialeurodes vaporariorum*), chrysomelids (*Diabrotica* spp.), bean pod weevil and the stored grain pest *Zabrotes subfasciatus. (Summary by T.B.)* E00 F00

See also 0215 0421 0424

E01 General Descriptive Studies

0256

11980 CASTAÑO A., J.J. **Enfermedades del fríjol (*Phaseolus vulgaris* L.).** *(Bean diseases).* Cali, Colombia, Centro Internacional de Agricultural Tropical, 1979. 14p. Span.

Paper presented at Curso Intensivo de Adiestramiento Posgrado en Investigación para la Producción de Fríjol, 4o., Cali, Colombia, 1979.

Phaseolus vulgaris. Fusarium solani phaseoli. Rhizoctonia solani. Macrophomina phaseoli. Sclerotium rolfsii. Pythium aphanidermatum. Corynebacterium flaccumfaciens. Meloidogyne. Colletotrichum lindemuthianum. Uromyces phaseoli. Isariopsis griseola. Ascochyta phaseolorum. Diaporthe phaseolorum. Sclerotinia sclerotiorum. Pseudomonas phaseolicola. Xanthomonas phaseoli. **Bean common mosaic virus. Bean golden mosaic virus. Disease control. Epiphytology. Mineral deficiencies. Drought. Storage. Colombia.**

The symptomatology and control of the principal bean diseases in Colombia are discussed, classifying them as (1) biotic: root rot caused by fungi, bacteria and nematodes; foliage diseases - anthracnose, rust, angular leaf spot, powdery mildew, Ascochyta leaf spot, gray spot, floury leaf spot, pod scorch caused by *Diaporthe phaseolorum*, white mild, halo blight, common and fuscous blights. (2) viral: BCMV and BGMV; (3) abiotic disorders: (a) physicogenic: natural deficiencies, sunscald and damage caused by high winds and excess drought; and (b) enzymatic: phytotoxemias and phytotoxicities; and (4) diseases during transportation and storage. *(Summary by F.G. Trans. by L.M.F.)* E01

0257

4321 **ENFERMEDADES DEL fríjol.** *(Diseases of beans).* Boletín Agrícola (Colombia) no. 581:11331-11332. 1969. Span.

Phaseolus vulgaris. **Mycoses. Viroses. Bacterioses. Etiology. Colombia.**

The principal diseases found in the Valle del Cauca, Colombia are discussed briefly: common blight, rust, BCMV, gray spot, angular leaf spot, Rhizoctonia root rot and white mold. Their importance varies according to planting time and climate. *(Summary by J.E.Z. Trans. by L.M.F.)* E01

0258

12625 KAISER, W.J. **Important diseases and pests of bean (*Phaseolus vulgaris*), lima bean (*Phaseolus lunatus*) and pigeon pea (*Cajanus cajan*) in Africa.** African Journal of Plant Protection 1:97-102. 1976. Engl., Sum. Engl., 38 Refs.

Phaseolus vulgaris. Colletotrichum lindemuthianum. Uromyces phaseoli. Pseudomonas phaseolicola. **Seed transmission.** *Melanagromyza phaseoli. Aphis fabae. Acanthoscelides obtectus. Zabrotes subfasciatus.* **Africa.**

Beans, lima beans and pigeon peas are important food crops that often provide a major

source of protein in the diets of inhabitants of many countries of Africa south of the Sahara. Diseases and pests are important factors contributing to the erratic, low yields and poor quality. Beans are adversely affected by several pests and pathogens at various stages of plant development, which seriously reduce seed yields and quality. Important bean diseases are anthracnose (*Colletotrichum lindemuthianum*), rust (*Uromyces phaseoli*), angular leaf spot (*Isariopsis griseola*), halo blight (*Pseudomonas phaseolicola*), common and fuscous blights (*Xanthomonas phaseoli* and *X. phaseoli* var. *fuscans*), and BCMV. Pests include *Acanthoscelides obtectus, Zabrotes subfasciatus, Maruca testulalis, Heliothis* spp. and *Agrotis* spp. Control of the diseases and pests limiting the cultivation of these legumes in Africa is essential if yields and quality are to be increased. Different control measures presently being utilized are discussed. Breeding and selection of var. that are resistant to one or more of the important pests and pathogens of these crops appear to offer the most attractive means of control for the long term. *(Summary by T.B.)* E01 F01 L01

0259

12374 LARIOS, J.F. and RIVERA F., E. **Una serie de claves ilustradas para la evaluación de daño por enfermedades en frijol.** (*Illustrated keys for evaluating disease damage in beans*). San Salvador, Universidad de El Salvador. Facultad de Ciencias Agronómicas, 1979. 23p. Span., Sum. Span., 14 Refs., Illus.

Phaseolus vulgaris. Colletotrichum lindemuthianum. Chaetoseptoria wellmanii. Uromyces phaseoli. Isariopsis griseola. Tanatephorus cucumeris. Erysiphe polygoni. Xanthomonas phaseoli. **Leaves. Developmental stages. El Salvador.**

Studies on epidemical development and the estimation of losses are based on the evaluation of damage caused by diseases. Generally, the methods of making these evaluations are inconsistent and, in the case of beans, have been designed mainly to evaluate varietal reactions and not the quantity of affected tissue. The objetive of this study is to present a series of illustrated keys for evaluating bean diseases, based exclusively on % scales, such as incidence (rots and systematic diseases) and severity (leaf spots and blights). With the purpose of standardizing the methods used in evaluating diseases, procedures are suggested for evaluating damage caused by the most important bean diseases in El Salvador and Central America: smut (*Entyloma petuniae*), Chaetoseptoria leaf spot (*Chaetoseptoria wellmanii*), rust (*Uromyces phaseoli*), angular leaf spot (*Isariopsis griseola*), web blight (*Thanatephorus polygoni*), anthracnose (*Colletotrichum lindemuthianum*), common and fuscous blights (*Xanthomonas phaseoli*). *(Author's summary. Trans. by L.M.F.)* E01

0260

11981 SCHWARTZ, H., CASTAÑO J., M. and RIVERO C., R. **Enfermedades del frijol.** (*Bean diseases*). Cali, Colombia, Centro Internacional de Agricultura Tropical, 1979. 28p. Span.

Paper presented at Curso Intensivo de Adiestramiento Posgrado en Investigación para la Producción de Frijol, 4o., Cali, Colombia, 1979.

Phaseolus vulgaris. Uromyces phaseoli. Colletotrichum lindemuthianum. Isariopsis griseola. Fusarium solani phaseoli. Fusarium oxysporum. Rhizoctonia solani. Pythium ultimum. Pythium debaryanum. Pythium aphanidermatum. Thanatephorus cucumeris. Sclerotium rolfsii. Cercospora vanderysti. Erysiphe polygoni. Xanthomonas phaseoli. Pseudomonas phaseolicola. Meloidogyne. **Bean common mosaic virus.** *Aphis fabae. Myzus persicae.* **Bean yellow mosaic virus. Bean golden mosaic virus.** *Bemisia tabaci.* **Vectors. Bean rugose mosaic virus. Bean southern mosaic virus. Colombia.**

Diseases are one of the limiting factors to bean production in L.A. The prevalency and severity of the disease depends on the quantity of inoculum existing in the region, environmental conditions

and the quality of the seed used. Data are given on geographic distribution, favorable climatic conditions for development, symptomatology, vectors, type of damage caused and control measures, including var. resistant to (1) fungal diseases, the most numerous and causing the most damage: rust, anthracnose, angular leaf spot, root rot, web blight, gray spot, powdery mildew; (2) virus diseases, some of economic importance transmitted by aphids (BCMV, BYMV); transmitted by whiteflies (BGMV, bean chlorotic mottle, euphorbia mosaic); transmitted by chrysomelids (BRMV, pod mottle, BSMV, yellow mottle); (3) bacterial diseases are few but can be a serious limitation to the crop: common and fuscous blights, halo blight; and (4) nematodes: *Meloidogyne* sp., *Trichodoru.* spp., *Pratylenchus* spp., *Heterodera* spp. (*Summary by J.E.Z. Trans. by L.M.F.*) E01

0261

13166 ZAMBOLIN, L. and CHAVES, G.M. **Doenças do feijoeiro e seu controle.** *(Bean diseases and their control).* Informe Agropecuário 4(46):50-63. 1978. Port., 27 Refs., Illus.

Phaseolus vulgaris. Colletotrichum lindemuthianum. Uromyces phaseoli. **Mycoses.** *Isariopsis griseola. Erysiphe polygoni. Macrophomina phaseoli. Sclerotium rolfsii. Rhizoctonia solani. Fusarium solani phaseoli. Xanthomonas phaseoli.* **Bacterioses.** *Pseudomonas phaseolicola. Meloidogyne incognita.* **Bean common mosaic virus. Viroses. Bean yellow mosaic virus. Bean golden mosaic virus. Disease control. Brazil.**

A description is given of the symptoms, causal agents and control measures of the bean diseases caused by: (1) fungi - *Colletotrichum lindemuthianum, Uromyces phaseoli, Isariopsis griseola, Erysiphe polygoni, Macrophomina phaseoli, Sclerotium rolfsii, Rhizoctonia solani* and *Fusarium solani;* (2) bacterias - *Xanthomonas phaseoli* and *Pseudomonas phaseolicola*; (3) nematodes - *Meloidogyne incognita, M. javanica, M. hapla* and *M. arenaria*; and (4) viruses - the common mosaic, the yellow mosaic, the chlorotic mottle and the golden mosaic viruses. The principal transmitting agents are included. *(Summary by I.B. Trans. by L.M.F.)* E01

See also 0125

E02 Bacterioses

0262

11946 CAFATI, C.R. **Effect of host genotype on multiplication, distribution and survival of bean common blight bacteria (*Xanthomonas phaseoli*).** Ph.D. Thesis. East Lansing, Michigan State University, 1979. 124p. Engl., Sum. Engl., 161 Refs., Illus.

Phaseolus vulgaris. Xanthomonas phaseoli. **Mutation. Plant breeding. Host-plant resistance. Leaves. Pods. Genotypes. Inheritance. Field experiments. Statistical analysis. Seed transmission. USA.**

Naturally-occurring rifampin-resistant mutants of common blight bacteria (*Xanthomonas phaseoli*, R15-1) and of fuscous blight bacteria (*X. phaseoli* var. *fuscans*, R1) were used as an antibiotic selective system in epidemiological studies. A wide range of *Phaseolus* germplasm was examined for their reaction to *Xp* and for their ability to support population build-ups of blight bacteria. Results indicate that most of the germplasm sources being utilized in bean breeding programs throughout the world may be potential "symptomless carriers" of the common blight pathogen. Multiplication and distribution patterns of *Xp* (R15-1) in resistant-R (Tepary beans - *P. acutifolius* - P597 and Arizona-Buff), moderately resistant-MR (MSU-51319 and G.N. Valley) and common blight-susceptible-S (Seafarer and Tuscola) bean genotypes were studied in 1977-78. While bacterial growth patterns were similar in and on leaves of MR and S cv., max bacterial populations were generally lower in the former, particularly during the reproductive stage of plant development. High R15-1 populations were detected in noninoculated, symtom-free leaves of both S and MR genotypes. *X. phaseoli* populations in and on pods of S and MR genotypes were initially similar, but approx 8 days after inoculation, populations on the MR genotypes reached stationary phase and most bacteria were epiphytic. In Tepary bean (Arizona-Buff), bacterial populations remained at relatively low levels in both leaves and pods, although detectable levels of R15-1 occurred 20 days after inoculation; however, no disease symptoms developed. In the R Tepary genotype, bacteria were detected consistently only in inoculated primary leaves. In MR G.N. Valley, bacteria were recovered from primary, 1st, 2nd and 3rd + 4th trifoliate leaves and also from stems. In S Tuscola, bacteria were isolated from primary, 1st, 2nd, 3rd + 4th, 5th and 6th trifoliate leaves; and from stem and roots. High bacterial populations and symptoms were detected 1st in the older leaves and later in the younger leaves, from the primary to the 5th trifoliate leaves in the S, from the primary to the 2nd trifoliate leaves in the MR. No symptoms and very low densities of bacteria were detected in inoculated and 1st trifoliate leaves of R Tepary. Tepary bean continues to be the best source of blight resistance presently available. Results of greenhouse and field studies indicate that leaves of S and R bean genotypes and nonhost plants may support epiphytic multiplication of *Xp* and that the bacteria may possess a resident phase in its life cycle. *Xp* and *Xpf* survived and retained pathogenicity after 2 yr storage in the lab in dry infected tissue samples of S and R plant species; however, neither isolate was detected in similar samples maintained on or buried in field soil at 3 different Michigan localities for the period No. 1977-June 1978. It is unlikely that leaf debris plays an important role in between-season survival of these pathogens under environmental conditions present in Michigan. Pods of R and S bean genotypes inoculated by scratching the dorsal suture with the needle of a syringe containing the bacterial suspension developed different disease reactions; however, seeds with and without disease symptoms of both S and R genotypes, carried internal blight infection.

The data suggest that tests to detect seed-borne bacterial blight should be a component in certified, blight-free bean seed production programs of all dry bean cv. Ultrastructural evidence suggests that attachment of *Xp* occurs in the intercellular spaces of leaves of blight-resistant Tepary bean (Arizona-Buff). (*Author's summary*) E02 G00

0263

1565 COYNE, D.P. and SCHUSTER, M.L. **Bacterial diseases of legumes: breeding and resistance.** *In* Summerfield, R. and Bunting, A.H., eds. Advances in legume science. London, HMSO, 1980. pp.225-233. Engl., Sum. Engl., 40 Refs.

Phaseolus vulgaris. **Bacteriosis. Plant breeding. Host-plant resistance. Germplasm. Genotypes. Inheritance. USA.**

Breeders have produced genotypes resistant to the principal bacterial pathogens of the major legume crops, but chemical control has proved ineffective. The wide range of virulence common in many pathogens complicates breeding efforts although numerous inoculation techniques have been successfully used to identify sources of resistance. Patterns of inheritance of disease reactions depend upon the host genotypes used in crosses and the bacterial isolates tested. Furthermore, different genes control different components of the disease reactions. Moderately large populations of bacteria occur in and on resistant germplasm with serious implications for the breakdown of resistance and seed transmission of disease. The genetic base of legumes must be extended in order to reduce their genetic vulnerability. The bacteria and their toxins do not exhibit similar host specificity and more research is necessary to understand the resp. mechanisms of resistance. Lectins appear to be involved in resistance mechanisms but their general significance is yet to be established. *(Author's summary)* E02 G00

0264

11938 DAUB, M.E. and HAGEDORN, D.J. **Resistance of *Phaseolus* line WBR 133 to *Pseudomonas syringae*.** Phytopathology 69(9):946-951. 1979. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. Pseudomonas syringae. **Cultivars. Host-plant resistance. Leaves. Epiphytology. Electron microscopy. USA.**

Bean line WBR 133 has a high degree of resistance to *Pseudomonas syringae*, causal agent of bacterial brown spot. Histologic leaf imprint, diffusive resistance porometric and scanning electron microscopic studies showed no differences between WBR 133 and Tenderwhite, a susceptible cv. that would affect penetration of the bacteria into the leaf. In vivo multiplication of the pathogen showed large differences between the 2 hosts. Bacteria multiplied exponentially in the susceptible host, reaching a final concn of ca. 5×10^6 cells/cm^2 of leaf, as compared with 5×10^4 cells in resistant plants. Resistance was decreased by high temp, high light intensity and short day length. (*Author's summary*) E02

0265

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

0266

13125 HILDEBRAND, D.C., ALOSI, M.C. and SCHROTH, M.N. **Physical entrapment of pseudomonads in bean leaves by films formed at air-water interfaces.** Phytopathology 70(2):98-109. 1980. Engl., Sum. Engl., 32 Refs., Illus.

Phaseolus vulgaris. Pseudomonas syringae. **Leaves. Laboratory experiments. Hosts and pathogens.**

Water infiltrated into the intercellular spaces of bean leaves appears to dissolve materials from the cell wall surfaces. Subsequent transpiration causes intercellular fluid to recede until films, consisting of amorphous and or fibrillar material condensing from the dissolved material, form at air-water interfaces. Bacteria introduced during water infiltration become trapped by films on cell wall surfaces or in corners between juxtaposed mesophyll cells. After infiltration, no difference in entrapment was observed at 3 h between homologous or heterologous strains of *Pseudomonas syringae* and the heterologous pathogens, *P. marginalis, P. pisi* and *P. tomato*, or the saprophyte *P. fluorescens*. By 12 h, bacterial multiplication was occurring with both the homologous *P. syringae* strain and heterologous *P. tomato* and colonies thereof, bounded by films, were expanding. Cells and pathogens or saprophytes were not attached to the cell wall and remained suspended in the intercellular fluid if the leaves were kept water soaked for 12 h. Under these conditions both pathogens and saprophytes appeared to multiply. Films observed in the water-soaked leaves were associated with gas pockets found in crevices between plant cells and not with bacterial cells. Leaf age greatly affected the amount of material that condensed in the films and the deposition of materials behind them. More films were formed and a greater amount of material was deposited in younger leaves. Vacuum infiltration of the electron microscopy fixative into tissue affected the integrity of the films. It is postulated that films may play a role in pathogenesis by assisting in the retention of moisture in the microenvironment surrounding the pathogen, thus enabling it to multiply. *(Author's summary)* E02

0267

11936 KADO, C.I. and HESKETT, M.G. **Selective media for isolation of *Agrobacterium, Corynebacterium, Erwinia, Pseudomonas,* and *Xanthomonas.*** Phytopathology 60:969-976. 1970. Engl., Sum. Engl., 36 Refs., Illus.

Phaseolus vulgaris. Agrobacterium tumefaciens. Corynebacterium flaccumfaciens. Erwinia carotovora. Pseudomonas phaseolicola. Xanthomonas phaseoli. **Culture media. Laboratory experiments. Plant tissues.**

Five selective plating media (designated as D-series media) were developed for plant-pathogenic bacteria in the genera *Agrobacterium, Corynebacterium, Erwinia, Pseudomonas* and *Xanthomonas*. The active constituents of these media were lithium chloride, sodium dodecyl sulfate, polymyxin and glycine, all of which are known to affect the permeability of bacterial membranes. These selective media were designed using one or a combination of these compounds to permit the growth of bacteria of one genus and restrict the growth of all others. Using inoculum containing a mixture of different bacteria, the efficiencies of these media are as follows: (1) Plating efficiencies [(colony no. on selective medium: colony no. on nonselective medium) x 10^2] were 90.3% for *A. tumefaciens* on medium D1; 27.1% for *C. michiganense* on medium D2; 77.7% for *E. amylovora* on medium D3; 6.5% for

P. syringae on medium D4; and 78.4% for *X. campestris* on medium D5. (2) Recovery efficiencies [(colony no. from soil on selective medium: colony no. without soil on the same selective medium) x 10^2] of the resp. bacteria from soil artificially inoculated with a mixture of bacteria were 48.1% on D1, 79.8% on D2, 57.0% on D3, 26.9% on D4 and 79.9% on D5. Recovery of the pathogenic bacteria from diseased tissues was facilitated by these media. *(Author's summary)* E02

0268

12354 KATHERMAN, M.J., WILKINSON, R.E. and BEER, S.V. **The potential of four dry bean cultivars to serve as sources of *Pseudomonas phaseolicola* inoculum.** Plant Disease 64(1):72-74. 1980. Engl., Sum. Engl., 8 Refs., Illus.

Phaseolus vulgaris. Pseudomonas phaseolicola. **Cultivars. Seedlings. Host-plant resistance. Leaves. Laboratory experiments.**

Seedlings of the cv. California Light Red Kidney, Redkloud, Redkote and HLR (a breeding line with a high degree of halo blight resistance) were inoculated with *Pseudomonas phaseolicola* and transplanted into small plots containing healthy french bean plants to assess the ability of inoculated plants to serve as sources of inoculum in the field. The % of transplants around which french bean plants showed symptoms of halo blight was 80% for California Light Red Kidney and 40% for Redkloud. No significant difference was found among the no. of secondary infection centers that developed in plots with Redkote and HLR transplants and in control plots without transplants. There was a direct relationship between cv. susceptibility to halo blight and its potential to serve as an inoculum source after artificial inoculation. *(Author's summary)* E02

0269

13122 MURCH, R.S. and PATIL, S. **Comparative studies of the exotoxins of *Pseudomonas glycinea* and *Pseudomonas phaseolicola*.** Canadian Journal of Botany 56:282-287. 1978. Engl., Sum. Engl., Fr., 16 Refs., Illus.

Phaseolus vulgaris. Pseudomonas phaseolicola. **Plant toxins. Chlorosis. Hosts and pathogens. Laboratory experiments. Analysis.**

A sensitive and quantitative bioassay, based on the ability of the exotoxin of *Pseudomonas glycinea* to inhibit ornithine carbamoyltransferase (OCT) of beans, was employed in a comparative study of the *P. glycinea* and *P. phaseolicola* toxins using high-voltage electrophoresis (HVF), TLC, ultrafiltration and Sephadex-gel chromatography. The *P. glycinea* toxin (glytoxin) has an elution vol/void vol (V_e/V_o) ratio different from that of phaseotoxin when chromatographed on Sephadex G 25. Glytoxin passes through a membrane filter with an exclusion limit of 500 daltons whereas phaseotoxin does not. HVF in buffers of different pH values showed that glytoxin, like phaseotoxin, migrates as an anion but shows greater mobility than phaseotoxin. Both toxins degrade on thin layers of silica gel. Glytoxin induces chlorosis in bean and soybean leaf tissues, and like phaseotoxin, is an inhibitor of OCT but not of aspartate carbamoyltransferase. Glytoxin is presumably responsible for the accumulation of ornithine which was observed in soybean leaves infected with *P. glycinea*. These studies show that glytoxin and phaseotoxin are similar but not identical. *(Author's summary)* E02

0270

13163 RECOMENDACIONES DE la reunión de trabajo sobre enfermedades del fríjol realizadas en el CIAT-Palmira. *(Recommendations from a bean disease workshop conducted at CIAT-Palmira).* Ascolfi Informa 6(1):2-4. 1980. Span.

Phaseolus vulgaris. Colletotrichum lindemuthianum. Isariopsis griseola. Xanthomonas phaseoli. Disease control. Mycoses. Bacterioses. Research. Colombia.

The recommendations resulting from a workshop of 50 plant pathologists from 24 countries in S. America, conducted at CIAT, Palmira (Colombia) in Nov. 1979, are given. The objectives were to exchange information on the relative importance of bean diseases caused by *Colletotrichum lindemuthianum, Isariopsis griseola* and *Xanthomonas phaseoli,* the progress obtained in their control and research priorities. It was concluded that it is necessary to study the epidemiology; etiology, pathogenic variability and methodologies for the genetic breeding and plant selection for resistance to the diseases caused by these pathogens. CIAT was requested to coordinate the international germplasm nurseries and those of improved materials resistant to *C. lindemuthianum* and *X. phaseoli* and design uniform scales for disease evaluation. *(Summary by I.B. Trans. by L.M.F.)* E02 E03

0271

2674 RIBEIRO, R. DE L. *et al.* **Characterization of the bacterium inciting bean wildfire in Brazil.** Phytopathology 69(3):208-212. 1979. Engl., Sum. Engl., 32 Refs., Illus.

Phaseolus vulgaris. Pseudomonas tabaci. **Host range. Leaves. Chlorosis. Brazil.**

The bacterium that incites bean wildfire and a foliar blight of garden peas in Brazil was identified as a strain of *Pseudomonas tabaci.* The organism conformed with this nomenspecies on the basis of in vitro biochemical properties, including the type of phytotoxins formed (tabtoxins). The Brazilian pathogen and a strain of *P. tabaci* originally isolated from soybean induced typical wildfire lesions on beans but were avirulent on tobacco. However, all the tobacco wildfire strains tested induced a hypersensitive response on beans. Cowpeas, lima beans and soybeans developed wildfire symptoms with all strains of *P. tabaci,* regardless of their original hosts. The *P. tabaci* strains reached populations substantially higher in cowpea leaves than in leaves of their respective natural hosts (tobacco and beans). The bean wildfire organism multiplied in tobacco leaves much less than did the tobacco wildfire pathogen. The bean wildfire bacterium did not infect bean seeds. Differential symptoms produced on inoculated bean pods were useful in distinguishing between bean wildfire and bean halo blight because the foliar symptoms of the 2 diseases were similar. The Brazilian pathogen and other strains that can induce wildfire symptoms on *Phaseolus* beans and are avirulent on wildfire-susceptible tobacco cultivars constitute a separate group within *P. tabaci. (Author's summary)* E02

0272

13117 RUDOLPH, K. and RASCHE, E. **A leaf bioassay for semiquantitative determination of the chlorosis inducing toxin from *Pseudomonas phaseolicola.*** Phytopathologische Zeitschrift 96:215-221. 1979. Engl., Sum. Engl., Germ., 14 Refs., Illus.

Phaseolus vulgaris. Pseudomonas phaseolicola. **Chlorosis. Toxins. Hosts and pathogens. Seed treatment. Leaves. Chlorophyll.**

A bioassay for semiquantitative determination of the chlorosis-inducing toxin from *Pseudomonas phaseolicola* was developed. Treatment of germinating seeds or "painting" of leaves with the toxin solution did not cause symptoms. The most sensitive test was found in placing a drop on a bean leaf which was then punctured by a needle. However, sometimes necrosis in the centre interferred with the evaluation, and results varied because of different growth stages of the bean leaves. Toxin infiltration into the intercellular spaces of swiss chard leaves by hypodermic syringe and needle appeared to be the easiest test with high degree of reproducibility. Young leaves of well nourished swiss chard were infiltrated with 2-5 µl of the toxin solution and kept under high light intensity at medium temp (not exceeding 20°C). Thus the toxin content of raw culture filtrates could be evaluated. Five to 6 days after treatment the toxin concn was rated in 5 grades from very low to very high. Symptoms of grade 4 (high) were induced by 1 toxin unit. *(Author's summary)* E02

0273

6049 SAETTLER, A.W. **Seedling injection as an aid in identifying bean blight bacteria.** Plant Disease Reporter 55(8):703-706. 1971. Engl., Sum. Engl., 8 Refs., Illus.

Phaseolus vulgaris. Pseudomonas phaseolicola. **Seedlings. Leaves. Pods. Cultivars. Plant tissues.**

Ten-day-old seedlings of Manitou light red kidney bean injected at the primary leaf node with halo blight *(Pp)*, common blight *(Xp)*, fuscous blight *(Xpf)* and brown spot *(Ps)* bacteria develop characteristic symptoms of infection. At 7-14 days after injection, symptoms are sufficiently distinctive to separate *Pp, Ps* and *Xp-Xpf* from each other, from a limited no. of bean nonpathogens and from a large no. of internally-borne bean seed contaminants tested in a similar manner. Liquid obtained after 18 h soaking from blighted *(Xp-Xpf)* and nonblighted, surface-sterilized bean seed lots was tested by the plant injection technique. Only plants injected with liquid from the blighted beans developed symptoms of infection. *(Author's summary)* E02

0274

4406 SCHUSTER, M.L. **Survival of bacterial pathogens of beans.** *In* Bean Improvement Cooperative. Annual Report no. 13. Lincoln, University of Nebraska, 1970. pp.68-70. Engl.

Phaseolus vulgaris. Pseudomonas phaseolicola. Xanthomonas phaseoli. Corynebacterium flaccumfaciens. **Isolation. Laboratory experiments. Field experiments. USA.**

Survival studies were initiated under greenhouse and field conditions by inoculating a susceptible bean var. with each of 6 bean bacterial pathogens: *Pseudomonas phaseolicola* (strains 1 and 2); *Xanthomonas phaseoli, X. phaseoli* var. *fuscans, Corynebacterium flaccumfaciens* and its var. *aurantiacum*. After harvesting the plants, the infested samples were placed on the soil surface or incorporated to a depth of ca. 15.5 cm. Samples placed on the soil surface survived longer and had greater viability than when incorporated into the soil. In the lab, dry soil (0.95% of field water-holding capacity) favored survival of the bacterial pathogens as compared to a moist soil. This emphasizes the possible dissemination of the bacteria in soil mixed with the infested leaf pieces or debris. The incorporation of residue material into the soil or its adequate elimination is a suggested cultural practice. (*Summary by I.B. Trans. by L.M.F.*) E02

0275

3912 SCHUSTER, M.L. *et al.* **Transmission of *Xanthomonas phaseoli* and other bacterial species or varieties in seeds of tolerant bean (*Phaseolus vulgaris*) cultivars.** Plant Disease Reporter 63:955-959. 1979. Engl., Sum. Engl., 19 Refs.

Phaseolus vulgaris. Xanthomonas phaseoli. **Cultivars. Disease transmission. Host-plant resistance. Plant breeding.**

Seven Great Northern bean cv. and a breeding line grown in replicated trials under natural conditions were examined for internal seed infection with *Xanthomonas phaseoli.* Detection was accomplished by soaking infected seed and then water-soak inoculating leaves of susceptible Kidney beans with the soakate. Soakate from the tolerant cv. (GN Jules, GN Tara, GN Valley, GN Star) and an early breeding line (Early Valley) caused slight to moderate infection on 50% of the plants, whereas the older established varieties had 92% of the plants exhibiting moderate to severe infection. *(Author's summary)* E02

0276

12614 SCHWARTZ, H.F. **Diversas enfermedades bacterianas.** *(Miscellaneous bacterial diseases). In* —— and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.173-194. Span., 91 Refs., Illus.

Also in English.

Phaseolus vulgaris. Pseudomonas phaseolicola. Corynebacterium flaccumfaciens. Pseudomonas syringae. **Seed. Leaves. Stems. Pods. Plant injuries. Host range. Cultural control. Chemical control. Host-plant resistance. Cultivars. Etiology. Symptomatology.**

Among the bacterial diseases that attack beans are (1) halo blight *(Pseudomonas phaseolicola)*, which is distributed worldwide and survives in infected seeds and plant residue. Three to five days after infection, water-soaked spots appear on the lower leaf surface, stem and pods; (2) bacterial wilt *(Corynebacterium flaccumfaciens)* has been registered in the USA, but its existence in L.A. is unknown. Drought and temp > 32°C are favorable conditions for disease development. The bacterium infects plants through the seed and wounds on aerial plant organs and roots; (3) bacterial brown spot *(Pseudomonas syringae)* produces flecks or necrotic brown lesions on the stem and pods. The bacterium has a wide host range. For efficient disease control, deep plowing, crop rotation and the use of disease-free seeds, adequate chemical products and resistant var. are recommended. The symptoms and damage caused by the disease are illustrated in color. *(Summary by J. E. Z. Trans. by L.M.F.)* E02

0277

12604 SMITH, A.G. and RUBERY, P. H. **N-phosphoglutamate does not behave as an active component of the exotoxin of *Pseudomonas phaseolicola*, the causative agent of haloblight of beans.** Physiological Plant Pathology 15:269-278. 1979. Engl., Sum. Engl., 30 Refs., Illus.

Phaseolus vulgaris. Pseudomonas phaseolicola. **Leaves. Culture media.**

N-phosphoglutamic acid (NPG) was chemically synthesized and characterized by electrophoretic mobility, acid lability and infrared spectroscopy. Residual-free glutamate could be removed by gel filtration through Sephadex G-15. NPG was stable in solution at neutral or alkaline pH, but attempts to prepare solid NPG resulted in partial decomposition. Earlier reports that NPG behaves as an active component of the exotoxin of *Pseudomonas phaseolicola* could not be confirmed. NPG did not bring about chlorosis in bean leaves, did not inhibit growth of *Chlamydomonas reinhardi*, and did not inhibit ornithine carbamyltransferase from either bean leaves of *Streptococcus faecalis*. In contrast, culture filtrate of *P. phaseolicola* was active in all 3 tests, and contained approx 12.5 x 10^3 units dm^{-3} of toxin activity. *(Author's summary)* E02

0278

13147 TAYLOR, J.D. **The quantitative estimation of the infection of bean seed with *Pseudomonas phaseolicola* (Burkh.) Dowson.** Annals of Applied Biology 66: 29-36. 1970. Engl., Sum. Engl., 10 Refs., Illus.

Phaseolus vulgaris. Pseudomonas phaseolicola. **Seed transmission. Seed. Laboratory experiments. Isolation. Dwarf beans.**

A routine lab method for detecting *Pseudomonas phaseolicola* in bean seed is described. The method detects low levels of seed-borne infection and has been used in a statistical procedure (the most probable no. method) to give an estimate of % infection. Infection in seeds harvested from heavily infected crops varied from 10 to 1%, compared with from 1% to less than 0.1% in commercial seed stocks. A high proportion of infected seeds failed to produce infected plants, which may account for the very low levels of primary infection reported in the field. Removal of seeds showing possible "symptoms" of disease reduced, but did not eliminate, infection from seed stocks. *(Author's summary)* E02

0279

13146 TAYLOR, J.D., DUDLEY, C.L. and PRESLY, L. **Studies of halo-blight seed infection and disease transmission in dwarf beans.** Annals of Applied Biology 93:267-277. 1979. Engl., Sum. Engl., 28 Refs., Illus.

Phaseolus vulgaris. Pseudomonas phaseolicola. **Disease transmission. Seed. Dwarf beans. Pods. Seedlings.**

The transmission of *Pseudomonas phaseolicola* from plant to seed was mainly by the penetration of bacteria from external pod lesions to the underlying seeds. There was no evidence for translocation of bacteria from other parts of the plant to the seed, and symptomless pods contained only healthy seeds. Although a small proportion of infected seeds showed obvious symptoms of infection, the majority showed either slight symptoms, which could be detected only by careful observation, or were symptomless. In tests of disease transmission from seed to seedling, seeds with slight symptoms, or those which were symptomless were responsible for 35 and 52%, resp., of the total disease transmission, compared to 13% for obviously infected seeds. The viability of bacteria in seed stored under relatively uncontrolled conditions (10-27°C) declined by a factor of 250/yr over the 1st 3 yr with extrapolation predicting effective extinction after ca. 5 yr. The pathogen survived longer under controlled conditions (7-10°C and 45-50% RH), but no viable bacteria were detected in seed stocks which were 10 yr old; and with one exception 6-yr old stocks were also free of the pathogen. *(Author's summary)* E02

0280

12388 TAYLOR, J.D., PHELPS, K. and DUDLEY, C.L. **Epidemiology and strategy for the control of halo blight of beans.** Annals of Applied Biology 93:167-172. 1979. Engl., Sum. Engl., 14 Refs., Illus.

Phaseolus vulgaris. Pseudomonas phaseolicola. **Chemical control. Leaves. Disease transmission. Seed transmission.**

A halo-blight epidemic model based on the equation of Van der Plank (1963) is described. The model is used to determine tolerance levels for seed infection and to compare the effectiveness of chemical control measures based on foliar sprays and seed treatments. Reduction of primary inoculum, derived from infected seed, by disease exclusion through seed testing, or by chemical seed treatment will give effective disease control under British conditions (i.e., with an expected apparent infection rate (r) of 0.15/infected plant/day). Under climatic conditions more favorable for the disease where higher r values would occur, control treatments directed against primary inoculum only would be less effective. Under such conditions, it is predicted that chemical sprays, which have no effect on primary inoculum but cause a reduction in the rate of disease increase, would be more effective. The most effective disease control, however, would be a combination of treatments. *(Author's summary)* E02

0281

11955 VALLADARES-SANCHEZ, N.E., COYNE, D.P. and SCHUSTER, M.L. **Differential reaction of leaves and pods of *Phaseolus* germplasm to strains of *Xanthomonas phaseoli* and transgressive segregation for tolerance from crosses of susceptible germplasm.** Journal of the American Society for Horticultural Science 104(5):648-654. 1979. Engl., Sum. Engl., 23 Refs., Illus.

Phaseolus vulgaris. Xanthomonas phaseoli. **Leaves. Pods. Germplasm. Crossbreeding. Host-plant resistance. Isolation. Laboratory experiments. Genetics. Inheritance. Genes.**

The leaf and pod reactions of greenhouse-grown plants of reportedly tolerant lines of *Phaseolus vulgaris:* Plant Introduction (PI) 169727, PI 197687, PI 163117, PI 207262, PI 325684, PI 325691, Great Northern Nebr. no. 1 sel. 27; *P. coccineus:* PI 165421 and *P. acutifolius:* Tepary (Nebr. Acc. 10) to *Xanthomonas phaseoli* isolates [*Xp*-S and *Xp*-816 (Nebr.), *Xp*-15 (Michigan), *Xp*-Br (Brazil)], and *X. p. fuscans* [Xpf-U1 (Uganda)], were studied. The multiple needle method was used to inoculate leaves and a dissecting needle was used to inoculate pods. A differential reaction of lines to isolates was observed for each of the reactions on leaves and pods. All *P. vulgaris* lines were susceptible or moderately susceptible to the new virulent *Xp*-Br strain. Leaves and pods of

P. acutifolius were highly tolerant to all isolates, while *P. coccineus* PI-165421 showed a differential reaction to all isolates: leaves were highly tolerant and pods highly susceptible. The internal reaction for pods was severer than the external reaction. *P. vulgaris* PI 20262 showed a uniform tolerance of leaf and pod to the USA isolates, while GN Nebr. no. 1 sel. 27 had a tolerant leaf and susceptible pod. These results suggested differential genetic control of pod and leaf reactions. Transgressive segregation for a high level of leaf tolerance to the virulent *Xp*-Br strain (water-soaking method of inoculation) was observed in field-grown *P. vulgaris* F_2 piants from the crosses GN Nebr. no. 1 sel. 27 x PI 163117 and GN Nebr. no. 1 sel. 27 x Guall. Transgressive segregation was confirmed in greenhouse-grown selected F_3 families. High leaf tolerance was not associated with pod tolerance. Linkage was detected among the major genes controlling late maturity and indeterminate plant habit, and the polygenes controlling common blight tolerance. (*Author's summary*) E02 G00

0282

4702 WALLEN, V.R. and GALWAY, D.A. **Effective management of bacterial blight of field bean in Ontario — a 10-year program.** Canadian Journal of Plant Pathology 1:42-46. 1979. Engl., Sum. Engl., Fr., 7 Refs., Illus.

Phaseolus vulgaris. Xanthomonas phaseoli. **Seed transmission. Disease control. Seed. Storage. Yields. Field experiments. Leaves. Cultivars. Canada.**

The influence of research and integrated management practices on the control of bacterial blight of field beans caused by *Xanthomonas phaseoli* utilizing data over a 10-yr period (1968-77) is summarized. The effectiveness of the Selected Seed Program, an integrated management program, and the use of aerial photographic techniques to monitor the success of the program is demonstrated. *X. phaseoli* was unable to survive in soil in tests conducted in field plots from 1971-77, but it did survive in long-term storage in seed. Infected seed harvested in 1971 produced virulent cultures 6 yr later following storage for the 1st 2 years at 18-32°C and the remaining time at -18°C. Similarly, seed harvested in ensuing years produced virulent cultures after long storage. (*Author's summary*) E02

0283

11929 WELLER, D.M. and SAETTLER, A.W. **Chemical control of common and fuscous bacterial blights in Michigan navy (pea) beans.** Plant Disease Reporter 60(9)793-797. 1976. Engl., Sum. Engl., 12 Refs.

Phaseolus vulgaris. Xanthomonas phaseoli. Xanthomonas phaseoli **var.** *fuscans.* **Chemical control. Foliage. Pods. Field experiments. Isolation. USA.**

Control of *Xanthomonas phaseoli (Xp)* and *X. phaseoli* var. *fuscans (Xpf)* on beans was evaluated using Agri-strep 500 (streptomycin sulfate), Bunema (potassium N-hydroxymethyl-N-methyldithiocarbamate), HPMTS (2-hydroxypropyl methanethiosulfonate), Nabac 25EC (hexachlorophene), Isobac 20 (monosodium salt of hexachlorophene), Kocide 101 (copper hydroxide) and For-Cop-80NC (copper ammonium carbonate). There were 2 spray schedules: an early one initiated 2 wk before the late spray (begun when symptoms of blight appeared). Best blight control was obtained with Kocide 101 and Bunema; however, pod infection was not significantly reduced by any treatment and yield was not increased. Three *Xp* and 4 *Xpf* isolates, tested in vitro for sensitivity to these chemicals by a disk assay method, demonstrated a wide sensitivity range. (*Summary by T.B.*) E02

0284

13151 WELLER, D.M. and SAETTLER, A.W. Evaluation of seedborne *Xanthomonas phaseoli* and *X. phaseoli* var. *fuscans* as primary inocula in bean blights. Phytopathology 70(2):148-152. 1980. Engl., Sum. Engl., 12 Refs.

Phaseolus vulgaris. Xanthomonas phaseoli. Xanthomonas phaseoli **var.** *fuscans.* **Seed transmission.**

Several types of seedborne *Xanthomonas phaseoli* (*Xp*) and *X. phaseoli* var. *fuscans* (*Xpf*) and the epidemiology of common (caused by *Xp*) and fuscous (caused by *Xpf*) bacterial blights of navy beans were evaluated. Seeds externally infested were a source of primary inoculum; 14% of the commercial navy bean lots were contaminated. Bacterial populations (*Xp* and *Xpf*) on the epidermis were 0-4 x 10^4 bacterial cells/seed; min populations of 10^3-10^4 bacterial cells/seed were required for plant infection under field conditions. It was found that symptomless seeds internally contaminated were primary inoculum sources. Seeds with visible symptoms were associated with pod affections; pod infection was due to a systemic invasion through lesions difficult to detect. *(Summary by J.C.L. Trans. by L.M.F.)* E02

0285

12613 YOSHII, K. **Los añublos común y fusco.** *(Common and fuscous blights). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.155-171. Span., 92 Refs., Illus

Also in English.

Phaseolus vulgaris. Xanthomonas phaseoli. Xanthomonas phaseoli **var.** *fuscans.* **Etiology. Epiphytology. Hosts and pathogens. Symptomatology. Cultural control. Chemical control. Host-plant resistance. Yields. Foliage. Leaves. Stems. Pods. Seed. Cultivation.**

Common blight (*Xanthomonas phaseoli*) and fuscous blight (*Xanthomonas phaseoli* var. *fuscans*) are the major bacterial diseases of beans. The 2 organisms are found frequently in association and are present in numerous bean production regions of the world. High temp and RH are favorable conditions for the development of the disease. The infection by the bacteria produces water spots on the leaves, stems, pods and seeds. The disease can be controlled by cultural practices such as the use of disease-free seed, proper crop rotation and deep plowing; various chemical products have been used in seed treatment or as a foliage protectant before the infection becomes severe; and by the utilization of resistant var. The symptoms and damage caused by the diseases are illustrated in color. *(Summary by J.E.Z. Trans. by L.M.F.)* E02

See also 0212

E03 Mycoses

0286

11922 ADAMS, P.B. **Factors affecting survival of *Sclerotinia sclerotiorum* in soil.** Plant Disease Reporter 59(7):599-603. 1975. Engl., Sum. Engl., 8 Refs., Illus.

Phaseolus vulgaris. Sclerotinia sclerotiorum. **Isolation. Laboratory experiments. Field experiments. Soil moisture.**

Sclerotia of *Sclerotinia sclerotiorum* in soil, buried at various depths in a field, survived well over a 15-mo period at 1-, 6- and 12-in. depths, but poorly at 24 in. At 2- to 4-in. depths, there was a significant increase in inoculum density on 6 sampling dates over 16 mo. In infested field plots, cropping sequence had no effect on inoculum density, which declined over a 2-yr period to ca. 30% of the original density of sclerotia. Most of this decline occurred in the summer and fall; there was little or no decline in the winter and spring. Lab expt with various soil amendments, temp and soil moistures failed to indicate factors favoring development of secondary sclerotia in soil. When soil containing sclerotia was incubated at 35°C, inoculum density declined ca. 90% in 6 wk. Inoculum density of soil air-dried for 1 day and then remoistened declined ca. 60% in 2 wk. Decline of inoculum density observed in field plots in thought to be due to the drying and remoistening of sclerotia near the soil surface. (*Author's summary*) E03

0287

4502 ALCORN, J.L. **Occurrence and host range of *Ascochyta phaseolorum* in Queensland.** Australian Journal of Biological Sciences 21:1143-1151. 1968. Engl., Sum. Engl., 9 Refs., Illus.

Phaseolus vulgaris. Ascochyta phaseolorum. **Isolation. Culture media. Host range. Pods. Leaves. Australia.**

The presence of *Ascochyta phaseolorum* as a pathogen of *Phaseolus vulgaris* in Queensland is reported. The fungus has a wide host range including vegetable crops, pastures, weeds and indigenous species. Natural infections were found in 48 hosts (14 families), and an additional 12 species proved susceptible when inoculated. Pathogenicity of isolates from french beans towards many of the natural hosts was demonstrated; and in reciprocal inoculations, cultures from field-infected hosts produced symptoms on beans typical of those produced by bean isolates. The fungus is a weak parasite, requiring some form of wounding to initiate infection. (*Author's summary*) E03

0288

5412 ANDERSEN, A.L. **White molds of beans.** East Lansing. Michigan State University. Cooperative Extension Service. Extension Bulletin E-892 no. 55. 1975. 2p. Engl., Illus.

Phaseolus vulgaris. Sclerotinia sclerotiorum. **Chemical control. Epiphytology. Cultivars. Host-plant resistance. USA.**

White mold fungus disease was found in Michigan bean var. Robust and Michelite Navy, whose very heavy intertwining vine growth favors disease development. Hybridization of upright bush habit resulted in var. Sanilac, Gratiot, Seaway and Seafarer; the 1st 2 showing greater disease tolerance. The symptoms of this disease caused by *Sclerotinia sclerotiorum* are discussed. In Michigan, the infection process requires plant exposure to several continuous days of high RH or wet weather and above-av seasonal temp. Recommendations for its control are given. (*Summary by L.M.F.*) E03

0289

3720 ARAUJO, E., CAMPOS G., L.A. and BARBOSA C., J. **Observações preliminares sobre a epidemiologia das doenças do feijoeiro (*Phaseolus vulgaris* L.) e resistência de cultivares na micro-região do "Curimataú" Paraibano.** *(Preliminary observations on bean disease epidemiology and varietal resistance in the state of Paraíba).* Agropecuária Técnica 1(1):7-12. 1980. Port., Sum. Port., Engl., 8 Refs.

Phaseolus vulgaris. Uromyces phaseoli. Isariopsis griseola. Colletotrichum lindemuthianum. **Cultivars. Host-plant resistance. Climatic requirements. Brazil.**

In the physiographic zone of Curimataú, Paraíba (Brazil) studies were conducted on bean disease epidemiology and var. resistance. Rust (*Uromyces phaseoli* var. *typica*) and angular leaf spot (*Isariopsis griseola*) were the most widespread diseases. Mosaic and anthracnose (*Colletotrichum lindemuthianum*) were also common. Cv. Favinha and Mistura 8 were the most susceptible to rust. In relation to angular leaf spot, IPA-3 was the most affected. *(Author's summary)* E03

0290

12394 BARTHE, J.P. and CANTENYS, D. **Purification of *Colletotrichum lindemuthianum* polygalacturonases effects on cell walls of susceptible and resistant (monogenic Cornell line) French beans.** Toulouse, France, Université Paul Sabatier. Centre Physiologie Végétale, 1980. 1p. Engl.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Analysis. Enzymes.**

Two polygalacturonases - endo (PG 1) and exo (PG 2) - excreted by *Colletotrichum lindemuthianum* were purified. Cell walls isolated from isogenic (susceptible and resistant) lines of Processor bean cv. were degraded by the 2 enzymes. *(Author's summary)*, E03

0291

11958 BAUMGART, R.W. and PORTO, M.D.M. **Avaliação em ensaio de laboratorio, da fungitoxicidade de seis produtos químicos usados para o controle de *Colletotrichum lindemuthianum* (Sacc. & Magn.) Scribner em feijoeiro (*Phaseolus vulgaris* L.).** *(Laboratory evaluation of the effectiveness of six fungicides in controlling Colletotrichum lindemuthianum).* Agronomia Sulriograndense 14(2):269-284. 1978. Port., Sum. Port., Engl., 46 Refs., Illus.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Disease control. Chemical control. Laboratory experiments. Brazil.**

The in vitro inhibition of mycelial growth of *Colletotrichum lindemuthianum*, the causal agent of bean anthracnose, by 6 fungicides was studied under lab conditions. Thiabendazole had no effect on mycelial growth. Thiram was efficient at 1 ppm, benomyl and maneb at 5 ppm, and captan and chlorothalonil at 10 ppm a.i. (*Author's summary*) E03

0292

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

0293

12609 BOLKAN, H.A. **Las pudriciones radicales.** *(Root rots). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.65-99. Span., 166 Refs., Illus.

Also in English.

Phaseolus vulgaris. Rhizoctonia solani. Fusarium solani phaseoli. Fusarium oxysporum. Pythium ultimum. Pythium irregulare. Pythium aphanidermatum. Sclerotium rolfsii. Thielaviopsis basicola. Phymatotrichum omnivorum. **Bean root rots. Etiology. Epidemiology. Symptomatology. Cultural control. Chemical control. Cultivars. Hoct-plant resistance. Roots. Hypocotyls. Biological control.**

Beans are attacked by different pathogens, causing root rots among which are: (1) Rhizoctonia root rot caused by *Rhizoctonia solani (Thanatephorus cucumeris).* This fungus is found in the majority of agricultural soils and can infect a large quantity of different plants. The organism produces damping-off, stem canker, root and pod rot. Seedling injury can be minimized by shallow planting so that less seedling tissue is exposed to inoculum. Fungicides that control the infection are generally applied to the seed prior to or during planting. (2) Fusarium root rot caused by the fungus *Fusarium solani phaseoli* initially appears as reddish lesions or streaks on the hypocotyl and primary root. To avoid the disease, beans should be planted in well-drained and fertilized soils which favor vigorous plant growth. Soil amendment by the incorporation of various crop residues can increase natural biological control by soil microorganisms. The majority of chemical treatments are not very effective. (3) Fusarium yellows, caused by the fungus *Fusarium oxysporum* f. *phaseoli,* occurs on the roots and hypocotyls, usually at wound sites. Control measures include crop rotation, chemical seed treatment and planting resistant or tolerant var. (4) Pythium root rot is caused by various species of *Pythium,* such as *P. ultimum, P. irregulare, P. aphanidermatum* and *P. myriotylum.* The most common species in L.A. is *P. aphanidermatum;* it can infect germinating seed, cotyledons, terminal buds, radicle and hypocotyl tissue. Disease incidence can be reduced by cultural practices; chemical seed treatment has given effective results. (5) Southern blight, caused by *Sclerotium rolfsii,* produces damping-off, stem blight and root rot. Inoculum levels can be reduced by selecting fields with low soil acidity and good drainage, utilizing wide plant spacing and crop rotation. (6) Black root rot, caused by *Thielaviopsis basicola,* infects the hypocotyl. (7) Texas root rot or Phymatotrichum root rot is caused by *Phymatotrichum omnivorum,* which survives in the soil and infects underground plant parts. Color illustrations are given of the symptoms and damage caused by the diseases. *(Summary by J.E.Z. Trans. by L.M.F.)* E03

0294

11956 CAMPOS A., J. **Estudio de algunos aspectos de la mancha angular causada por** *Isariopsis griseola* **Sacc. en el cultivo del frijol.** (*Some aspects of Isariopsis griseola, causal agent of angular leaf spot on beans*). Tesis Mag. Sc. Chapingo, México, Colegio de Postgraduados, 1979. 51p. Span., Sum. Span., 42 Refs., Illus.

Phaseolus vulgaris. Isariopsis griseola. **Host range. Legume crops. pH. Temperature. Etiology. Leaves. Laboratory experiments. Mexico.**

Angular leaf spot is a factor limiting to bean production in Chiapas, Oaxaca and Durango (Mexico), where up to 90% incidence has been recorded. A study is made of the growth and sporulation of the pathogen *Isariopsis griseola*, as well as its pathogenicity on different bean var. and legumes. The fungus developed best on V8-juice agar at 24°C (no growth at 28°). Max sporulation occurred when the fungus was cultured on V8-juice agar and incubated at 16°, optimum pH 6.0 (4.0-8.0). When bean var. Ojabra was inoculated with *I. griseola* and exposed to a RH of 95% for 4-56 h, greatest infection occurred at 56 h; symptoms were 1st observed at 12 h. Of 43 bean var. evaluated for resistance, VII-13, Amarillo-153, Jamapa, P-524, Negro Purísima and Amapolo were tolerant; the most susceptible were Ojabra, Pinto Nacional, Delicias-71, F-F00004-18F_c, Chimbo and Sesentanon. The most outstanding material was P-524 (Colombian), with an av of 7 spots/plant. *Phaseolus coccineus, P. angularis, P. lunatus, P. acutifolius, P. calcaratus* and *P. vulgaris* (wild) were susceptible; whereas *Vigna sinensis, Cajanus cajan, Glycine max, Vicia faba, Medicago sativa, Pisum sativum* and *Lupinus* sp. are apparently nonhosts. (*Author's summary. Trans. by T.B.*) E03

0295

11190 CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL. COLOMBIA. **Vivero Internacional de Roya del Fríjol: resultados 1975-1976.** (*International Bean Rust Nursery; 1975-76 results*). Cali, Colombia, 1979. 19p. Span., Illus.

Phaseolus vulgaris. Uromyces phaseoli. **Host-plant resistance. Cultivars. Germplasm. Plant geography. Colombia.**

The International Bean Rust Nursery (IBRN) is in charge of testing promising bean cv. and breeding lines for resistance to rust (*Uromyces phaseoli, U. appendiculatus*). In 1975, 132 cv. were evaluated at 11 sites in L.A. and the USA; in 1976, 104 cv. were evaluated at 15 sites in Australia, L.A. and the USA. Evaluations were made 30 and 45 days after planting, on the basis of the intensity of infection and the type of pustules. None of the cv. was resistant or immune at all sites, but the introductions Ecuador 299, Mexico 309 and Turrialba 1 were resistant or intermediately so at many of the sites over the 2 yr. Cv. Pinto 650 showed the greatest susceptibility and is therefore considered useful for future studies on rust. (*Summary by F.G. Trans. by L.M.F.*) E03

0296

12627 CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL. **Vivero Internacional de Roya del Fríjol; resultados 1977-1978.** (*International Bean Rust Nursery*). Cali, Colombia, 1979. 22p. Span., Illus.

Phaseolus vulgaris. Uromyces phaseoli. **Host-plant resistance. Cultivars. Races. Identification.**

The International Bean Rust Nursery (IBRN) is in charge of testing promising *Phaseolus vulgaris* cv. and lines for their resistance to rust (*Uromyces phaseoli*). In 1975-76 132 bean lines were tested, among which there were 28 potential rust-race differentials. In 1977-78, 26 trials were planted with the help of 20 collaborators in 22 locations of L.A., U.S.A., Europe, Africa and Australia. Rust incidence was evaluated 20-40 days after planting and 40-60 days after germination, according to the intensity of infection and type of pustule that can be found at any of the 5 stages of development. The final classification of the plant's reactions to each material at the different sites is given in table form. Var. Cocacho (4), Cuilapa 72 (26), Redlands Pioneer (28), Redlands Greenleaf B (44), Redlands Greenleaf C (46) and Puebla 87 (88) did not show susceptibility at any of the locations. (*Summary by J.E.Z. Trans. by L.M.F.*) E03

0297

12607 CHAVES, G. La antracnosis. *(Anthracnose). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.37-53. Span., 93 Refs., Illus.

Also in English.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Etiology. Epiphytology. Symptomatology. Cultural control. Chemical control. Host-plant resistance. Hosts and pathogens. Inheritance. Climatic requirements. Seed. Leaves. Pods. Seed transmission. Rotational crops. Germplasm.**

Bean anthracnose, caused by the fungus *Colletotrichum lindemuthianum,* is a worldwide disease in susceptible var. grown in locations with cool to moderate temp and with a high RH. It can appear on any part of the plant. Losses can be up to 100% when severely infected seed is planted. For efficient disease control, the production of disease-free seed, crop rotations, utilization of adequate chemical products, and the use of resistent var. are recommended. The symptoms and damage caused by the disease are illustrated in color. *(Summary by J.E.Z. Trans. by L.M.F.)* E03

0298

11932 CLARKSON, J.D.S. **Pathogenicity of *Fusarium* spp. associated with foot-rots of peas and beans.** Plant Pathology 27:110-117. 1978. Engl., Sum. Engl., 27 Refs.

Phaseolus vulgaris. Fusarium solani phaseoli. **Isolation. Laboratory experiments. Host range.**

The pathogenicity of isolates of *Fusarium solani, F. solani* var. *coeruleum, F. oxysporum, F. oxysporum* var. *redolens, F. avenaceum, F. graminearum, F. sambucinum* var. *coeruleum* and *F. equiseti,* obtained from field samples of *Pisum sativum, Phaseolus vulgaris, Phaseolus coccineus* and *Vicia faba* with foot-rot symptoms, was tested in the glasshouse using artificially infested soil. *F. solani* var. *coeruleum* and *F. oxysporum* var. *redolens* were later regarded as strains of *F. solani* on the evidence of their pathogenicity. Virulent isolates of *F. solani* from *P. sativum* were also pathogenic to *P. vulgaris* but not usually to *V. faba.* Less virulent isolates from *P. sativum, P. vulgaris* and *P. coccineus* were generally equally pathogenic to both *P. sativum* and *P. vulgaris.* Isolates of *F. avenaceum, F. graminearum* and *F. sambucinum* var. *coeruleum* showed nonspecific pathogenicity to *P. sativum, P. vulgaris* and *V. faba* generally causing seedling death. *(Extracted from author's summary)* E03

0299

11919 CLINE, K., WADE, M. and ALBERSHEIM, P. **Host-pathogen interactions. XV. Fungal glucans which elicit phytoalexin accumulation in soybean also elicit the accumulation of phytoalexins in other plants.** Plant Physiology 62:918-921. 1978. Engl., Sum. Engl., 29 Refs., Illus.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Phytoalexins. Cotyledons. Hosts and pathogens.**

A β-glucan isolated from the mycelial walls of *Phytophthora megasperma* var. *sojae* and a glucan purified from yeast extract stimulated the accumulation of phytoalexins in *Phaseolus vulgaris,* and stimulated the accumulation of the phytoalexin rishitin in potato tubers. These glucans had previously been shown to be potent elicitors of glyceollin accumulation in soybeans. Treatments of bean cotyledons with the glucan elicitors resulted in the accumulation of at least 6 fungistatic compounds. These compounds migrated during TLC identically to the fungistatic compounds which accumulated in beans that had been inoculated with *Colletotrichum lindemuthianum,* a fungal pathogen of *P. vulgaris.* Potatoes accumulated as much as 29 μg rishitin/g fresh wt following exposure to the glucan from *P. megasperma* var. *sojae* and as much as 19.5 μg rishitin/g

fresh wt following exposure to yeast glucan. Potatoes accumulated 28 μg rishitin/g fresh wt following inoculation with live *P. megasperma* var. *sojae*. *(Summary by Field Crop Abstracts)* E03

0300

4685 CORDOBA A., J.V. **Identification of the Nebraska races of bean rust (*Uromyces phaseolus typica*) and methods for preliminary screening for resistance in *Phaseolus vulgaris*.** Mag. Sc. Thesis. Lincoln, University of Nebraska, 1979. 92p. Engl., Sum. Engl., 101 Refs., Illus.

Phaseolus vulgaris. Uromyces phaseoli. **Races. Identification. Cultivars. Laboratory experiments. Leaves. Host-plant resistance. Field experiments. USA.**

The development of an efficient inoculation method for the bean rust fungus *Uromyces phaseoli* var. *typica* is of primary importance in the identification of physiological races of the fungus and sources of rust resistance. Five inoculation methods were tested on bean seedlings: (1) spreading urediospores with a spatula; (2) spraying a mixture of talc and urediospores; (3) spraying a suspension of urediospores, tap water and a drop of Tween-20; (4) spraying urediospores suspended in sterilized water; and (5) spraying urediospores suspended in oil (Philips Soltrol-170). Method 1 produced more pustules but lacked uniformity of pustule distribution. Inoculation with methods 3-4 produced a low no. of pustules/leaf area; the latter also produced smaller pustules due to spore aggregation. Method 5 resulted in toxicity in the bean seedlings and produced the lowest no. of pustules. Method 2 was the most consistent and efficient method of inoculation (a moderate no. of uniformly distributed pustules developed when a mixture of talc and urediospores was sprayed on slightly moistened leaves) and was used for race and resistance identification tests. The presence of the bean rust fungus and physiological races in Nebraska was reported nearly 30 yr ago; however, no race identification studies have been conducted since 1951. Five isolates of rust from W. Neb. and NE Colorado were inoculated to the 7 Harter & Zaumeyer (1941) differential bean cv: U.S. no. 3, Bountiful (no. 181), California Small White (no. 643), Pinto (no. 650) and Kentucky Wonder (no. 765, 780, 814). In addition, Golden Gate Wax, used by Fisher (1952) was also inoculated. One physiologic race, race 25, was identified for the Neb.-Colorado isolates; only Golden Gate Wax was R. The S of all the other differential cv. made identification of the bean rust race difficult. Future investigations of bean rust identification should include more differential cv. that have worldwide acceptability. All cv. of Pinto and Great Northern bean types grown in Neb. are S to race no. 25 except Colorado (3385). In a field screening plot at North Platte, 61 of 107 cv. and breeding lines tested were considered R. In greenhouse expt 40 out of 221 cv. were considered R. (*Author's summary*) E03

0301

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 an 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

0302

4704 DONGO, S.L. and CRISPIN M., A. **El chahuixtle del fríjol en México.** *(Bean rust in Mexico).* Agricultura Técnica en México 2(1):26-28. 1962. Span., Sum. Span., Illus.

Phaseolus vulgaris. Uromyces phaseoli. **Races. Cultivars. Maps. Resistance. Mexico.**

Thirty-one strains of the fungus *Uromyces phaseoli-typica* were found distributed in the principal bean-producing areas of Mexico, using the var. Canario 101 as an indicator of variation of the organism that causes the disease or of the selection of biotypes capable of attacking it. *(Author's summary. Trans. by L.M.F.)* E03 G01

0303

12608 FERRAZ, S. **La mancha foliar angular.** *(Angular leaf spot). In* Schwartz, H.F. and Gálvez, G.E. eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.55-64. Span., 36 Refs., Illus.

Also in English.

Phaseolus vulgaris. Isariopsis griseola. **Etiology. Symptomatology. Cultural control. Chemical control. Host-plant resistance. Leaves. Seed transmission.**

Angular leaf spot, caused by the fungus *Isariopsis griseola* in tropical and subtropical regions, can cause losses up to 50%. The pathogen infects the leaves by entering through the stomata or can be transmitted by the seed. Disease control can be carried out by cultural practices, use of disease-free seeds, planting in well-drained soils, the removal of harvest debris, and the utilization of chemical products and resistant var. Color illustrations are given of the symptoms and damage caused by the disease. *(Summary by J.E.Z. Trans. by L.M.F.)* E03

0304

11918 GABRIELSON, R.L., GUILFORD, R.K. and COAHRAN, D.R. **Field control of white and gray molds of beans in western Washington.** Plant Disease Reporter 55(3):234-238. 1971. Engl., Sum. Engl., 19 Refs.

Phaseolus vulgaris. Sclerotinia sclerotiorum. Botrytis cinerea. **Chemical control. Pods. USA.**

An evaluation was made of the effectiveness of DCNA, thiabendazole, cyanamide, BAY 33172 (fuberidazol), benomyl and PCNB in the control of white and gray molds (*Sclerotinia sclerotiorum* and *Botrytis cinerea*). DCNA was effective against white rot, but an adequate amount must be applied before serious infection occurs and regular applications made until 2 wk before harvest. Both thiabendazole and benomyl were more active against these diseases and should provide more effective control. (*Summary by T.B.*) E03

0305

12610 GALVEZ, G.E., GUZMAN, P. and CASTAÑO, M. **La mustia hilachosa.** *(Web blight). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.101-110. Span., 44 Refs., Illus.

Also in English.

Phaseolus vulgaris. Thanatephorus cucumeris. **Etiology. Epiphytology. Symptomatology. Climatic requirements. Host range. Leaves. Flowers. Petioles. Pods. Cultural control. Chemical control. Cultivation. Host-plant resistance. Cultivars.**

Web blight, caused by the fungus *Thanatephorus cucumeris,* is prevalent in tropical regions with high to moderate temp and RH; more than 200 plant species serve as hosts to this pathogen. Hyphae can grow rapidly over healthy tissue of leaves, flowers, petioles and pods. For efficient control, the use of disease-free seeds, elimination of harvest debris, crop rotation, the use of adequate chemical products and the use of resistant var. are recommended. The symptoms and damage caused by the disease are illustrated in color. *(Summary by J.E.Z. Trans. by L.M.F.)* E03

0306

11951 GOMES, J.C. **Avaliação da reação de cultivares de feijão (*Phaseolus vulgaris* L.) à raça alfa de *Colletotrichum lindemuthianum* (Sacc. & Magn.) Scrib., e transmisão do patógeno, por sementes.** (*Evaluation of bean cultivars for resistance to the alpha race of Colletotrichum lindemuthianum and seed transmission*). Tese Mag. Sc. Porto Alegre, Brasil, Universidade Federal do Rio Grande do Sul, 1979. 115p. Port., Sum. Port., Engl., 56 Refs., Illus.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Cultivars. Host-plant resistance. Leaves. Stems. Field experiments. Seed transmission. Laboratory experiments. Statistical analysis. Brazil.**

An evaluation was made of the reaction of 15 bean cv. to the alpha race of *Colletotrichum lindemuthianum* under greenhouse and field conditions, using scales developed by the author for the leaves, stems and pods. Artificial inoculations were made with spore suspensions of 1.2 x 10^5/ml. Seed transmission was estimated on seedlings and on a malt extract-agar with 20 ppm, 2,4-D at 20°C. Some cv. showed an atypical reaction on leaves, which produced malformation and restricted growth. Resistance increased with plant age in 7 cv. Due to the variation observed in the reactions among plants and organs of the same cv., it was necessary to use McKinney's disease index to characterize the cv. Although a high % of infected pods was found in several cv., there was no relation between no. of infected pods and % of seed transmission, which was $<$ 1%. (*Author's summary*) E03

0307

12355 GONZALEZ A., M. and CASTELLANOS, J.J. **Presencia del micoparásito *Darluca filum* sobre uredosoros de *Uromyces phaseoli* var. *typica*.** (*Presence of the mycoparasite Darluca filum on uredospores of Uromyces phaseoli var. typica*). Ciencias de la Agricultura no. 3:119-125. 1978. Span., Sum. Span., Engl., 21 Refs., Illus.

Phaseolus vulgaris. Uromyces phaseoli. Darluca filum. **Biological control. Host range. Leaves. Laboratory experiments. Field experiments. Rotational crops. Cuba.**

The mycoparasite *Darluca filum* was found on uredosori of *Uromyces phaseoli* var. *typica,* collected from bean leaves in different parts of Cuba. This mycoparasite was also observed on other Uredinales affecting maize, millet, elephant grass (*Pennisetum purpureum*) and the weed Johnsongrass (*Sorghum halepense*). Under natural conditions parasitism of *U. phaseoli* var. *typica* sori was lower than in other Uredinales; nevertheless, when maize preceded beans in periods of high rust incidence, parasitism of *D. filum* on *U. phaseoli* var. *typica* increased. The efficiency of this mycoparasite as a means of biological control must be determined. (*Author's summary*) E03

0308

7301 GROTH, J.V. and MOGEN, B.D. **Completing the life cycle of *Uromyces phaseoli* var. *typica* on bean plants.** Phytopathology 68(11):1674-1677. 1978. Engl., Sum. Engl., 12 Refs., Illu

Phaseolus vulgaris. Uromyces phaseoli. **Etiology. Leaves. Epiphytology. Laboratory experiments. USA.**

A technique was developed for germinating teliospores of bean rust (*U. phaseoli* var. *typica*), which allowed all 5 spore stages to develop on bean plants. Teliospores germinated on water-agar plates, beginning about 3-4 wk after a brief washing. Pycnia were obtained by inverting those plates over young plants in a glasshouse. Pycniospores were transferred between pycnia with sterile toothpicks. Leaves were inoculated with aeciospores and incubated using the same methods as for urediospores. (*Summary by Review of Plant Pathology*) E03

0309

12382 GUZMAN, P., DONADO, M.R. and GALVEZ, G.E. **Control químico de la antracnosis del fríjol (*Phaseolus vulgaris* L.) en Colombia.** *(Chemical control of bean anthracnose in Colombia).* Turrialba 29(1):59-63. 1979. Span., Sum. Engl., Span., 9 Refs.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Chemical control. Cultivars. Host-plant resistance. Pods. Colombia.**

Effective control of bean anthracnose caused by *Colletotrichum lindemuthianum* was obtained with certain systemic fungicides such as benomyl (Benlate) and carbendazim (Derosal 60) under prevalent rainy conditions. Protectant fungicides such as mancozeb (Dithane M-45), fentin acetate (Brestan 60), captafol (Difolatan 80) and chlorthalonil (Daconil 2787) could be used economically in regions where the disease is endemic and the conditions favoring the pathogen are not so prevalent. The use of resistant var. is the ideal method of control; but in the meantime, the use of fungicides is needed to produce pathogen-free seed to diminish severe losses due to anthracnose. *(Author's summary)* E03

0310

12381 GUZMAN, P., DONADO, M.R. and GALVEZ, G.E. **Pérdidas económicas causadas por la antracnosis del fríjol (*Phaseolus vulgaris* L.) en Colombia.** *(Economic losses due to bean anthracnose in Colombia).* Turrialba 29(1):65-67. 1979. Span., Sum. Engl., Span., 9 Refs.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Cultivars. Host-plant resistance. Chemical control. Statistical analysis. Colombia.**

Losses due to bean anthracnose, caused by the fungus *Colletotrichum lindemuthianum*, were 88, 82, 80, 74, 72, 29 and 2% when the plants were infected 1-7 wk postemergence for the tolerant var. Diacol-Andino. The losses were relatively higher for the susceptible var. Diacol-Nima: 95, 87, 88, 84, 77, 38 and 27% for the same periods, resp. The proportion of losses was about the same in the 1st semester of the yr, but the amount was ½ that the 2nd semester of the yr. This semester is characterized by more frequent and heavy rains, as well as lower temp, which favor the development and dissemination of the fungus. *(Author's summary)* E03

0311

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

0312

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

0313

11933 HEUVEL, J. VAN DEN and VOLLAARD, P.J. **Metabolism of phaseollin by different races of *Colletotrichum lindemuthianum*.** Netherlands Journal of Plant Pathology 82:103-108. 1976. Engl., Sum. Engl., 8 Refs., Illus.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Races. Phaseollin. Metabolism. Analysis. Laboratory experiments.**

The ability of 4 races of the bean pathogen *Colletotrichum lindemuthianum* to metabolize the phytoalexin phaseollin in shake cultures was compared. Apart from some differences in the rate of conversion, all races metabolized the phytoalexin in the same way. Phaseollin was 1st converted to 6a-hydroxyphaseollin, which was further metabolized to 6a,7-dihydroxyphaseollin. No metabolites of the latter were detected. 6a,7-Dihydroxyphaseollin was as inhibitory as phaseollin to race δ 11, but was only slightly inhibitory to races α 1, α 2 and γ 1. *(Author's summary)* E03

0314

13539 HOPPE, H.H., HUMME, B. and HEITEFUSS, R. **Elicitor induced accumulation of phytoalexins in healthy and rust infected leaves of *Phaseolus vulgaris*.** Phytopathologische Zeitschrift 97:85-88. 1980. Engl., Sum. Engl., Germ., 5 Refs., Illus.

Phaseolus vulgaris. Uromyces phaseoli. **Mycoses. Phytoalexins. Leaves.**

Glucans isolated from the germ tube cell walls of uredospores of *Uromyces phaseoli* were effective as elicitors and induced phytoalexin accumulation and protection against the bean rust fungus in susceptible primary leaves of beans. Both effects were first visible 2 days after infiltration of the glucan elicitor into the bean tissue. Glucans applied simultaneously with the pathogen could not protect the plant. Phytoalexins, however, accumulated in the elicitor treated and infected tissue with the same onset and to about the same concn as in the expt in which fungal development was suppressed by applying the elicitor at least 2 days before inoculation. *(Author's summary)* E03

0315

13543 ISIDRON P., M., CRUZ R., J.M. and VALKOUN, J. **Evaluación de la resistencia a la roya *Uromyces phaseoli* de 15 variedades de fríjol en condiciones de campo.** *(Evaluation of rust resistance of fifteen bean varieties under field conditions).* Agrotecnia de Cuba 11(1):115-122. 1979. Span., Sum. Span., Engl., 7 Refs., Illus.

Phaseolus vulgaris. **Field experiments. Cultivars.** *Uromyces phaseoli.* **Mycoses. Host-plant resistance. Cuba.**

Fifteen bean var., 60 days old, were evaluated according to their resistance to bean rust. This evaluation involves 2 aspects: disease severity according to the no. of pustules/leaf, and according to pustule ϕ and modality (with or without chlorosis). A 5 class scale was used as a mathematical function of the no. of pustules/leaf. Data from the disease severity in the studied var. are showed, and observed differences for this character are graphically displayed, and its statistic assessment was carried out. Disease type was evaluted by measuring the pustule ϕ. Carruaro and Mulangri var. showed the highest resistance for both evaluation indexes, whereas Holguín 20 VL, Víctor 8 and Jicotea var. showed a marked susceptibility. *(Author's summary)* E03

0316

12322 KEENAN, J.G. **Phytoalexin synthesis and disease resistance in beans as effected by host-inducer interaction.** Ph.D. Thesis. Fort Collins, Colorado State University, 1973. 76p. Engl., 69 Refs., Illus.

Phaseolus vulgaris. Fusarium solani phaseoli. **Phytoalexins. Cultivars. Hosts and pathogens. Host-plant resistance. Hypocotyls. USA.**

All bean cv. tested produced 2 phytoalexins, phaseollin and kievitone, when etiolated hypocotyls were inoculated with *Fusarium solani* f. sp. *phaseoli, F. solani* f. sp. *cucuberatace,* $CuCl_2$ and peptone. Peptone has not previously been reported to induce phytoalexin synthesis. The resistant cv. N203 had the capacity to produce phaseollin and kievitone more rapidly than the susceptible Dark Red Kidney during the 1st 24 h after inoculation. The susceptible cv. also produced less phaseollin and kievitone in response to infection by the pathogen than the resistant cv. The quantity of phaseollin and kievitone produced is influenced by both the host and the inducing agent. When a bean cv. was inoculated with different inducing agents, the amount of phytoalexin produced was characteristic of each inducer. Cv., however, produced a quantity of phytoalexin characteristic of the host genotype. The nonpathogen induced the synthesis of greater quantities

of phytoalexin than did the pathogen. The amount of each phytoalexin produced is a function of the ability of the host to synthesize the phytoalexin, the ability of the pathogen to induce synthesis, and the interactive capacity of the pathogen to interfere with phytoalexin synthesis. The results suggested that the ability of a host to produce phaseollin is not influenced by its ability to produce kievitone. (*Summary by Dissertation Abstracts*) E03

0317

12662 KIMATI, H. **Algumas raças fisiológicas de *Colletotrichum lindemuthianum* (Sacc. et Magn.) Scrib. que ocorrem no Estado de São Paulo.** *(Some physiological races of Colletotrichum lindemuthianum that occur in the state of São Paulo).* Anais da Escola Superior de Agricultura "Luiz de Queiroz" 23:247-264. 1966. Port., Sum. Port., Engl., 18 Refs.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Races. Cultivars. Identification. Laboratory experiments. Brazil.**

This paper deals with the variation of *Colletotrichum lindemuthianum*, the fungus causing anthracnose, one of the most serious diseases of beans in Brazil. Nineteen cultures of *C. lindemuthianum* were isolated from different regions of the state of São Paulo and were tested on the differential var. Michelite, Dark Red Kidney and Perry Marrow, as well as on local var. The Dark Red Kidney var. from Cornell behaved differently from that from Beltsville when inoculated with cultures C-12, C-13 and C-18. It was therefore impossible to determine whether these cultures belonged to the *delta* race or to a new race not yet reported. For cultures C-3 and C-15 the Dark Red Kidney var. behaved similarly, independent of its origin. Therefore these cultures belong to the *alfa* race. For the other cultures the race is unknown. Local var. were, for the most part, susceptible to all isolates tested. Some varied in their reaction to isolates of the *alfa* race. Var. 54 was resistant to 18 isolates and var. 131 was resistant to all isolates in a single trial. *(Author's summary)* E03

0318

10697 KOHN, L.M. **Delimitation of the economically important plant pathogenic *Sclerotinia* species.** Phytopathology 69(8):881-886. 1979. Engl., Sun.. Engl., 26 Refs.

Phaseolus vulgaris. Sclerotinia sclerotiorum. **Host range.**

The controversial taxonomic position of *Sclerotinia* (> 250 spp.) is attributed to the use of only a few traditional taxonomic characters. A revised and more limited circumscription of the genus is presented on the basis of examination of type specimens of preserved material as well as observation of living isolates, using microanatomical and cultural characters. (*Summary by T.B.*) E03

0319

13555 KUSHALAPPA, A.C. **Aflatoxin-producing fungi of *Aspergillus flavus* group in stored corn and beans in farms of Minas Gerais state.** Fitopatologia Brasileira 4: 391-395. 1979. Engl., Sum. Engl., Port., 11 Refs.

Phaseolus vulgaris. Seeds. *Aspergillus.* Mycoses. **Storage. Laboratory experiments. Brazil.**

Samples of corn cobs, seeds and meal and bean seeds were collected from storehouses of farmers in Minas Gerais (Brazil). All the samples were collected at random except for the corn cobs where relatively poor quality cobs were collected. The *Aspergillus flavus* group (AFG) fungi were isolated from all 10 samples of corn cobs, 8/10 of seeds and 4/8 meal, and from 4/8 samples of bean seeds. The av incidence of AFG fungi in these samples ranged from 4-34% depending on the type of samples. The isolation of AFG fungi from all the locations sampled and also the high prevalence of the fungi within some samples (up to 64%) were considered to be due to poor storage conditions. Of the 26 isolates of AFG

fungi from corn and beans, 19 produced aflatoxins. The isolates that produced aflatoxins in agar medium also produced aflatoxin B_1 in liquid medium. *(Author's summary)* E03

0320

13124 LANDES, M. and HOFFMANN, G.M. **Ultrahistologische Untersuchungen über die Interaktionen bei kompatiblen und inkompatiblen Systemen von *Phaseolus vulgaris* und *Colletotrichum lindemuthianum*.** *(Ultrahistological investigations on interactions in compatible and incompatible systems of Phaseolus vulgaris and Colletotrichum lindemuthianum).* Phytopathologische Zeitschrift 96:330-351. 1979. Germ., Sum. Germ., Engl., 33 Refs., Illus.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Hosts and pathogens. Laboratory experiments.**

Compatible and incompatible interactions of *Colletotrichum lindemuthianum* and *Phaseolus vulgaris* were investigated by light- and electron-microscope, paying special attention to the early stages of infection and to the propagation of the parasite in the host tissue. In susceptible systems the hypha of the parasite 1st grow intracellularly in a nearly "neutral-symbiotic" manor; at the beginning of infection the protoplasts of infected host cells remain completely intact. Transgressing from one cell to another, the parasite dissolves the cell wall of the host cell. At the narrow transgression point, the hypha forms a septum with typical accompanying organelles (Woronin bodies). Degenerative changes of the fine structure of the host protoplast do not occur until approx 70 h after inoculation. Beginning with the traumatotactic behavior of the host cell nucleus, with changes in the shape of the nuclear membrane, and with the formation of long parallel profiles of the endoplasmatic reticulum, vesicles are formed near the hypha, and the plasmalemma shows invaginations. The size of the vacuole is reduced and finally the tonoplast is decomposed, the mitochondria lose their fine structure and the membrane systems disintegrate into fragments. In the parasite the hyphal tips shows signs of high physiological activity: accumulation of mitochondria, endoplasmatic reticulum, lomasomes and invagination structures. After the disintegration of the host tissue the hypha vacuolize more and more, and in the center of the lesion acervuli with sporogenous cells are formed. In incompatible systems degenerative reactions start immediately after the primary hypha and the host protoplast have come into direct contact. In both organisms invaginations or ondulations of the plasmalemma and vesicles, as well as vacuoles, are formed. The organelles decompose and host cell and parasite finally die. The infection remains restricted to the hypersensitive reacting cell. Sporadic incapsulations of the primary hypha could be observed in compatible and incompatible systems. These unspecific reactions of the host cell are, however, more widespread in nonhost plants. *(Author's summary)* E03

0321

12362 LANDES, M. and HOFFMANN, G.M. **Zum Keimungs-und Infektionsverlauf bei *Colletotrichum lindemuthianum* auf *Phaseolus vulgaris*.** *(Germination and infection behavior of Colletotrichum lindemuthianum on Phaselus vulgaris).* Phytopathologische Zeitschrift 95:259-273. 1979. Germ., Sum. Engl., Germ., 28 Refs., Illus.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Races. Hosts and pathogens. Host-plant resistance.**

The detection of a new race of *Colletotrichum lindemuthianum* (race *x*) and of new sources of resistance in *Phaseolus vulgaris* gave rise to study of the spore germination and the infection processes in different race/var. combinations. In vitro, the germination of the conidia could only be stimulated by complex nutrient media (e.g., biomalt solution); single sugars, vitamins and nucleic acid did not influence the germination process. In vivo the germination of the spore is immediately followed by formation of an appressorium. Differences between compatible and incompatible interactions could not be detected. As the spores show the same germination behaviour on nonhost plants, the stimulants for the germination seem to

be of a relatively unspecific nature. The appressorium is tightly attached to the plant surface by polymerized mucous substances. At the site of contact the appressorial pore is formed and inside the appressorium the appressorial cone develops. By an increase of pressure in the appressorium the appressorial cone is pushed through the pore and penetrates the cuticle of the plant. The cellulose and pectin containing cell-wall layers are then decomposed enzymatically by the penetrating infection hypha. This infection process is additionally supported by mechanical pressure of the hypha. The penetration process shows no differences in susceptible or resistant combinations. The penetration rate is markedly lower than the germination rate and seems to be influenced by the age of the epidermal cells. *(Author's summary)* E03

0322

10896 LE TOURNEAU, D. **Morphology, cytology, and physiology of *Sclerotinia* species in culture.** Phytopathology 69(8):887-890. 1979. Engl., Sum. Engl., 35 Refs.

Phaseolus vulgaris. Sclerotinia sclerotiorum. **Isolation. Laboratory experiment. Enzymes.**

The formation and germination of sclerotia of *Sclerotinia* spp. are obviously programmed and controlled processes. Results of studies in culture summarized in this paper highlight the deficiencies in our knowledge. While the general sequence of events and some of the factors affecting these processes have been described, little is known about the control mechanisms involved and the concomitant biochemical changes in the various stages of morphogenesis. Much more additional basic research is needed to provide the information necessary to develop effective control disease measures. (*Author's summary*) E03

0323

9001 MANZANO, J.M. **Evaluación de fungicidas para el control de la Mustia hilachosa *Thanatephorus cucumeris* y su efecto sobre el cultivo del fríjol común El Salvador.** (*Evaluation of fungicides in the control of web blight caused by Thanatephorus cucumeris and their effect on the bean plant*). Santa Tecla, El Salvador, Ministerio de Agricultura y Ganadería. Centro Nacional de Tecnología Agropecuaria, 1973. 20p. Span., 9 Refs., Ilus.

Paper presented at Reunión Anual del Programa Cooperativo Centroamericano para el Mejoramiento de Cultivos Alimenticios, San José, Costa Rica, 1973.

Phaseolus vulgaris. Thanatephorus cucumeris. **Chemical control. Field experiments. Statistical analysis. El Salvador.**

Since there are no beans var. resistent to the different strains of the fungus *Thanatephorus cucumeris* in El Salvador, it is necessary to control it chemically. Five fungicides were tested at the San Andrés Exptl Station, using a randomized block design with 4 replications, 5 treatments and one control (with H_2O). Readings were taken 24, 34 and 45 days after planting. Benlate (benomyl) protected the crop better during the vegetative cycle and also presented the best av yield increases, followed by Difolatan (captafol) and Dithane M-45 (mancozeb). Three applications of the fungicides were uneconomical. (*Summary by I.S. Trans. by I.M.F.*) E03

0324

13589 MENTEN, J.O.M. *et al.* **Efeito da mancha de levedura na qualidade de sementes de feijão (*Phaseolus vulgaris* L.).** *(Effect of yeast spot on bean seed quality).* Fitopatologia Brasileira 4:493-501. 1979. Port., Sum. Port., Engl., 33 Refs., Illus.

Phaseolus vulgaris. **Cultivars. Seeds. Mycoses. Seed characters. Germination. Brazil.**

Yeast spot in beans caused by *Nematospora coryli* and *Asibya gossypii* has been reported in Brazil as causing spots in almost 100% of seeds, therefore impairing their appearance. As these pathogens are specific to seeds, but not transmitted through them, their importance has not yet been established as a propagation material. Using samples of bean seeds, cv. Carioca and Rosinha G2, from Tietê, São Paulo, normal seeds typical of both cv. were selected with and without yeast spot. The sub-samples, after being homogenized, were compared for quality using different indicators. The quality of the seeds of the cv. Carioca and Rosinha G2 with yeast spot had been reduced in relation to those without spots, by 14.7 and 28.4% in wt of 100 seeds; 37.8 and 51.1% at germination; 36.4 and 58.7% at the first counting (4 days) of the germination test; 50.8 and 84.7% in the rapid aging test, taking into account only the normally germinated plantules; 35.4 and 66.0% in the rapid aging test considering both normal and abnormal plantules; 34.1 and 59.6% emergence; 32.8 and 58.3% emergence speed; 26.2 and 27.5% in hypocotyl length; 27.8 and 41.1% plantule dry wt; 39.8 and 70.8% survival at 14 days; and 43.5 and 70.4% of seeds with microorganisms, using the agar method. Among the fungi detected, *Alternaria* sp. was significantly more frequent in seeds with yeast spot; on the other hand with this test it was possible to recover about 20% of *N. coryli* in seeds with yeast spot. *(Author's summary)* E03

0325

11953 MORA, B.E. and GALVEZ, G.E. **Evaluación de variedades promisorias de fríjol (*P. vulgaris*) a la incidencia de "telaraña" o "mustia".** (*Screening promising bean varieties for resistance to web blight*). Cali, Colombia, Centro Internacional de Agricultura Tropical, 1979. 8p. Span., Sum. Span., 6 Refs.

Paper presented at Reunión del Programa Cooperativo Centroamericano para el Mejoramiento de Cultivos Alimenticios, 25a., Tegucigalpa, Honduras, 1979.

Phaseolus vulgaris. Thanatephorus cucumeris. **Cultivars. Host-plant resistance. Germplasm. Leaves. Costa Rica.**

CIAT's collection of promising bean lines was evaluated over a 2-mo period for resistance to web blight (*Rhizoctonia microsclerotia*) on a highly infested soil in Esparza, Costa Rica, where conditions are very favorable for the development of this disease. A scale of 1-5 was used, based on the % of dead leaf area. Only P.368 and P.740 showed some tolerance to the fungus. (*Author's summary. Trans. by T.B.*) E03

0326

12663 OLIVEIRA, E.A., ANTUNES, I.F. and COSTA, J.G.C. **Raças fisiológicas de *Colletotrichum lindemuthianum* identificadas no Rio Grande do Sul e em Santa Catarina de 1968 a 1972.** *(Physiological races of Colletotrichum lindemuthianum identified in Rio Grande do Sul and Santa Catarina from 1968-1972).* Pelotas-RS, Brasil, Instituto de Pesquisas Agropecuárias do Sul. Comunicado Técnico no. 8. 1973. 5p. Port.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Races. Cultivars. Host-plant resistance. Identification. Brazil.**

Studies were conducted on variations in pathogenicity of the fungus *Colletotrichum lindemuthianum* at the Instituto de Pesquisas Agropecuárias do Sul, Brazil, to identify the physiological races and the geographical distribution of the fungus. Ninety samples were collected, and 1-5 monosporal isolations were made of each one. The races α, β, γ, *Mexicano* I and *Brasileiro* I were found, the 1st and last being the most important. The breeding program is incorporating anthracnose resistance into local cv. on the basis of these results. *(Summary by J.E.Z. Trans. by L.M.F.)* E03

0327

12389 PARADIES, I. *et al.* **Induction of ethylene formation in bean (*Phaseolus vulgaris*) hypocotyl segments by preparations isolated from germ tube cell walls of *Uromyces phaseoli*.** Planta 146:193-197. 1979. Engl., Sum. Engl., 12 Refs., Illus.

Phaseolus vulgaris. Uromyces phaseoli. **Hosts and pathogens. Leaves. Cultivars. Host-plant resistance.**

Hypocotyl segments of beans produce ethylene at pH 8.0 and ethane at pH 5.4. Ethylene formation, but not ethane formation, was stimulated by met, while α -linolenic acid stimulated both ethylene and ethane formation. Detached primary leaves of var. Favorit (susceptible to *Uromyces phaseoli)* show no enhanced ethylene formation, whereas primary leaves from var. 017 (hypersensitive) exhibit 2 distinct ethylene peaks ca. 10 and 50 h after inoculation with *U. phaseoli.* Cell wall preparations from uredospore germ tubes of *U. phaseoli* strongly stimulate ethylene formation in hypocotyl segments of the hypersensitive var. 017 but to a much lesser extent in the susceptible Favorit. *(Author's summary)* E03

0328

13570 PONS, N., ALVARADO, H. DE and CASTRO, J.L. *Whetzelinia sclerotiorum* **en lechuga, repollo y caraota; nuevo patógeno en Venezuela.** *(Whetzelinia sclerotiorum, a new pathogen in Venezuela on lettuce, cabbage and beans).* Fitopatología 14(1):10-14. 1979. Span., Sum. Span., Engl., 9 Refs., Illus.

Phaseolus vulgaris. Whetzelinia sclerotiorum. **Mycoses. Laboratory experiments. Inoculation. Seeds. Venezuela.**

Sclerotinia sclerotiorum was isolated from lettuce, cabbage and beans. Growth and reproduction of the fungus in culture were studied under controlled conditions. Pathogenicity was demonstrated on using sterilized lettuce seed colonized by the fungus as inoculum. After 8 days infection on inoculated lettuce was 100%, on cabbage 73% and on beans 25%. *(Summary by Review of Plant Pathology)* F03

0329

10389 PURDY, L.H. *Sclerotinia sclerotiorum:* **history, diseases and symptomatology, host range, geographic distribution, and impact.** Phytopathology 69(8):875-880. 1979. Engl., 43 Refs., Illus.

Phaseolus vulgaris. Sclerotinia sclerotiorum. **Etiology. Epiphytology. Host range. USA.**

A general history is given of the synonymy of *Sclerotinia sclerotiorum,* causal agent of white mold of beans. The life cycle, symptomatology, host range (extremely broad), geographic distribution (worldwide, in relatively cool and moist areas as well as hot and dry sites) and reported crop losses (5-10% yield losses on beans in Florida, 6% loss in grade) are discussed in detail. *(Summary by T.B.)* E03

0330

13538 RAGGI, V. **Correlation of CO_2 compensation point (Γ) with photosynthesis and respiration and CO_2-sensitive Γ in rust-affected bean leaves.** Physiological Plant Pathology 16:19-24. 1980. Engl., Sum. Engl., 29 Refs., Illus.

Phaseolus vulgaris. Uromyces phaseoli. **Plant respiration. Photosynthesis. CO_2. Leaves.**

In healthy and rust-affected (100-120 pustules/cm^2) Pinto 111 bean primary leaves, the CO_2 compensation point (at 10, 21 and 60% O_2 concn), respiration and photosynthesis (at 21% O_2) were determined daily, from the 2nd - 10th day after infection, in 6 independent expt. The CO_2 compensation point of the infected leaves increased almost gradually and highly significantly (regression analysis) especially from the 5th - 10th day after infection

(highly significant at the *t*-test); photosynthesis decreased highly significantly in the infected leaves (regression analysis) especially from the 6th day onwards (differences highly significant at the *t*-test); respiration increased significantly (regression analysis) with a higher value from the 6th day onwards after infection (highly significant at the *t*-test). The increase of the CO_2 compensation point was significantly correlated with the increase of respiration and mainly with the decrease in photosynthesis (multiple regression and correlation analysis). The increase of the CO_2 compensation point in the infected leaves appears to be the result of increased respiration and mainly of decreased photosynthesis; the contribution of photorespiration appears inconsistent because no significant increase of the CO_2 compensation point of diseased leaves (compared with healthy ones) was observed at 10% with respect to 21% O_2 concn. *(Author's summary)* E03 C00

0331

12687 RAHE, J.E. *et al.* **Correlation of phenolic metabolism with histological changes in *Phaseolus vulgaris* inoculated with fungi.** Netherlands Journal of Plant Pathology 75:58-71. 1969. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Host range. Metabolism. Hosts and pathogens. Seedlings. Host-plant resistance.**

Acetone powders were prepared at intervals after inoculation of bean var. Toperop, with fungi inciting hypersensitive (*Helminthosporium carbonum*), resistant (*Colletotrichum lindemuthianum, gamma* race), and susceptible (*C. lindemuthianum, beta* race) host responses. Phenylalanine ammonia-lyase activity was determined in extracts of the acetone powders, and quantitative and qualitative measurements were made of phenolic compounds in the acetone filtrates obtained during powder preparation. The developmental morphology of the fungi on host tissue was observed histologically. Data obtained indicate that host/fungus physiology is accompanied by readily detectable and specific alterations of phenolic metabolism during various stages of infection and host response. Phaseolin production in hypocotyls inoculated with *C. lindemuthianum* accompanied the appearance of symptoms in resistant and susceptible reactions; it was produced earlier and in greater amount in resistant reactions. *(Author's summary)* E03

0332

13103 RIBEIRO, R. DE L.D. and HAGEDORN, D.J. **Screening for resistance to and pathogenic specialization of *Fusarium oxysporum* f. sp. *phaseoli*, the causal agent of bean yellows.** Phytopathology 69(3):272-276. 1979. Engl., Sum. Engl., 18 Refs., Illus.

Phaseolus vulgaris. Fusarium oxysporum phaseoli. **Host-plant resistance. Cultivars. Selection. Leaves. Temperature. U.S.A.**

Bean cv. were root-dip inoculated with suspensions of microconidia of *Fusarium oxysporum* f. sp. *phaseoli* and placed in chambers at 20, 24 and 28°C. Although optimum temp for fungal growth in vitro was ca. 28°, a variable proportion of plants for a susceptible cv. (Bush Blue Lake 274) did not develop wilt when incubated at 28°. All plants developed symptoms at 20° even with the lowest inoculum level. Preto Uberabinha behaved as resistant regardless of the test conditions employed, whereas Tenderette was resistant to inoculum containing 10^4 conidia/ml, but completely susceptible to that containing 10^6 conidia/ml. The differential response of bean cv. and lines inoculated with strains from Brazil, USA and the Netherlands allowed the characterization of 2 pathogenic races of *F. oxysporum* f. sp. *phaseoli*. The European and N.A. strains appeared to represent a single race, and the Brazilian strains a different one. Strains from USA and Europe were highly virulent on *Phaseolus coccineus*, whereas the Brazilian strains failed to induce wilt in this sp. *(Author's summary)* E03

0333

11939 RIBEIRO, R. DE L.D. and HAGEDORN, D.J. **Inheritance and nature of resistance in beans to *Fusarium oxysporum* f. sp. *phaseoli*.** Phytopathology 69(8):859-861. 1979. Engl., Sum. Engl., 16 Refs.

Phaseolus vulgaris. Fusarium oxysporum. **Inheritance. Cultivars. Host-plant resistance. Crossbreeding. Races.**

Strains of *Fusarium oxysporum* f. sp. *phaseoli*, representing 2 distinct pathogenic races, were used to study the mode of inheritance and nature of yellows resistance in beans. Analysis of progenies of each of the crosses between 4 resistant and 1 susceptible cv. indicated that a single gene controls resistance to each race. Resistance to a race from Brazil appears to be controlled by a dominant gene tentatively designated *Fop* 1; this gene is present in Tenderette, Pintado and possibly Early Gallatin. Resistance to a race from the USA appears to be controlled by an incompletely dominant gene tentatively designated *Fop* 2. The heterozygous F_1 progeny of resistant Preto Uberabinha x susceptible cv. displayed a degree of resistance lower than that of the resistant parent. Resistance to both races is expressed by a restriction of distribution and/or growth of the pathogen in the vascular system of inoculated plants. (*Author's summary*) E03 G00

0334

12697 SALGADO, J.M. *et al.* **Aspectos da mancha de nematospora em feijão (*Phaseolus vulgaris* L.) e soja (*Glycine max* Merril).** *(Nematospora spot on beans and soybeans).* Solo 69(1):22-26. 1977. Port., Sum. Port., Engl., 22 Refs.

Phaseolus vulgaris. Nematospora. **Mycoses. Cultivars. Host-plant resistance. Host range. Brazil.**

Several aspects of Nematospora spot on beans, soybeans and lablab (*Dolichos lablab*) were studied. In the state of São Paulo, Brazil, disease incidence varied from 0-9% (rainy season crop of 1973-74). Plating an aseptic suspension of ascospores and vegetative cells, on a solid medium (GPL), was the most efficient technique for isolating the pathogen. The best inoculum concn for pathogenicity tests and var. trials (mechanical inoculation) was 4×10^6 propagules/ml during the intermediate stage of seed development. A marked difference in susceptibility was not observed among beans (Pintado seems to be the least susceptible), soybeans and lablab var. Some considerations were made with respect to the pathogen/vector/host relationships, as well as the potential importance of the disease. The biochemical tests of *Nematospora* sp. were positive to invertase, maltase and amylase and negative to lactase and gelatinase. *(Author's summary)* E03

0335

13535 SANTOS FILHO, H.P., FERRAZ, S. and SEDIYAMA, C.S. **Isolamento e esporulação "in vitro" de *Isariopsis griseola* Sacc.** *(Isolation and sporulation of Isariopsis griseola in vitro).* Experientiae 22(7):175-193. 1976. Port., Sum. Port., Engl., 21 Refs.

Phaseolus vulgaris. Isariopsis griseola. **Culture media. Laboratory experiments. Isolation. Temperature.**

Growth and sporulation of *Isariopsis griseola* in vitro and its pathogenicity to *Phaseolus vulgaris* were studied. Of 4 isolation techniques the best was the one in which the conidia were picked up from synnema on bean leaves with an agar block. A baby food medium and honey peptone agar gave the best growth and sporulation. Conidial production increased up to the 20th day, no significant differences being found from 20 - 30 days after inoculation. Spore production was better with 12 h light or continuous darkness than under continuous light. The optimum temp was 24°C. Spore germination was slightly greater in light; spores from cultures that had not been transferred having a higher % of germination. These 2 factors did not affect pathogenicity. *(Summary by Review of Plant Pathology)* E03

0336

10325 SCHWARTZ, H.F. and TEMPLE, S.R. **Bean rust resistance strategy at CIAT.** *In* Bean Improvement Cooperative. Annual Report no. 21. Lincoln, University of Nebraska, 1978. pp.48-49. Engl.

Phaseolus vulgaris. Uromyces phaseoli. **Host-plant resistance. Crossbreeding. Cultivars. Colombia.**

Data obtained from the International Bean Rust Nursery (IBRN) in 1975-76 showed that none of the 132 cv. and breeding lines tested was resistant to bean rust; however, some were susceptible only in specific geographical regions. CIATs bean program has concentrated its efforts on selecting rust-resistant cv. from crosses from IBRN parents under natural and artificially induced field conditions. It identifies unique and more stable forms of rust resistance by specific and/or horizontal mechanisms, but emphasis is placed on resistance mechanisms easy to select in large segregating populations. (*Summary by F.G. Trans. by L.M.F.*) E03 G00

0337

12612 SCHWARTZ, H.F. Diversos patógenos fúngicos. *(Miscellaneous fungal pathogens). In* —— and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.127-151. Span., 46 Refs., Illus.

Also in English.

Phaseolus vulgaris. Alternaria solani. Ascochyta fabae. Macrophomina phaseoli. Cercospora vanderysti. Ramularia phaseoli. Botrytis cinerea. Phyllosticta phaseolina. Erysiphe polygoni. Nematospora coryli. **Leaves. Pods. Cultural control. Chemical control. Seedlings. Stems. Cultivation.**

Bean plants are exposed to many fungal diseases; among these are: Alternaria and Ascochyta leaf and pod spots, ashy stem blight (*Macrophomina phaseoli*), Cercospora leaf spot, Chaetoseptoria leaf spot, Diaporthe pod blight, downy mildew (*Phytophthora parasitica*), Entyloma leaf smut, floury leaf spot (*Ramularia phaseoli*), gray mold (*Botrytis cinerea*) gray leaf spot (*Cercospora vandersysti*), Phyllosticta leaf spot, white leaf spot (*Pseudocercosporella albida*), powdery mildew (*Erysiphe polygoni*) and the yeast spot (*Nematospora coryli*). Infection may occur on seedlings or adult plants during the growing season or after harvesting. Some affect production slightly; but as cultural practices are modified, it may severely limit production in the future. The symptoms and damage caused by the diseases are illustrated in color. *(Summary by J.E.Z. Trans. by L.M.F.)* E03

0338

12611 SCHWARTZ, H.F. and STEADMAN, J.R. El moho blanco. *(White mold). In* —— and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp. 111-126. Span., 81 Refs., Illus.

Phaseolus vulgaris. Sclerotinia sclerotiorum. **Etiology. Symptomatology. Host range. Cotyledons. Seed. Leaves. Plant injuries. Biological control. Chemical control. Cultural control. Host-plant resistance. Cultivars. Cultivation. Flowering.**

White mold, caused by the fungus *Sclerotinia (Whetzelinia) sclerotiorum*, is distributed worldwide and has more than 300 hosts. It infects flowers, cotyledons, seeds, leaves or injured plant tissue. The disease can be controlled by crop rotation, flooding, reduced seeding rates, application of chemical products in the middle of the flowering period, modifying plant architecture and the use of resistant var. Many soil microorganisms are associated

with sclerotia and may cause them to degrade or fail to germinate. The symptoms and damage caused by the disease are illustrated in color. *(Summary by J.E.Z. Trans. by L.M. F.)* E03

0339

12688 SILVERA C., A. **Evaluación de la resistencia de fríjol a la mancha angular; algunos aspectos fisiológicos de *Isariopsis griseola* Sacc. y su patogenicidad de algunas cepas colectadas en Costa Rica.** *(Evaluation of resistance to angular leaf spot in beans; physiological aspects of Isariopsis griseola and pathogenicity of some strains from Costa Rica).* Turrialba, Costa Rica, Instituto Interamericano de Ciencias Agrícolas de la OEA, 1967. 59p. Span., Sum. Span., Engl., 10 Refs., Illus.

Phaseolus vulgaris. Isariopsis griseola. **Culture media. Cultivars. Host-plant resistance. Races. Leaves. Inoculation. Seed color. Costa Rica.**

A nutrient medium of agar, dextrose and bean leaf extract (AHFD) was prepared for culturing *Isariopsis griseola*. A strain of this fungus that sporulated abundantly at 8 days on the AHFD medium was also selected. Plants were inoculated at 20 days; 2 readings were taken of the symptoms produced, one at 7-8 days and one at 10-11 days. In an evaluation of the resistance of 527 var. 2.6% were highly resistant, 46.6% moderately resistant, 28.1% susceptible, 14.8% highly susceptible, and 7.7% of mixed susceptibility. Fourteen var. (10 black-seeded types, 2 chestnut-colored types and 2 red types) were highly resistant. Physiological studies showed that the optimum temp for formation of coremia and spore production is 25°C; both processes occur within 24 h at this temp. Sporulation is more abundant in complete darkness than alternating light with darkness or with continual light. The fungus requires the presence of air for growth; spores germinate only in the presence of free water. Initiation of sporulation of 8 strains was equally affected by the same temp; in studies with temp from 10-30°C, the optimum was 25°C, the temp at which sporulation was initiated at 5 days. In a study of the pathogenicity of 7 strains in 8 var., little variation in pathogenicity was encountered; however, the strain from Liberia was slightly more pathogenic than that from San Isidro. *(Author's summary)* F03

0340

11672 STEADMAN, J.R. **Control of plant diseases caused by *Sclerotinia* species.** Phytopathology 69(8):875-880. 1979. Engl., Sum. Engl., 43 Refs.

Phaseolus vulgaris. Sclerotinia sclerotiorum. **Disease control. Chemical control. Seed treatment. Canopy. Host-plant resistance. Foliage.**

Most diseases caused by *Sclerotinia minor*, *S. sclerotiorum* and *S. trifoliorum* have not been controlled consistently and economically. The explosive pathogenicity of these fungi under favorable conditions and the ability of their sclerotia to withstand adverse conditions make them pathogens on many crops. Because of yr-to-yr and field-to-field variation in disease severity in field crops such as beans, use of routine chemical control may be uneconomical unless a forecasting system is devised. Cultural practice modifications can reduce disease in most crops but are not compatible with high yield, especially in semiarid irrigated areas. Resistance and microclimate modification appear to be the most useful control measures for beans, utilizing chemical control where high disease pressure is expected. Inherent and architectural escape-type resistance exist in *Phaseolus vulgaris;* effective and practical biological control remains to be devetoped. (*Summary by T.B.*) E03

0341

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

0342

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

0343

11973 TU, J.C. and JARVIS, W.R. **Ontogeny, organization, and longevity of sclerotium-like structures produced by *Colletotrichum lindemuthianum* in the presence of benomyl.** Canadian Journal of Plant Pathology 1:17-22. 1979. Engl., Sum. Engl., Fr., 15 Refs., Illus.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Chemical control. Hosts and pathogens Electron microscopy.**

An ultrastructural study was made of the sclerotium-like structures (SLS) of *Colletotrichum lindemuthianum* that are formed in the presence of benomyl. Scanning and transmission electron microscopy showed that structurally they resemble sclerotia, characterized by the presence of rind and medulla. The rind was composed of parallel, tightly-packed and well-cemented paraplectenchymatous cells. Most of them were thick-walled, empty and apparently dead. The medulla was composed of thick-walled and loosely-packed prosoplectenchymatous cells with many intercellular spaces. The prosoplectenchymatous cells were of 3 forms: empty cells, cells rich in lipid globules and apparently ordinary hyphal cells. The SLS survived desiccation for at least 7 mo and germinated at the onset of favorable conditions by producing mycelia. It is thus concluded that the SLS are both structurally and functionally true sclerotia. *(Author's summary)* E03

0344

12365 TU, J.C. and JARVIS, W.R. **Response of *Colletotrichum lindemuthianum* to benomyl.** Canadian Journal of Plant Pathology 1:12-16. 1979. Engl., Sum. Engl., Fr., 9 Refs., Illus.

Phaseolus vulgaris. Colletotrichum lindemuthianum. **Chemical control. Races. Laboratory experiments. Etiology. Culture media. Canada.**

Of 3 benzimidazole fungicides tested, Tecto (thiabendazole) was the least effective in inhibiting germination of spores of the delta race of *Colletotrichum lindemuthianum*. Easout (thiophanate-methyl) and Benlate (benomyl) were more effective, but a small proportion of spores germinated and survived at 20, 100 and 500 μ/ml of the resp. a. i. The germinability and survival rate of the spores decreased as the concn of thiophanate-methyl and benomyl increased, and the germinated spores failed to develop into typical colonies. Instead they developed into sclerotium-like structures (SLS), which were hardened acervuli. On benomyl agar the SLS varied in size from about 0.2-5 mm^3 after 3 wk growth. Numerous spores were formed on the upper surface of the SLS, some of which were viable and pathogenic. Upon transferring the SLS to benomyl-free media, typical fungal colonies developed. There were no apparent differences in colony growth, morphology and pathogenicity between an isolate recovered from benomyl and the original. (*Author's summary*) E03

0345

12606 VARGAS, E. **La roya.** *(Rust). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.17-36. Span., 86 Refs., Illus.

Also in English.

Phaseolus vulgaris. Uromyces phaseoli. **Etiology. Epiphytology. Symptomatology. Cultural control. Chemical control. Host-plant resistance. Races. Leaves. Pods. Cultivation. Cultivars. Host range. Climatic requirements.**

Bean rust (*Uromyces phaseoli*), a common disease with worldwide distribution, is considered as one of the most important bean production problems in the tropics. Prolonged periods of moisture and moderate temp (17-27°C) favor disease development. The infection process begins when an urediospore produces a germ tube, which develops an appressorium after physical contact with the edges of a stomata. The fungus may infect leaves and pods, and rarely stems and branches. For efficient disease control, crop rotation, elimination of harvest debris, the utilization of chemical products during the initial stages of plant development and resistant var. are recommended. A table is included on differential var. and infection rates used by different investigators to identify physiological races of this pathogen. The symptoms and damage caused by the disease are illustrated in color. *(Summary by J.E.Z. Trans. by L.M.F.)* E03

0346

4666 YARWOOD, C.E. **Translocated heat therapy of bean rust.** Phytopathology 68(8):1170-1171. 1978. Engl., Sum. Engl., 5 Refs., Illus.

Phaseolus vulgaris. Uromyces phaseoli. **Heat treatment. Leaves. Plant injuries. Plant tissues. Physical control.**

When the distal halves of bean leaves were heated for 10 s in water at 75°C 10 h after inoculation with *Uromyces phaseoli*, the heated tissue was killed and most of the *U. phaseoli* in the proximal halves of the same leaves was killed without permanent injury to the proximal leaf tissue. The amount of surviving fungus in the nonheated tissue was further reduced if the entire leaf was dipped in water at 45° or in ice water for 10 s immediately after heat treatment. (*Author's summary*) E03

0347

10197 YOSHII, K. and COJULUM, R. **Existencia de distintas razas fisiológicas de la roya del fríjol en el sur-oriente y altiplano de Guatemala.** (*Existence of different physiological races of bean rust in Guatemala*). Guatemala, Guatemala. Instituto de Ciencia y Tecnología Agrícolas. Boletín Técnico no. 1. 1978. 4p. Span., 14 Refs.

Phaseolus vulgaris. Uromyces phaseoli. **Races. Cultivars. Host-plant resistance. Field experiments. Plant breeding. Guatemala.**

In Jutiapa and Chimaltenango (Guatemala), 212 var. of beans were tested for their resistance to rust to determine the possible existence of physiological races. At the beginning of florescence and during pod formation, material was classified as immune, resistant, moderately resistant, moderately susceptible and susceptible, according to Davison and Vaughan's scale of 1-5. There was a high natural incidence, which permitted reliable classification. There are different physiological races in the 2 areas, but no inventory was made of them, merely identifying the sources of resistance under field conditions. (*Summary by F.G. Trans. by L.M.F.*) E03 G00

See also 0216 0219 0270

0348

13113 ASHBY, J.W., TEH, P.B. and CLOSE, R.C. **Symptomatology of subterranean clover red leaf virus and its incidence in some legume crops, weed hosts, and certain alate aphids in Canterbury, New Zealand.** New Zealand Journal of Agricultural Research 22:361-365. 1979. Engl., Sum. Engl., 10 Refs.

Phaseolus vulgaris. **Viroses. Legume crops. Vectors. Host range. Weeds. Homoptera. New Zealand.**

Top-yellowing of peas, stunting and yellowing of dwarf beans *(Phaseolus vulgaris)*, and leaf roll of broad beans *(Vicia faba)* in New Zealand, were found to be due almost entirely to infection with subterranean clover red leaf virus (SCRLV). SCRLV was also isolated from lupins *(Lupinus* spp.),soybean, lentil and a wide range of clovers *(Trifolium* spp.) and weed hosts, including some nonleguminous ones. In dwarf beans, pod yield was reduced by 77% when all the plants were infected. Investigations on the alatae of 6 species of aphids that were collected in traps in 1972-77 showed that 41% of alatae of *Aulacorthum solani* carried SCRLV. The possible relationship of SCRLV, soybean dwarf virus and filagree red leaf virus is discussed. The possibility is discussed that *Acyrthosiphon pisum*, which has recently arrived in New Zealand, could transmit SCRLV. *(Summary by Review of Applied Entomology)* E04

0349

11680 BLANCO S., N. and BENCOMO, I. **Daños causados por el virus del moteado amarillo (VMoAc) en distintas variedades de fríjol.** *(Damage caused by bean yellow stipple virus in different bean varieties).* Ciencias de la Agricultura no. 4: 135-143. 1979. Span., Sum. Span., Engl., 11 Refs., Illus.

Phaseolus vulgaris. **Bean yellow stipple virus. Cultivars. Yields. Yield components. Field experiments. Cuba.**

Damage caused by the bean yellow stipple virus on bean yield and its components, was determined under field conditions. Five commercial var. (Cuba C-25-9, Borinquen, Jaspeado, Velasco, Víctor 8 and Bonita 11) were studied for 3 consecutive yr. Yield losses in infected plants ranged from 44-75% , according to the var. The no. of pods and bean wt were the yield components most affected by the virus. A formula for predicting max losses caused by the virus in the studied var. is proposed. *(Author's summary)* E04

0350

12356 BLANCO S., N. **El virus del moteado amarillo del fríjol (BYSVc). Sus características y formas de transmisión en Cuba.** *(A new strain of bean yellow stipple virus in Cuba: characteristics and form of transmission).* Ciencias de la Agricultura no. 3:127-133. 1978. Span., Sum. Span., Engl., 3 Refs., Illus.

Phaseolus vulgaris. **Bean yellow stipple virus. Virus transmission.** *Diabrotica balteata.* **Vectors. Leaves. Cultivars. Inoculation. Host range. Seed transmission. Cuba.**

The characteristics of a virus affecting beans in Cuba, observed in the principal bean-growing zones, are reported. This virus is transmitted by the chrysomelids *Diabrotica balteata* and *Andrector (Cerotoma) ruficornis*. It appears as brilliant yellow spots, its intensity depending on the var. The virus is inactivated when held for 10 min between 70-74°C. Dilution endpoint is between 1-400 and 1-500. Crude sap resists aging for 56, but not for 72 h. The host plants and their symptomatology are reported. In relation to its characteristics, the virus is considered to be a new strain of bean yellow stipple virus referred to as BYSVc. (*Author's summary*) E04

0351

12632 BLANCO, N. and SCHUMANN, K. **Vectores del virus moteado amarillo del frîjol (bean yellow stipple virus) en Cuba.** *(Vectors of bean yellow stipple virus in Cuba). In* Academia de Ciencias de Cuba. Colaboración científico-técnica. La Habana, Cuba, 1979. pp.28-30. Span., Sum. Span., Germ., Engl., Russ., 14 Refs., Illus.

Phaseolus vulgaris. **Bean yellow stipple virus. Vectors. Leaves.** *Diabrotica balteata. Cerotoma ruficornis.* **Virus transmission. Homoptera. Cuba.**

Research has been undertaken on the transmission of the bean yellow stipple virus by different insects. *Myzus persicae* did not transmit the virus. Transmission indices by the vectors *Diabrotica balteata* and *Cerotoma ruficornis* were 30 and 17%, resp. The vectors maintained their infection capacity up to 3 days after infection by the virus. Each individual was able to infect only one plant; this plant could have been the 1st,2nd or 3rd one on which the vector was feeding after virus infection. The virus was not detected in the hemolymph of *D. balteata. (Author's summary)* E04

0352

12681 CALOT, L., LEON, C. and TEYSSANDIER, E.E. **El mosaico común del poroto** *(Phaseolus vulgaris)* **en quintas de los alrededores de Buenos Aires.** *(Incidence of BCMV around Buenos Aires).* Revista de la Facultad de Agronomía y Veterinaria de Buenos Aires 19(1/2):25-31. 1971. Span., Sum. Span., Engl., 33 Refs., Illus.

Phaseolus vulgaris. **Bean common mosaic virus. Cultivars. Host-plant resistance. Field experiments. Symptomatology. Host range. Virus transmission. Leaves. Pods. Argentina.**

Widespread incidence of a virus disease in bean fields around Buenos Aires was noted. The causal agent was identified as BCMV. In greenhouse inoculations, as well as in field observations of 8 bean var., Balin de Albenga was highly susceptible and Acay Magnif INTA was apparently resistant. *(Extracted from author's summary)* E04

0353

12692 CARDENAS A., M. and GALVEZ E., G.E. **Diferencias de concentración del virus del mosaico dorado del frîjol (BGMV) en las variedades Topcrop (susceptible) y Porrillo 1 (tolerante).** *(Differences in BCMV concentrations in a susceptible and tolerant bean variety).* Fitopatología Colombiana 3(2):83-86. 1979. Span., Sum. Engl., Span., 13 Refs., Illus.

Phaseolus vulgaris. **Bean golden mosaic virus. Inoculation. Laboratory experiments. Cultivars. Leaves. Cotyledons.**

Aspects related to the distribution of BGMV in the bean plant, were studied by analytical density-gradient centrifugation. In addition, the influence of the var. (tolerant Porrillo 1 or susceptible Topcrop) and the effect of the infection in the incubation period of the virus on the concn and infectivity were studied. Sap from trifoliate leaves and stems showed simi-

lar virus infectivity, but the highest virus concn was in the trifoliate leaves. There was less concn and infectivity in the 1st trifoliate leaf than in the remaining trifoliate leaves, showing a direct relation between symptomatology and concn. The virus was detected 10 days after inoculation, reaching the highest concn at 20 days. No virus could be detected by purification 40 days after inoculation. Virus concn and infectivity were always higher in the susceptible than in the tolerant var. *(Author's summary)* E04

0354

12693 CARDENAS A., M. and GALVEZ E., G.E. **Un método para seleccionar variedades de fríjol (*Phaseolus vulgaris* L.) por tolerancia al virus del mosaico dorado del fríjol (BGMV).** *(A method for selecting BGMV-tolerant bean varieties).* Fitopatología Colombiana 8(2):89-96. 1979. Span., Sum. Engl., Span., 11 Refs., Illus.

Phaseolus vulgaris. **Bean golden mosaic virus. Cultivars. Host-plant resistance. Inoculation. Leaves. Laboratory experiments. Age.**

Aspects related to the distribution of concn of BGMV in the bean plant were studied by sucrose analytical density-gradient centrifugation. In addition, the influence of the var. and of the time of inoculation on the concn and infectivity were studied. When plants of 6 var. were inoculated in primary, 1st, 2nd and 3rd trifoliate leaves, the best differentiation by symptoms and by concn occurred when they were inoculated in the 1st trifoliate leaf. The use of sucrose analitical density-gradient centrifugation to determine virus concn in the bean plant proved to be an accurate, efficient, and consistent method to evaluate resistance to BGMV. *(Author's summary)* E04

0355

12694 CARDENAS A., M and GALVEZ E., G.E. **El virus del mosaico dorado del fríjol (BGMV), un virus con ácido deoxiribonucleico (DNA) en su genoma.** *(BGMV, a virus with DNA in its genome).* Fitopatología Colombiana 8(2):73-82. 1979. Span., Sum. Engl., Span., 15 Refs., Illus.

Phaseolus vulgaris. **Bean golden mosaic virus. Isolation. Inoculation. Laboratory experiments. Nucleic acid. Colombia.**

Partially purified BGMV, Colombian isolate, was dissociated and analyzed by polyacrylamide gel electrophoresis for nucleic acid and proteins. In addition, the extracted nucleic acid was exposed to nuclease sensitivity tests. It was determined that BGMV consisted of a particle with an approx mol wt of 10×10^6 daltons containing DNA and 2 proteins with 38,000 and 55,000 daltons mol wt, resp. BGMV-DNA did not pass through 2.5% polyacrylamide gels. The BGMV cryptogram is D/1:0.75/29:S/S: S/Ve/A1. *(Author's summary)* E04

0356

12619 GALVEZ, G.E. and CASTAÑO, M.J. **Virus misceláneos del fríjol.** *(Miscellaneous bean viruses). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp. 291-298. Span., 31 Refs.

Also in English.

Phaseolus vulgaris. **Alfalfa mosaic virus. Curly top virus. Bean summer death. Red node. Vectors. Virus transmission. Disease control. Symptomatology.**

Bean crops are attacked by several viruses transmitted by insects among which are: (1) the alfalfa mosaic virus (aphids); susceptibility is correlated with plant age; (2) curly top (*Circulifer tenellus*); the best control measure is the utilization of resistant var.; (3) bean summer

death (*Crosius argentatus*); (4) tomato spotted wilt virus, which is transmitted mechanically and by various types of thrips; (5) red node, which is transmitted mechanically and in the seed. Insect vectors have not been reported; it can be controlled using resistant var. *(Summary by J.E.Z. Trans. by L.M.F.)* E04

0357

12616 GALVEZ, G.E. Virus transmitidos por áfidos. *(Aphid-transmitted viruses). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.211-238. Span., 173 Refs., Illus.

Also in English.

Phaseolus vulgaris. **Bean common mosaic virus. Bean yellow mosaic virus. Cucumber mosaic virus. Virus transmission. Homoptera. Seed transmission. Yields. Seed. Host range. Host-plant resistance. Cultivars. Insect control. Cultural control. Chemical control. Host and pathogens. Pods. Leaves. Symptomatology. Roots.**

There are various viruses transmitted by aphids that infect beans in almost all countries: (1) BCMV causes yield losses from 35-98% according to the var., time of infection and environmental conditions. The virus can attack any part of the plant and produces 3 types of symptoms: mosaic, necrosis and local lesion resistance. BCMV particles may be transmitted mechanically, in pollen and seed from infected plants, and by insect vectors. Planting date and clean seed production are 2 cultural practices that have been used to reduce the incidence of the disease, as well as the use of resistant var. (2) BYMV can cause yield losses of up to 33 and 41% due to the reduction in no. of pods and seeds, resp. The BYMV host range is very wide and can cause chlorotic spots, yellow and green mottling, stunting and necrosis. Alternate hosts of BYMV should be eliminated from bean fields, and chemical control should be used to reduce aphid populations on the crops. The best control method is the utilization of resistant var. (3) Cucumber mosaic virus (CMV) is not considered of economic importance. Infection symptoms consist of a mild mosaic, vein clearing, vein banding, leaf rolling epinasty and/or apical necrosis. CMV particles are easily transmitted mechanically, in seed and by insect vectors. Among control measures are included the planting of healthy seed and crop rotation. The symptoms and damage caused by the disease are illustrated in color. *(Summary by J.E.Z. Trans. by L.M.F.)* E04

0358

12618 GALVEZ, G.E. and CARDENAS, M.R. Virus transmitidos por moscas blancas. *(Whitefly-transmitted viruses). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol, enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.261-289. Span., 128 Refs., Illus.

Also in English.

Phaseolus vulgaris. **Bean golden mosaic virus. Bean chlorotic mottle virus. Homoptera.** *Bemisia tabaci.* **Vectors. Symptomatology. Cultural control. Chemical control. Host-plant resistance.**

Whiteflies (Homoptera) are well known for their capacity to transmit 28 plant viruses of beans and other crops. Whitefly populations are generally restricted to tropical zones with alt. < 1300 m. Among the viruses transmitted there are: (1) BGMV is an economically important disease especially in regions of L.A., some parts of Central America and the Caribbean. Symptoms are clearly visible; the leaves take on a brilliant yellow or golden color. The virus can be transmitted artificially by inoculation. Disease incidence can be reduced by eliminating alternative plant reservoirs of inoculum with crop rotation. Planting date should

be programmed so that oung plants develop during periods of low temp and high moisture. Whiteflies can be controlled economically, applying insecticides in order to reduce the vector population and incidence of BGMV transmission. Plant resistance is an economical method of control. (2) Bean chlorotic mottle virus produces severe dwarfing of susceptible plants, accompanied by a high proliferation of buds and a bunchy or rosette type of plant development. (3) Euphorbia mosaic virus produces necrotic leaf lesions at feeding sites of whiteflies. (4) Rhynchosia mosaic virus includes a wide host range, causes leaf malformation, yellowing, witches'-broom and plant stunting in young plants. The symptoms and damage caused by the viruses are illustrated in color. *(Summary by J.E.Z. Trans. by L.M.F.)* E04

0359

2838 GAMEZ, R. **El virus del moteado amarillo del fríjol; plantas hospederas y efecto en producción.** *(Bean yellow stipple virus: host plants and effect on production). In* Reunión Anual del Programa Cooperativo Centroamericano para el Mejoramiento de Cultivos Alimenticios, 16o., Antigua, Guatemala, 1970. Memoria. Antigua, Guatemala, Ministerio de Agricultura. Dirección General de Investigación y Extensión Agrícola, 1970. 6p. Span., 2 Refs.

Phaseolus vulgaris. **Bean yellow stipple virus. Host range. Production. Cultivars. Yield components. Costa Rica.**

Bean yellow stipple virus (BYSV) is a viral disease of great importance in the coastal regions of Central America. An expt was conducted in the greenhouse with var. Jamapa to measure the effect of the virus on production on the basis of the no. of pods/plant, no of beans/pod and bean wt. The no. of beans/pod and the av wt of the beans were reduced by the disease. A list of susceptible bean var. is given. *(Summary by J.E.Z. Trans. by L.M.F.)* E04

0360

12617 GAMEZ, R. **Virus transmitidos por crisomélidos.** *(Beetle-transmitted viruses). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas en *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.239-259. Span., 74 Refs., Illus.

Also in English.

Phaseolus vulgaris. **Bean rugose mosaic virus. Bean pod mottle virus. Bean southern mosaic virus. Bean yellow stipple virus. Bean curly dwarf mosaic virus. Virus transmission. Symptomatology. Vectors. Host range. Disease control. Epiphytology. Coleoptera.**

One group of bean diseases with characteristic virus symptoms is the mosaic group, frequently associated with leaf and plant malformations and green and yellow stippling. Insect vectors belong to the family Chrysomelidae. In this group of viruses there are: the BRMV and the BPMV belonging to the comovirus group; the BSMV and the BYSV belonging to the bromovirus group; and the bean curly dwarf mosaic and the bean mild mosaic viruses. The geographic distribution, economic importance, host plants, physical properties, purification, transmission, epidemiology, symptomatology and control measures are given for each one. The symptoms and damage caused by the diseases are illustrated in color. *(Summary by J.E.Z. Trans. by L.M.F.)* E04

0361

13515 HOBBS, H.A. and FULTON, J.P. **Beetle transmission of cowpea chlorotic mottle virus.** Phytopathology 69(3):255-266. 1979. Engl., Sum. Engl., 7 Refs.

Phaseolus vulgaris. **Cowpea chlorotic mottle virus. Viroses. Virus transmission. North America. Central America.**

In tests in Arkansas (USA), cowpea chlorotic mottle virus was transmitted by *Cerotoma trifurcata* and *Diabrotica undecimpunctata howardi*. Three strains of the virus were transmitted at low levels, the level being highest when the virus was acquired from and transmitted to beans. Levels were very much lower from and to cowpeas. *Lespedeza cuneata*, which may be a plant in which the virus overwinters, was a poor source of virus for the vectors. Transmission was only occasionally obtained with *Epilachna varivestis*. *(Summary by Review of Applied Entomology)* E04

0362

12359 INNES, N.L. and WALKEY, D.G.A. **Gene for resistance to bean common mosaic virus in cvs Seafarer and Aurora of *Phaseolus vulgaris*.** Journal of Agricultural Science 93:129-131. 1979. Engl., Sum. Engl., 12 Refs.

***Phaseolus vulgaris*. Bean common mosaic virus. Cultivars. Host-plant resistance. Genes. Hosts and pathogens. USA.**

Resistance to BCMV in cv. Seafarer and Aurora from the USA is controlled by the dominant gene *I*, originally found in the cv. Corbett Refugee. *(Author's summary)* E04

0363

12392 JAFARPOUR, B., SHEPHERD, R.J. and GROGAN, R.G. **Serologic detection of bean common mosaic and lettuce mosaic viruses in seed.** Phytopathology 69 (10):1125-1129. 1979. Engl., Sum. Engl., 20 Refs., Illus.

***Phaseolus vulgaris*. Bean common mosaic virus. Serology. Seed transmission. Enzymes. Antisera. Seeds.**

Serologic methods for detecting seed-borne BCMV and lettuce mosaic (LMV) viruses were investigated because preliminary tests showed that enzyme-linked immunosorbent assays (EIA) could be used to detect the purified viruses at concn as low as 10 ng/ml. With artificially contrived levels of infection, the equivalent of one BCMV-infected embryo homogenized with 2000 healthy embryos and one LMV-infected seed homogenized with 1400 healthy seeds could be detected. EIA detected BCMV in all flower and seed parts tested in infected beans. In mature bean seed, the virus was mainly in the embryo, with only a small amount in the seed coat. In contrast, considerable virus was detected in the coat of immature seeds as well as in the embryo after surface decontamination. *(Author's summary)* E04

0364

11985 JEAN, J-H. **Inactivation of southern bean mosaic virus and its ribonucleic acid by nitrous acid.** Ph.D. Thesis. Columbia, University of Missouri, 1972. 89p. Engl., Sum. Engl., 66 Refs., Illus.

***Phaseolus vulgaris*. Bean southern mosaic virus. RNA. Hosts and pathogens. Virus inhibition. Serology. Laboratory experiments. USA.**

Upon treatments with nitrous acid (NA), intact southern bean mosaic virus (SBMV) was inactivated 2-3 times faster than its isolated ribonucleic acid (RNA). Inactivation of SBMV or SBMV RNA by NA was exponential in relation to the treatment time. UV light absorption spectrophotometry, sucrose density-gradient centrifugation, gel electrophoresis and immunodiffusion tests showed that the physical integrity of SBMV was fully retained during treatment with NA. Similarly, analyses by rate zonal sucrose density-gradient centrifugation and polyacrylamide gel electrophoresis confirmed that SBMV-RNA remained physically intact during treatment with NA. NA treatment resulted in a greater sensitivity of SBMV to fragmentation and denaturation by urea. SBMV-RNA released by phenol treatment from NA-treated virions was highly fragmented. Macromolecular RNA was released from NA-treated

virions by short incubation in a dissociative medium (DM) that contained 0.1 M carbonate pH 9.3, 1.33% SDS and 0.004 M EDTA. The RNA was separated from the dissociated viral protein by sucrose density-gradient centrifugation. Quantitative recovery of SBMV-RNA from virions was obtained by this method; furthermore, the viral coat protein also became available for other studies. Expt based on the effect of EDTA on the integrity of SBMV suggested that NA treatment induced cross-linking of some coat protein subunits to RNA in the virions. Additional evidence for NA-induced cross-linking between RNA and protein in SBMV was indicated from sucrose density-gradient centrifugation and gel electrophoretic studies. In the inactivation of intact SBMV by NA, in addition to lethal base deaminations, probably, cross-linking of protein to RNA is also involved. Phenol treatment to release RNA from "native" or NA-treated SBMV was unsatisfactory. For preparative purposes, highly infectious SBMV-RNA can be prepared by incubating SBMV in DM and removing the viral coat protein by precipitation with ammonium sulfate. For microanalytical studies, SBMV-RNA and SBMV-protein after dissociation can be separated by the rate zonal sucrose density-gradient centrifugation or electrophoresis on agarose or polyacrylamide gels. (*Summary by Dissertation Abstracts*) E04

0365

4233 MEINERS, J.P. *et al.* **Mechanical transmission of whitefly (*Bemisia tabaci*)-borne disease agents of beans in El Salvador.** *In* U.S. Department of Agriculture. Tropical diseases of legumes. Beltsville, Madison, Agricultural Research Services, 197?. pp.61-69. Engl., 8 Refs., Illus.

Phaseolus vulgaris. Bemisia tabaci. **Bean golden mosaic virus.** *Calopogonium mucunoides.* **Virus transmission. Cultivars. Temperature. Leaves. El Salvador.**

A disease agent producing symptoms in beans similar to mottled dwarf and golden mosaic diseases in Brazil was transmitted with the sweet potato whitefly (*Bemisia tabaci*) from a wild legume (*Calopogonium mucunoides*). Whitefly-infected beans from El Salvador were used as inoculum sources in mechanical transmission tests at Beltsville. The agent was sap-transmitted in the greenhouse at temp varying from 20-30°C. A higher % of the inoculated plants showed conspicuous disease symptoms with increasing temp under 26,900 lx on a 12-h photoperiod. At 21, 24, 27, 32 and 35°C the % of plants with golden mosaic and mottled dwarf symptoms was 24, 33, 52, 66 and 66%, resp. Symptoms often appeared about 1 wk after inoculation when plants were held at ≥ 27°C and about 2-3 wk after inoculation when plants were incubated at 21 and 24°C. The golden mosaic disease described in Brazil is transmitted only by *B. tabaci*, and mottled dwarf is mechanically transmitted only with difficulty. The whitefly-borne agent reported may differ from the incitants of golden mosaic and mottled dwarf diseases in Brazil. *(Summary by Field Crop Abstracts)* E04 F01

0366

4568 MIGLIORI, A., MARCHOUX, G. and QUIOT, J.B. **Dynamique des populations du virus de la mosaïque du Concombre en Guadeloupe.** *(Dynamics of populations of the cucumber mosaic virus in Guadeloupe).* Annales de Phytopathologie 10(4):455-466. 1978. Fr., Sum. Fr., Engl., 16 Refs.

Phaseolus vulgaris. Viroses. Host range. Serology. Virus inhibition.

Twenty one hosts of the cucumber mosaic virus, including 7 new ones, are listed. The principal weed host is *Commelina diffusa.* The prevalent strain is the leguminous type, systemic on cowpeas and beans. *C. diffusa* is infected by the systemic *Vigna* strain as well as by a local *V.* strain, singly or in combination. *P. vulgaris* and several Papilionaceae, particularly *V. hosei*, are infected only by the systemic *V.* strain. The local *V.* strain is predominant on tomatoes, cucumber and *Capsicum annuum* var. *grossum.* The role of the host in the natural selection of strain populations is discussed in relation to other environmental factors, particularly temp. *(Summary by Review of Plant Pathology)* E04

0367

13131 MORALES G., F.J. **Aislamiento de cepas del virus del mosaico amarillo del fríjol.** *(Isolation of bean yellow mosaic virus strains).* Fitopatología Colombiana 8 (1):3-7. 1979. Span., Sum. Engl., Span., 11 Refs., Illus.

Phaseolus vulgaris. **Bean yellow mosaic virus. Isolation. Laboratory experiments. Strains. Colombia.**

Five strains of BYMV, including one which causes systemic necrosis in beans, were purified by equilibrium density gradient centrifugation. With the exception of Na-DIECA in the case of the necrosis-inducing strain of BYMV, the use of this chelating agent and urea in the extraction process had no appreciable effect on the isolation of the BYMV strains studied. The purified strains of BYMV formed one major band in cesium chloride and, upon recovery, showed 260/280 nm absorbance ratios of 1.18-1.20. Corrected yields for the 5 BYMV strains ranged from 1.50 to 0.8 mg/100 g of infected tissue. This purification procedure has already been used for the production of specific BYMV antiserum. *(Author's summary)* E04

0368

12601 MORALES, F.J. **El mosaico común del fríjol (Bean common mosaic virus); metodología de investigación y técnicas de control.** *(Bean common mosaic; research methods and control techniques).* Cali, Colombia, Centro Internacional de Agricultura Tropical, Serie 05SB-1, 1980. 22p. Span., 18 Refs., Illus.

Phaseolus vulgaris. **Bean common mosaic virus. Virus transmission. Vectors. Seed transmission. Electron microscopy. Research. Plant tissues. Serology. Races. Host-plant resistance. Plant breeding. Integrated control. Germination. Cultivars. Colombia.**

BCMV causes losses of up to 50% and produces mosaic and systemic necrosis on the plant. It is seed borne and several species of aphids are vectors; it is transmitted mechanically with relative facility. A description is given of the methodology used by CIAT to identify and manage the virus and its strains during the evaluation process of bean material resistant to the virus in the breeding programs. *(Summary by J.E.Z. Trans. by L.M.F.)* E04

0369

13138 MORALES, F.J. **Purification and serology of bean common mosaic virus.** Turrialba 29(4):320-324. 1979. Engl., Sum. Span., 14 Refs., Illus.

Phaseolus vulgaris. **Bean common mosaic virus. Serology. Laboratory experiments. Leaves. Electron microscopy.**

The type strain of the bean common mosaic virus (BCMV) was purified from infected bean leaves through clarification with chloroform-carbon tetrachloride, precipitation with polyethylene glycol and density gradient centrifugation with cesium chloride. The final suspension examined with an electron microscope, showed the presence of particles 730-740 nm in length, characteristic of this virus. By spectrophotometric analysis, the purified virus suspension showed a 260/280 ratio of 1.27. Three molecular wt components, 29.0, 32.5 and 34.4 x 10^3d, were observed by virus electrophoresis in 10% polyacrylamide gels with sodium dodecyl sulfate (SDS). An antiserum was produced by the toe-pad immunization technique in rabbits, which demonstrated great specifity in double immunodiffusion tests in an agar medium with SDS. *(Author's summary. Trans. by L.M.F.)* E04

0370

11968 NAYYAR, V. **The action of antibiotics and antimetabolites on the tobacco mosaic virus infection process in bean leaves.** Ph.D. Thesis. Logan, Utah State University, 1972. 75p. Engl., Sum. Engl., 92 Refs., Illus.

Phaseolus vulgaris. **Tobacco mosaic virus. Leaves. RNA. DNA. Antibiotics. Inhibitors. Colchicine.**

The action of 28 antibiotics and antimetabolites at varying concn was studied in coincidence with the bioassay of tobacco mosaic virus on detached bean leaves by using an ultrasonic method of inoculation developed by Lamborn, Cochran & Chidester (1971). All tested chemicals were classified, in regard to the virus infection process, as inhibitory or stimulatory and their optimal concn in the inoculum were determined. Of the 28 antibiotics and antimetabolites studied, 8 were found to stimulate while 20 inhibited TMV infection in bean leaves. Based on these results, an attempt was made to characterize the nature of the cellular antiviral defense mechanism operating in the bean leaves. The results of this study may also be used in the development of a new TMV bioassay procedure with increased sensitivity. (*Summary by Dissertation Abstracts*) E04

0371

11928 CRELLANA, R.G. and FAN, F.F. **Nodule infection by bean yellow mosaic virus in *Phaseolus vulgaris*.** Applied and Environmental Microbiology 36(6):814-818. 1978. Engl., Sum. Engl., 10 Refs., Illus.

Phaseolus vulgaris. **Bean yellow mosaic virus. Nodulation. Roots.** *Rhizobium phaseoli*. **N. Nitrogen fixation. Serology. Growth. Antisera. Leaves.**

Infection of root nodules of beans by bean yellow mosaic virus (BYMV) and the effect of the disease on the specific activity of the nodule are reported. Infectivity and serological microprecipitin assays with 2 sources of BYMV antiserum demonstrated that nodules from bean plants whose leaves had been inoculated with BYMV contain BYMV antigen. The disease reduced the fresh wt of tops, roots and root nodules and induced premature nodule decay and/or nodule drop. The disease also reduced leghemoglobin content, on a plant wt basis, and N_2 fixation rate, on an individual plant basis, as measured by the acetylene reduction assay. The increased leghemoglobin content per gram-nodule in BYMV-infected nodules relative to healthy nodules might be associated with multiplication of the virus in the nodule and/or unknown cellular effects derived from the BYMV/*Rhizobium* interaction. (*Author's summary*) E04 101

0372

13116 RAYMENT, I., JOHNSON, J.E. and ROSSMANN, M.G. **Metal-free southern bean mosaic virus crystals.** Journal of Biological Chemistry 264(12):5243-5245. 1979. Engl., Sum. Engl., 28 Refs.

Phaseolus vulgaris. **Bean southern mosaic virus. Leaves. Isolation. Laboratory experiments. Host range. Hosts and pathogens.**

Native BSMV contains a significant number of Mg^{2+} and Ca^{2+} ions. These can be removed by treatment with EDTA, causing the virus to swell by 7% in radius at alkaline pH values. The swollen virions are susceptible to protease and nuclease digestion. They are likely to be an intermediate during assembly and disassembly. Crystals of the metal-free virus have been grown and were found to be approx isomorphous with the orthorhombic type III BSMV crystals although the cell dimensions are longer by 2%. Native rhombohedral type II crystals disintegrate on changing the pH or increasing the ionic strength of the mother liquor. Damage can be prevented by adding ethylene glycol. At alkaline pH values these crystals also show a 2% increase in their cell dimensions, as well as a significant alteration in their diffraction patterns. In type II and III crystals the viruses pack with only their 5-fold axes in contact. Thus the difference of the apparent swelling in solution and in the crystals may be one of differential swelling over the virus surface. *(Author's summary)* E04

0373

13528 REISMAN, D., RICCIARDI, R.P. and GOODMAN, R.M. **The size and topology of single-stranded DNA from bean golden mosaic virus.** Virology 97:388-395. 1979. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. **Bean golden mosaic virus. Viroses. DNA. Laboratory experiments.**

The single-stranded DNA (ssDNA) of BGMV was resolved into 2 components by polyacrylamide gel electrophoresis in 8 *M* urea and by rate-zonal sedimentation in 5-20% alkaline sucrose density gradients. Viral DNA, either unfractionated or fractionated and electroeluted from polyacrylamide gels, was spread for electron microscopic examination. Unfractionated DNA and the slower of the 2 fractionated components contained predominantly circular molecules. The faster component consisted entirely of linear molecules. Circular molecules had contour lengths corresponding to 8 x 10^5 daltons. *(Author's summary)* E04

0374

13548 SCOTT, H.A. and PHATAK, H.C. **Properties of blackgram mottle virus.** Phytopathology 69(4):346-348. 1979. Engl., Sum. Engl., 17 Refs., Illus.

Phaseolus vulgaris. **Viroses. Virus transmission. Blackgram mottle virus.**

Blackgram *(Vigna mungo)* mottle virus was purified from infected Black Valentine bean plants by a chloroform-butanol procedure. Purified preparations contained polyhedral particles 28 nm in ϕ and exhibited a single immunoelectrophoretic component that migrated toward the anode at pH 8.8. Analytical ultracentrifugation showed a single component with a sedimentation coefficient of 122S and a density of 1364 g/cm^3. Polyacrylamide gel electrophoresis demonstrated one nucleic acid component and one coat protein subunit with estimated mol wt of 1.4 x 10^6 and 38,200 daltons, resp. Phenol-extracted nucleic acid was infectious on pinto bean and sensitive to ribonuclease and had a nucleotide ratio of G = 24.9%; A = 25.9%; C = 25.3%; U = 24%. The virus was transmitted by the bean leaf beetle, *Cerotoma trifurcata,* and the Mexican bean beetle, *Epilachna varivestis.* Reciprocal serologic tests failed to show relationships with members of other beetle-transmitted legume virus groups. *(Author's summary)* E04

0375

13551 SEHGAL, O.P. **Effect of protein cross-linking reagents and sodium dodecyl sulfate on southern bean mosaic virus.** Phytopathology 70(4):342-348. 1980. Engl., Sum. Engl., 33 Refs., Illus.

Phaseolus vulgaris. **Bean southern mosaic virus. Laboratory experiments. Proteins. pH.**

Sodium dodecyl sulfate (SDS) sensitivity of the "native" and divalent cation-free virions of southern bean mosaic virus (SBMV) was examined under the various conditions. In the absence of SDS (25°C, 1 h), "native" virions sedimented at 115S between pH 2.5 and 9.5; at pH 10.0-10.5, SBMV was converted progressively into a 60-65S entity; but it was degraded into a 35-40S nucleoproteinaceous product at pH 11.0. In the presence of 0.1% SDS, SBMV dissociated readily at pH 2.5-3.0 or pH 10.5-11.0; an increasing proportion of the virions were rendered SDS-sensitive at pH 9.5-10.0, but they were stable in the presence of SDS within the pH range of 3.5 and 9.0. Virions were dissociated with 2% SDS at pH 5.5 if exposed at 60-70°C for 10 min, but remained structurally stable in 0.5 M NaCl + SDS. Divalent cation-free SBMV in the "swollen" form (100 S) at pH 7.5 or in the compact conformation (115S) at pH 5.5 was sensitive to SDS. When treated with the protein cross-linking reagents viz, formaldehyde or dimethyl adipimidate, "swollen" SBMV at pH 7.5 was transformed into a sharply sedimenting 105-107S form, but remained sensitive to SDS. With additional stabilization of the viral capsid by reducing the pH to 5.5, however, such virions sedimented uniformly at 115S and also became resistant to SDS. These results are discussed relative to the available information on SBMV-stabilizing interactions. *(Author's summary)* E04

0376

13101 SEHGAL, O.P., VAN, M. and WHITE, J.A. **pH-Dependent urea sensitivity of southern bean mosaic virus.** Virology 94:479-483. 1979. Engl., Sum. Engl., 20 Refs., Illus.

Phaseolus vulgaris. **Bean southern mosaic virus. Yields. Laboratory experiments.**

In the absence of urea (5°, 1 h) BSMV was stable as a 115 S entity between pH 2.5 and 9.5, yielded a slowly sedimenting (ca.60-65) entity at pH 10.5 and was degraded into a 35-40 S product at pH 11. In 4 *M* urea, BSMV was precipitated irreversibly at pH 2.5 or 10, yielded variously sedimenting aggregates at pH 3, was transformed progressively into an 80 S entity at pH 7-9.5 or remained structurally intact at pH 3.5-6.5. In 8 *M* urea, BSMV was precipitated at ≤ pH 3.5 or ≥ pH 7.5, showed a tendency for the particle:particle interaction at pH 6.5 and 7 but remained stable between pH 4 and 6. Under conditions where BSMV was somewhat destabilized with urea, increase in the temp or ionic concn caused virion precipitation without any detectable degradation. BSMV was dissociated with 4 or 8 *M* urea at pH 5.5 but only in the presence of 1 *M* sodium chloride and at high temp (> 50°). The results of the rather unusual BSMV behavior in urea are discussed in relation to the available information on the BSMV stabilizing interactions. *(Author's summary)* E04

0377

13540 THOMAS, J.E. and BOWYER, J.W. **Properties of tobacco yellow dwarf and bean summer death viruses.** Phytopathology 70(3):214-217. 1980. Engl., Sum. Engl., 32 Refs., Illus.

Phaseolus vulgaris. **Bean summer death. Tobacco yellow dwarf.** *Orosius argentatus.* **Vectors.**

Tobacco yellow dwarf and bean summer death diseases apparently are confined to Australia, and the causal pathogens are transmitted by the leafhopper *Orosius argentatus.* The diseases were shown to be caused by viruses. Purified preparation obtained from *Datura stramonium* plants, infected with either tobacco yellow dwarf virus (TYDV) or bean summer death virus (BSDV), contained viruslike particles occurring in pairs about 20 nm x 35 nm in size. On sedimentation in sucrose density gradients, the geminate particles of TYDV and BSDV each formed discrete zones which were associated with infectivity. TYDV preparations have an ultraviolet absorbance typical of a nucleoprotein, contain a single centrifugal component with a sedimentation coefficient of 76S, and yield a single structural protein species of mol wt 27,500. The yield of TYDV was about 100-250 μg/kg of tissue, and of BSDV about 20-50 μg/kg of tissue. In addition to producing similar host reactions and having similar vector relations, TYDV and BSDV are serologically related, and are therefore considered likely to be strains of one virus. TYDV and BSDV have many properties in common with beet curly top virus (CTV), and a distant serological relationship was established between TYDV and CTV. *(Author's summary)* E04 F01

0378

1077 TURNER, M.P. and STACL-SMITH, R. **Plant-virus disease survey of Jamaica.** FAO Plant Protection Bulletin 27(1):9-11. 1979. Engl., Sum. Engl., 2 Refs.

Phaseolus vulgaris. **Viruses. Host range. Serology. Legume crops. Jamaica.**

A survey of cultivated plants in Jamaica resulted in new records for cowpea mosaic virus on kidney and broad beans, squash mosaic virus on cantaloupe melon and watermelon mosaic virus on pumpkin. Other viruses previously identified mainly on the basis of field symptoms were confirmed by host range studies and serology. Lyophilized leaf tissue was inoculated to a range of indicator plants. Those that developed symptoms were checked by electron microscopy for virus particles and extracted sap was used in serological tests to identify the viruses. *(Author's summary)* E04

0379

12685 WALKEY, D.G.A. and DANCE, M.C. **The effect of oil sprays on aphid transmission of turnip mosaic, beet yellows, bean common mosaic, and bean yellow mosaic viruses.** Plant Disease Reporter 63(10):877-881. 1979. Engl., Sum. Engl., 15 Refs.

Phaseolus vulgaris. **Bean yellow mosaic virus. Bean common mosaic virus. Disease control. Virus transmission. Vectors. Field experiments. Homopters.**

In glasshouse experiments, mineral oil diluted to 1, 2.5 or 5% (vol/vol) in distilled water and sprayed onto leaves prevented or greatly reduced aphid transmission of turnip, bean common and bean yellow mosaic viruses. The sprays were effective in controlling transmission by *Myzus persicae, Brevicoryne brassicae* and *Aphis fabae.* Moderate to severe phytotoxicity was induced by 2.5 and 5% sprays, but 1% oil had little or no adverse effect. Consequently, 1% sprays were used in field tests; these, however, failed to control aphid transmission of the above viruses or beet yellows virus. *(Author's summary)* E04

0380

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

0381

13160 YOSHII, K. *et al.* **Release of three new Guatemalan bean varieties tolerant to golden mosaic virus.** Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. 4p. Engl.

Phaseolus vulgaris. **Bean golden mosaic virus. Cultivars. Host-plant resistance. Selection. Yields. Guatemala.**

In search of tolerance to BGMV, screening of 41 F_2 and F_3 populations of a group of crosses from CIAT was started in Guatemala in 1977. In 1978, some F_4, F_5 and F_6 selections were evaluated in preliminary yield trials with high infection pressure. In 1979 the best F_7 and F_8 lines were widely tested in NE, SE and S.coastal Guatemala. On the basis of 50 regional trials, 3 new bean BGMV-tolerant var. were evaluated: (1) ICTA-Quetzal (Porrillo Sintético x ICA Pijao), highly tolerant to BGMV, wide adaptation, intermediate maturity, indeterminate growth habit, bush type; (2) ICTA-Jutiapán (ICA Pijao x Turrialba-1) tolerant to BGMV, adaptable to regions at 400-1200 m alt., intermediate maturity, indeterminate growth habit, bush type; and (3) ICTA-Tamazulapa (ICA Pijao x Turrialba-1) moderately tolerant to BGMV, wide adaptation, intermediate maturity, indeterminate growth habit, bush type with vines. *(Author's summary. Trans. by L.M.F.)* E04

See also 0252 0402 0415

E05 Nematodes

0382

11930 NAVARRO A., R. and BARRIGA O., R. **Control de nematodos fitoparásitos por medio de rotación con cultivos resistentes a estos organismos.** (*Control of nematodes by rotating with resistant crops*). Revista ICA 5(3):173-184. 1970. Span., Sum. Span., 16 Refs., Illus.

Phaseolus vulgaris. Meloidogyne sp. *Rotylenchulus* sp. **Nematodes. Nematode control. Rotational crops. Green manures. Colombia.**

Control of nematodes on susceptible crops (tomatoes and bean var. Diacol Calima) by rotating them with resistant crops (*Tagetes minuta* and *Crotalaria spectabilis*) was tested at the Centro Nacional de Investigaciones Agropecuarias-Palmira (Colombia) on soils infested with high populations of the genera *Rotylenchulus, Meloidogyne, Pratylenchus, Helicotylenchus* and *Tylenchorhynchus. T. minuta* and *C. spectabilis* were highly efficient as resistant crops, reducing nematode populations to very low levels. Although *T. minuta* gave better results, *C. spectabilis* may have greater acceptance as a rotational crop due to its use as a green manure. (*Author's summary. Trans. by T.B.*) E05

0383

11931 NAVARRO A., R. and BARRIGA O., R. **Identificación de especies del género** *Meloidogyne* **(Göldi, 1887) Chitwood 1949, (Nematoda:Heteroderidae) en Colombia.** (*Identification of Meloidogyne spp. in Colombia*). Revista ICA 9(4):499-519. 1974. Span., Sum. Span., Engl., 30 Refs., Illus.

Phaseolus vulgaris. Meloidogyne incognita. Meloidogyne javanica. **Host range. Nematode biology. Culture media. Laboratory experiments. Colombia.**

A morphological study was made of different populations of the root-knot nematode, *Meloidogyne* spp., collected from several crops and ecosystems in Colombia. The perineal pattern of adult females and the morphology of 2nd stage larvae were used to differentiate among the species. Of the 4 species identified, *M. javanica* and *M. incognita* were found on beans. (*Summary by T.B.*) E05

0384

12346 OLTHOF, H.A. **The use of beans and Kentucky blue-grass for rearing** *Pratylenchus neglectus, Pratylenchus projectus* **and** *Helicotylenchus digonicus.* Canadian Journal of Plant Science 59:897-898. 1979. Engl., Sum. Engl., 9 Refs.

Phaseolus vulgaris. Pratylenchus. **Nematodes. Host range. Laboratory experiments.**

Beans are recommended for rearing large no. of the nematodes *Pratylenchus projectus* and *P. neglectus*, and Kentucky bluegrass (*Poa pratensis*) for *Helicotylenchus digonicus*. Beans and

cucumber (*Cucumis sativus*) are new additions to the host lists of *P. projectus* and *P. neglectus*. (*Author's summary*) E05

0385

12621 VARON DE AGUDELO, F. **Nemátodos.** *(Nematodes). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris*. Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.315-326. Span., 56 Refs., Illus.

Also in English.

Phaseolus vulgaris. Meloidogyne incognita. Pratylenchus. **Nematodes. Symptomatology. Cultural control. Chemical control. Cultivars. Host-plant resistance.**

A list of nematodes associated with the roots of beans and other plants is given in table form, the species of *Meloidogyne* and *Pratylenchus* being the most common in bean crops in the Americas. *Meloidogyne* species are prevalent in light sandy soils with good drainage. Length of survival in the soil depends on the nematode species, stage of development of the pathogen, soil type, moisture and temp. Color illustrations are given of the symptoms and damage caused by nematode feeding on root systems. They often appear on aerial plant parts which become chlorotic, stunted, burned at the leaf edges and finally wilt. Crop rotation, along with deep plowing and flooding for 1-2 wk, reduces nematode populations. Chemical control is effective but expensive and requires special equipment for soil applications. *(Summary by J.E.Z. Trans. by L.M.F.)* E05

E06 Physiological Disorders

0386

12357 BECKERSON, D.W., HOFSTRA, D. and WUKASCH, R. **The relative sensitivities of 33 bean cultivars to ozone and sulfur dioxide singly or in combination in controlled exposures and to oxidants in the field.** Plant Disease Reporter 63(6):478-482. 1979. Engl., Sum. Engl., 8 Refs.

Phaseolus vulgaris. **Cultivars. Ozone. Leaves. Plant injuries. Pollution. Laboratory experiments. Field experiments. Host-plant resistance. Chlorosis.**

Primary leaves of 33 bean cv. were assessed for injury after 5 consecutive days of lab exposure to 0.15 ppm O_3, 0.15 ppm SO_2/0.15 ppm O_3 mixture or 1.00 ppm SO_2. Development of injury from the SO_2/O_3 mixture was delayed up to 3 days for 29 of the cv. compared with those exposed to O_3 alone. Although the degree of attenuation of O_3 injury by SO_2 varied considerably among cv., the general trend was for leaf injury on an area basis caused by the pollutant mixture to be less severe. The highest correlation of sensitivity to air pollution existed between field-grown plants and those exposed to O_3 alone in the lab. (*Author's summary*) E06 C00

0387

11921 CARNAHAN, J.E., JENNER, E.L. and WAT, E.K.W. **Prevention of ozone injury to plants by a new protectant chemical.** Phytopathology 68:1225-1229. 1978. Engl., Sum. Engl., 29 Refs., Illus.

Phaseolus vulgaris. **Ozone. Air pollution. Plant injuries. Leaves. Chemical control.**

A new chemical N-[2-(2-oxo-1-imidazolidinyl) ethyl]-N'-phenylurea (EDU) protects plants against O_3 injury. It is effective in foliage and root applications. Dose-response measurements on Pinto beans treated by foliage spray showed that the O_3 dose required to cause 50% leaf area injury (ED_{50}) increased linearly with the quantity of protectant applied. A 500 μg/ml foliage spray to runoff increased O_3 resistance (ED_{50}) of Pinto beans about 30-fold relative to unprotected controls. (*Author's summary*) E06

0388

13102 DAVIS, D.D. and GESALMAN, C.M. **Sensitivity of bean foliage to sulfur dioxide observed.** Science in Agriculture 26(3):16. 1979. Engl., Illus.

Phaseolus vulgaris. SO_2. **Foliage. Air pollution. Plant injuries. Cultivars. Host-plant resistance. USA.**

The relative susceptibility of 10 bean cv. to 2 ppm SO_2 for 4 h at 23°C and 75% RH, and their reactions to O_3 and peroxyacetyl nitrate (pollutants present in photochemical smog) were determined. *(Summary by Review of Plant Pathology)* E06

0389

10657 DICKSON, M.H. **Variation in bean cultivars for seed quality characters.** Geneva, New York, N.Y. State Agricultural Experimental Station, 1978. 8p. Engl.

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

Phaseolus vulgaris. **Seed. Seed characters. Cultivars. Cotyledon cracking. Host-plant resistance. Cotyledons. Australia.**

A wide range of bean cv., many of Australian origin, were screened for tight seed coat (SH - resistance to seed coat shattering) and transverse cotyledon cracking (TVC). Seed was dried to 5-6% moisture, nicked with a scalpel and tested for SH; the seed was then imbibed, the cotyledons opened and TVC determined. A 2nd group was tested for TVC and rate of imbibition without nicking of the seed coat. The 2nd test was less severe for TVC since imbibition occurred uniformly through the seed coat. Results are discussed for the different types of beans. (*Summary by T.B.*) E06 D04

0390

12380 ENDRESS, A.G. OSHIMA, R.J. and TAYLOR, O.C. **Age-dependent growth and injury responses of Pinto bean leaves to gaseous hydrogen chloride.** Journal of Environmental Quality 8(2):260-264. 1979. Engl., Sum. Engl., 26 Refs., Illus.

Phaseolus vulgaris. **Growth. Plant injuries. Leaves. Age. Leaf area. Analysis. HCL**

Pinto bean plants varying in age from 6-12 days postseeding were treated with 25.6 ± 3.3 mg HCl m^{-3} for 20 min. Foliar injury consisted primarily of abaxial glazing and bifacial interveinal necrosis. Plants that were 6 days old at the time of exposure were uninjured; the % of injured unifoliate leaves increased with tissue age at the time of HCl treatment. The relationship was sigmoidal, and probit analysis indicated that the estimated stage of maturity at which 50% of the unifoliate leaves became injured was 9 days. The rate of leaf expansion between control and fumigated leaves did not differ significantly, but expansion of the fumigated leaves was significantly delayed. The delay was apparently not directly related to visible foliar injury, nor were any differences in the relationship of leaf fresh wt to dry wt noted between control and HCL-treated leaves. *(Summary by Horticultural Abstracts)* E06

0391

11940 ENDRESS, A.G. *et al.* **Foliar and microscopic observations of bean leaves exposed to hydrogen chloride gas.** Environmental and Experimental Botany 18(2):139-149. 1978. Engl., Sum. Engl., 32 Refs., Illus.

Phaseolus vulgaris. **Leaves. Plant injuries. HCl. Electron microscopy. Laboratory experiments. Seedlings.**

Eight-day-old pinto bean seedlings were exposed for 20 min to different concn of gaseous HCl Macroscopic injury to the primary leaves examined 24 h later consisted of bifacial interveinal necrosis and glazing of the abaxial leaf surface. Only abaxial glazing was observed when $<$ 17.9 mg HCl/m^3 was used; at higher concn necrotic lesions were also present. The frequency of injured primary leaves, the no. of primary leaves with necrotic lesions and the necrotic area/primary leaf increased with increased HCl concn in the range of 6.0-54.2 mg/m^3. At all HCl concn the distribution of injury was variable. At the end of the exposure period and at various intervals throughout the subsequent 24-h period, segments were taken from the primary leaves and examined by light microscopy. Alterations noted in the treated tissues were plasmolysis, cytoplasmic vesiculation, cell-wall deformation, transient appearance of crystalline figures in chloroplasts and accumulation of particulates in vacuoles. The glazed abaxial epidermis was produced by complete collapse of the epidermal cells. In contrast with previous reports, tissues

most sensitive to HCl gas were the 2 epidermal layers. The mechanism for HCl gas phytotoxicity may initially be a surface phenomenon rather than depending upon entry through stomata. (*Summary by Horticultural Abstracts*) E06

0392

11699 HINDAWI, I.J., REA, J.A. and GRIFFIS, W.L. **Response of bush bean exposed to acid mist.** American Journal of Botany 67(2):168-172. 1980. Engl., Sum. Engl., 28 Refs.

Phaseolus vulgaris. **Dwarf beans. Plant injuries. Leaves. Ozone. Seed. Chlorophyll. Growth. Pods.**

Bush bean plants cv. Contender were treated once a week for 6 wk with simulated acid mist at 5 pH levels ranging from 5.5-2.0. Leaf injury developed on plants exposed to acid concn < pH 3, and many leaves developed a flecking symptom similar to that caused by ozone. An adaxial, interveinal bleached area resembling SO_2 injury also developed on some trifoliate leaves at the low pH treatments. Microscopic observation of injured trifoliates indicated that the palisade cells were plasmolyzed and that the chloroplasts lost structural integrity. Reductions in plant wt and chlorophyll content were detected across the pH gradient. Seed and pod growth were reduced at some intermediate acid depositions even though no visible foliar injury developed. Foliar losses of N, Ca, Mg, and P increased with decreases in acid mist pH, whereas foliar K concn were unaffected by acid mist treatment. *(Author's summary)* E06

0393

11990 KOHUT, R.J. **The interaction of O_3 and PAN on hybrid poplar and pinto bean.** Ph.D. Thesis. University Park, Pennsylvania State University. 1975. 64p. Engl., 47 Refs., Illus.

Phaseolus vulgaris. **Ozone. Air pollution. Leaves. Plant injuries. USA.**

Pinto bean plants were grown under controlled environmental conditions and exposed for 4 h in groups of 20 plants to either 558.6 $\mu g\ m^{-3}$ (30 pphm) O_3, 247.3 $\mu g/m^3$ (5 pphm) peroxyacetylnitrate (PAN), or the 2 pollutants combined at these concentrations. The plants were exposed 10 days after emergence; the series of exposures were replicated 5 times. Three days after exposure, the visible injury on the adaxial, abaxial and combined leaf surfaces of the 1st trifoliate leaf was evaluated. The O_3 exposures produced adaxial fleck while PAN produced primarily abaxial bronzing with slight necrosis. The combined pollutant exposures produced adaxial fleck similar to O_3, but produced nearly a complete suppression of abaxial bronzing. The interaction evaluation showed that O_3 and PAN interacted synergistically on the adaxial leaf surface in 3 of the 5 replications. The interaction on the abaxial surface was antagonistic in all replications. The combined surface response to the pollutants indicated that O_3 and PAN interacted antagonistically. A process employing EDTA and pectinase was used to macerate the injured tissue into a suspension of cells. The degree of injury in the foliar mesophyll tissue could then be determined from the % of plasmolyzed palisade and spongy mesophyll cells in the suspension. Pinto bean plants were grown and exposed as described above. Three days after exposure, the tip leaflet of the 1st trifoliate leaf was evaluated visually for adaxial, abaxial and combined surface injury. The leaflet was then macerated and the % of plasmolyzed cells in the palisade, spongy and combined mesophyll determined. The visual estimates of adaxial and abaxial injury were compared with the incidence of plasmolysis in the palisade and spongy mesophyll. The interaction of O_3 and PAN was evaluated using both the visual and cellular estimates of injury. There were only a few significant differences observed when the visual estimates of foliar injury were compared with the cellular estimates. It appears that there is a close association between the incidence of visible foliar injury due to O_3 and PAN and the % of foliar mesophyll cells

plasmolyzed. The visual and cellular evaluations of the interaction of O_3 and PAN were in general agreement in the 3 replications conducted. The adaxial response was additive while the abaxial response indicated a synergistic pollutant interaction with both evaluation systems. The visual system indicated that the overall pollutant interaction was antagonistic while the cellular system indicated it was additive. (*Extracted from the summary by Dissertation Abstracts*) E06

0394

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

0395

13112 RIST, D.L. and DAVIS, D.D. **The influence of exposure temperature and relative humidity on the response of pinto bean foliage to sulfur dioxide.** Phytopathology 69(3):231-235, 1979. Engl., Sum. Engl., 34 Refs., Illus.

Phaseolus vulgaris. **Plant injuries. Temperature. Relative humidity. Foliage. Leaves.**

When 20-day-old bean cv. Pinto 111 plants were exposed for > 2 h to 0.9 ppm SO_2, trifoliate leaf injury was greater at 32°C than at 13 or 21, and greater at 80% than at 40 or 60% RH. Unifoliate leaves were less sensitive than trifoliate leaves. With only 1 h exposure, injury was greatest at 13°. Stomatal conductance increased significantly with increased temp and RH. Stomatal conductance of trifoliate leaves from plants exposed to SO_2 was less than that of unexposed controls. The leaf SO_2 content was greater at 32° than at 21°. (*Summary by Soils and Fertilizers Abstracts*) E06

0396

12622 SCHWARTZ, H.F. **Problemas misceláneos.** (*Miscellaneous problems*). *In* ___. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.327-340. Span., 25 Refs., Illus.

Also in English.

Phaseolus vulgaris. **Water requirements (plant). Temperature. Soil water. Plant physiological disorders. Toxicity. Chemical control. Air pollution. Biotic problems.**

Many factors can severely affect beans during their growth cycle: (1) Parasitic plants, such as *Cuscuta epithymum* and *Cassytha filiformis*, can reduce yields. (2) Various environmental conditions including frost, extreme conditions of high or low MC, sudden changes in soil and air temp and periods of intense sunlight and wind can damage bean seedlings or mature plants. (3) Variations in soil properties and drainage may produce marked differences in plant appearance and vigor. (4) Genetic and physiological abnormalities may cause obvious or subtle change in plant development. (5) Improper pesticide and fertilizer applications and toxic air pollutants may cause chemical damage. Sometimes the symptoms produced by these factors are confused with those produced by insects, diseases, nematodes and nutri-

tional disorders. A complete history of all factors relevant to bean production in a specific region is required to identify the causal agent correctly. *(Summary by J.E.Z. Trans. by L.M. F.)* E06

0397

11646 TESO, R.R., OSHIMA, R.J. and CARMEAN, M.I. **Ozone-pesticide interactions.** California Agriculture 33(4):13-15. 1979. Engl., Illus.

Phaseolus vulgaris. **Ozone. Pesticides. Air pollution. Leaves. Seedlings. Plant injuries. USA.**

Bean seedlings (cv. UI III) were dipped in Spectracide (diazinon) at 1 oz/3 gal water or Lannate (methomyl) at 0.5 lb/100 gal water, or not dipped; on the following day they were exposed to ozone at 0 or 30 pphm for 2 h and leaf phytotoxicity assessed 3 days later. The response to methomyl and ozone was synergistic; with diazinon and ozone, however, the response was antagonistic, and there was no leaf injury. Data are also presented on the effects on plant dry wt. *(Summary by Fertilizer Abstracts)* E06

0398

13130 WEIDENSAUL, T.C. **N-[2-(2-oxo-1-imidazolidinyl) ethyl]-N'-phenylurea as a protectant against ozone injury to laboratory fumigated pinto bean plants.** Phytopathology 70(1):42-53. 1980. Engl., Sum. Engl., 27 Refs., Illus.

Phaseolus vulgaris. **Ozone. Plant injuries. Laboratory experiments. Air pollution. Foliage. Leaves. Chemical control. USA.**

The protective capacity of N-[2-(2-oxo-1-imidazolidinyl) ethyl]-N'-phenylurea against O_3 injury to pinto bean plants was evaluated. This expil compound, known as ethylene diurea (EDU), was applied as a foliar spray 1, 3, 7 or 10 days before a 6-h fumigation with 0, 200, 500, 800, 1000, or 1500 μg of O_3/m^2. EDU levels were 0, 500, 1000, or 5000 $\mu g/g$ in water with 0.05 or 0.10% Triton X-100. EDU gave better protection when applications were larger. Treating plants 3-7 days before O_3 exposure gave best protection. EDU treatments were most effective in protecting plants exposed to O_3 levels of 800 $\mu g/m^3$ or more. EDU did not protect foliage that had not yet formed when the chemical was applied. *(Author's summary)* E06

See also 0026

E07 Mycoplasmoses

0399

12615 KITAJIMA, E.W. and GRANADA, G.A. **Enfermedades similares a micoplasmas.** *(Mycoplasma-like diseases). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.197-210. Span., 49 Refs., Illus.

Also in English.

Phaseolus vulgaris. **Mycoplasmoses. Host range. Symptomatology. Etiology. Disease control. Disease transmission. Vectors. Injurious insects. Colombia.**

Since 1967 many diseases have been associated with mycoplasma-like microorganisms (MLM), especially when symptoms have been characterized by general plant chlorosis, stunting, excessive proliferation of branches (witches'-broom) and disorders of floral organs (phyllody). Many causal agents are transmitted naturally by leafhoppers to various hosts. Various MLM are known to infect beans, such as legume little-leaf transmitted by *Orosius argentatus,* witches'-broom, phyllody and virescence. In Colombia, a MLM was detected and is known as machismo or amachamiento, transmitted by *Scaphytopius fuliginosus.* The symptoms of infection generally become apparent during flowering and pod development. Control measures include adequate crop rotation and elimination of weed hosts. The symptoms and damage caused by the organisms are illustrated in color. *(Summary by J. E.Z. Trans. by L.M.F.)* E07

F00 PEST CONTROL AND ENTOMOLOGY

0400

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

0401

11636 POSADA O., L. *et al.* **Frijol.** (*Beans*). *In* ——. Lista de insectos dañinos y otras plagas en Colombia. Bogotá. Instituto Colombiano Agropecuario. Programa Nacional de Entomología. Publicación Miscelánea no. 17. 1970. pp.75-80. Span.

Phaseolus vulgaris. **Injurious insects. Injurious mites. Thysanoptera. Hemiptera. Homoptera. Lepidoptera. Coleoptera. Diptera. Colombia.**

Tables are given on the taxonomic classification, scientific and common names, the insect stage causing damage, and habits of the main bean pests. (*Summary by J.E.Z. Trans. by L.M.F.*) F00

See also 0255 0489 0490 0492 0495 0496 0497 0498 0499

F01 Injurious Insects, Mites and their Control

0402

12301 ALONZO, F. **Estudios en *Phaseolus vulgaris* L. sobre el control de la mosca blanca *Bemisia tabaci* (Genn) en la zona sur-oriente de Guatemala.** (*Control of the whitefly Bemisia tabaci in beans in Guatemala*). *In* Bean Plant Protection Workshop, Cali, Colombia, 1975. Trabajos presentados. Cali, Centro Internacional de Agricultura Tropical, 1975. 18p. Span., 26 Refs., Illus.

Phaseolus vulgaris. Bemisia tabaci. **Bean golden mosaic virus. Chemical control. Vectors. Yields. Host range. Cultural control. Guatemala.**

A study was conducted on the chemical and cultural control (traps) and host range of the whitefly *Bemisia tabaci*, vector of BGMV, at the exptl station of the Instituto Centroamericano de Tecnología Agropecuaria in SE Guatemala (Monjas). The frequency of plants with BGMV was taken as the index of control efficiency. Best chemical control was obtained with Metasystox. Cubic-shaped traps captured 27% more than cylindrical ones. The most common hosts of this fly are tobacco, tomatoes and weeds (*Sida* sp. and *Hetianthus* sp.). Sources of resistance to the whitefly vector should be sought. (*Summary by J.E.Z. Trans. by L.M.F.*) F01 E04

0403

13523 BARRETO, B.A. and TEIXEIRA, R.M. DE C. Primeira ocorrência de *Hedylepta indicata* (Fabr., 1794), Lepidoptera-Pyraustidae, em feijoeiro (*Phaseolus vulgaris* Lin.) no Estado do Rio Grande do Sul. *(First incidence of Hedylepta indicata, Lepidoptera-Pyraustidae, on beans in the state of Rio Grande do Sul).* Agronomia Sulriograndense 15(2):335-337. 1979. Port., Sum. Port., Engl., 4 Refs., Illus.

Phaseolus vulgaris. Hedylepta indicata. **Brazil.**

For the 1st time, the presence of *Hedylepta indicata*, Lepidoptera-Pyraustidae, is reported on the bean plant in the state of Rio Grande do Sul - Osório county, during the 1977/78 growing season. The presence of the insect was observed in December, on the late planted cv. *(Author's summary)* F01

0404

13514 BELAL, M.H. and GOMAA, E.A.A. **Determination of dimethoate residue in some vegetables and cotton plants.** Bulletin of Environmental Contamination and Toxicology 22:726-730. 1979. Engl., 13 Refs.

Phaseolus vulgaris. **Field experiments. Pest control. Chemical control. Leaves. Analysis. Egypt.**

Tomato, cucumber and bean plants were sprayed twice, 15 days apart in June and July, with ½ *l* dimethoate/feddan (1 feddan = 4200 m^2) and leaf samples were collected 1, 3, 7, 14 or 21 days after the 2nd application. On all dates the highest residues were found in tomato leaves, and at 21 days these leaves yielded the only determinable residue which, at 2.1 ppm, was above the tolerance level. *(Summary by Horticultural Abstracts)* F01

0405

10315 BEREZA, K. **White bean insects.** Ontario, Canada. Ministry of Agriculture and Food. Factsheet Order no. 76-040. 1976. 3p. Engl., Illus.

Phaseolus vulgaris. **Injurious insects. Insect control. Chemical control. Cultural control. Canada.**

Some species of insect pests that attack white beans in Canada are described and illustrated: underground feeders - seedcorn maggot (*Hylemya* sp.) and cutworms (*Spodoptera* sp., *Agrotis ipsilon*); foliage feeders - potato leafhopper (*Empoasca* sp.), aphids (*Aphis fabae*), green cloverworm (*Pseudoplusia includens*), Mexican bean beetle (*Epilachna varivestis*). Data are included on the type of damage, cultural and chemical control. (*Summary by F.G. Trans. by I.M.F.*) F01

0406

12637 BLICKENSTAFF, C.C. **History and biology of the western bean cutworm in southern Idaho, 1942-1977.** Moscow, Idaho Agricultural Experiment Station. Bulletin no. 592. 1979. 23p. Engl., Sum. Engl., 22 Refs., Illus.

Phaseolus vulgaris. Loxagrotis albicosta. Zea mays. **Cultural control. Insect biology. Entomology. Plant injuries. Host range. Cultivars. Pods. USA.**

The western bean cutworm *Loxagrotis albicosta* has been found in Idaho, only in the irrigated portions of Magic Valley and in Bingham County. It is a primary pest of dry edible beans, french beans and maize. The Magic Valley has been an important bean production area since the 1930s. The cutworm was 1st recognized as a pest of beans in the Magic Valley in the early 1940s and as a pest of maize in 1952. Moth populations and damage to beans have fluctuated in 4- to 8-yr cycles for reasons unknown. Black-light traps have been used since 1958 to monitor moth populations. These have proven to be highly correlated with damage on an area basis and are thus useful as a warning to growers; however, they are of lesser value for predicting damage in individual fields. Less information is available for maize, but light traps appear to be useful to this industry also. Although moth populations and damage to beans have been cyclic and damage to maize sporadic, peaks in moth population cycles as determined by black-light traps have become increasingly greater since 1958. The increasing total acreage of host plants in the area and the increasing % of maize may be the cause of increasing populations. Peak moth flight occurs between July 15-Aug. 7 with the av date July 23. The preoviposition period is about 4 days and the av no of eggs laid/female is 407 in lab studies. Egg incubation is 6 days and larvae complete development in about 31 days in the lab. Full-fed larvae overwinter in the soil at depths of 2-13 in. Overwintering mortality was 72% in cages and 90% in the field. Plowing may be an important factor in overwintering mortality. In addition to beans and maize, tomato was the only host found capable of supporting the cutworm from eggs to full-grown larvae. Larger larvae feed readily and are capable of completing development on fruits of nightshade and ground cherry. Growth stages of both maize and beans affect degree of infestation and damage, but this has not yet been defined well enough to be useful in surveying fields for potentially damaging populations. In maize, eggs and evidence of larval feeding are rather easily observed and can be used during and soon after moth flight to assess potential damage. No satisfactory survey method is available in beans. Information on natural biotic control agents is limited to general observations on 1 disease and 6 predators. *(Author's summary)* F01

0407

12302 BONNEFIL, L. **The control of bean insects in Latin America.** *In* Bean Plant Protection Workshop, Cali, Colombia, 1975. Trabajos presentados. Cali, Centro Internacional de Agricultura Tropical, 1975. 12p. Engl., 5 Refs., Illus.

Phaseolus vulgaris. **Injurious insects. Chemical control. Cultural control. Biological control. Latin America. Central America.**

Bean insect problems in L.A. are briefly discussed, emphasizing the necessity of strengthening cultural and biological control. Nonresidual, fast-acting, narrow-spectrum insecticides are preferred. Recommendations of the US Dept of Agriculture and the U. of Florida are given for the chemical control of aphids, Mexican bean beetles, the bean pod weevil, leafhoppers, banded cucumber beetle, leaf beetles and whiteflies. Application of insecticides should be minimal, especially with properly timed spraying. Cultural practices such as plowing, elimination of weeds and wild hosts should be encouraged, and biological and ecological studies intensified. A table is included on the distribution of *Empoasca* on common beans in Central America. *(Summary by L.M.F.)* F01

0408

11974 CARDONA, C. Metodología de investigación en entomología de fríjol. *(Methodology of research in bean entomology)*. Cali, Colombia, Centro Internacional de Agricultura Tropical, 1979. 9p. Span., Illus.

Paper presented at Curso Intensivo de Adiestramiento Posgrado en Investigación para la Producción de Fríjol, 4o., Cali, Colombia, 1979.

Phaseolus vulgaris. **Injurious insects. Injurious mites.** *Empoasca kraemeri.* **Cultivars. Host-plant resistance. Latin America. Colombia.**

The objectives of CIATs Entomology Program are: (1) the survey and identification of insect and mite species in L.A.; (2) establishment of the economic importance of pest species in terms of yield decrease and their geographic distribution; (3) evaluation of cv. for their resistance to determined species; (4) incorporation of resistance in improved var.; and (5) development of control measures. Priority has been given to var. resistance as the ideal pest control measure in order to reduce or eliminate the use of insecticides. CIAT has developed a mass selection program for resistance to *Empoasca*, mites and stored bean insects; and in collaboration with national institutions, it is testing var. resistance to *Apion godmani* and *Epinotia opposita*. Var. resistance alone is not sufficient; therefore, it is convenient to study other aspects related to the insect, such as its biology, habits and alternative control methods. *(Summary by J.E.Z. Trans. by L.M.F.)* F01

0409

12337 **CONTROLE DE pragas aumenta a produção.** (*Pest control increases production*). Granja 33(351):66-79. 1977. Port.

Phaseolus vulgaris. Empoasca kraemeri. **Thysanoptera. Homoptera. Chemical control. Production Brazil.**

Chemical control of the principal pests in different crops, among them beans (aphids, thrips and leafhopper) is briefly discussed; common pest names, chemical products, rates of application and considerations for efficient pest control are given in table form. (*Summary by J.E.Z. Trans. by L.M.F.*) F01

0410

2699 GALWAY, N. Bean breeding for resistance to *Empoasca kraemeri*. Cali, Colombia, Centro Internacional de Agricultura Tropical. Seminario Interno. Serie SE-14A-78. 1978. 3p. Engl.

Phaseolus vulgaris. Empoasca kraemeri. **Host-plant resistance. Plant injuries. Chlorosis. Leaves. Genetics. Genes. Colombia.**

Factors that influence the evaluation of resistance to *Empoasca* are discussed: plot size, genotype season interaction or the high level of nonadditive genetic variance, agronomic characters such as the color of the flowers and seeds, growth habit, and vigor or ability

to produce new leaves. Recurrent selection with a progeny test is suggested as a good methodology to use, even though the expt that measures the genetic advance produced by it has not yet been analyzed. *(Summary by F.G. Trans. by L.M.F.)* F01

0411

11971 GARCIA B., J.E. **Estrategias para el control de plagas.** *(Pest control strategies).* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1979. 10p. Span., 4 Refs., Illus.

Paper presented at Curso Intensivo de Adiestramiento Posgrado en Investigación para la Producción de Fríjol, 4o., Cali, Colombia, 1979.

Phaseolus vulgaris. **Injurious insects. Insect control. Integrated control. Colombia.**

The principal terms used in pest control are discussed: the agrosystem, tolerance to pest damage (economic damage level and the economic threshold) and the general point of equilibrium (av population density of an insect). The methods used in insect control include cultural, mechanical, physical, biological, chemical, genetic and regulation. None of these methods alone is sufficient to control pests; complementation or integrated control is recommended. *(Summary by F.G. Trans. by L.M.F.)* F01

0412

13189 GUERRERO R., E. **El barrenador del tallo del fríjol en la región de los Llanos de Durango.** *(Bean stem borers in the Llanos region of Durango).* Durango, México, Instituto Nacional de Investigaciones Agrícolas. Campo Agrícola Experimental "Valle del Guadiana". Folleto Técnico. 1979. 16p. Span., Sum. Span., Illus.

Phaseolus vulgaris. Centrinaspis. **Insect biology. Yields. Field experiments. Mexico.**

In the Llanos region of Durango (Mexico) 100,000 ha of beans are planted yearly under temporary conditions with an av annual yield of 350 kg/ha. In 1975, the presence of *Centrinaspis* sp. larvae, as plant borers, was detected; since 1976 studies were initiated to determine whether or not this insect is a limiting production factor of this crop in the region. The biological cycle of the insect was determined. In studies on the use of insecticides to reduce *Centrinaspis* sp. populations, bean yields were similar in plants with high and low no. of larvae. Thirty commercial lots of this crop were also sampled and yields/plant with or without larval attacks were similar. It was determined that the damage caused by the larva on bean plants is not sufficient to reduce yields; therefore, it is considered that this insect was not worth controlling. *(Author's summary. Trans. by L.M.F.)* F01

0413

13188 GUERRERO R., E. *et al.* **La conchuela del fríjol y su combate en el Valle del Guadiana, Dgo.** *(The Mexican bean beetle and its control in the Valle del Guadiana, Durango).* Durango, México, Instituto Nacional de Investigaciones Agrícolas. Campo Agrícola Experimental "Valle del Guadiana". Folleto Técnico. 1979. 22p. Span., Sum. Span., 9 Refs., Illus.

Phaseolus vulgaris. Field experiments. *Epilachna varivestis.* **Insect biology. Planting. Timing.** Insect control. Chemical control. Mexico.

Bean cultivation under irrigated conditions in the Guadiana Valley, Durango (Mexico) was affected by the strong attack of the Mexican bean beetle (*Epilachna varivestis*) that may lower the production. Of 5000 ha of beans normally planted in the region until 1977, only 1% was planted with this crop in 1978 due partly to the strong pest infestation. It was concluded that the Mexican bean beetle interrupts its hibernation with the 1st strong rains in the region; the 3rd and 4th instars are the most destructive phases of this insect. Plantings conducted on early dates (May 5-25) for long-cycle var. and during the 1st fortnight of June

for intermediate-cycle var. are the ones that best resist the attack of this pest. Chemical control can be conducted with a no. of insecticides, mainly to protect the flowering and pod-filling periods (August 5-25). The max no. of applications is 3 for the long-cycle var. and 2 for the intermediate-cycle var. With this period of chemical protection, production is secured and insect attacks such as by the bean pod weevil and others that damage pods are reduced. *(Author's summary. Trans. by L.M.F.)* F01

0414

12397 HERRERA A., Y. and MUÑIZ V., R. **Respuesta de *Epilachna varivestis* Mulls. ante superficies de color; ensayos de laboratorio.** *(Response of Epilachna varivestis to colored surfaces in laboratory experiments).* Folia Entomológica Mexicana no. 41:17-32. 1979. Span., Sum. Span., Fr., 11 Refs., Illus.

Phaseolus vulgaris. Epilachna varivestis. **Physical control. Laboratory experiments. Statistical analysis. Mexico.**

The response of the Mexican bean beetle *Epilachna varivestis* towards colored surfaces was studied in an insectary. Five colors were used (blue, green, yellow, brown and red) and 3 tones (black, gray and white). A circular, glass-plated box was used, 80 cm in ϕ alternatively covered with 6 sections of cardboard with 2 different colors. A strong attraction towards the tone black was found in comparison with other tones and colors. Red was the most attractive color; yellow and brown also had a certain degree of attraction. Field trials should be conducted in order to compare results with those obtained in the lab. *(Author's summary. Trans. by L.M.F.)* F01

0415

2842 NENE, Y.L. **Note on a fungus parasite of *Bemisia tabaci* Genn., a vector of several plant viruses.** Indian Journal of Agricultural Science 43(5):514-516. 1973. Engl., 8 Refs., Illus.

Phaseolus vulgaris. Bemisia tabaci. Paecilomyces farinosus. **Biological control. Host range. Laboratory experiments. Viroses. Vectors.**

In 1971, the fungus *Paecilomyces farinosus* was reported as a parasite of the whitefly *Bemisia tabaci.* Adult whitefly mortality due to fungal attack was > 90%. Previously, the fungus had been reported as a parasite of some Lepidoptera and Hemiptera species. *(Summary by J.E.Z. Trans. by L.M.F.)* F01 E04

0416

10330 POUZAT, J. **Effets de la destruction de certains récepteurs de l'ovitube sur l'ovogenese de la Bruche de Haricot, *Acanthoscelides obtectus* Say.** *(Influence of the destruction of ovarian tube receptors on the oviposition of bruchids).* Comptes Rendus de l'Académie de Sciences de Paris (Série D) 273:2554-2556. 1971. Fr., 10 Refs., Illus.

Phaseolus vulgaris. Acanthoscelides obtectus. **Insect biology. France.**

Regulation of ovarian activity in insects is controlled by a group of delicate, complex-operating mechanisms, which are affected by external stimuli (photoperiod, grouping and forced locomotive activity), picked up by sensorial organs. The influence of receptors (located on the ovarian tube) on the behavior and oviposition of female bruchids (*Acanthoscelides obtectus*) was determined in a normal line (needs bean seeds to oviposit). Virgen females (24 h old) were used and females anesthestized with ether for the control. Two hypotheses are proposed with regard to the mechanism by which the operation reduces ovarian production 50%: (1) destroyed receptors cannot pick up stimuli to assure a normal level of vitellogenesis and (2) when receptors are destroyed, certain influences that cause a loss in vitellogenesis, circulate in the axons that connect

them to the centers. These hypotheses imply the existence of fundamental relationships, perhaps neuroendocrinol, between ovarian tube receptors and ovarioles. (*Summary by I.B. Trans. by L.M.F.*) F01

0417

4867 **RECONHECIMENTO E CONTROLE das principais pragas das culturas em Minas Gerais. Reconhecimento das principais pragas do feijoeiro.** *(Identification and control of the principal crop pests in Minas Gerais. Identification of principal bean pests).* Informe Agropecuário 5(57):46-48. 1979. Port., Illus.

Phaseolus vulgaris. **Injurious insects. Injurious mites.** *Empoasca kraemeri. Elasmopalpus lignosellus. Diabrotica speciosa. Agrotis ipsilon. Tetranychus telarius. Polyphagotarsonemus latus. Zabrotes subfasciatus. Acanthoscelides obtectus.* **Insect biology. Insect control. Mite control. Brazil.**

The principal insects and mites that attack bean crops in Brazil were identified, including *Empoasca* spp., *Elasmopalpus lignosellus, Diabrotica speciosa, Agrotis* spp., *Tetranychus* spp., *Polyphagotarsonemus latus, Zabrotes subfasciatus, Acanthoscelides obtectus* and *Lagria villosa.* A description is given on the biology of each species and their chemical control is presented in table form. *(Summary by J.E.Z. Trans. by L.M.F.)* F01

0418

12659 RUP, P.J. and SHARMA, S.P. **Behavioural response of males and females of** *Callosobruchus maculatus* (F.) **to the sex pheromones.** Indian Journal of Ecology 5(1):72-76. 1978. Engl., Sum. Engl., 7 Refs., Illus.

Phaseolus vulgaris. Callosobruchus maculatus. **Genetic control. Insect control. Insect biology.**

The intra-and intersex responses of adults *Callosobruchus maculatus* (Col. Bruchidae) observed with a simple olfactometer showed that females were highly attractive to males. The males on exposure to females showed characteristic courtship behavior. The insignificant attraction of females towards males, males towards males and of the females towards females confirmed the absence of aggregation pheromone in this bruchid. *(Summary by Entomology Abstracts)* F01

0419

12624 SCHOONHOVEN, A. VAN and CARDONA, C. **Insectos y otras plagas del fríjol en América Latina.** *(Insects and other bean pests in Latin America). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.363-412. Span., 133 Refs., Illus.

Also in English.

Phaseolus vulgaris. Hylemya cilicrura. Agrotis ipsilon. Spodoptera frugiperda. Elasmopalpus lignosellus. Urbanus proteus. Estigmene acrea. Hedylepta indicata. Epilachna varivestis. Empoasca kraemeri. Apion godmani. Heliothis zea. Epinotia opposita. Maruca testulalis. Acanthoscelides obtectus. Zabrotes subfasciatus. Tetranychus desertorum. Vaginulus plebeius. **Chemical control. Cultural control. Host-plant resistance. Biological control. Integrated control. Latin America.**

Pests may affect bean production, before and after harvest; losses vary greatly from one region to another due to the differences that exist in planting dates, var. and cultural practices. (1) Those that attack bean seedlings are the seed corn maggot (*Hylemya cilicrura*),

which causes poor germination and deformed seedlings. Biological control can only be used with low populations and is not totally effective. The most common genera of cutworms include *Agrotis, Feltia* and *Spodoptera;* white grubs and crickets also attack the seedlings. Attacks are erratic and difficult to predict; therefore, it is better to control them with baits that are placed near the plants in the late afternoon. The lesser cornstalk borer (*Elasmopalpus lignosellus*) attacks a great var. of weeds and cultivated plants. (2) Leaf-feeding insects: many species of chrysomelids attack beans. The most prevalent genera are *Diabrotica, Neobrotica, Cerotoma* and *Andrector;* these are also the vectors of BRMV. Several species of Lepidoptera develop on beans, among them the bean leafroller *(Urbanus proteus)*, the saltmarsh caterpillar *(Estigmene acrea)* and *Hedylepta indicata.* Natural control by parasites and predators is commonly observed. The Mexican bean beetle *(Epilachna varivestis)* is a pest found in many countries. Several species of cultivated plants and weeds are hosts. Predators act as a natural control; in addition the removal of plant debris, deep plowing, lower planting density and the use of resistant var. are recommended. Chemical control is recommended when there is a population of 25 adults/ha. (3) Piercing insects: leafhoppers *(Empoasca kraemeri)* are the most important pests. Damage appears as leaf curling and chlorosis, stunted growth, greatly reduced yield or complete crop loss. Different cultural practices can be used to reduce populations and damage. The planting of beans/maize in association reduces populations. Parasites of eggs (2) and nymphs (1) have been found. Chemical control is obtained by a variety of products.. Five species of Aleyrodidae (among them *Bemisia tabaci,* a vector of BGMV and bean chlorotic mottle) live on beans, but they also have other host plants. (4) Pod-attacking insects: bean pod weevil *(Apion godmani)*, whose chemical control is conducted 6 days after initiation of flowering; the corn ear worm *(Heliothis zea* and *H. virescens);* podborers *(Epinotia opposita* and *Maruca testulalis).* (5) Storage insects: the principal pests are *Acanthoscelides obtectus* and *Zabrotes subfaciatus.* Weevils can be controlled by applying ashes, black pepper, inert dusts, vegetable oils or by chemical control. (6) Mites: spider mites *(Tetranychus desertorum)* and tropical mites *(Polyphagotarsonemus latus).* Mites can develop resistance to pesticides, therefore, different combinations should be used. (7) Slugs are not insects but can be serious pests; species are *Vaginulus plebeius, Limax maximus* and *Deroceras agreste.* Best control is obtained by cleaning weeds and plant debris; baits can also be used. The principal pests in L.A. are presented in table form; there are color illustrations of the insects and the type of crop damage. *(Summary by J.E.Z. Trans. by L.M.F.)* F01

See also 0125 0127 0258 0365 0491 0493 0494 0500

C00 GENETICS AND PLANT BREEDING

0420

13154 ALBERINI, J.L. and MOHAN, S.T. **Caráter altura basal longa: herança e utilidade no melhoramento da arquitetura de planta em feijoeiro.** *(Long basal height character, its inheritance and utility in breeding for plant architecture in dry beans).* Pesquisa Agropecuária Brasileira 14(4):339-341. 1979. Port., Sum. Port., Engl., 5 Refs., Illus.

Phaseolus vulgaris. **Mutation. Inheritance. Plant breeding. Cultivars. Plant architecture. Crossbreeding. Brazil.**

A spontaneous mutant with basal height (height of epicotyl + hypocotyl) 3 times longer than normal was observed in the field planting of a commercial bean var. The inheritance studies revealed that this character is under the control of a single recessive gene which is designated a gene symbol "Mia" (Mutante inserção alta). The height of pod insertion is also increased, thus avoiding the contact of the pods with the soil, which can be of value in maintaining the high seed quality. The crosses of this line with commercial var. resulted in several promissory selections to be tested for their suitability for mechanical harvest. *(Author's summary)* G00

0421

10419 AYONOADU, U.W.U., MUGHOGHO, L.K. and EDJE, O.T. **The breeding and genetic improvement of** *Phaseolus vulgaris* **beans.** Lilongwe, Malawi. Bunda College of Agriculture. Research Bulletin no. 2:10-14. 1971. Engl., 4 Refs.

Phaseolus vulgaris. **Plant breeding. Selection. Hybridizing. Crossbreeding. Cultivars. Host-plant resistance. Diseases and pathogens. Seed characters. Malawi.**

The progress made during 1970-71 with regard to mass selection of promising lines added to the collection is summarized. Hybridization used 74 lines and var. in crosses and reciprocal crosses, selecting 64 to obtain F_1s. For F_2s, 75 lines were planted under irrigation, using a compound fertilizer, and harvested individually. Date of maturity, growth habit, no. of pods/plant, seeds/pod, seed wt/plant and changes in the seed coat color, were used as parameters. The 10 highest yielding plants were continued in the F_3. In 1971-72, selection was based on resistance to rust (*Uromyces appendiculatus*), anthracnose (*Colletotrichum lindemuthianum*) and bacterial blight (*Xanthomonas* spp.), and on seed size. (*Summary by F.G. Trans. by L.M.F.*) G00 E00

0422

13527 BARRETO, P.D., BOSCO, J. and LOPES, E.B. **Comportamento de cultivares de feijão.** *(Performance of bean cultivars).* Pesquisa Agropecuária Brasileira 14 (4):333-337. 1979. Port., Sum. Port., Engl., 5 Refs., Illus.

Phaseolus vulgaris. **Plant breeding. Cultivars. Host-plant resistance. Diseases and pathogens. Yields. Brazil.**

The behaviour of 17 bean cv. was studied in 3 different areas of Paraiba, Brazil, during the years of 1976-78, with respect to production and disease resistance. The results demonstrate that the RC4 cv. is the most stable in terms of production and disease resistance in the different physiographic zones of Paraiba. *(Author's summary)* G00

0423

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

0424

10658 DICKSON, M.H. **Bean breeding now and in the future.** Geneva, New York, N.Y. State Agricultural Experiment Station, 1978. 4p. Engl.

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

Phaseolus vulgaris. **Mycoses. Bacterioses. Viroses. Host-plant resistance. Injurious insects. Plant breeding. Plant nutrition. Human nutrition. Nodulation. USA.**

An analysis is made of the principal factors that should be taken into account for bean improvement: resistance to pests (*Empoasca* sp), diseases (*Pythium, Rhizoctonia,* white mold, common bacterial blight, brown spot, BCMV, rust); environmental conditions such as heat and cold tolerance; plant efficiency (plant habit); nodulation efficiency; protein content and sulfur-containing amino acids; elimination of flatulence. (*Summary by F.G. Trans. by L.M.F.*) G00

0425

13145 INNES, N.L. and HARDWICK, R.C. **Possibilities for the genetic improvement of *Phaseolus* beans in the UK.** Outlook on Agriculture 8(3):126-132. 1974. Engl., Sum. Engl., 18 Refs., Illus.

Phaseolus vulgaris. **Plant breeding. Adaptation. Climatic requirements. Dwarf beans. Host-plant resistance. Drought.** *Pseudomonas phaseolicola. Botrytis cinerea. Colletotrichum lindemuthianum* **Cultivars. United Kingdom.**

Green beans are an important crop for the UK processing industry and for the fresh farm market, and there is a small but rapidly expanding UK area of dry or navy beans. The requirements for genetic improvement include better stability and predictability of farm yields, and better appearance and taste to the consumer. Perhaps the most urgent problem is improved adaptation of the navy bean. *(Author's summary)* G00

0426

12321 LAMSEEJAN, S. **Genetic, physiological and anatomical studies of a narrow-leaflet mutant in the dry bean (*Phaseolus vulgaris* L.).** Ph.D. Thesis. East Lansing, Michigan State University, 1978. 102p. Engl., Sum. Engl., 102 Refs., Illus.

Phaseolus vulgaris. **Mutation. Genetics. Plant physiology. Plant anatomy. Leaves. Crossbreeding. Inheritance. Statistical analysis. Photosynthesis. Translocation. Stomata. Laboratory experiments. USA.**

A narrow-leaflet mutant was observed in bean var. Seafarer, which had been treated with fast neutrons. The mutant is characterized by small and narrow leaflets, sterility, many slender weak branches, a dwarf and bushy appearance, and prolonged vegetative growth. Since the narrow-leaflet mutant is sterile, the gene for this trait has been maintained in the population through heterozygotes, recognizable by their intermediate-type leaflets. Genetic, physiological and anatomical studies were undertaken to investigate the mode of inheritance, the nature of induced mutation and obtain additional information concerning the physiological-agronomic potential for narrow-leaflet mutants. A series of expt was conducted in the greenhouse as well as in the lab from summer 1975 to winter 1977. The intermediate-leaflet plants were outcrossed to 6 other unrelated varieties. Genetic study was made on plants of the F_1 to F_3 generations. Plants of the F_3 generation were used for physiological study. Anatomical study was made on plants resulting from selfed seeds of the Original Intermediate. The intermediate-leaflet types, upon selfing, yielded 3 classes of progenies according to leaf shape. They were normal, intermediate and narrow-leaflet plants with a ratio of 1:2:1. Upon crossing the intermediate to 6 other unrelated var. the F_1 progenies of every cross could be classified into 2 classes: normal and intermediate types with a ratio 1:1. Upon selfing the F_1 intermediate-leaflet types, they yielded plants classifiable in the 3 previously mentioned categories in the same ratio. The gene controlling leaf shape, therefore, follows a monogenic segregation with incomplete dominance. Narrow-leaflet plants of the F_2 generation were associated with sterility, short stature, many branches and prolonged vegetative growth. The whole complex was inherited as a single mendelian unit along with the narrow-leaflet character. In the F_2 generation of 2 crosses, a few narrow-leaflet plants were found to produce seeds. When seeds were planted, they bred true for narrow leaflet and fertility. The data can be interpreted on the basis of either of 2 hypotheses as regards genetic regulation of this complex. According to the 1st hypothesis, the original mutation affected 2 closely linked genes, one responsible for leaf shape, the other affecting fertility. In the crosses to Montcalm and 31908, these effects were separated by intra-chromosomal recombination to produce a few fertile plants with narrow leaves. The 2nd hypothesis specifies that the mutated gene is pleiotropic for shape, stature, branching and fertility, but that in the crosses the normal genotypes of Montcalm and 31908 contributed modifier genes to the F_1 and F_2 which restored fertility to certain recombinants without affecting leaf shape or other components of the complex. There is little evidence that would favor one of these hypotheses over the other; if the 1st interpretation is the correct one, then the recombinant products should have included a sterile-normal, which was not obtained; however, the populations were quite small and that recombination could have been missed for reasons of insufficient sampling. Physiological studies conducted on F_3 plants of 2 crosses revealed that photosynthetic rate, translocation rate, stomatal resistance and stomatal density of the narrow-leaflet plant did not show any significant difference from either the normal or the intermediate. Anatomical study of the normal and narrow-leaflet phenotypes did not show any significant difference in cell size or cell thickness. The narrow-leaflet gene is believed to control leaflet length and width by increasing or decreasing the no. of cells rather than changing tissue components. (*Summary by Dissertation Abstracts*) G00 C00 A00

0427

11952 MARECHAL, R. and BAUDOIN, J.P. **Observations sur quelques hybrides dans le genre *Phaseolus*. IV. L'hybride *Phaseolus vulgaris* x *Phaseolus filiformis*.** (*Observations on hybrids within the genus Phaseolus. IV. Phaseolus vulgaris x P. filiformis*). Bulletin des Recherches Agronomiques de Gembloux 13(3):233-240. 1978. Fr., Sum. Fr., Engl., 7 Refs., Illus.

Phaseolus vulgaris. Phaseolus filiformis. **Hybridizing. Hybrids. Host-plant resistance. Diseases and pathogens. France.**

The wild species *Phaseolus filiformis* possesses interesting disease resistance characters that may be useful in grain legume improvement. Several attempts at crossing it with other *Phaseolus* spp.

are reported. Interspecific hybrids with 2 *P. vulgaris* cv. were successful. The hybrids, hitherto completely sterile after selfing and backcrossing, are analyzed for pollen quality and for meiotic chromosome pairing. This latter analysis confirms the supposed taxonomic position of *P. filiformis* within the genus. (*Author's summary*) G00

0428

10350 MIRANDA, P. *et al.* **Estudo do comportamento das linhas e suas "misturas".** (*Study of the performance of bean lines and their combinations*). *In* Projeto Feijão; Relatorio anual de pesquisas. Recife, Brasil, Convênio SUDENE/IPA, 1977. pp.4-10. Port.

Phaseolus vulgaris. **Cultivars. Crossbreeding. Production. Brazil.**

The performance of 2 groups of 10 bean lines (F_{12}) obtained from crosses between cv. Costa Rica x L-3-0-50, both from the germplasm bank at the Instituto de Pesquisas Agronômicas, was compared with the av of their isolated components. Lines L37-(04-15), L94-(27-15), L28-(02-34) and L53-(06-36), as well as combinations of treatments 11-15 performed well. There were no significant differences between the production of combinations and the av of their components at the 5% level (Scheffe's test). There was a high incidence of rust on some lines and combinations. In 2 expt conducted in the region of San Francisco on irrigated alluvial soils, statistical analysis could not be performed at Belém since there were salty patches. At Petrolina yields averaged 1570 kg/ha. A C.V. of 22.8% did not permit differences between lines, and there was no significant difference between combinations and their components, indicating the absence of competition among plants of the same combination. Some lines were sensitive to rust. These results confirm the theory of Welhausen Shands & Vieira, who recommended var. combinations (given the greater genetic diversity) to prevent dissemination of pathogens. (*Summary by I.B. Trans. by L.M.F.*) G00

0429

13541 MUTSCHLER, M.A. and BLISS, F.A. **Genic male sterility in the common bean (*Phaseolus vulgaris* L.).** Journal of the American Society for Horticultural Science 105(2):202-205. 1980. Engl., Sum. Engl., 10 Refs., Illus.

Phaseolus vulgaris. **Sterility. Genetics. Pollen. Plant fertility.**

A male sterile bean plant was observed in the F_2 population of WI 74-2047 x Swedish Brown. Male sterile phenotypes were characterized by all pollen grains being shriveled and non-functional, but with female fertility unaffected. Expression of sterility was genic, involving 2 unlinked loci, Ms_1 and $In\text{-}ms_1$, which interact to give a 13:2:1 F_2 ratio of non-sterile:sterile:lethal individuals. Swedish Brown contained fully fertile and semisterile plants, the latter presumed to be caused by the presence of a reciprocal translocation. One of the loci involved in male sterility is loosely linked to one of the break points of the translocation, and lines segregating for sterility but not semisterility were obtained. (*Author's summary*) G00

0430

4703 NUILA, L.R. **Informe final de adiestramiento en el programa de mejoramiento de frijol.** (*Final training report of the Bean Improvement Program*). Cali, Colombia, Centro Internacional de Agricultura Tropical, 1979. 24p. Span., Illus.

Phaseolus vulgaris. Xanthomonas phaseoli. Uromyces phaseoli. Empoasca kraemeri. **Host-plant resistance. Plant breeding. Productivity. Cultivars. Adaptation. Seed color. Selection. Colombia.**

Research was conducted at CIAT on bean resistance to bacterial blight, rust and *Empoasca kraemeri.* A description is given of disease symptoms, damage caused by *E. kraemeri* and the

techniques used to incorporate resistance. Evaluation criteria for F_2 progenies and those in advanced stages are included for the following characteristics: maturity, biotype, lodging, adaptation and seed color. The hybridization technique of stigma-covered emasculation is discussed. *(Summary by L.E.A. Trans. by L.M.F.)* G00 E01 F01

0431

13159 RHEENEN, H.A. VAN, MUIGAI, S.G.S. and KITIVO, D.K. **Male sterility in beans (*Phaseolus vulgaris* L.).** Euphytica 28:761-763. 1979. Engl., Sum. Engl., 2 Refs., Illus.

Phaseolus vulgaris. **Male sterility. Genes. Kenya.**

Male sterile bean plants were discovered at the Embu Agricultural Research Station, Kenya. The character is controlled by one recessive gene. *(Author's summary)* G00

0432

4492 RHEENEN, H.A. VAN, MUIGAI, S.G.S. and OOIJEN, J.W. VAN. **Male sterility in beans.** Thika, Kenya, National Horticultural Research Station. Grain Legume Project, 1979. 6p. Engl., Sum. Engl., 7 Refs.

Paper presented at B.I.C. - N.D.B.C. Conference, Madison, Wisconsin, 1979.

Phaseolus vulgaris. **Plant reproduction. Crossbreeding. Stigma. Pollination. Genes.**

Additional evidence that male sterility in beans is controlled by 1 recessive gene was obtained. When crosses were made on male-sterile plants, hormone treatment stimulated pod growth but had no effect on seed set, while other factors as crossing time, humidity and stigma scratching had no effect on either pod growth or seed set. Possible applications and advantages of male sterility are discussed. *(Author's summary)* G00

0433

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

0434

11147 RUBAIHAYO, P.R. and LEAKEY, C.L.A. **Protein improvement in beans and soybeans by mutation breeding.** *In* Nuclear techniques for seed protein improvement. Vienna, Austria, International Atomic Energy Agency, 1973. pp. 291-296. Engl., Sum. Engl., 31 Refs.

Phaseolus vulgaris. **Mutation. Seed. Proteins.Protein content. Amino acids. Legume crops. Cultivars. Uganda.**

The grain legume improvement program at Makerere U.,Kampala, was initiated in 1965.

Its major objectives include the improvement of protein [i.e., higher protein content and better amino acid composition (more methionine)], yield potential and disease resistance. Studies of important nutritional factors (such as trypsin inhibitors) will soon be included. A substantial amount of germplasm of each crop has been assembled and tested. Mutation breeding will soon be initiated. In beans emphasis has been on hybridization for higher yield (large-seeded Colombian Diacol Nima x stringless french bean var. carrying the *are* gene from Versailles). Evaluation of germplasm has revealed var. resistant to rust and tolerant to *Xanthomonas phaseoli*. Work is also being done to obtain a new navy bean cv. to replace susceptible Mexico 142 for the Govt's 30,000 ha project. *(Summary by T.B.)* G00 C03

0435

13135 SMARTT, J. **Interspecific hybridization in the grain legumes—a review.** Economic Botany 33(3):329-337. 1979. Engl., Sum. Engl., 62 Refs.

Phaseolus vulgaris. **Hybridizing. Legume crops. Hybrids.**

The current position regarding reports in the literature on interspecific hybridization in the pulses is confused. Two major reasons can be advanced in explanation. The 1st is that frequently conspecific wild and cultivated forms have received different binomials and crosses between such are frequently regarded as interspecific hybrids. The 2nd arises from mistaken interpretation of results of attempted interspecific hybridization when progeny strongly resembling the maternal parent are produced. It is suggested that these progeny might have been produced by failures in emasculation or rare accidental apomixis. All cultigens of the genera *Arachis, Cajanus, Cicer, Phaseolus* and *Pisum* are able to some extent to produce viable true interspecific hybrids as are the Asiatic forms of *Vigna*. True interspecific hybrids have not been produced with *Vicia faba* nor with *Vigna unguiculata*. *(Author's summary)* G00

0436

13148 TEMPLE, S.R. and SONG, L. **Crop improvement and genetic resources in *Phaseolus vulgaris* for the tropics.** *In* Summerfield, R. and Bunting, A.H., eds. Advances in legume science. London, HMSO, 1980. pp.365-373. Engl., Sum. Engl., 13 Refs., Illus.

Phaseolus vulgaris. **Plant breeding. Germplasm. Host-plant resistance. Diseases and pathogens. Injurious insects. Yields. Cultivars. Adaptation. Colombia.**

It is essential that genetic improvement of *Phaseolus vulgaris* for tropical conditions be based upon priorities such as those obtained from estimates of farmers' yield losses and assessments of alternative factors and strategies. The availability of carefully organized and properly evaluated germplasm collections greatly increases the utility of genetic resources in the attainment of crop improvement objectives. The germplasm improvement program for dry beans at CIAT emphasizes progressive screening in many diverse environments in which materials are confronted by a wide range of adverse factors. Nurseries designed to evaluate resistance to principal diseases and insect pests are artificially inoculated, and all members of an interdisciplinary team contribute information on progeny performance. Special programs for plant architecture, yield potential and adaptation breeding, as well as for specific disease- and insect-resistance breeding, complement mainstream activities. *(Author's summary)* G00

0437

4461 TONGUTHAISRI, T. **Genetic analysis of morphological characteristics of field bean (*Phaseolus vulgaris* L.) as expressed in a diallel cross.** Ph.D. Thesis. East Lansing, Michigan State University, 1976. Engl., Sum. Engl., 23 Refs., Illus.

Phaseolus vulgaris. **Genetics. Cultivars. Inheritance. Agronomic characters. Plant habit. Seed color. Seed characters. Flowering. Crossbreeding. Statistical analysis. Flowers. Maturation. USA.**

As opposed to rice and wheat, ideal plant types for beans are only beginning to be identified for different ecological zones. The focus of this thesis is on the genetic analysis of morphological characteristics believed to be associated with improved yield potential. Inheritance of these characteristics was studied in 5 x 5 and 8 x 8 diallels for 2 yr. Pod length in the 8 x 8, F_1 and 5 x 5, F_2, no. of seeds/pod (5 x 5, F_2) and 100-seed wt were found to be inherited additively. Additivity was not detected for days to 1st flowering, duration of flowering, days to maturity, total plant wt, no. of main stem branches, no. of main stem nodes, total no. of nodes, length of internode (8 x 8, F_1 and 5 x 5, F_2), no. of racemes (8 x 8, F_1 and 5 x 5, F_2), no. of seeds/pod (5 x 5 and 8 x 8, F_1), no. of pods/plant, pod dry wt/plant, no. of seeds/plant and seed dry wt/plant. Heterosis was generally high in the F_1 generation for most traits. The level of heterosis decreased in many traits in the F_2 generations due to the increase of homozygosity. The heritability estimate of 100-seed wt was the highest (82%) in the 5 x 5, F_1 data. Pod length in the 8 x 8, F_1 had a heritability estimate of approx 100%, and 100-seed wt was 90% in the same set of data. However, in the 5 x 5, F_2 data, no. of seeds/pod and no. of seeds/plant were both 90% whereas 100-seed wt was 81%. The rest of the traits studied had much lower heritability estimates (< 30%). Var. Swedish Brown (SB) had the highest HI in both the 5 x 5, F_1 and 8 x 8, F_1 data. Strain 0674 had the lowest HI in the 5 x 5, F_1 and strain 0685 had the lowest in the 8 x 8, F_1. In the F_2, the highest HI values were very close; Black Turtle Soup (BTS), and Seafarer (SFA) were the highest with the value of 0.61 whereas SB and strain 72-7427 were the next highest with the value of 0.60. The cross 72-7427 x Jules gave the highest HI value of 0.71 in the 8 x 8, F_1; the cross SB x 72-7427 gave the highest HI of 0.61 in the F_2 set of data. HI was not found to be directly related to yield nor of high heritability, but it can be useful as one important measure of efficiency of the plant. BTS was found to be a promising var. in yielding ability. It has highest mean values of no. of pods/plants, pod wt/plant, no. of seeds/pod and no. of seeds/plant. Being a black-seeded var. seemed to associate with high yield. However, if highly mechanized planting is concerned, Tui may be a good substitution. This is because of the erect plant type of Tui which can be grown at a higher no. of plants/unit area. Besides Tui is only slightly inferior to BTS in seed yield. With higher no. of plants/unit area Tui may be equal to or better than BTS in yield. The evaluation of SEA and strain 0674 may not be completely accurate in some characteristics because of their sensitivity to ozone injury. Each var. seemed to have the highest mean value of a particular trait it therefore depends on the breeder to exploit these parental lines and incorporate those traits that have additive effect into a new var. (*Summary by Dissertation Abstracts*) G00

See also 0004 0050 0123 0194 0245 0262 0263 0281 0333 0336 0547 0472

0438

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 recessive 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 inter-

node 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

0439

4819 GABELMAN, W.H. and GERLOFF, G.C. **Isolating plant germplasm with altered efficiencies in mineral nutrition.** HortScience 13(6):682-684. 1978. Engl., 17 Refs.

Phaseolus vulgaris. **K. Germplasm. Mineral deficiencies. Cotyledons. Genetics. Backcrossing.**

An outline is given of the results of solution culture expt in which differences in growth of strains of *Phaseolus vulgaris* were measured in relation to their efficiency of use of NPK. Symptoms of K deficiency were associated with rapid reflexing of leaves and the onset of development of an abscission layer before development of chlorosis. K in unifoliate leaves was re-exported to the growing point of the plant before the abscission layer formed. These changes did not occur in K-efficient plants. *(Summary by Field Crop Abstracts)* G01 C01

0440

12375 GUTIERREZ, J.A. Estado actual del mejoramiento por arquitectura en el fríjol arbustivo. *(Present state of architectural improvement in bush beans).* Cali, Colombia. Centro Internacional de Agricultura Tropical. Seminarios Internos. Serie SF-2-80. 1980. 5p. Span., Sum. Span.

Phaseolus vulgaris. Dwarf beans. Yields. Plant breeding. Crossbreeding. Cultivars. Selection. Colombia.

Towards the end of 1977, the Bush Bean Architectural Improvement Project at CIAT was started with the following objectives: (1) to reduce yield differences between small- and large-seeded types; (2) increase yield capacity and (3) make the crop more attractive and competitive for the different production systems. The pedigree and the fast, intermating and selection (FIS) methods are being used. Early generations (F_4) are used for character recombinations. From previous crossings, 36 lines were selected;those of type III had reclining stems and branches and, therefore, their pods had little contact with the soil; and those of type II, a strong stem and retarded senescence. Eighteen lines of habit II were produced with a strong, erect stem. In 1978, parents were used for more specific architectural components. It is necessary to intensify the improvement of types II and III. *(Summary by J.E.Z. Trans. by L.M.F.)* G01

0441

13521 HERRERA H., H.H. **Observaciones de cinco variedades de fríjol (*Phaseolus vulgaris* L.) en Santa Fe de Antioquia.** *(Observations on five bean varieties in Santa Fe, Antioquia).* Tesis Ing. Agr. Medellín, Universidad Nacional de Colombia. Facultad de Agronomía, 1976. 54p. Span., Sum. Span., 12 Refs., Illus.

Phaseolus vulgaris. **Field experiments. Cultivars. Adaptation. Yields. Colombia.**

The present research was conducted at the Cotové farm, El Espinal, municipality of Santa Fe, Antioquia (Colombia), a region ecologically classified as tropical dry forest (T-df). The performance of 5 bean var. was studied: 3 black-seeded, ICA-Huasano, ICA-Tuí and ICA-Pijao, and 2 pink or common var., ICA-Gualí and Diacol Calima. The Latin Square design was

used with 5 treatments and 5 replications. Results were analyzed using the Duncan test and a significant difference was found at the 1% level among the black-seeded and common var. Among black-seeded var., ICA-Pijao exceeded var. ICA-Huasano and yieldwise, there was no significant difference with var. ICA-Tuí. There was no significant difference between ICA-Guali and Diacol Calima. Black-seeded var. were found to give a better response to all the indicative parameters of adaptability, thus placing var. ICA-Huasano as the most promising one for the region. Black-seeded var. showed greater resistance to pests and fungous root diseases than var. ICA-Guali and Diacol Calima. *(Author's summary. Trans. by L.M.F.)* G01

0442

12629 MENOSSO, O.G. *et al.* **Hereditariedade do teor de prolina em folhas túrgidas e desidratadas de feijoeiro** *(Phaseolus vulgaris* L.). *(Inheritance of proline content in turgid and dehydrated bean leaves).* Turrialba 28(4):340-342. 1978. Port., Sum. Engl., 12 Refs.

Phaseolus vulgaris. **Inheritance. Leaves. Amino acids. Cultivars. Backcrossing.**

Manteigão Fosco 11, which has a high proline content, was crossed with Rico 23, which is low in proline. Analysis of data from turgid leaves of parental, F_1, F_2 and backcross generations indicated the partial dominance of low free proline content and suggested that about 4 genes determine this character. Broad-sense heritability was estimated as 65.9% and narrow-sense heritability as 51.7% . Broadly similar indications were obtained from the analysis of data from leaves dehydrated in mannitol solution, but the broad-sense heritability was 84.5% in this case, while narrow-sense estimates could not be obtained, nor the degree of dominance or no. of genes estimated because of the low phenotypic variance in the backcross generations. *(Summary by Plant Breeding Abstracts)* G01

0443

13137 MOHAN, S.T. **EMS- induced dwarf mutant of dry beans** *(Phaseolus vulgaris* L.). Turrialba 29(4):317-318. 1979. Engl., Sum. Engl., Port., Span., 1 Ref., Illus.

Phaseolus vulgaris. **Mutation. Cultivars. Plant anatomy. Yield components. Inheritance. Genes. Dwarf beans.**

In the M_2 generation of a black bean var. Porrillo Sintético, treated with ethylmenthane sulfonate, a dwarf mutant was identified. The mutant exhibits a general reduction in the height and various other parts of the plant. The character is controlled by a dominant gene. *(Author's summary)* G01

0444

13132 MOTTO, M., SORESSI, G.P. and SALAMINI, F. **Growth analysis in a reduced leaf mutant of common bean** *(Phaseolus vulgaris* L.). Euphytica 28:593-600. 1979. Engl., Sum. Engl., 22 Refs., Illus.

Phaseolus vulgaris. **Leaves. Mutation. Plant breeding. Leaf area. Laboratory experiments. Cultivars. Growth. Italy.**

A comparison between the Royal Red bean var. and a reduced leaf mutant on the basis of growth indices is reported. The mutant had lower LAI and leaf area duration (-43.7%), higher specific leaf wt (on the mean + 33.3%) and accumulated less DM (7.7%) than the normal genotype. When the NAR is considered, the mutant is superior to the normal (+ 62.3%). It is concluded that the unit area of the mutant leaves accumulates DM more efficiently than that of the corresponding normal var. *(Author's summary)* G01

0445

12329 NUÑEZ G., S. Cruzamiento artificial en fríjol *Phaseolus vulgaris* L. *(Artificial crossbreeding in beans).* Tesis Mag. Sc. Chapingo, México, Colegio de Postgraduados, 1979. 84p. Span., Sum. Span., 44 Refs., Illus.

Phaseolus vulgaris. **Crossbreeding. Cultivars. Pollination. Agronomic characters. Field experiments. Flowers. Statistical analysis. Seed. Pods. Mexico.**

The efficiency of artificial crossbreeding (AC) in beans can be affected by factors that depend on the var. involved in crossbreeding as well as on the environment where pollination takes place. This study was conducted to determine whether (a) differences exist in the % of AC when pollinations take place under greenhouse or field conditions; (b) AC varies according to the progenitors used; (c) pollination should take place in the a.m. or the p.m., and (d) the % of AC varies with the cutting or not of the flowers remaining on the female parent. The % of AC under greenhouse conditions varied between 25.83-69.58% and under field conditions, 6.25-55.83%; therefore, it is more efficient to pollinate under greenhouse conditions. When var. Canario-107 was used as a female parent, AC was better than when Bayo-107 was used, inferring that there are differences in AC when different parents are used. In the greenhouse, a % of AC was obtained when flowers remaining on the female parent were cut; while under field conditions, the cutting of remaining flowers was immaterial. No differences in AC were observed when pollination occurred in the a.m. or in the p.m. under greenhouse conditions; however, under field conditions AC was > in a.m. pollinations. It is concluded that AC depends on the var. used, handling of the remaining flowers on the female parent, the hour and place of pollination. Pollination under greenhouse conditions produced a > no. of seeds/pod. *(Author's summary. Trans. by L.M.F.)* G01

0446

11146 RUBAIHAYO, P.R. **The performance of gamma-ray induced mutants of three pulse crops.** *In* Seed protein improvement by nuclear techniques. Vienna, Austria, International Atomic Energy Agency, 1978. pp.235-241. Engl., Sum. Engl., 2 Refs.

Phaseolus vulgaris. **Mutation. Seed. Protein content. Yields. Cultivars. Field experiments. Legume crops. Production. Irradiation. Uganda.**

The M_6-M_9 generations of white-seeded beans, french beans and soybean elite mutants were evaluated for their seed and protein yield potential in replicated trials over several seasons. Several mutant lines of each crop with significantly higher yield potential than the initial lines were identified and given to the Govt field trials officer for further testing on stations throughout Uganda for at least 3 more seasons. Results will then be considered by the National Variety Release Committee if any of these mutants show outstanding performance in these trials. *(Author's summary)* G01

0447

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 the 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

0448

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

0449

11988 TULMANN NETO, A., ANDO, A. and MENTEN, J.O.M. **Obtenção de linhagens melhoradas de feijoeiro (*Phaseolus vulgaris* L.) como primeira etapa em estudos de indução de mutações.** (*Obtention of improved lines of beans as a first step in studies on induction of mutations*). Energia Nuclear e Agricultura 1(2):102-107. 1979. Port., Sum. Port., Engl., 3 Refs.

Phaseolus vulgaris. **Mutation. Plant breeding. Cultivars. Genotypes. Selection. Host-plant resistance. Diseases and pathogens. Yields. Brazil.**

Mutation induction in plant breeding can be more efficient if the material to be used presents certain uniformity, together with good agronomic characteristics. It is well known in Brazil that many Brazilian bean var. are a mixture of various genotypes. For this reason, a method of individual stratified selection with progeny tests was applied to 3 bean var. prior to the initiation of a mutation breeding program. The selection in Roxo resulted in 2 lines resistant to rust and with high yield potential. Selection in Carioca and Rosinha G_2 resulted in several lines with a tendency towards higher yields than the original material. The improved lines are being utilized in the mutation breeding program. (*Author's summary*) G01

0450

13153 ZEVEN, A.C. **Collecting genetic resources in highly industrialized Europe, especially the Netherlands.** *In* Conference of Broadening Genetic Base Crops, Wageningen, Netherlands, 1978. Proceedings. Wageningen, 1979. pp.49-58. Engl., Sum. Engl., 27 Refs., Illus.

Phaseolus vulgaris. Germplasm. Genetics. Europe.

Some collecting work within the Netherlands and some other parts of industrial Europe is discussed. For some species, wild and semiwild types are common and there is no need yet to collect them for inclusion in a gene bank. Dutch collections of cultivars of brassicas, bulbs and potato should be protected by law. As rye and turnips are being superseded by silage maize, their cultivars should also be collected and included in a gene bank. The same is true for cultivars of ornamentals which are also disappearing because of the high cost of maintenance by commercial growers. In a highly developed country like the Netherlands, many different types of the dry bean type of the common bean are still being cultivated in private gardens. Some 100 dry bean accessions were collected in the Netherlands. After multiplication, the collection will be sent to various gene banks. Material for other species should also be collected, described and included in gene banks. This is not only of benefit for future food production, but is also an aid in a study of the history of a region or a country. *(Author's summary)* G01

See also 0035 0144

H00 NUTRITION

0451

12331 EL-HAG, N., HAARD, N.F. and MORSE, R.E. **Influence of sprouting on the digestibility coefficient, trypsin inhibitor and globulin proteins of red kidney beans.** Journal of Food Science 43(6):1874-1875. 1978. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. **Digestibility. Tripsin. Proteins. Bean sprouts. Cooking. Diets. Inhibitor. Enzymes.**

The digestibility of raw kidney beans increased from 29.5 to 66.4% and that of cooked beans from 69.3 to 84.4% after sprouting for 10 days. The globulin fraction of raw and sprouted beans was 62.5 and 73.4% digestible. Sprouting decreased trypsin inhibitor activity (TIA) by ca. 50% and the globulin E protein fraction, which was rich in TIA, by ca. 33%. (*Summary by Nutrition Abstracts and Reviews*) H00 C03

0452

11621 KEMPFF S., F.N., comp. **Algúnas recetas a base de frejol.** *(Some bean recipes).* Santa Cruz, Universidad Boliviana "Gabriel Rene Moreno". Instituto de Investigaciones Agrícolas y de Recursos Naturales Renovables, 1979. 4p. Span.

Phaseolus vulgaris. **Human nutrition. Dietary value. Cooking. Diets. Bolivia.**

A compilation is presented of Bolivian bean recipes as an effective alternative to substitute animal protein in daily diets. *(Summary by F.G. Trans. by L.M.F.)* H00

0453

5990 LIMA, Z.B. DE **Estudo bromatológico de feijões** *(Phaseolus vulgaris,* **L. e** *Vigna sinensis,* **Endl.) nas condições em que são vulgarmente consumidos.** *(Bromatological study of cooked beans and cowpeas).* Revista de Farmacia e Bioquímica da Universidade de São Paulo 10(1):37-52. 1972. Port., Sum. Port., Engl., 18 Refs.

Phaseolus vulgaris. Vigna sinensis. **Animal nutrition. Protein content. Carbohydrate content. N. Mineral content. Amino acids. Methionine. Cultivars. Laboratory animals. Brazil.**

Beans and cowpeas *(Vigna sinensis)* constitute the staple food of most of the population in NE Brazil. Analytical results are usually based on the raw material, and the real contribution of cooked beans for nutritional purposes is unknown. Results of studies on raw and cooked bean var. Nanus and cowpeas are given. When cooked, these legumes present a total solid fraction of ca. 33.0 and 35.5% , resp. The most outstanding components in the solid fraction are carbohydrates and protein. The protein content in 100 g of solid material is 27.20 and 26.62 for cowpeas and beans, resp. Both legumes had 19 amino acids in their composition, 8 of which are essential: isoleucine, leucine, lysine, phenylalanine, methionine, treonine, tryptophan and valine. In both products the limiting amino acid was methionine. The seeds of the cooked legumes contain the majority of nutrients, but 10% of the protein, 10% of the carbohydrates and 10% of ether-soluble components and 50% of the mineral

components are transferred to the broth, upon cooking. The use of these legumes as the only source of protein, at the level of 10%, is insufficient to promote the normal growth of exptl animals (rats), though cowpeas are strongly superior to beans, because the loss of wt of the exptl animals was less. *(Author's summary)* H00 C03

0454

4656 MONDRAGON, M.C. and GONZALEZ, D.I. **Caldos de frijoles en relación a su contenido de aminoácidos y polifenoles.** (*The nutritional value of bean broth in relation to its amino acid and polyphenol contents*). Archivos Latinoamericanos de Nutrición 28(1):41-62. 1978. Span., Sum. Span., Engl., 24 Refs., Illus.

Phaseolus vulgaris. **Cooking. Cultivars. Seed color. N. Methionine. Cystine. Lysine. Tryptophane. Tannin content. Diets. Laboratory animals. Mineral content. Digestibility. Venezuela.**

Three batches of black beans and one of white beans were boiled in open pans; the broth was then separated from the cooked beans; the yield, total N, met, cystine, lysine, tryptophan and tannin contents of the broth and the beans were determined; and nutritional values were determined in rat feeding trials. Tables of results are given. The bean broth has a very low nutritional value, due to low lysine, met and tryptophan concn and high polyphenol concn. (*Summary by Food Science and Technology Abstracts*) H00 C03

0455

12340 NORDSTROM, C.L. and SISTRUNK, W.A. **Effect of type of bean, moisture level, blanch treatment and storage time on quality attributes and nutrient content of canned dry beans.** Journal of Food Science 44(2):392-395. 1979. Engl. Sum. Engl., 20 Refs.

Phaseolus vulgaris. **Water content. Storage. Mineral content. Vitamin content. Processing. Plant habit. Canned beans. Nutritive value. Blanching.**

The study was conducted on canned dry beans including 8 types, 2 moisture levels, 4 blanching treatments and 4 storage times. Low original moisture level before soaking resulted in higher water-uptake ratios in all beans types except Pinks and Avenger. Drained wt were higher in bean types that had lower shear press readings. Beans blanched in steam and lots containing 16% initial moisture were firmer in texture. Blanch method did not affect % splits, but type and storage time created significant differences. There were differences among types in riboflavin and vitamin E. Both vitamins decreased during storage of canned beans, but only riboflavin was lower in beans of 16% moisture, and blanched in steam as compared to water. Carbohydrate composition was significantly different between types of beans, but the greatest differences were in hemicellulose. Steam blanching leached out less sugars and high blanch temp increased the solubility of cellulose. Dwarf Horticulture No. 4 rated highest in quality followed by Red Kidney, Navy and Pinto. *(Author's summary)* H00 C03

See also 0101 0106 0118 0119

0456

12320 BOLOORFOTOOSHAN, M. **Bean protein evaluation and supplementation.** Ph.D. Thesis. East Lansing, Michigan State University, 1977. 148p. Engl., Sum. Engl., 192 Refs., Illus.

Phaseolus vulgaris. **Laboratory animals. Proteins. Amino acids. Nutritive value. Analysis. Methionine. Zn. Tryptophane. Fibre content. Ash content. Moisture content. USA.**

Feeding expt conducted with weanling rats showed that the protein quality of navy beans (a poor source of sulfur-containing amino acids) can be largely improved by mixing the beans with sesame flour (a rich source of met). The protein quality of navy beans, sesame meal and mixtures of navy beans: sesame flours (B:S) were evaluated using PER, NPR and slope-ratio techniques. Protein scores and modified essential amino acid indices (MEAA) were also computed. Compared to a PER of 100 for casein, the PER for B:S 87.5:12.5, B:S 75:25 and B:S 50:50 were 62, 49, 72, 90 and 92%, resp. The Relative Protein Value (RPV) and Relative Nutritive Value (RNV) were obtained from slope-ratio comparisons in which the corresponding lactalbumin values were set equal to 100. The RPV were 57, 52, 67, 7' and 74%, resp. The RNV were 54, 52, 66, 68 and 74%, resp. The protein scores for the tested samples were 48, 50, 60, 72 and 78, resp. The MEAA indices were 88, 78, 89, and 88, resp. Linear regression equations and correlation coefficients were derived, relating the protein values obtained by the different assays for the 5 diets. All the bioassays correlated very well with the av correlation coefficient of 0.96. The correlation between the chemical assays was poor (r = 0.50); and of the 2 methods tested, only protein scores gave a high correlation coefficient with the biological methods (r = 0.94). The supplementary effect of whole egg powder on navy beans was also studied; protein quality of the navy beans was improved by the presence of egg protein in the diet. The protein quality of navy beans subjected to different processing methods, (canning with or without sugar, home cooking and autoclaving) was estimated. PER, met availability (growth assay with weanling rats) and lysine availability (reaction with 1-fluro-2, 4-dinitrophenol benzene) were used to estimate protein quality. For the canned beans with 1.5% sugar in brine, home-cooked beans and autoclaved beans, the PER values were 58, 56, 56 and 60%, resp.; the met availability values (compared to 100 for crystalline met) were 49, 42, 48 and 50%, resp.; the lysine availability values were 93.3, 93.9, 97.5 and 97.4%, resp. It was concluded that the processing methods did not seriously impair the protein quality of navy beans. Zn supplementation of a 10% protein diet for the rat in which the sole source of protein was autoclaved navy beans was carried out. Graded levels of zinc sulfate were added to bean diets so that the final concn of Zn in the diet varied from 16.6-37.8 ppm. A very modest increase in growth, 6% in PER, over the unsupplemented diet, was observed when the Zn content of the bean diet was raised to 20 ppm. It was calculated that only 0.002% of the phytic acid of the beans could be involved in the binding of Zn. Supplementation of the same diet with 0.5% D, L-met resulted in a much greater increase in growth rate, 110% in PER. Furthermore, the very modest additional growth obtained by supplementing the bean diet with Zn disappeared when bean protein quality was upgraded by adding met. (*Summary by Dissertation Abstracts*) H01

0457

13506 CHANG, R., KENNEDY, B.M. and SCHWIMMER, S. **Effects of autolysis on the nutritional qualities of beans (*Phaseolus vulgaris*).** Journal of Food Science 44:1141-1143. 1979. Engl., Sum. Engl., 24 Refs., Illus.

Phaseolus vulgaris. **Laboratory animals. Cooking. Digestibility. Diets. P. Fe. Mn. Ca. N. Nutritive value.**

In studies with rats availability of P, PER and apparent digestibility of N were not affected by heating California Small White beans at 60°C. Retention of Fe increased from control 13 to 20 and of Mn from 43 to 58%; Ca and P were not affected. *(Summary by Nutrition Abstracts and Reviews)* H01

0458

13533 OBIZOBA, I.C., EZEKWE, M.O. and AKAIGWE, B.N. **Utilization of sorghum, wheat, and navy beans by human adults: protein metabolism.** Nutrition Reports International 20(3):291-301. 1979. Engl., Sum. Engl., 18 Refs.

Phaseolus vulgaris. **Diets. Human nutrition. N. Proteins.**

In a preliminary study, 5 healthy college women, 19 to 25 yr old, were given 4 diets with mixed plant protein similar in N content in which whole wheat flour (WF), 3 var. of sorghum [Purdue normal (PN), high lysine (HLY) and Nigeria normal (NN)] and navy bean flour (B), in different combinations, provided 6.7 g N with 0.8 g N from foods low in N daily for 24 days. Mean daily N balances were 0.52, 0.90, 1.00 and 2.14 g, resp., when WF:NN:HLY, WF:PN:B, WF:HLY and WF:HLY:PN diets supplied the N. The mixtures induced different N balances sufficiently positive to cover integumental losses. Mean N balance of women given diet WF:HLY:PN (1:1:2) was significantly different from that of women given WF:NN:HLY (14:3:3) diet. Replacement of 15% HLY with NN decreased N balance. Excretion of 3-methylhistidine in urine was not affected by treatment. *(Summary by Nutrition Abstracts and Reviews)* H01

0459

13123 BETHLENFALVAY, G.J., NORRIS, R.F. and PHILLIPS, D.A. **Effect of bentazon, a Hill reaction inhibitor, on symbiotic nitrogen-fixing capability and apparent photosynthesis.** Plant Physiology 63:213-215. 1979. Engl., Sum. Engl., 13 Refs., Illus.

Phaseolus vulgaris. Rhizobium phaseoli. **Symbiosis. Photosynthesis. Nitrogen fixation. N. CO_2. Nodulation. USA.**

Symbiotic associations of bean cv. Blue Lake plants and *Rhizobium phaseoli* strain 127K17 were treated with bentazon (3-isopropyl-1 H 2.1.3-benzothiadiazin-4-(3H)-one-2.2-dioxide). Plants receiving foliar and root treatments of 1.8 kg/ha bentazon were assayed at 6-h intervals for N_2-fixing capacity by measuring C_2H_2-dependent C_2H_4 production and H_2 evolution and for CO_2 exchange rates (CER). In foliar treated plants, greatest measured inhibition of CER and N_2 fixing capacity occurred 6 and 12 h after treatment, resp. In root treated plants max inhibition of both processes was delayed by 6 h, and was less severe than in foliar treated plants N_2-fixing capacity and CER recovered to control levels in all plants. Application of higher rates of bentazon resulted in greater inhibition of CER and N_2-fixing capacity. Inhibition of the 2 processes was positively correlated (r = 0.985). Results indicate that inhibition of N_2-fixing capacity was not caused by bentazon directly, but indirectly through limiting the availability of photosynthate to support root nodule activity. *(Author's summary)* I01 C00

0460

11197 GRAHAM, P.H. **Influence of temperature on growth and nitrogen fixation in cultivars of *Phaseolus vulgaris* L., inoculated with *Rhizobium*.** Journal of Agricultural Science 93:365-370. 1979. Engl., Sum. Engl., 9 Refs., Illus.

Phaseolus vulgaris. Rhizobium phaseoli. **Temperature. Growth. Nitrogen fixation. Cultivars. Photoperiod. Nodulation. Colombia.**

Growth and N fixation of 3 bean cv., inoculated *Rhizobium* with strain CIAT 161 of *Rhizobium phaseoli*, were compared at day/night temp of 35-25, 30-20 and 25-15°C. Temp affected the duration and magnitude of $N_2(C_2H_2)$ fixation. Max fixation increased from 33.8 μmol C_2H_4 produced/plant/h at 35-25°C to 73.0 μmol C_2H_4 produced/plant/h at 25-15°C, but the peak in fixation was increasingly delayed as growth temp was reduced. In the 25-15°C treatment this delay in the onset of fixation led to decreasing leaf N concn and visible N-deficiency symptoms at the 28-day harvest. Var. differences in response to temp were not marked, though one cv. achieved greater nodule development at 35-25°C than the others. This early-flowering cv. again appeared weak in $N_2(C_2H_2)$ fixation with low specific nodule activity at all temp studied. Results are related to bean production in L.A. and to the possible need for "starter" N in the cooler bean-producing regions. *(Author's summary)* I01 C02 C00

0461

1249 GRAHAM, P.H. and HALLIDAY, J. **Inoculation and nitrogen fixation in the genus *Phaseolus*.** *In* Workshop on Exploring the Legume-*Rhizobium* Symbiosis in

Tropical Agriculture. Kahului, Maui, Hawaii, 1977. Proceedings. Honolulu, University of Hawaii. Department of Agronomy and Soil Science, College of Tropical Agriculture. Miscellaneous Publication no. 145. 1977. pp.313-334. Engl., 104 Refs., Illus.

Phaseolus vulgaris. Rhizobium. **Nitrogen fixation. N. Nodulation. Inoculation. Cultivars. Soil temperature. Soluble carbohydrates. pH. Symbiosis. Inheritance. Legume crops. Colombia.**

A literature review on inoculation and N-fixation processes in the genus *Phaseolus* is presented, emphasizing *P. vulgaris;* specificity in the *Rhizobium* - *Phaseolus* association; N fixation; characteristics of nodule development; greenhouse and field evaluations; carbohydrate supply; soil temp and its influence on nodulation; fertilization with N. There is need for further research on these aspects; as well as studies on bean improvement that combine yield and N-fixation characteristics in comercial var. CIAT has a large germplasm bank for these purposes (> 10,000 cv.). (*Summary by I.B. Trans by L.M.F.*) 101

0462

12677 GRAHAM, P.H. and ROSAS, J.C. **Phosphorus fertilization and symbiotic nitrogen fixation in common bean.** Agronomy Journal 71:925-926. 1979. Engl., Sum. Engl., 11 Refs., Illus.

Phaseolus vulgaris. **P. N. Nodulation. Nitrogen fixation. Symbiosis. Cultivars. Germplasm. Mineral content. Fertilizers. Colombia.**

Soils in the major bean-producing regions of L.A. are frequently deficient in both P and N. With the limited fertilizer available to small farmers, the appropriate strategy for efficient fertilizer use could depend on the relative P requirements for plant and nodule development and N fixation in this species. In this field study the objective was to examine the growth, P distribution, and parameters of $N_2(C_1H_x)$-fixation of bean cv. at different levels of P fertilization. Seeds from 30 bean cv. (replicates) were inoculated and lime pelleted, then sown into a Typic Dristandept soil low in available P. P fertilization from 0-315 kg/ha as triple superphosphate was applied; plant and nodule development, P distribution and $N_2(C_2H_2)$-fixation were measured 42 days after planting. Nodules were a strong sink for P, nodule wt increasing 9-fold and P concn in nodules by almost 50% over the range of P fertilization used. Other plant tissues benefited less; levels of $N_2(C_2H_2)$-fixation, specific nodule activity, and nonstructural carbohydrate in nodules were highly correlated with supply of P. Though P concn in nodules reached 27%, there was no indication that the max fertilization rate used was adequate for full nodule development or N fixation. Furthermore, none of the 30 cv. tested showed reasonable $N_2(C_2H_2)$-fixation at low rates of P fertilization. It is concluded that identification of bean cv. able to grow at low P, but still efficient in N_2 fixation, will be difficult. *(Author's summary)* 101 D01

0463

13529 HOLLEY, J.D. and PETERSON, R.L. **Development of a vesicular-arbuscular mycorrhiza in bean roots.** Canadian Journal of Botany 57(19):1960-1978. 1979. Engl., Sum. Engl., Fr., 46 Refs., Illus.

Phaseolus vulgaris. **Symbiosis. Laboratory experiments. Roots. Canada.**

Electron-dense particles adjacent to external hyphae of a *Glomus* sp. bind Fe, as shown by X-ray microprobe analysis, when roots of beans are fixed by glutaraldehyde-ferric chloride. This material is thought to be phenolic. External spores, each with a subtending hyphal stalk, were hyaline to black. Intercellular hyphae; initially densely cytoplasmic, become progressively more vacuolate, with some vacuoles containing electron-dense particles. The hyphae form peg-like projections causing the cell to be stretched inwards. Penetration of the inner cortex is followed by the formation of a simple haustorial trunk which dichotomizes successively until fine hyphae fill the cell. The endophyte is at first enclosed by a wall layer but the finer branches are covered only by an extrahaustorial matrix and cortical cell plasma

membrane. Cortical cell cytoplasm changes in response to the fungus. Most arbuscules collapse or degenerate to some extent. Initially the cytoplasm loses its well-defined appearance and small vacuoles develop which then fuse into larger vacuoles until the cytoplasm is a thin dense band at the periphery. The hyphae then collapse and coagulate into successively larger clumps until only a dense residual mass remains in the cell. A membrane encloses the developing hyphal clumps and the cortical cytoplasm degenerates as clumping advances. No cell wall matrix is seen around the clumped endophyte. *(Summary by Review of Plant Pathology)* 101

0464

12364 NOGUEIRA, N. DE L., SILVA, D.M.DA and SAITO, S.M.T. **Estudo ao microscópio electrônico de nódulos em *Phaseolus vulgaris* L. causados por uma estirpe inefetiva de *Rhizobium*.** *(Electron microscope study of bean nodules produced by an ineffective strain of Rhizobium).* Turrialba 29(2):93-96. 1979. Port., Sum. Port., Engl., 14 Refs., Illus.

Phaseolus vulgaris. Rhizobium. **Nodulation. Races. Electron microscopy. Isolation. Nitrogen-fixing bacteria. N. Analysis. Brazil.**

An ineffective strain of *Rhizobium* in bean nodules was isolated in a soil in N. Paraná, where a rotation of wheat/beans is practiced. As this is the first N_2-fixation ineffective strain isolated in Brazil, the morphology and fine structure of the *Rhizobium* and of the host tissue were examined with the electron microscope, and compared with an effective strain of *Rhizobium* of the same cv. The ineffective bacteria, although nodulating on the host, did not show nitrogenase activity (reduction of C_2H_2) in the nodules. These bacteria were also smaller, fewer in no./envelope (1-2) containing less poly-β-hydroxybutyric acid in the cells, and were more frequently located in the intercellular walls. Starch granules were observed in the cells of ineffective nodules. *(Author's summary)* 101

0465

12361 RUSCHEL, A.P., SAITO, S.M.T. and TULMANN NETO, A. **Eficiência da inoculação de *Rhizobium* em *Phaseolus vulgaris* L. I. Efeito de fontes de nitrogênio e cultivares.** *(Efficiency of Rhizobium inoculation on beans. I. Effect of nitrogen sources and cultivars).* Revista Brasileira de Ciencia do Solo 3:13-17. 1979. Port., Sum. Engl., Port., 12 Refs.. Illus.

Phaseolus vulgaris. Rhizobium phaseoli. **Nitrogen fixation. N. Urea. Fertilizers. Symbiosis. Cultivars. Yields. Nodulation. Brazil.**

The effect of bean cv., N fertilization and sources of N on symbiotic N fixation and on bean yield were studied in 2 expt under field conditions, with the following treatments: a) control, b) *Rhizobium* inoculation, c) N fertilizer (urea-100 kg/ha N) added to the soil, and d) inoculation + N added to soil in the 1st expt. In the 2nd expt,N-sources (ammonium sulfate, sodium nitrate and urea - 50 kg/ha N) were also studied besides treatments a, b and d. Nodulation (nodules dry wt), dry wt and N content of plants were determined and 3 different times during plant development in the 1st expt and once in the 2nd. Seed yield and N content of seed and plant were analyzed. In the 1st expt, *Rhizobium* inoculation and N added to the soil increased wt and total N of plant and seed when compared to the control. Yield was not affected by different sources of N in the 2nd expt but plants inoculated with $(NH_4)_2SO_4$ presented lower seed N when compared with noninoculated plants treated with the same N source. Cv. were not statistically affected by treatments (inoculation and/or N added to the soil) when 50 kg/ha N were used. The mutant line of Carioca presented lower yield than the original lines Carioca and Venezuela-350, when 100 kg/ha N of urea were applied in the 2nd expt. *(Author's summary)* 101 C01

0466

12308 RUSCHEL, A.P., SALATI, E. and VOSE, P.B. **Nitrogen enrichment of soil and plant by *Rhizobium phaseoli* - *Phaseolus vulgaris* symbiosis.** Plant and Soil 51:425-429. 1979. Engl., Sum. Engl., 13 Refs., Illus.

Phaseolus vulgaris. Rhizobium phaseoli. **Symbiosis. N. Nodulation. Nitrogen fixation. Analysis. Roots. Soils. Brazil.**

Bean plants 35 day old showed high enrichment of ^{15}N-isotope in tops, roots and soil after 72 h in the growth chamber under ^{15}N-enriched atm as compared with samples taken from the control outside the chamber and from soil under the same exptl conditions. In a 2nd expt, bean, soybean and maize plants (25, 20 and 35 days old, resp.) were put under the same exptl conditions for 24 h. N enrichment of the soil was higher in beans than with soybeans, and there was no enrichment in the maize rhizosphere. Is is concluded that the plants influenced N enrichment of the soil, possibly due to excretions, sloughed off material from roots and nodules, or the influence of the plant on free-living N-fixers. Work is continuing with nutrient solution to eliminate any effect of microflora. (*Summary by T.B.*) 101

0467

11989 SAITO, S.M.T. and CARDOSO, E.J.B.N. **Seleção de estirpes de *Rhizobium phaseoli* para o feijoeiro cultivar Carioca.** (*Selection of Rhizobium phaseoli strains for bean cultivar Carioca*). Solo 69(1):44-47. 1977. Port., Sum. Port., Engl., 4 Refs.

Phaseolus vulgaris. Rhizobium phaseoli. **Selection. N. Nodulation. Nitrogen fixation. Symbiosis. Brazil.**

N fixation by 14 *Rhizobium phaseoli* strains in symbiosis with bean cv. Carioca was studied on inoculated plants under greenhouse conditions. Three wk after inoculation the highest total N content was noted in plants inoculated with strains C-05 and C-09; at 6 wk this was found in plants inoculated with strains 127-K 14 and C-01, followed by C-05 and C-09. Data are tabulated on plant dry wt and the no. and size of nodules at 3 and 6 wk after inoculation. Nodulation was noted at both dates, but there was no correlation between the total N fixed and the amount of nodular tissue in the plants. (*Summary by Horticultural Abstracts*) 101

0468

11617 WESTERMANN, D.T. and KOLAR, J.J. **Symbiotic N_2 (C_2H_2) fixation by bean.** Crop Science 18(6):986-990. 1978. Engl., Sum. Engl., 23 Refs., Illus.

Phaseolus vulgaris. **N. Symbiosis. Nitrogen fixation. Seed. Yields. Cultivars. Analysis. Field experiments. Nodulation. Nutrient absorption.**

In field trials on a Portneuf silt loam at Kimberly, Idaho, the acetylene reduction method was used to determine the relative seasonal N_2 (C_2H_2) fixation of several bean cv. The relative nitrogenase activity was estimated from 8-15 cm soil cores taken around the main root of a decapitated plant. Activities rapidly increased from the 3-node vegetative to early pod-filling growth stages, thereafter decreasing to zero at physiological maturity. Accumulated daily activity totals showed a 5- to 6-fold difference in seasonal N_2 (C_2H_2) fixation between cv. which was significantly related to the av nodule wt and to the plant dry wt near physiological maturity. However, cv. with similar plant dry wt. showed a 2- to 3-fold difference in relative N_2 (C_2H_2) fixation. Seed yields and total N uptakes were also positively related. *(Summary by Field Crops Abstracts)* 101

See also 0011 0117 0371

J00 ECONOMICS AND DEVELOPMENT

0469

12655 ARCIA, G. **Attitudes toward risk among small farmers in southern Huila.** Cali, Colombia, Centro Internacional de Agricultura Tropical. Seminarios Internos. Serie SE-08-80. 1980. 20p. Engl., Sum. Engl.

Phaseolus vulgaris. **Technology evaluation. Economics. Income. Production. Colombia.**

Timely evaluation of new technology performance is extremely important for international research centers. As part of the evaluation efforts of new bean technology currently in process at CIAT, a mathematical model of the bean farm is being implemented. One of its features is the incorporation of risk aversion on the farmer's objective function. The present paper deals with the methods and results of the elicitation of risk aversion among farmers in S. Huila, Colombia. The results seem to indicate that farmers are generally risk averse when faced with uncertain options. Furthermore, their degree of risk aversion is significantly inverse to subsistence security. Regressions of socioeconomic factors on risk aversion indicate that there is room for risk aversion reduction through policy instruments. *(Author's summary)* J00

0470

13342 COLOMBIA. MINISTERIO DE AGRICULTURA. OFICINA DE PLANEAMIENTO DEL SECTOR AGROPECUARIO. **Estudio del caso del cultivo del fríjol.** *(Case study on bean cultivation).* Bogotá. Serie D.A. no. 4. 1979. 111p. Span.

Phaseolus vulgaris. **Cultivation. Production. Costs. Intercropping. Technology. Income. Colombia.**

Beans are cultivated in Colombia, mostly on a small scale level (92% of the area sown), which accounts for approx 90% of the total production. Cultivation is generally traditional, using unimproved seeds and obtaining yields of approx 550 kg/ha. Small farmers face difficulties in commercialization and have credit restrictions as well as deficient technical assistance. The technologies were divided into 3 groups: beans in monoculture, beans intercropped as the principal component or beans intercropped as the secondary component. Crops were also separated as traditional and mechanical. The role technologies play in the area sown, production obtained and uses (self-consumption and marketing) is indicated as well as their characterization according to the frequency observed, area planted and production and yield levels. A summary is given of production costs according to the use of inputs, machinery, animal power and labor, and crop income return for the different types of technology was determined on this basis. Tables are included on all the aspects analyzed. *(Summary by F.A.E. Trans. by L.M.F.)* J00

0471

7846 GUTIERREZ P., U., INFANTE, M. and PINCHINAT, A. **Situación del cultivo de fríjol en América Latina.** *(The situation of beans in Latin America).* Cali, Colombia, Centro Internacional de Agricultura Tropical. Serie ES-19. 1975. 33p. Span., Sum. Span., 14 Refs., Illus.

Phaseolus vulgaris. **Production. Yields. Cultivation systems. Seed color. Diseases and pathogens. Injurious insects. Marketing. Consumption. Trade. Latin America.**

Beans are a source of nutritional enrichment that could well contribute towards solving L.A. food problems. They are generally cultivated in association or intercropped, especially with maize. Land preparation and planting are done using rudimentary practices, generally on small family-exploited farms. Storage is for < 6 mo and under poor conditions. The principal problems of this crop are poor rainfall distribution, inefficiency of marketing systems, diseases (rust, anthracnose) and pests (*Empoasca* spp. chrysomelids and cutworms) Even though some govtl entities seek to control the marketing, their intervention has not been sufficient to stabilize price fluctuations. In the majority of countries, the funds allotted to research are few, and seed production policies have little impact on them. Restructuring of national programs, training of research staff and more credit facilities are recommended. Farm-level studies determining the participation of beans as a source of income, nutrition and labor are suggested. Policies offering better possibilities for benefiting farmers and consumers and that contribute towards incrementing production at the same time should be studied. (*Extracted from author's summary. Trans. by L.M.F.*) J00

0472

6414 INSTITUTO NACIONAL DE INVESTIGACIONES AGROPECUARIAS. (Ecuador). **Programa de leguminosas; informe anual 1977.** (*Legume program; 1977 annual report*). Quito, Ecuador, Estación Santa Catalina, 1978 36p. Span.

Phaseolus vulgaris. **Research. Plant breeding. Cultivars. Adaptation. Agronomic characters.** *Zea mays.* **Intercropping. Yields. Fertilizers. Plant habit. Ecuador.**

A summary is given of the activities carried on at the Sta. Catalina exptl station and in the principal ecological areas apt for legume cultivation (bean, soybean, *Lupinus* spp.) in the Ecuatorian Sierra. Research is focused on improvement programs (genotype/system interaction) and on cultural practices for beans in monoculture and in association with maize. Trials on adaptation and fertilizer rates with national and introduced var. were also performed. (*Summary by I.B. Trans. by L.M.F.*) J00 G00 D03

0473

11170 JACKIX, M. DE N.H. **Influência de armazenamento e diferentes tratamentos de maceração e cocção na qualidade de feijões (*Phaseolus vulgaris* L.) enlatados.** (*Influence of storage and different soaking and cooking treatments on the quality of canned beans*). Tese. Mag. Sci. São Paulo, Brasil, Universidade Federal de Campinas. Facultad de Engenharia de Alimentos e Agrícola, 1978. 148p. Port., Sum. Port., Engl., 87 Refs., Illus.

Phaseolus vulgaris. **Cooking. Canned beans. Storage. Soaking. Cultivars. Protein content. Water absorption. Seed. Composition. pH. Nutritive value. Processing. Brazil.**

The main purpose of this work was to test the effect of soaking and cooking periods on different var. of dry beans used for canning. The var. used were Rosinha, Carioca, Rico 23 (black beans), Bico de Ouro and Piratã beans grown during the rainy and dry seasons. Tests were performed soon after harvest and at 12-18 mo of storage, respectively. Soaking processes were as follows: water at 25°C for 8 h; 0.5% sodium hexametaphosphate (SHMP) solution at 25°C for 8 h; water at 25°C for 3 h, after scalding; water at 60°C for 1 h; and 0.5% SHMP solution at 60°C for 1 h. Cooking periods were 20, 30 or 40 min at 121°C. Protein content was significantly higher for dry season beans, especially for Bico de Ouro and Rico 23. Soaking did not increase water absorption when using 0.5% SHMP solution; however, cooked beans were significantly more tender and showed a greater wt gain when SHMP was used, independent of the stage of the process at which it was added. For assessing the tenderness of the product, sensory analyses and Instrom tests were

carried out. A relation between organoleptic and mechanical tests was obtained when in addition to the measurement of the force applied in the Instron the C.V. of force was considered. The beans were classified as tender by the testing panel when the medium force applied in the Instron was < 1200 gf and the C.V. < 32%. After 1 yr storage beans did not become tender even after 40 min of cooking, when only water was used for soaking and cooking. The use of 0.5% SHMP solution as filling liquid dispensed with the necessity of soaking and made it possible to obtain a product considered "ideally" tender by the testing panel after 30 min of cooking. (*Author's summary*) J00 C03

0474

12674 LEON D., J.R., BARRIOS G., A. and ORTEGA I., S. **Repercusión de la tecnología en el desarrollo de los principales cultivos de Venezuela. Cuarto caso: Leguminosas de granos comestibles.** *(The impact of technology on the development of the principal crops in Venezuela. IV. Edible legumes).* Maracay, Venezuela. Consejo Nacional de Investigaciones Agrícolas. Publicación Miscelánea no. 21. 1975. 215p. Span., 141 Refs.

Phaseolus vulgaris. **Legume crops. Technology evaluation. Plant development. History. Production. Climatic requirements. Cultivation systems. Cultivation. Venezuela.**

In Venezuela, an evaluation was made of research on edible legumes (beans, cowpeas and soybeans), with the purpose of determining the utilization of new technological elements derived from the results of the research. Furthermore, a synthesis was made of the bibliographic information on crop history, production zones, level of the production system technology, var., planting dates and methods, cultural practices, pest and disease control, harvesting, commercialization and utilization of products. The correlation between the researcher's motivation and the research conducted was analyzed. *(Summary by J.E.Z. Trans. by L.M.F.)* J00

0475

7759 MILLER, G.F. **An economic analysis of basic grains in El Salvador.** Ph.D. Thesis. Columbia, University of Missouri, 1974. 186p. Engl., Sum. Engl., 15 Refs., Illus.

Phaseolus vulgaris. **Marketing. Economics. Production. Yields. Consumption. Prices. El Salvador.**

El Salvador has a large agricultural work force, a high population density and suffers from high seasonal unemployment, low rural income and a generally deficient national diet. The Govt embarked on a program to expand its grain stabilization program to eliminate the market imperfections that currently contribute to the undesirable conditions. The primary objective of this study was to develop realistic supply and demand relationships that will pinpoint the factors responsible for lagging grain production. Another objective was to develop a price predictive model to enhance the opportunities of improving grain marketing by providing the Instituto Regulador de Abastecimientos (IRA) with data for its price stabilization work. Existing patterns of grain production, demand and distribution were analyzed on the basis of area planted, yields and distribution of the 4 basic grains (maize, beans, rice, sorghum). It was determined that total annual production of all 4 grains was increasing over time, but at a decreasing rate. This increased productivity was primarily brought about by application of modern technology (increasing yield), not by increased plantings. The area devoted to maize is much greater than that devoted to the other grains, being nearly double that of sorghum, its closest competitor. The upward trend in yields is more pronounced for maize and rice. The amount of grains moving into commercial channels varies from about 40% of the total for sorghum to about 90% for rice. The general flow is toward the population concn of San Salvador, San Miguel, Sonsonate and Santa Ana. Generally, the grain surplus does not move very far, which fortunately simplifies an otherwise unmanageable marketing problem. There are some net exports during peak production years. Per capita human consumption of the basic grains has always been high

and the rapidly growing population will need a rapidly increasing supply. The demand for multipurpose grains such as maize and sorghum for livestock feed is also expanding rather rapidly. Population is growing at the rate of 3.8%/yr; per capita income is growing modestly. Combined grain consumption should reach ca. 136% of the 1973 level in 1980. If these projections are realistic, there will continue to be periodic shortages of maize and sorghum through 1980. At present there are shortages of beans; only by maintaining the trend line for beans can sustained shortages be averted. Rice is in ample supply and should continue to be so through 1980. There are economic incentives for increased grain production; however, there is a lack of land since 63% of the land is already planted. As more farmers adopt higher yielding var., fertilizer, irrigation and improved cultural practices higher yields should continue through 1980. Prices have fluctuated widely over the past 15 yr. The stabilization program was ineffective because of lack of funds and of knowledge. To overcome these problems funds have been provided, and an investigation was launched to determine the source and magnitude of the price variations. Variations stem from 2 sources: yr-to-yr and intrayear fluctuations. The latter were regarded as the major problem area. IRA developed a model for maize to project the equilibrium wholesale price for the marketing year in question. The 1st attempt for 1973-74 met with limited success, probably due to the world situation. The summer of 1973 saw world grain stocks plunge to record lows, export demand from many sources pull at the available world supplies, and harvest prices reach new highs. The need for further price predictive analysis is paramount if El Salvador is to deal with an intrayear price fluctuation for maize that could be greater than ever before. A maize price for 1974-75 has been developed by regression analysis from the model. *(Author's summary)* J00

0476

5536 NEELY, M. and SISTRUNK, W.A. **Influence of processing methodology on the strength of wastewater from canning dry beans.** Journal of Food Science 44(2):407-410. 1979. Engl., Sum. Engl., 16 Refs., Illus.

Phaseolus vulgaris. **Processing. Water content. Experiment design. Analysis. Statistical analysis.**

The effect of soaking procedures on wastewater strength (WS) during canning of dried beans was determined at several soaking times (3, 6, 14 h), temp (15°, 25°, 35°C) and soaking solutions (EDTA, citric acid, malic acid, H_2O, deionized H_2O). WS was measured as COD, total suspended solids (TSS) and total P (TP). Reducing soaking times and temp and the addition of EDTA reduced WS, whereas the addition of citric and malic acid increased WS. Navy beans generated more COD and TP than Pinto or Red Kidney beans. The WS from soaking navy beans increased dramatically at 25 and 35° as compared to 15°C. Significant interactions indicated that the type of soaking solution was of greater importance in navy and Pinto beans than in Red Kidney. (*Author's summary*) J00 C03

0477

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

0478

12675 OVIEDO Z., R. and AGUIRRE, J.A. **Costos de operación del cultivo del fríjol (*Phaseolus vulgaris* L.) en la cosecha de agosto a diciembre de 1971: resultados preliminares.** *(Bean production costs in El Salvador in 1971).* Ciudad de Guatemala. Convenio IICA/ZN-ROCAP. Publicación Miscelánea no. 99. 1972. 11p. Span.

Phaseolus vulgaris. **Costs. Production. Cultivation. Harvesting. Soil preparation. El Salvador.**

A study was conducted in El Salvador in 1971 to establish bean production costs for improved technology (adequate land preparation, fertilization, 1-2 weedings, chemical pest control) and the traditional system (no inputs, 1 weeding). The improved system is superior in yields (32.6 vs. 18.09 quintals/ha) and more economical than the traditional one. The cost/benefit ratio is $1.89. Seen as the introduction of simple technology, labor input increases. Technological changes related to inputs have been accepted because the investment can be afforded by the producers. *(Summary by J.E.Z. Trans. by L.M.F.)* J00

0479

12358 **RAPID GAINS in bean improvement drive.** Third World Agriculture 1(4): 12-15: Engl., Illus.

Also in Spanish.

Phaseolus vulgaris. **Germplasm. Host-plant resistance. Diseases and pathogens. Injurious insects. Production. Yields. Research. Colombia. Latin America.**

The role of beans in L.A. is briefly analyzed, where it constitutes an important source of proteins in human nutrition, especially among people with low incomes. The main problems that affect bean production are low soil fertility, pests and diseases; these last 2 are the factors most limiting to yields. CIAT's Bean Program started in 1975 with the purpose of investigating bean production, developing a regional network of researchers on this crop and establishing a world germplasm center, started with 21,000 samples. These materials are evaluated at CIAT to determine yield, maturity and resistance to pests and diseases. Selected material is distributed for international testing to national scientists in different countries. On the other hand, > 70 scientists are trained each yr in bean production and research. *(Summary by L.E.A. Trans. by L.M.F.)* J00

0480

11647 RESTREPO T., L.F. **Evaluación agroeconómica de nueva tecnología para la producción de fríjol en la región sur del Huila-Colombia.** *(Agroeconomic evaluation of new technology for bean production in southern Huila, Colombia).* Tesis Mag. Sc. Bogotá, Universidad Nacional-Instituto Colombiano Agropecuario, 1979. 108p. Span., Sum. Span., Engl., 41 Refs., Illus.

Phaseolus vulgaris. **Technology evaluation. Technological package. Production. Seed treatment. Seed. Experiment design. Statistical analysis. Yields.** *Zea mays.* **Intercropping. Costs. Fertilizers. Economics. Colombia.**

In 1978, the CIAT Bean Program in cooperation with the Instituto Colombiano Agropecuario (ICA), carried out 13 farm trials to evaluate bean production technology available in S.

Huila (Colombia). Based on exptl results and previous farm-level testing, the technologies evaluated were: (a) use of protected seed (produced under rainfed conditions, but with intensive chemical protection) and certified seed of the var. Calima; (b) different levels (0, 200 and 400 kg/ha) of the complete fertilizer 10:30:10; (c) chemical pest control; fields were sprayed once to control anthracnose and *Empoasca*. The agroeconomic evaluation was made on the basis of partial and total budgets. Monoculture yields under normal farmers' conditions were favored by excellent rainfall distribution and reached 1044 kg/ha. When there was no soil fertility problem, just the utilization of better agronomic practices with the farmers' seed increased yields 50% (1561 kg/ha). These agronomic practices involved chemical spraying after the pest problem (anthracnose or *Empoasca*) had been identified in the field and weeding before flowering (the apparent optimum time). The use of protected seed slightly improved yields (by 130 kg/ha). On those farms with a fertility problem, the combined effect of all 3 technologies was necessary to raise yields to equivalent levels of the other group; on these soils fertilizer use did increase yields. The simple agronomic changes with farmers' seed increased yields only 15%. Yield increase is not a sufficient validation of new technology; profitability and risk must also be considered. On farms without a fertility problem, the choice is simple. All other technologies except optimum weeding with chemical pest control decrease income. On farms with a fertility problem the high fertilizer/improved seed combination was more profitable, but also involved higher production costs than the weeding/pest control treatment with the farmers' seed. The farmer could choose between the low-cost technology (good agronomic practices with his own seed) or the more profitable, but higher cost technology (use of fertilizer and cleaner seed). The payoff to fertilization with soil tests and the definition of min initial nutrient levels were determined. In most cases fertilization was not profitable on these alluvial soils which had often been highly fertilized for growing tomatoes; nor was seed quality very important. Certified seed actually gave lower yields than farmers' seed although differences were not significant. It is important not to understimate the farmer, who correctly preferred his own seed to certified seed. Finally, chemical pest control along with weeding at the optimum time gave a reasonable yield increase and was profitable with farmers' seed. *(Extracted from author's summary)* J00

0481

13185 SANDERS, J.H. Beans. *In* Centro Internacional de Agricultura Tropical. Latin America: trend highlights for CIAT commodities. Cali, Colombia. Internal Document Econ 1.5. 1980. pp.85-98. Engl., Illus.

Phaseolus vulgaris. Production. Trade. Consumption. Yields. Latin America.

L.A. bean production has stagnated due to the continuing yield declines. Production has been maintained by area expansion in some countries (Brazil); in others, it has increased due to a strong export demand from European and Venezuelan markets. High population and per capita income growth kept demands > 3%. As beans are grown in more marginal areas, prices and potential returns to yield-increasing technology increase. Production seems to be limited by a supply problem. Price collapse can be avoided by price floors established by the govt in good harvest yr. *(Summary by L.M.F.)* J00

0482

12605 SANDERS, J.H. and SCHWARTZ, H.F. La producción de fríjol y limitaciones impuestas por las plagas en América Latina. *(Bean production and pest constraints in Latin America). In* Schwartz, H.F. and Gálvez, G.E., eds. Problemas de producción del fríjol; enfermedades, insectos, limitaciones edáficas y climáticas de *Phaseolus vulgaris.* Cali, Colombia, Centro Internacional de Agricultura Tropical, 1980. pp.1-14. Span., Sum. Span., 29 Refs.

Also in English.

Phaseolus vulgaris. Diseases and pathogens. Injurious insects. Economics. Plant damage. Yields. Disease control. Seed production. Insect control. Host-plant resistance. Production. Latin America.

Beans are attacked by a large no. of plant pathogens and insect pests, many of which can reduce yields drastically. Farmers with small land holdings usually have limited resources but produce most of the beans in L.A. Control strategies feasible for these growers may be restricted to those strategies that do not require large cash inputs; hence breeding for resistance may be the most desirable alternative available. National and international bean production programs, must accurately identify yield constraints prevalent in specific production regions to provide more efficient use of the large amount of manpower, research expenditure and time required to implement resistance breeding. Stability of resistant materials can be improved with an integrated control strategy consisting of resistance, cultural practices, chemicals and clean seed production for those diseases in which resistance does not confer immunity to infection. This integrated control strategy must be adapted to specific regional problems. A more systematic collection of information is necessary to evaluate the costs and probability of success for control strategies so that the pathology, entomology and breeding research at the expt station is more applicable and quickly available to farmers. *(Author's summary)* J00

0483

12872 WALDER, V.M. *et al.* Padrões estacionais de preços de produtos agropecuários no estado do Espíritu Santo. *(Seasonal price indices of agricultural and animal products in the state of Espíritu Santo).* Revista Ceres 25(104):372-389. 1978. Port., Sum. Port., Engl., 10 Refs.

Phaseolus vulgaris. Prices. Economics. Statistical analysis. Brazil.

Seasonal price analysis is an important tool for market policy. The objective of this study is the analysis of seasonal price patterns for 6 important farm products in the state of Espíritu Santo: paddy rice, maize, green coffee, beans, bananas and cassava. Moving av of prices paid to farmers over a 12-mo period were used as basic information; data were obtained by extension agents. Products such as rice, maize and coffee, harvested only once a yr, showed a decreasing seasonal index during the 1st semester and an increasing index during the 2nd semester, suggesting an inverse relationship between supply and price. Products harvested throughout the year such as bananas and cassava show stable seasonal patterns. However, products harvested twice a yr, such as beans, presented higher seasonal indices the 1st semester and lower seasonal indices the 2nd semester. These seasonal price indices may be useful for marketing policies for farmers, middlemen and govt decision-makers. *(Author's summary)* J00

See also 0191 0192 0200 0231 0232 0233 0243

K00 FIELD PLOT TECHNIQUE

0484

3947 CRUZ N., G. **Determinación del tamaño y forma óptimo de parcela experimental en el cultivo de fríjol.** *(Determination of optimum exptl plot size and shape in bean cultivation).* Tesis Ing. Agr. Chapingo, México, Escuela Nacional de Agricultura, 1971. 92p. Span., 28 Refs., Illus.

Phaseolus vulgaris. **Field experiments. Experiment design.**

Statistical methods were studied at the Instituto Nacional de Investigaciones Agrícolas in Mexico: (1) Smith's maximum curvature, (2) multiple regression model for best fit and (3) the Hatheway method to estimate plot size and shape; and the methodology to follow in this type of investigation. Methods 1 and 2 require data variability for recommendations on plot size and shape. This is a little desired characteristic; therefore, Hatheway's method is recommended which uses the determination capacity of each plot size or the utilization of other methods which are based on the type of surface response for variation coefficients, taking into account the value at the ordinate to the origin. In all the cases, the no. of replications was observed to be a factor that establishes a greater capacity of determining plot size. When many treatments were used, the determination capacity was not affected by the no. of replications. For 5 treatments, 6 replications are recommended and for 20-25 treatments, 2 or 3 replications. Since climbing var. show higher variability than bush var., large sized plots are recommended for an acceptable detection capacity. *(Summary by J.E.Z. Trans. by L.M.F.)* K00

0485

3743 MONZON P., D.E. and AVILAN C., W. **Efecto de competencia y bordura entre parcelas experimentales en ensayos de poblaciones con maíz, algodón, fríjol, soya y caraotas.** *(Effects of competition and borders among experimental plots in maize, cotton, cowpea, soybean and bean trials).* Maracay, Venezuela. Ministerio de Agricultura y Cría. Fondo Nacional de Investigaciones Agropecuarias. Boletín Técnico no. 4. 1977. 44p . Span., 67 Refs.

Phaseolus vulgaris. **Experiment design. Field experiments. Cultivars. Spacing. Yields. Statistical analysis. Venezuela.**

The effect of competition between plots and borders was determined in 7 maize, cotton, cowpea, soybean and bean trials conducted at the Gonzalito exptl station, state of Aragua (Venezuela) in 1970. It is concluded that competition has no effect among treatments. In relation to the border effect, there were no significant differences; nevertheless, the outer rows yielded more than the others. A literature review is included. *(Summary by L.E.A. Trans. by L.M.F.)* K00

0486

11155 RAMALHO, M.A.P. *et al.* **Estimativa do tamanho ideal da parcela para os experimentos com a cultura do feijão.** *(Determination of ideal plot size for field trials with beans).* Ciência e Prática 1(1):5-12. 1977. Port., Sum. Port., Engl., 8 Refs.

Phaseolus vulgaris. **Statistical analysis. Field experiments. Experiment design. Plot size. Brazil.**

A uniformity expt dealing with the cultivation of beans was conducted at the Escola Superior de Agricultura de Lavras, Minas Gerais in 1973. These were 630 basic units, each measuring 1.0 x 0.5 m; the coefficient of variance (C.V.) was used to measure the variability existing between different plot sizes. The C.V. was also applied to the FEDERER formula to calculate the index of soil heterogenicity: h=0.54. The estimate of plot size was calculated using the HATHEWAY formula for those expt conducted in blocks receiving 10-20 treatments with 2, 3, 4 and 5 replications and with C.V. 5, 10, 15 and 20%. The probability of obtaining significant results using the *t* test (at 5% probability) was stipulated at 80% *(Author's summary)* K00

0487

12400 ARTHUR, V. *et al.* **Mortalidade larval e pupal e esterilidade de adultos induzida em pupas de *Acanthoscelides obtectus* (Say, 1831) (Col., Bruchidae) por radiação gama de ^{60}Co.** *(Larval and pupal mortality and imago sterility induced on pupae of Acanthoscelides obtectus through gamma radiation on beans).* Energia Nuclear e Agricultura 1(2):76-81. 1979. Port., Sum. Port., Engl., 9 Refs.

Phaseolus vulgaris. Acanthoscelides obtectus. **Insect biology. Irradiation. Genetic control. Insect control. Brazil.**

Results are given of irradiation by a ^{60}Co gamma source. The use of 0, 3, 4, 5, 6, 7, 8, 9, 10 and 12 kR on larvae and pupae of *Acanthoscelides obtectus* showed, through regression, that 11.82 kR was lethal for larvae and 13.86 kR for pupae. Imagoes, irradiated at the pupal stage with 3 kR, were sterile. On a commercial scale, the use of 15 kR is recommended to inhibit the development of the immature stages and the emergence of adults. *(Author's summary)* L01 F01

0488

4718 BHATTACHARYA, A.K., PATHAK, P.K. and SHAH, S.P. **The oviposition and development of *Callosobruchus chinensis* Linn. (Coleoptera: Bruchidae) on several host species.** Bulletin of Grain Technology 15(1):38-41. 1977. Engl., Sum. Engl., 6 Refs.

Phaseolus vulgaris. Callosobruchus chinensis. **Insect biology. Host range.**

The oviposition and development of *Callosobruchus chinensis* were investigated on 11 food commodities. These foods were offered as whole grain, flour dough balls and flour dough balls fortified with 5% brewers yeast. Insects oviposited on all the commodities, but the ovipositional behavior was not related to the suitability of seeds for the development. Larvae did not mature to adult on grains of french beans, mung beans and wheat. Changes in the physical nature of the seed greatly affected the biology of this pest. On artificial balls complete failure in adult emergence was recorded on lentils, french beans, soybeans, lathyrus and wheat. Best growth was observed on chick peas. *(Author's summary)* L01 F00

0489

4720 HUIGNARD, J. and BIEMONT, J.C. **Comparison of four populations of *Acanthoscelides obtectus* (Coleoptera:Bruchidae) from different Colombian ecosystems.** Oecologia 35:307-318. 1978. Engl., Sum. Engl., 25 Refs., Illus.

Phaseolus vulgaris. Acanthoscelides obtectus. **Stored grain pests. Insect biology. Climatic requirements. Seed. Ecosystems. Colombia.**

The bean weevil (*Acanthoscelides obtectus*) and its preferential host plant *Phaseolus vulgaris* probably originate from Central or South America. *A. obtectus* populations have developed for many years in varied and relatively isolated ecosystems in these regions. The influence of the host

and of copulation on reproductive activity was studied in 4 Colombian insect populations from medium (2000 m) and low alt (1200 m). Most medium-alt strains of females do not produce oocytes in the absence of hosts or of copulation. These external stimuli can still influence oogenesis after a long period. Virgin females of low-alt strains produce oocytes early in imaginal life and oviposit rapidly in the presence of the host or after copulation. These characteristics can be maintained for many generations. The different strains react differently to a change of thermoperiod. It is suggested that the strain differences are related to the climatic and ecological conditions prevailing at the various alt in the Andes; differences are also apparently related to the reproductive cycle of the host plant, which is ingested by the larvae. (*Author's summary*) L01 F00

0490

11602 HUIGNARD, J. **Influence de la durée de la copulation sur la fécondité des femelles chez** *Acanthoscelides obtectus* **Say (Insecte Coléoptere).** *(Effect of the duration of copulation on female fertility of Acanthoscelides obtectus).* Compte Rendu Hebdomadaire des Séances de l'Academie des Sciences 266(12):1311-1313. 1968. Fr., 5 Refs., Illus.

Phaseolus vulgaris. Acanthoscelides obtectus. **Insect biology. France.**

Copulations of *Acanthoscelides obtectus* were artificially interrupted after 2, 3 and 4 min, studying the fertility and fecundity of 30 females for each case over a 12-day period. In comparison with normal females (6-7 min copulation), oviposition decreased: 28 females laid eggs with a delay of 24 h, with 77.23% fertile eggs with 4 min of copulation; 23 females with a delay of 24 h with 73% fertile eggs with 3 min; 8 females with all eggs sterile with 2 min of copulation. It is concluded that the paragonads must secrete a substance capable of activating the spermatozoa. The decrease in fecundity is due to the weak concn of a substance secreted by the paragonads in the spermatophore, which stimulates oögenesis. These different male secretions are progressively deposited on the spermatophore, which explains the greater fecundity after longer copulation. (*Summary by I.B. Trans. by L.M.F.*) L01 F00

0491

11608 LABEYRIE, V. **Action de la présence des grains de haricot sur l'ovogénèse d'***Acanthoscelides obtectus* **Say (Coléoptère, Bruchidae).** *(Effect of bean seeds on oögenesis of Acanthoscelides obtectus).* Compte Rendu Hebdomadaire des Séances de l'Academie des Sciences 250(14):2626-2628. 1960. Fr., 5 Refs.

Phaseolus vulgaris. Acanthoscelides obtectus. **Insect biology. Seed. France.**

The evolution of oögenesis in *Acanthoscelides obtectus* females was studied, in the presence or absence of bean seeds. To minimize errors, the ovaries were classified by different quantitive elements (no. of eggs in the oviduct, no. of mature eggs with a membrane in the ovarioles, no. of ovocytes in vitellogenesis, no. of ovocytes differentiated from a previous state, no. of elements in the reabsorption process). It is concluded that the presence of seeds acts on ovarial activity, causing an acceleration in the rhythm of differentiation of the ovocytes and affecting the reabsorption process as well. *(Summary by I.B. Trans. by L.M.F.)* L01 F01

0492

11606 LABEYRIE, V. **Evolution au cours de la vie individuelle de la capacité reproductrice des mâles d'***Acanthoscelides obtectus* **Say (Coléoptere Bruchidae).** (*Evolution of individual reproductive capacity of male Acanthoscelides obtectus*). Compte Rendu Hebdomadaire des Séances de l'Academie des Sciences 263(10):774-777. 1966. Fr., 6 Refs., Illus.

Phaseolus vulgaris. Acanthoscelides obtectus. **Insect biology. France.**

The reproductive capacity of 19 male *Acanthoscelides obtectus* was studied; from the day of emergence on, they were each isolated for 24 h with a female. The females were replaced daily. The fertility and offspring of females was studied in relation to the order of presentation to males. Two supplementary sources of variability related to the reproductive capacities of females and males were considered. Male fertility did not decline proportionately with the fertilization of new females; the reproductive activity of males was periodic. It is possible that the stimulation of spermatogenesis increases due to the renewing of females, together with an endogenous rhythm of activity of the male gonads. (*Summary by I.B. Trans. by L.M.F.*) L01 F00

0493

11604 LABEYRIE, V. **Influence de l'hôte sur la fécondité d'** *Acanthoscelides obtectus* **Say (Coléoptere-Bruchidae).** (*Influence of the host on the fertility of Acanthoscelides obtectus*). Compte Rendu Hebdomadaire des Séances de l'Académie de Sciences 250(3):615-617. 1960. Fr., 5 Refs., Illus.

Phaseolus vulgaris. Acanthoscelides obtectus. **Insect biology. Laboratory experiments. France.**

Oviposition of *Acanthoscelides obtectus* was studied in the lab, (a) isolated, (b) in the presence of 10 seeds and fed with water sweetened with honey in petri dishes, and (c) under the same conditions as (b) but the seeds were introduced on the 9th day. Fertility during the 1st 8 days was 8 eggs for (c) and 65 for (b). From the 9th day on, it was 16 eggs for (c) and 3 for (b); the quickness of oviposition from the introduction of the seeds onward shows that at that moment, females had a great no. of mature eggs in the dilated oviducts. The difference between both groups was significant at the 1% level. Reproductive potential was not maintained; females emitted fewer eggs (35-55) when no seed was available as compared to 70-75 with seeds. Great heterogeneity was observed in egg emission, which is partially governed in some females (25%) by ovarial pressure, whereas, in others, the presence of seed is sufficient. It is suggested that this can be related to the 2 completely different life styles of *A. obtectus:* on the crop and under storage conditions. (*Summary by I.B. Trans. by L.M.F.*) L01 F01

0494

11607 LABEYRIE, V. **Influence de la date de fécondation des fenelles sur la multiplication d'***Acanthoscelides obtectus* **Say (Insecte coléoptère).** *(Influence of date of fertilization of females on multiplication of Acanthoscelides obtectus).* Compte Rendu Hebdomadaire des Séances de l'Académie de Sciences 259(5):1229-1231. 1964. Fr., 6 Refs.

Phaseolus vulgaris. Acanthoscelides obtectus. **Insect biology. France.**

The influence of the time of male presence and, consequently, the moment of possible copulation and fertilization, on the quantity of eggs laid and on the proportion of eggs giving descendants was studied. The following conclusions were reached. Females stimulated by the host plant, that did not oviposit until fertilized, immediately emitted significant no. of eggs after copulation; thus oögenesis does not depend on copulation nor on the spermatic state. The absence of copulation merely starts a blockage of egg emission. The proportion of fertile eggs does not depend on the time elapsed between insemination and oviposition. A sole encounter with a male during the 1st 10 days of the reproductive cycle permits a normal multiplication rate to be maintained. It is pointed out that these factors as a whole permit *Acanthoscelides obtectus* to multiply whenever the population is low. *(Summary by I.B. Trans. by L.M.F.)* L01 F01

0495

11603 LABAYRIE, V. **Influence des techniques de récoltes des haricots secs sur l'intensité des attaques de la bruche** (*Acanthoscelides obsoletus* **Say).** (*Influence of bean harvesting*

techniques on the intensity of attacks by the bruchid Acanthoscelides obsoletus). Compte Rendu Hebdomadaire des Séances de l'Academie d'Agriculture de France 43(3):138-140. 1957. Fr., 3 Refs.

Phaseolus vulgaris. Acanthoscelides obsoletus. **Pods. Laboratory experiments. Seed. Harvesting. Maturation. Timing. France.**

Trials were conducted on artificially contaminated plots to determine the influence of the length of time mature pods are in the field before harvesting on the intensity of bruchid attacks. Every day the pods of the different var. cultivated were marked when maturity was reached. Half of these were harvested 2 days later; the other half after 10 days. The intensity of the attacks was recorded according to the no. of adult bruchids from the following generation in 100 harvested seeds. The frequency of attacks varied according to season; therefore, when making comparisons, all the harvests during the season were considered together. The considerable increase in the intensity of attacks with the lengthening of the duration of mature pods in the field is derived from the relationship between eggs laid and the phenological stage reached by the pod. In the lab, the influence of the length of time elapsed between pod harvesting and shelling was determined. A significant decrease in frequency of attacks was observed when pod shelling occurred 48 h after harvesting: these results can be improved if the seeds are sifted after shelling. According to a survey of farmers, these procedures gave almost total protection, even in considerably contaminated areas. *(Summary by I.B. Trans. by L.M.F.)* L01 F00

0496

11605 LABEYRIE, V. **Nature de la répartition des larves d'*Acanthoscelides obtectus* Say.** (*Nature of larval distribution of Acanthoscelides obtectus*). Compte Rendu Hebdomadaire des Séances de l'Académie de Sciences 251(1):149-151. 1960. Fr., 1 Ref., Illus.

Phaseolus vulgaris. Acanthoscelides obtectus. **Insect biology. Seed. France.**

The postulate that individuals are equally distributed in a homogeneous media was confirmed when examining larval emission from eggs placed in tubes containing a defined no. of seeds. The distribution of larvae was easily observed by examining the exit holes of adults, each of which emerged from a different hole. It was demonstrated that holes are significantly concentrated in certain seeds. Entrance holes were also examined, concluding that these are randomly distributed. The no. of entrance holes was $<$ the no. of exit holes, indicating that several larvae use the same entrance hole. It was concluded that population distribution is not homogeneous in the interior of the medium. *(Summary by I.B. Trans. by L.M.F.)* L01 F00

0497

11601 LABEYRIE, V. **Sur les conditions de pullulation en France de la bruche du haricot (*Acanthoscelides obsoletus* Say) en culture.** (*Conditions for pullulation of Acanthoscelides obsoletus on crops in France*). Compte Rendu Hebdomadaire des Séances de l'Académie d'Agriculture de France 43:590-593. 1957. Fr., 9 Refs., Illus.

Phaseolus vulgaris. Acanthoscelides obsoletus. **Seed. Maturation. Pods. France.**

The economic importance of bruchids on dry bean crops or seeds, occupying tens of thousands of ha in France, is analyzed. The insect depends on pod maturity for its evolution, occurring in seasons when the temp is sufficient to facilitate its activity. On the basis of these data, the extension of bruchids in French crops was determined (a map is included). In regions bordering on noxious areas, late-maturing var. (maturing in mid-Sept.) should be planted; in warmer regions, french beans should be planted so that harvesting can be done at the end of Oct. or in Nov. (*Summary by I.B. Trans. by L.M.F.*) L01 F00

0498

11609 LABEYRIE, V. and MAISON, P. **Sur les relations entre la ponte d'*Acanthoscelides obsoletus* Say dans la nature et les stades phénologiques de *Phaseolus vulgaris* Linné.** (*Relationship between natural oviposition of Acanthoscelides obsoletus and the phenological stages of Phaseolus vulgaris*). Compte Rendu Hebdomadaire des Séances de l'Académie des Sciences 238(14):1920-1922. 1954. Fr., 6 Refs.

Phaseolus vulgaris. Acanthoscelides obsoletus. **Insect biology. Pods. France.**

The oviposition of *Acanthoscelides obsoletus* in the 3 principal evolutional stages of french bean pods — filling (F), drying (D) and maturity (M) — was studied in a total of 111 holes. Sixty-three % of the holes were bored in M, discarding the need for nourishment. Once the hole is bored, the female introduces its oviscapt; this is not always followed by egg emission (87% of ovipositions in M, in relation to total holes bored). Due to the fact that 97% of the total eggs laid occurs in M it is concluded that a relationship exists between oviposition and the tension of moisture vapor inside the carpellary cavity. The presence of hygro-receptors in the last abdominal segments is suggested. In granaries, explorative boring does not take place. (*Summary by I.B. Trans. by L.M.F.*) L01 F00

0499

10185 PUZAT, J. **Effects comparés de l'ablation des palpes sur la reproduction chez des femelles de deux lignées sélectionnées de Bruche du Haricot (*Acanthoscelides obtectus* Say).** (*Comparative effects of the ablation of the palpi on female reproduction in two selected lines of bruchids*). Comptes Rendus de l'Académie de Science de Paris (Série D) 270:712-713. 1970. Fr., Sum. Fr., 3 Refs.

Phaseolus vulgaris. Acanthoscelides obtectus. **Insect biology. Cultivars. Laboratory experiments. France.**

Aspects of ovipositional behavior are analyzed for 2 lines of bruchids (*Acanthoscelides obtectus*): a normal line (requiring the presence of bean seed for oviposition to take place) and a "free" line (no specific stimuli required). Ablation of the 2 pairs of palpi was performed on the females, after which they were fertilized once and left 8 days without bean seed and another 8 days with seed. Females were dissected and mature oocytes counted; these, together with the no. of eggs laid constituted production. Results were in agreement with the natural behavior of these lines. Ablation decreased egg laying in a highly significant manner in the normal line as compared to the control, mainly because of the blockage of emission and, to a lesser extent, a decrease in production (19.5%). In the free line, emission also decreased very significantly (21%), but this was principally due to the decreased production in the operated females (2 oocytes). (*Summary by M.R.T. Trans. by L.M.F.*) L01 F00

0500

10178 POUZAT, J. **Rôle des organes sensoriels céphaliques dans l'ovogenèse et l'émission chez la bruche du haricot *Acanthoscelides obtectus* Say.** (*Influence of the sensorial cephalic organs on egg production and laying by the bean weevil Acanthoscelides obtectus*). Colloques Internationaux du Centre National de la Recherche Scientifique no. 189:381-400. 1970. Fr., Sum. Fr., Engl., 23 Refs., Illus.

Phaseolus vulgaris. Acanthoscelides obtectus. **Stored grain pests. Insect biology. France.**

The influence of sensorial chephalic organs on egg production and laying was studied in 2 lines of the bean weevil *Acanthoscelides obtectus:* the normal line (never lays eggs in the absence of beans) and the "emancipated" line (may lay eggs even when there are no beans). Total and bilateral excision of the palpi and antennae was performed on both. Palpus

excision had a significant effect on the normal line, decreasing egg laying and production significantly, while excision of the antennae increased production and egg laying. In the emancipated line, only palpus excision had a clear and significant effect on egg production, which was lowered. Based on these results, it is concluded that the palpi are the main point of entrance of bean stimuli for egg-laying release. Contact with the beans seems necessary, probably a matter of gustation. The stimuli picked up by the antennae may have—except for beans—an inhibitory effect on oogenesis; tact and vision may also play a part. *(Extracted from author's summary)* L01 F01

See also 0258 0400

AUTHOR INDEX

Abellan C., E.E. 0131
Aorahao, I.O. 0005
Aburto, S. 0226
Adams, M.W. 0006
Adams, P.B. 0286
Aharoni, N. 0013
Alberini, J.L. 0420
Alcorn, J.L. 0287
Alonzo, F. 0402
Andersen, A.L. 0288
Apolitano S., C. 0125
Araujo, E. 0289
Arcia, G. 0469
Arthur, V. 0487
Ashby, J.W. 0348
Austenfeld, F.A. 0053
Ayonoadu, U.W.U. 0421

Balderston, J.H. 0054
Ballester, A. 0014
Balvan C., F. 0128
Barbosa Filho, M.P. 0079
Barreto, B.A. 0403
Barreto, P.D. 0422
Barthe, J.P. 0290
Baudet, J.C. 0001
Baumgart, R.W. 0291
Beckerson, D.W. 0386
Beckman, K.M. 0292
Begbie, R. 0007
Belal, M.H. 0404
Benvenuti, G. 0227
Bereza, K. 0405
Berger, R.K. 0015
Bethlenfalvay, G.J. 0459
Bevan, M. 0016
Bhattacharya, A.K. 0488
Blanco S., N. 0349 0350 0351
Blickenstaff, C.C. 0406
Bolkan, H.A. 0293
Bollini, R. 0017
Boloorforooshan, M. 0098 0456
Bonnefil, L. 0407
Breteler, H. 0132
Brouwer, H.M. 0166
Brown Junior, F.A. 0018 0019
Bulisani, E.A. 0126

Cafati, C.R. 0262
Caixeta, T.J. 0133
Calot, L. 0352
Cameron, D.R. 0134
Campos, A.J. 0294
Candal-Neto, J.F. 0228
Cárdenas, A. 0353 0354 0355
Cardona, C. 0408
Carmi, A. 0020
Carnahan, J.E. 0387
Carvalho, N.M. 0167
Carvalho, R.C. 0135
Castaño A., J.J. 0256
Centro Internacional de Agricultura Tropical 0186 0295 0296
Chagas, D. 0168
Chang, R. 0457
Chaves, C. 0297
Chowdhury, A.T.M.S. 0229
Clarkson, J.D.S. 0298
Cline, K. 0299
Collins, J.L. 0423
Colombia. Ministerio de Agricultura. Oficina de Planeamiento del Sector Agropecuario 0470
Córdoba A., J.B. 0300

Coyne, D.P. 0263
Crump, J.A. 0021
Cruz N., G. 0484
Cunha, J.M. 0211

Daub, M.E. 0264
Davies, H.M. 0022
Davis, D.D. 0388
Davis, D.R. 0169
Davis, J. 0187 0188 0189
Davis, S.D. 0023
Davis, W.D. 0438
Debost, M. 0099
Delgado C., E. 0136
Deschot, C.C. 0212
Dhingra, O.D. 0301
Dias, B.C. 0190
Díaz C., H. 0230
Dickson, M.H. 0213 0389 0424
Dongo, S.L. 0302

Edwards, E.T. 0214
Egorin, M.J. 0100
El-Hag, N. 0451
Elfving, D.C. 0137
Elias, L.G. 0101
Elizondo, J. 0055
Ellis, M.A. 0215
Empresa Brasileira de Pesquisa Agropecuaria 0170 0191 0192 0231 0232 0233
Empresa Brasileira de Assistência Técnica 0171
Endress, A.G. 0024 0390 0391
Escalante E., J.A. 0025
Evans, R.J. 0102

Fardim, F. 0193
Farlow, F.J. 0080
Fernández H., M. 0127
Ferraz, S. 0303
Fiscus, E.L. 0008
Fong, E. 0026
Forster, R. 0172 0173
Fouilloux, G. 0234
Francis, C.A. 0194
Frota, J.N.E. 0056
Fulco, W. da S. 0216
Furr, A.K. 0103

Gabelman, W.H. 0439
Gabrielson, R.L. 0304
Gale, J. 0027
Gálvez, G.E. 0305 0356 0357 0358
Galway, N. 0410
Gamez, R. 0359 0360
García B., C.M. 0195
García B., J.E. 0411
García M., S. 0196 0197
Gerodetti B., M. 0198

Giordano, P.M. 0057
Giraldo Z., M. 0217
Giralt, P., E. 0138
Goepfert, C.F. 0139
Gokhale, V.G. 0400
Gómez A., C. 0174
Gómez C., O. 0235
Gómez, J.C. 0306
Gonzalez A., M. 0307
Graham, P.H. 0460 0461 0462
Groth, J.V. 0308
Guerrero R., D. 0412 0413
Gutierrez P., U. 0471
Gutierrez, J.A. 0440
Gutierrez, L.E. 0058
Guven, A. 0081
Guzmán, P. 0309 0310

Haissig, B.E. 0009
Hallenbeck, W.H. 0140
Halterlein, A.J. 0082
Hammerton, J.L. 0175
Hardt, R.D. 0199
Hardwick, R.C. 0028 0141 0236
Hargreaves, J.A. 0104
Harrison, D.E. 0265
Harrison, M.A. 0010
Hart, J.M. 0142
Hayes, A.B. 0083
Heath, M.C. 0311
Herrera A., Y. 0414
Herrera H., H.H. 0441
Heuvel, J. van den 0312 0313
Hildebrand, D.C. 0266
Hile, M.M.S. 0029
Hindawi, I.J. 0392
Hiroce, R. 0059
Hobbs, H.A. 0361
Hoddinott, J. 0030
Holley, J.D. 0463
Hoppe, H.H. 0314
Hosfield, G.L. 0105
Hove, E.I. 0106
Howeler, R.H. 0060
Hsu, F.C. 0218
Huignard, J. 0489 0490

Innes, N.L. 0362 0425
Instituto Interamericano de Ciencias Agrícolas. Departamentos de Cultivos y Suelos Tropicales 0200
Instituto Nacional de Investigaciones Agropecuarias 0472
Instituto de Ciencia y Tecnología Agrícolas 0238
Instituto de Recherches Agronomiques Tronicales et des Cultures Vivrieres 0237
Instituto de Investigaciones Agropecuarias

Estación Experimental Quilamapu. Chile 0239
Isidron P., M. 0315

Jackix, M. 0473
Jacoby, B. 0061
Jafarpour, B. 0363
Jean, J.H. 0364
Jerie, P.H. 0031
Jones, P. 0143
Jones, R.H. 0176

Kado, C.I. 0267
Kaiser, W.J. 0258
Karmoker, J.L. 0032 0084
Katagiri, K. 0107
Katherman, M.J. 0268
Kays, S.J. 0085
Keenan, J.G. 0316
Kempff S., F.N. 0452
Khan, A. 0062
Kimati, H. 0317
Kitajima, E.W. 0399
Kdehler, D.E. 0033
Kohn, L.M. 0318
Kohut, R.J. 0393
Kono, Y. 0034
Kretchmer, P.J. 0086 0144
Kueneman, E.A. 0035 0129 0240
Kushalappa, A.C. 0319

Labeyrie, V. 0491 0492 0493 0494 0495 0496 0497 0498
Labrada, R. 0177 0178
Lacharme, E.J. 0201
Lai, C.C. 0108
Laing, D.R. 0202
Lamseejan, S. 0426
Landes, M. 0320 0321
Larios, J.F. 0203 0259
Lasca, C.C. 0219
Le Torneau, D. 0322
Lee, J.M. 0002
Legarda, L. 0145
León D., J.R. 0474
Leoroy, W.H. 0241
Letham, D.S. 0109
Lewis, L.N. 0110
Lima, G.R. 0204
Lima, Z.B. 0453
Longstreth, D.J. 0036
Lord, E.M. 0111
Lozano, C. 0146
Lucas, R.E. 0063
Lugo, R. 0205

Machowiez, E. 0037
Mackay, D.C. 0064
McMahon, P.J. 0180

Mafra, R.C. 0206
Magalhaes, A.A. 0065
Mangual, G. 0179
Mansfield, D.H. 0038
Manzano, J.M. 0323
Marcos Filho, J. 0087
Marechal, R. 0427
Meakins, L. 0181
Meiners, J.P. ~~0365~~ 0394
Menosso, O.G. 0442
Menten, J.O.M. 0324
Meredith, F. 0112
Migliori, A. 0366
Miller, G.F. 0475
Mills, H.A. 0113
Miranda C., S. 0003
Miranda, L.N. 0147
Miranda, P. 0428
Miyasaka, S. 0148 0149 0150
Mohan, S.T. 0443
Moll, W.A.W. 0039
Mondragón, M.C. 0454
Montero R., R.A. 0242
Monzón P., D.E. 0485
Mora, B.E. 0325
Morales, F.J. 0367 0368 0369
Morales, J. 0088
Moreno, R. 0207
Mota, F.S. 0151
Motto, M. 0444
Muirhead, W.A. 0089
Mulligan, D.R. 0040
Murch, R.S. 0269
Mustchler, M.A. 0114 0429

Naivikul, O. 0115
Navarro A., R. 0382 0383
Nayyar, V. 0370
Neely, M. 0476
Nene, Y.L. 0415
Neptune, A.M.L. 0152 0153 0154
Ness, P.J. 0041 0116
Newcomb, W. 0011
Nogueira, N. de L. 0464
Nordstrom, C.L. 0455
Noyes, R.D. 0042
Nuila, L.R. 0430
Nuñez G., S. 0243 0445

O'Reilly, M. 0220
O'Toole, J. 0066
Obizoba, I.C. 0458
Oliveira, E.A. 0326
Olthof, H.A. 0384
Oorschot, J.L.P. van 0182
Orellana, R.G. 0371
Ormrod, D.P. 0155
Oviedo Z., R. 0478
Ozbun, J.L. 0043

Paau, A.S. 0117
Pacheco, A.C. 0244
Pagano, S.N. 0067
Palaniyandi, R. 0068 0156
Pandey, D.P. 0157
Paradies, I. 0327
Pardo, A.D. 0090
Patrick, J.W. 0044
Peterson, C.A. 0069
Petolino, J.F. 0045
Pimentel, M. de L. 0221
Pons, A.L. 0158
Pons, N. 0328
Posada O., L. 0401
Pouzat, J. 0416 0499 0500
Purdy, L.H. 0329
Pusztai, A. 0118

Raggi, V. 0330
Rahe, J.E. 0331
Rains, D.W. 0070
Ramalho, M.A.P. 0091 0245 0486
Ramírez M., G.F. 0071
Ramírez, E. 0159
Rao, M.A. 0246
Rauser, W.E. 0046
Rayment, I. 0372
Reisman, D. 0373
Restrepo T., L.F. 0480
Rheenen, H.A. 0431 0432
Ribeiro, R. 0332 0333
Ribeiro, R. de L. 0271
Rice Junior, R.P. 0092
Ríos B., M.J. 0247
Rist, D.L. 0395
Rodríguez, A.J. 0248
Rogers, H.H. 0072
Romero J., P. 0249
Rubaihayo, P.R. 0433 0434 0446
Rudolph, K. 0272
Rup, P.J. 0418
Ruschel, A.P. 0465 0466
Saettler, A.W. 0273
Saito, S.M.T. 0467
Salado N., L. 0160
Salamini, F. 0447
Salassier, B. 0161
Salgado, J.M. 0334
Salvioli, R.A. 0250
Samarakoon, A.B. 0047
Sameni, A.M. 0073
Samirudin, M. 0222
Sanabria de Mojica, E. 0208
Sanders, J.H. 0481 0482
Santos Filho, H.P. 0335
Santos, A.B. 0162
Santos, J.B. 0251
Schirach-Szmigiel, L. 0093
Schoonhoven, A. van 0419
Schuster, M.L. 0274 0275
Schwartz, H.F. 0260 0276 0336 0337 0338 0396
Scolari, D.D.G. 0184
Scott, H.A. 0374
Sehgal, O.P. 0375 0376
Sgarbieri, V.C. 0119
Shaner, D.L. 0048
Shea, P.F. 0223
Siddique, A. 0094
Siddique, M.A. 0448
Silva, H.C. 0120
Silveira, P.M. 0163
Silvera C., A. 0339
Siman, A. 0164
Smartt, J. 0435
Smith, A.G. 0277
Stanwood, P.C. 0224
Steadman, J.R. 0340
Suge, H. 0095
Sun, S-M.S. 0121

Taylor, J.D. 0278 0279 0280
Tejada, G. 0209
Temple, S.R. 0436
Teso, R.R. 0397
Theodorou, M.K. 0341 0342
Thomas, J.E. 0377
Thomas, R.J. 0074
Tolla, G.E. 0096
Tonguthaisri, T. 0437
Trippi, V.S. 0049
Tsao, S.J. 0050
Tu, J.C. 0343 0344
Tulmann Neto, A. 0449
Turner, M.P. 0378

Urbina, J.T. 0252

Valladares-Sánchez, N. 0281
Vargas, E. 0345
Varón de A., F. 0385
Varriano-Marston, E. 0122
Vázquez M., E.J. 0004
Verbelen, J.P. 0051
Victor, J.A. 0210
Viera, M. 0225
Vilhordo, B.W. 0253
Vlcek, L.M. 0075
Volkenburgh, E. van 0012
Voysest V., O. 0254

Waines, J.G. 0123
Walder, V.M. 0483
Walker, G.K. 0165
Walker, M.R. 0185
Walkey, D.G.A. 0379 0380
Wallace, A. 0076 0077
Wallen, V.R. 0282

Waters Junior, L. 0124
Weidensaul, T.C. 0398
Weller, D.M. 0283 0284
Westermann, D.T. 0468

Yardwood, C.E. 0346
Yopp, J.H. 0097
Yoshii, K. 0285 0347 0381

Zambolin, L. 0261
Zeven, A.C. 0450
Zimdahl, R.L. 0078
Zimmerman, D.C. 0052

SUBJECT INDEX

ABSCISSION
0033
LEAVES
0013 0015 0028 0049

ACANTHOSCELIDES OBTECTUS
0149 0258 0489 0490 0491 0492 0493
0494 0495 0496 0497 0498 0499 0500
HOST-PLANT RESISTANCE
0419
INSECT CONTROL
0417 0419 0487
CHEMICAL CONTROL
0419

ADAPTATION

CULTIVARS
0128 0227 0229 0234 0235 0237 0239
0247 0250 0251 0254 0425 0430 0436
0441 0472

AFRICA
0001 0212 0258 0404 0421 0431 0446

AGRICULTURAL EQUIPMENT
0246
HARVESTING
0181
PLANTING
0180 0181

AGRICULTURAL LIME

FERTILIZERS
0147 0150 0158 0164
PH
0158 0164

AGROBACTERIUM TUMEFACIENS
0267

AGRONOMIC CHARACTERS
0029 0088 0129 0187 0195 0209 0210
0226 0229 0244 0253 0437 0445 0447
0472

AIR POLLUTION
0396
PLANT INJURIES
0026 0387 0388 0393 0394 0397 0398
OZONE
0026 0387 0393 0394 0397 0398

ALANINE
0112

ALFALFA MOSAIC VIRUS

DISEASE CONTROL
0356
VIRUS TRANSMISSION
0356

APION GODMANII

HOST-PLANT RESISTANCE
0255 0419
INSECT BIOLOGY
0255
INSECT CONTROL
0255 0419
BIOLOGICAL CONTROL
0255 0419
CHEMICAL CONTROL
0255 0419

ALTERNARIA SOLANI

DISEASE CONTROL
0337
CHEMICAL CONTROL
0337

ALUMINIUM
0139
PH
0135
PHOSPHORUS
0135 0147

AMINO ACIDS
0056 0098 0112 0453 0454
ANALYSIS
0074 0101 0102 0109 0111 0119 0169
0456
LEAVES
0074 0109 0442
SEED
0102 0118 0121 0434

AMMONIUM NITRATE
0155

AMMONIUM SULPHATE

FERTILIZERS
0056 0156 0164

ANIMAL NUTRITION
0453 0457 0457

ANTIBIOTICS
0370

APHIS FABAE
0258

ARGENTINA
0160 0250 0352

ARGININE
0112

ASCOCHYTA FABAE

DISEASE CONTROL
0337

ASCOCHYTA PHASEOLORUM
0287
DISEASE CONTROL
0256

ASH CONTENT
0098 0103 0105 0108 0456

ASIA
0034 0229

ASPERGILLUS SP
0319

AUXINS
0009 0010 0016 0110 0251
GROWTH
0083
PLANT DEVELOPMENT
0083 0097

AUSTRALIA
0044 0084 0094 0109 0164 0166 0180
0181 0185 0214 0220 0222 0223 0265
0287 0389 0448

BACTERIOSES
0212 0239 0257 0258 0259 0260 0266
0267 0269 0271 0272 0273 0274 0277
0278 0279 0283 0284
DISEASE CONTROL
0215 0255 0256 0261 0265 0270 0280
0282 0285 0291
HOST-PLANT RESISTANCE
0255 0262 0263 0264 0268 0275 0276
0281 0285 0424 0425 0430

BEAN CHLOROTIC MOTTLE VIRUS
0358 0361

BEAN COMMON MOSAIC VIRUS
0215 0256 0261
ELECTRON MICROSCOPY
0368 0369
HOST-PLANT RESISYANCE
0255 0352 0357 0362 0368 0380
PLANT BREEDING
0368
VECTORS
0255 0368 0379
VIRUS INHIBITION
0363
VIRUS TRANSMISSION
0255 0352 0357 0363 0368 0379

BEAN CURLY DWARF MOSAIC VIRUS
0360

BEAN GOLDEN MOSAIC VIRUS
0062 0256 0261 0353 0355 0365 0373
0402
HOST - PLANT RESISTANCE
0354 0358 0381

BEAN POD MOTTLE VIRUS

VECTORS
0360
VIRUS TRANSMISSION
0360

BEAN RED NODE VIRUS
0356

BEAN ROOT ROTS

DISEASES AND PATHOGENS
0255 0256 0293

BEAN RUGOSE MOSAIC VIRUS

DISEASE CONTROL
0360
VECTORS
0360
VIRUS TRANSMISSION
0360

BEAN SPROUTS
0451

BEAN SOUTHERN MOSAIC VIRUS
0364 0372 0375 0376
DISEASE CONTROL
0360
VECTORS
0360
VIRUS TRANSMISSION
0360

BEAN SUMMER DEATH VIRUS
0356 0377

BEAN YELLOW MOSAIC VIRUS
0261 0367 0371
HOST-PLANT RESISTANCE
0252 0255 0357 0380
VECTORS
0255 0379
VIRUS TRANSMISSION
0255 0357 0379

BEAN YELLOW STIPPLE VIRUS
0349 0359
VECTORS
0350
VIRUS TRANSMISSION
0350 0351 0360

BEMISIA TABACI
0365 0415
HOST-PLANT RESISTANCE
0358
INSECT CONTROL
0402
CHEMICAL CONTROL
0402

BIOMASS
0131 0198 0199 0201 0201

BIOTIC PROBLEMS
0396

BLANCH TREATMENT
0455

BOLIVIA
0452

BORON
0103
MINERAL DEFICIENCIES
0060 0063 0071
TOXICITY
0060

BOTRYTIS CINEREA

DISEASE CONTROL
0304 0337
HOST-PLANT RESISTANCE
0312 0425

BRANCHING
0059

BRAZIL
0044 0058 0065 0079 0087 0091 0126
0133 0135 0139 0147 0148 0149 0150
0151 0152 0153 0154 0158 0162 0163
0167 0168 0168 0170 0171 0172 0173
0178 0184 0191 0192 0193 0204 0206
0211 0216 0219 0221 0225 0228 0231
0232 0233 0242 0244 0245 0246 0251
0253 0261 0271 0289 0291 0301 0306
0317 0324 0326 0334 0404 0417 0420
0422 0428 0449 0453 0464 0465 0466
0467 0473 0483 0486 0487

CALCIUM
0164 0201 0241 0457
LEAVES
0059 0062 0068 0071 0156 0208
MINERAL DEFICIENCIES
0060 0071
PODS
0068 0070

CALLOSOBRUCHUS MACULATA

INSECT BIOLOGY
0400 0418
INSECT CONTROL
0418

CANNED BEAN
0099 0105 0112 0169 0455 0473

CANOPY
0035 0072 0165 0340

CARBOHYDRATE CONTENT
0098 0115 0124 0190 0453
LEAVES
0090 0120
SEED
0121

CARBON DIOXIDE
0077
PHOTOSYNTHESIS
0023 0036 0040 0043 0330 0459
PLANT RESPIRATION
0043 0330

CELL STRUCTURE
0002 0007 0008 0010 0024 0027 0033
0067 0104

CENTRE OF ORIGIN
0003

CERCOSPORA VANDERYSTI
0260
DISEASE CONTROL
0337

CEROTOMA RUFICORNIS
0351

CHAETOSEPTORIA WELLMANII
0259

CHILE
0239 0252

CHLOROSIS
0062 0182 0269 0271 0272 0386 0410

CLIMBING BEANS
0130 0142 0188 0195 0196 0202 0204
0247

COBALT
0046 0047 0053 0069 0075 0079 0103
0162

COLCHICINE
0370

COLEOPTERA
0149 0255 0258 0360 0377 0401 0413
0414 0417 0418 0419 0487 0488 0490
0492 0493 0499 0500
LEAVES
0351
PODS
0495 0497 0498
SEED
0400 0489 0495 0496 0497

COLLETOTRICHUM LINDEMUTHIANUM
0258 0259 0260 0290
DISEASE CONTROL
0215 0255 0256 0261 0270 0291 0297
0309 0310 0344
BIOLOGICAL CONTROL
0255
CHEMICAL CONTROL
0215 0255 0291 0297 0309 0310
0344
HOST-PLANT RESISTANCE
0255 0289 0297 0306 0309 0310 0321
0326 0331 0425
HOSTS AND PATHOGENS
0297 0299 0320 0321 0331 0341 0343
PHASEOLLINS
0313
PLANT BREEDING
0297 0425
RACES
0313 0317 0321 0326 0341 0342 0344

COLOMBIA
0086 0088 0130 0144 0174 0186 0187
0188 0189 0194 0196 0197 0202 0209
0217 0247 0249 0256 0257 0270 0295
0309 0310 0336 0355 0367 0368 0382
0383 0399 0401 0408 0410 0411 0430
0436 0440 0441 0460 0461 0462 0469
0470 0479 0480 0489

CONSUMPTION
0471 0475 0481

COOKING
0101 0105 0108 0451 0452
EFFECT ON NUTRITIVE VALUE
0454 0457 0473

CUPPER
0103
LEAVES
0076
MINERAL DEFICIENCIES
0060 0063
PODS
0062
STEMS
0076

CORYNEBACTERIUM FLACCUMFACIENS
0267 0274
DISEASE CONTROL
0215 0255 0256
HOST-PLANT RESISTANCE
0255 0276

COSTA RICA
0004 0071 0101 0131 0136 0145 0190
0199 0200 0201 0207 0208 0210 0295
0339 0359

COSTS
0194 0191 0205 0249 0470 0478 0480

COTYLEDONS
0007 0010 0017 0021 0022 0027 0031
0032 0084 0097 0110 0114 0299 0338
0342 0439
COTYLEDON CRACKING
0213 0389
GERMINATION
0104 0120

CUBA
0138 0177 0178 0210 0230 0235 0307
0315 0349 0350 0351

CUCUMBER MOSAIC VIRUS
0357

CULTIVARS
0002 0003 0004 0005 0006 0011 0028
0035 0058 0066 0082 0086 0088 0089
0101 0105 0114 0118 0119 0123 0126
0127 0142 0146 0147 0160 0166 0179
0187 0188 0199 0192 0194 0195 0197
0200 0202 0207 0213 0214 0216 0217
0218 0219 0221 0223 0226 0228 0230
0232 0236 0236 0238 0240 0241 0242
0243 0244 0245 0248 0249 0252 0253
0255 0264 0268 0273 0275 0276 0282
0288 0289 0293 0302 0305 0306 0309
0310 0315 0316 0324 0327 0332 0333
0334 0336 0338 0339 0341 0342 0345
0347 0349 0350 0352 0353 0354 0357
0359 0365 0368 0380 0381 0385 0386
0388 0389 0394 0406 0408 0420 0421
0422 0423 0428 0433 0434 0437 0438
0440 0442 0443 0444 0445 0446 0449
0453 0454 0460 0461 0468 0471 0473
0477 0485 0499
ADAPTATION
0128 0227 0229 0234 0235 0237 0239
0247 0250 0251 0254 0425 0430 0436
0441 0472
GERMPLASM
0295 0325 0436 0462
IDENTIFICATION
0296 0300 0317 0326

CULTIVATION SYSTEMS
0062 0073 0089 0125 0126 0128 0129
0130 0133 0136 0138 0144 0147 0149
0151 0152 0153 0154 0155 0157 0158
0160 0161 0165 0167 0168 0170 0171
0177 0179 0180 0181 0184 0185 0191
0192 0196 0197 0198 0199 0200 0210
0227 0231 0232 0233 0234 0239 0240
0241 0247 0249 0285 0305 0337 0338
0345 0395 0425 0462 0465 0470 0474
0477 0478 0480

CULTURE MEDIA
0267 0277 0287 0335 0339 0344 0383

CURLY TOP VIRUS
0255 0356

CUTTINGS
0209

CYSTINE
0102 0112 0454

CYTOKININ
0016 0083 0109 0311

CYTOLOGY
0007 0012 0024 0027 0033 0051 0067

DEFOLIANTS
0013

DEVELOPMENTAL STAGES
0048 0064 0094 0141 0167 0201 0259
FLOWERING
0006 0025 0050 0091 0138 0247 0338
0437
GERMINATION
0080 0081 0087 0088 0089 0092 0093
0104 0120 0163 0166 0217 0220 0224
0225
MATURATION
0247 0437
PODDING

0002 0138 0253

DIABROTICA BALTEATA
0350 0351
HOST-PLANT RESISTANCE
0255
INSECT BIOLOGY
0255
INSECT CONTROL
0255
BIOLOGICAL CONTROL
0255
CHEMICAL CONTROL
0255

DIABROTICA SPECIOSA
0417

DIETARY VALUE
0101 0451 0452 0457

DIGESTIBILITY
0101 0118 0451 0454 0457

DIPTERA
0350 0401
INSECT CONTROL
0255 0402 0419

DISEASE CONTROL
0125 0170 0310 0357 0477 0482
BACTERIOSES
0215 0255 0256 0261 0265 0270 0280
0282 0285 0291
MYCOPLASMOSES
0399
MYCOSES
0215 0255 0256 0261 0270 0288 0291
0292 0293 0297 0303 0304 0305 0309
0323 0337 0338 0340 0344 0345
VIROSES
0215 0255 0261 0356 0360 0366 0379

DISEASE TRANSMISSION
0265 0275 0279 0297 0399
SEED TRANSMISSION
0216 0219 0280 0282 0350 0357 0368
VIROSES
0255 0350 0351 0352 0356 0357 0358
0360 0361 0363 0365 0368 0374 0379

DNA
0107 0117 0376 0373

DOMINICAN REPUBLIC
0477

DRAINAGE
0210

DROUGHT
0065 0256 0425

DRY MATTER
0043 0058 0059 0086 0145 0447

DWARF BEANS
0023 0038 0054 0076 0077 0156 0194
0234 0249 0278 0279 0392 0425 0440
0443
SPACING
0142

ECOLOGY
0160 0463 0465
ECOSYSTEMS
0489

ECONOMICS
0190 0195 0198 0200 0202 0205 0210
0249 0469 0470 0471 0475 0477 0478
0480 0481 0482 0483

ECUADOR
0227 0472

EL SALVADOR
0195 0203 0259 0323 0365 0475 0478

EMERGENCE
0141 0167

EMPOASCA KRAEMERI

HOST-PLANT RESISTANCE
0408 0419 0430
INSECT BIOLOGY
0417
INSECT CONTROL
0409 0417 0419
BIOLOGICAL CONTROL
0419
CHEMICAL CONTROL
0409 0419

ENGLAND
0380

ENZYMES
0009 0015 0016 0021 0033 0038 0039
0041 0052 0099 0110 0119 0132 0290
0322 0363 0451

EPILACHNA VARIVESTIS

HOST-PLANT RESISTANCE
0255
INSECT BIOLOGY
0255 0413
INSECT CONTROL
0255 0413 0414
BIOLOGICAL CONTROL
0255
CHEMICAL CONTROL
0255

ERWINIA CAROTOVA
0267

ESTIGMENE ACREA

HOST-PLANT RESISTANCE
0419
INSECT CONTROL

0419
CHEMICAL CONTROL
0419

EUROPE
0014 0053 0234 0237 0380 0416 0425
0427 0444 0447 0450 0490 0491 0492
0493 0494 0495 0496 0497 0498 0499
0500

EVAPOTRANSPIRATION
0138 0163

EXPERIMENT DESIGN
0135 0146 0189 0199 0205 0476 0480
0484 0485 0486

FAT CONTENT
0098 0122

FERTILIZERS
0055 0056 0073 0087 0096 0126 0127
0130 0134 0135 0136 0142 0147 0149
0150 0152 0153 0154 0155 0156 0157
0158 0159 0164 0171 0183 0199 0201
0207 0231 0233 0238 0239 0240 0241
0246 0462 0465 0472 0477 0480

FIBRE CONTENT
0376 0456

FLOWERING
0006 0091 0138 0247 0338
GENETICS
0050 0437
PHOTOPERIOD
0025 0050
TEMPERATURE
0050

FOLIAGE
0155 0156 0293 0285 0340 0388 0395
0398

FUSARIUM OXYSPORUM
0260
DISEASE CONTROL
0293
CHEMICAL CONTROL
0293
HOST-PLANT RESISTANCE
0293 0332 0333
PLANT BREEDING
0333

FUSARIUM SOLANI PHASEOLI
0216 0260 0296
DISEASE CONTROL
0256 0261 0293
BIOLOGICAL CONTROL
0293
CHEMICAL CONTROL
0293
HOST-PLANT RESISTANCE
0293 0316

GENES
0050 0281 0362 0410 0431 0432 0438
0443

GENOTYPES
0129 0189 0194 0240 0262 0263 0448
0449

GERMINATION
0120 0163 0166 0368
SEED
0081 0087 0088 0089 0093 0104 0217
0220 0224 0225 0324
DISEASES AND PATHOGENS
0089 0324
MECHANICAL DAMAGE
0089
TEMPERATURE
0080 0092 0220

GERMPLASM
0186 0224 0263 0281 0295 0297 0325
0436 0439 0450 0462 0479

GIBBERELLINS
0010 0046 0095 0097
SEED
0093 0121

GLYCINE MAX
0028 0150 0243

GREEN MANURES
0149 0382

GROWTH
0083 0086 0095 0222 0371 0390 0392
0444 0447
LIGHT
0051 0081
MINERALS AND NUTRIENTS
0059 0068 0073 0084
NUTRIENT SOLUTION
0027
PLANTING
0141 0198
SALINITY
0027 0073
SPACING
0129
TEMPERATURE
0057 0466

GUATEMALA
0238 0347 0381 0402

HARVESTING
0085 0126 0149 0166 0169 0170 0171
0176 0181 0185 0191 0192 0198 0199
0227 0231 0232 0233 0239 0248 0478
0495

HCl TREATMENT
0024 0390 0391

HEAT TREATMENT
0346

HEDYLEPTA INDICATA
0403 0419

HELIOTHIS ZEA
0419

HEMIPTERA
0401
INSECT CONTROL
0419

HERBICIDES
0048 0092 0130 0172 0173 0174 0175
0177 0182 0184 0186 0198 0209
PLANT INJURIES
0183

HETEROSIS
0438

HG TREATMENT
0104

HISTORY
0474

HOMOPTERA
0348 0351 0358 0365 0379 0401 0408
0410 0415 0430
INSECT CONTROL
0255 0357 0409 0417 0419

HUMAN NUTRITION
0424 0452 0458 0473

HUMAN PHYSIOLOGY
0100

HYBRIDS
0427 0435

HYLEMIA CILICRURA

INSECT CONTROL
0419

INCOME
0200 0205 0249 0469 0470

INDOLEACETIC ACID
0009 0044 0097

INDUSTRIALIZATION
0423

INHIBITORS
0016 0034 0042 0090 0106 0370 0451
GROWTH
0081 0083

INJURIOUS INSECTS
0003 0089 0125 0126 0127 0239 0243
0399 0405 0407 0411 0412 0416 0424
0436 0471 0477 0479 0482 0491 0494
COLEOPTERA
0255 0258 0360 0377 0400 0401 0414
0417 0418 0419 0487 0488 0489 0490
0492 0493 0495 0496 0497 0498 0499
0500
DIPTERA
0255 0401 0402 0419
HEMIPTERA
0401 0419
HOMOPTERA
0255 0348 0357 0358 0365 0379 0401
0408 0409 0410 0415 0417 0419 0430
LEPIDOPTERA
0401 0403 0406 0417 0419
THYSANOPTERA
0401 0409

INJURIOUS MITES
0401 0408
MITE CONTROL
0417 0419
TETRANYCHUS TELARIUS
0417

INOCULATION
0055 0328 0339 0350 0353 0354 0355
0461

INTER-CROPPING
0171 0203 0205 0210 0247 0470
CASSAVA
0198 0199 0200 0201 0207
ZEA MAYS
0184 0186 0187 0188 0189 0190 0191
0192 0193 0194 0195 0196 0197 0198
0199 0202 0204 0206 0208 0209 0231
0233 0472 0480

INTERLOCULAR CAVITATION
0002

INTRODUCTION
0227 0235

IRON
0103 0119 0457
LEAVES
0062 0071 0075 0076
MINERAL DEFICIENCIES
0060 0063 0071
PODS
0062
ROOTS
0076 0157
STEMS
0076

IRRADIATION
0446 0487

IRRIGATION
0065 0086 0094 0133 0138 0144 0146
0149 0161 0165 0239 0477

ISARIOPSIS GRISEOLA
0259 0260 0294 0335
DISEASE CONTROL
0255 0256 0261 0270 0303
CHEMICAL CONTROL
0255 0303

HOST-PLANT RESISTANCE
0255 0289 0303 0339

JAMAICA
0175 0378

LAND PREPARATION
0149 0170 0171

LATIN AMERICA
0143 0407 0408 0419 0471 0479 0481
0482

LEAF AREA
0008 0020 0023 0025 0035 0036 0086
0107 0136 0142 0208 0390 0444

LEAVES
0005 0007 0008 0010 0012 0013 0014
0015 0017 0021 0023 0024 0025 0026
0028 0030 0032 0034 0035 0036 0037
0039 0041 0042 0044 0045 0046 0049
0051 0053 0069 0077 0083 0086 0090
0107 0109 0110 0114 0116 0120 0129
0148 0297 0336 0367 0390 0391 0392
0393 0394 0395 0397 0398 0404 0426
0442 0444

0271 0273 0282 0287 0300 0308 0346
0365 0386 0471
DISEASES AND PATHOGENS
0259 0262 0264 0265 0266 0268 0272
0276 0277 0280 0281 0285 0294 0303
0305 0306 0307 0311 0314 0325 0327
0330 0332 0337 0338 0339 0341 0345
0350 0351 0352 0353 0354 0357 0369
0370 0371 0372
INJURIOUS INSECTS
0357 0365 0410 0471
MINERALS AND NUTRIENTS
0020 0040 0046 0047 0054 0059 0062
0066 0067 0068 0071 0074 0075 0076
0079 0084 0096 0142 0156 0208

LEGUME CROPS
0106 0115 0123 0125 0206 0212 0220
0294 0348 0378 0427 0434 0435 0446
0461 0474

LEPIDOPTERA
0401 0403
INSECT CONTROL
0406 0417 0419

LIGHT
0012 0037 0049 0063
GROWTH
0051 0041
PHOTOPERIOD
0025 0039 0050 0051 0182

LUXAGRAPTIS ALBICOSTA
0406

LYSINE
0112 0454

MACROPHOMINA PHASEOLI
0149
DISEASE CONTROL
0256 0261 0337

MAGNESIUM
0060 0062 0068 0071 0075 0103 0156
0201 0208 0241
PLANT ASSIMILATION
0059

MALAWI
0421

MALE STERILITY
0431

MANGANESE
0062 0063 0071 0076 0103 0139 0156
0164 0457

MANURES
0140 0148 0149 0158

MARKETING
0471 0475 0481 0483

MARUCA TESTULALIS

HOST-PLANT RESISTANCE
0419
INSECT BIOLOGY
0419

MATURATION
0247 0437 0448 0495 0497

MECHANICAL DAMAGE
0089 0166 0180 0213 0448

MECHANIZATION
0176 0180 0181 0185 0192 0246

MELOIDOGINE SP
0260 0382 0383

MELOIDOGYNE INCOGNITA
0256 0260 0261
CHEMICAL CONTROL
0385
HOST-PLANT RESISTANCE
0385

METABOLISM
0026 0056 0109 0313 0331

METHIONINE
0101 0102 0112 0453 0454 0456

MEXICO
0003 0075 0095 0127 0128 0159 0226
0243 0255 0294 0302 0412 0413 0414
0445

MICRONUTRIENTS
0047 0057 0060 0062 0063 0068 0069
0076 0103 0113 0137 0139 0162 0164

MINERAL DEFICIENCIES
0058 0060 0063 0071 0134 0238 0256
0439

MOISTURE CONTENT
0062 0456

MOLYBDENUM
0063 0079 0162

MULCHING
0124

MUTATION
0262 0420 0426 0433 0434 0443 0444
0446 0447 0449

MYCOPLASMOSES
0399

MYCOSES
0149 0239 0255 0256 0257 0258 0260
0261 0270 0286 0288 0289 0290 0291
0295 0298 0299 0310 0312 0313 0315
0317 0320 0321 0322 0323 0326 0329
0333 0334 0340 0342 0343 0344 0347
0364 0415 0424 0425 0430
LEAVES
0259 0294 0297 0300 0303 0305 0306
0307 0309 0311 0314 0325 0327 0330
0332 0337 0338 0339 0341 0345 0346
PODS
0297 0301 0304 0305 0309 0345
SEED
0168 0215 0216 0219 0297 0301 0319
0324 0328 0338 0339
SEEDLINGS
0331 0337
STEMS
0292 0306 0337
ROOTS
0293 0301 0316
TEMPERATURE
0294 0332 0335

NEMATODES
0255 0256 0260 0261 0384
NEMATODE BIOLOGY
0383
NEMATODE CONTROL
0382 0385

NEMATOSPORA
0334
NEMATOSPORA CORYLI
0337

NITROGEN
0020 0045 0064 0068 0079 0108 0162
0208 0224 0371 0457 0458 0459 0461
0464 0466 0467
FERTILIZERS
0055 0056 0073 0096 0134 0135 0142
0150 0152 0153 0154 0155 0156 0157
0158 0159 0201 0233 0239 0240 0241
0462 0465
MINERAL DEFICIENCIES
0060 0071 0134 0238
NUTRIENT ABSORPTION
0059 0072 0073 0132 0134 0135 0157
0468
PLANT ASSIMILATION
0059 0072 0073 0132 0134 0135 0157
0468
PROTEIN CONTENT
0056 0074 0096 0102 0118 0119 0142
0453 0454

NITROGEN-FIXING BACTERIA
0464

NODULATION
0011 0117 0148 0371 0424 0459 0460
0461 0464 0466 0467
MINERALES AND NUTRIENTS
0462 0465 0468
NITROGEN
0462 0465 0468
PHOSPHORUS
0462

NORTH AMERICA
0003 0008 0009 0011 0012 0017 0025
0026 0029 0035 0036 0038 0042 0043
0050 0054 0055 0062 0068 0069 0070
0090 0096 0100 0105 0108 0113 0120
0127 0128 0142 0156 0169 0171 0183
0199 0213 0226 0240 0243 0255 0262
0263 0264 0274 0282 0283 0288 0292
0300 0302 0304 0308 0316 0332 0344
0361 0364 0393 0394 0397 0398 0405
0406 0412 0413 0424 0426 0437 0438
0445 0456 0463

NOXIOUS ANIMALS
0255 0256 0260 0382 0383 0384 0385
0417 0419

NUCLEIC ACID
0132 0355
DNA
0107 0117 0370 0373
RNA
0041 0107 0116 0364 0370

NUTRIENT ABSORPTION
0037 0057 0059 0070 0072 0073 0076
0077 0078 0092 0132 0134 0135 0140
0157 0164 0468

NUTRIENT SOLUTION
0005 0008 0027 0036 0053 0056 0058
0066 0077 0096 0208

NUTRIENT TRANSPORT
0040 0084 0157

NUTRITIONAL REQUIREMENTS
0029 0055 0060 0068 0073 0076 0089
0095 0126 0127 0130 0136 0140 0142
0147 0149 0150 0152 0153 0154 0155
0156 0157 0158 0159 0164 0199 0201
0209 0231 0233 0238 0239 0241 0246
0462 0465 0472 0477 0430

NUTRITIVE VALUE
0113 0118 0119 0169 0454 0455 0456
0457 0473

OSMOTIC POTENTIAL
0027 0030

OZONE

AIR POLLUTION
0026 0387 0393 0394 0397 0398
HOST-PLANT RESISTANCE
0386 0394
PLANT INJURIES
0026 0386 0387 0392 0393 0394 0397
0398

PB
0078 0137

PERU
0125 0146

PH
0060 0063 0135 0153 0156 0191 0192
0201 0294 0375 0461 0473
AGRICULTURAL LIME
0154 0164

PHASEOLINS

ANALYSIS
0313
PLANT INJURIES
0312

PHASEOLUS ACUTIFOLIUS
0123

PHASEOLUS COCCINEUS
0212

PHOSPHORUS
0020 0040 0062 0064 0068 0079 0096
0147 0150 0151 0153 0154 0156 0159
0162 0231 0236 0239 0241 0457 0462
MINERAL DEFICIENCIES
0060 0071 0238
NUTRIENT ABSORPTION
0059 0076 0135
PLANT ASSIMILATION
0135 0136

PHOTOPERIOD
0025 0039 0050 0151 0160 0162 0466

PHOTOSYNTHESIS
0014 0020 0023 0025 0026 0030 0035
0036 0037 0040 0041 0042 0043 0044
0045 0047 0053 0066 0192 0330 0426
0447 0457

PHYLLOSTICTA PHASEOLINA

DISEASE CONTROL
0337

PHYSIOLOGICAL DISEASES
0256

PHYTOALEXINS
0104 0169 0299 0312 0313 0316 0342

PHYTOHEMAGGLUTININS
0022 0100 0101 0118

PLANT ANATOMY
0001 0002 0003 0004 0005 0006 0009
0010 0011 0012 0023 0024 0033 0054
0066 0069 0074 0078 0122 0391 0392
0426 0432 0443 0463

PLANT ARCHITECTURE
0420

PLANT ASSIMILATION
0040 0057 0059 0070 0072 0073 0077
0078 0092 0132 0134 0135 0136 0140
0157 0164 0468

PLANT BREEDING
0123 0262 0263 0275 0297 0347 0368
0410 0422 0423 0424 0425 0427 0431
0434 0436 0443 0444 0445 0447 0472
0479
BACKCROSSING
0050 0438 0439 0442
CROSSBREEDING
0050 0291 0333 0336 0420 0421 0426
0428 0432 0437 0438 0440 0445
SELECTION
0188 0213 0421 0430 0440 0449 0477

PLANT DEVELOPMENT
0025 0027 0031 0032 0051 0053 0057
0059 0068 0073 0079 0080 0081 0082
0083 0084 0085 0086 0090 0091 0093
0095 0097 0129 0138 0141 0198 0218
0222 0247 0371 0396 0392 0444 0447
0448 0460 0474

PLANT GEOGRAPHY
0003 0295

PLANT - GROWTH SUBSTANCES
0009 0010 0014 0016 0029 0032 0040
0044 0052 0083 0084 0093 0095 0097
0109 0110 0121

PLANT HABIT
0023 0038 0054 0076 0077 0129 0130
0142 0156 0186 0187 0189 0189 0194
0195 0196 0197 0204 0209 0239 0242
0247 0249 0253 0278 0279 0392 0425
0437 0438 0440 0455 0472

PLANT INJURIES
0024 0089 0276 0336 0346 0386 0390
0391 0392 0406 0410
AIR POLLUTION
0026 0387 0388 0393 0394 0397 0399
HERBICIDES
0183
PHASEOLINS

0312
TEMPERATURE
0155 0395 0448
TOXICITY
0155

PLANT NUTRITION
0056 0058 0060 0063 0064 0066 0068
0070 0071 0208 0424 0439

PLANT PHYSIOLOGICAL DISORDERS
0213 0389 0396

PLANT PIGMENTS
0014 0020 0028 0037 0045 0058 0116
0272 0392

PLANT REPRODUCTION
0065 0432 0445

PLANT RESPIRATION
0043 0045 0222 0330

PLANT TISSUE
0002 0011 0031 0054 0069 0092 0
0267 0273 0342 0346 0368
AGE
0049 0070
ENZYMES
0033

PLANT TOXINS
0269

PLANT VASCULAR SYSTEM
0010 0054 0074

PLANTING
0141 0165 0167 0191 0192 0221 0227
0230 0231 0232 0233 0243 0247 0248
0413
AGRICULTURAL EQUIPMENT
0180 0181
SPACING
0125 0126 0127 0128 0149 0170 0171
0179 0185 0197 0199 0209 0236 0240
PRODUCTIVITY
0198 0199

PLOT SIZE
0486

PODDING
0002 0139 0253

PODS
0002 0029 0062 0068 0082 0091 0113
0140 0213 0392 0423 0438 0445
DISEASES AND PATHOGENS
0234 0262 0265 0273 0276 0279 0281
0283 0285 0287 0297 0301 0304 0305
0309 0345 0352 0357
INJURIOUS INSECTS
0357 0406 0495 0497 0498

POLLEN
0080 0429

POLLINATION
0082 0432 0445
ANTHERS
0060

POLLUTION
0026 0386 0388 0393 0394 0396 0397
0398

POTASSIUM
0062 0066 0067 0068 0079 0096 0148
0150 0156 0201 0208 0327
MINERAL DEFICIENCIES
0059 0060 0439
NUTRIENT ABSORPTION
0059 0070 0135 0157
PLANT ASSIMILATION
0059 0070 0135 0157

PRATYLENCHUS
0385

PRICES
0475 0483

PROCESSING
0085 0112 0198 0223 0455 0473 0476

PRODUCTION
0065 0125 0131 0145 0160 0191 0193
0198 0200 0204 0227 0230 0232 0233
0359 0409 0428 0446 0469 0470 0471
0474 0475 0477 0478 0479 0480 0481
0482

PRODUCTIVITY
0004 0193 0199 0200 0201 0206 0207
0430 0431 0471

PROTEIN CONTENT
0007 0056 0074 0098 0101 0105 0109
0111 0112 0115 0119 0169 0190 0442
0453 0454 0456 0477
SEED
0022 0096 0102 0118 0121 0123 0142
0433 0434 0446 0473

PROTEINS
0017 0056 0096 0200 0375 0458
AMINOACIDOS
0056 0098 0102 0434 0456
ANALYSIS
0038 0102 0106 0114 0456
DIGESTIBILITY
0451

PSEUDOMONAS PHASEOLICOLA
0258 0260 0267 0269 0272 0273 0274
0277 0278 0279
DISEASE CONTROL
0255 0256 0261 0280
CHEMICAL CONTROL
0255 0280
HOST-PLANT RESISTANCE
0255 0268 0276 0425

PSEUDOMONAS SYRINGAE

0266
DISEASE CONTROL
0265
CHEMICAL CONTROL
0265
HOST-PLANT RESISTANCE
0264 0276

PSEUDOMONAS TABACI
0271

PYTHIUM APHANIDERMATUM
0260
DISEASE CONTROL
0256 0293
CHEMICAL CONTROL
0293
HOST-PLANT RESISTANCE
0293

PYTHIUM DEBARYANUM
0260

PYTHIUM IRREGULARE
0293

PYTHIUM ULTIMUM
0260
DISEASE CONTROL
0293
CHEMICAL CONTROL
0293
HOST-PLANT RESISTANCE
0293

RAINFALL DATA
0131 0163

REO NODE
0356

RELATIVE HUMIDITY
0395

RAMULARIA PHASEOLINA
0337

RHIZOBIUM
0117 0371 0459 0460 0461 0464 0466
0467

RHIZOBIUM LEGUMINOSARUM

NODULATION
0117

RHIZOBIUM PHASEOLI
0371 0459 0460 0465 0466 0467

RHIZOCTONIA SOLANI
0168 0216 0260
DISEASE CONTROL
0256 0261 0293 0305 0323
BIOLOGICAL CONTROL
0293
CHEMICAL CONTROL
0293 0305 0323
HOST-PLANT RESISTANCE
0293 0305 0325

RNA
0041 0107 0116 0364 0370

ROOTS
0004 0005 0006 0009 0011 0028 0030
0032 0038 0054 0061 0068 0072 0076
0077 0078 0079 0084 0096 0110 0155
0157 0293 0301 0316 0357 0371 0463
0466

ROTS
0301 0316

SALINITY
0036 0045 0054 0056 0061 0122
GROWTH
0027 0073
PLANT DEVELOPMENT
0027 0073

SAP
0074

SCLEROTIUM ROLFSII
0260
DISEASE CONTROL
0256 0261 0293
CHEMICAL CONTROL
0293
HOST-PLANT RESISTANCE
0293

SE
0103

SEED
0005 0018 0019 0052 0113 0114 0167
0168 0176 0180 0181 0211 0213 0214
0218 0221 0222 0223 0339 0389 0392
0423 0437 0445
AMINO ACIDS
0102 0118 0121 0434
DISEASES AND PATHOGENS
0089 0212 0215 0216 0219 0234 0272
0276 0278 0279 0282 0285 0297 0301
0319 0324 0328 0338 0357 0363 0421
0482
GERMINATION
0081 0087 0098 0089 0093 0104 0217
0220 0224 0225 0324
INJURIOUS INSECTS
0387 0357 0400 0482 0489 0491 0495
0496 0497
PRODUCTION
0446 0480 0482
PROTEIN CONTENT
0022 0096 0102 0118 0121 0123 0142
0433 0434 0446
STORAGE
0089 0215 0220 0224 0225 0282 0319
0473
YIELDS
0002 0089 0096 0123 0142 0248 0251
0252 0282 0285 0357 0433 0446 0468

0480 0482

SEED COAT
0105 0166 0213 0243
ANALYSIS
0031 0101 0104

SEED COLOR
0003 0009 0101 0122 0138 0211 0223
0234 0251 0339 0430 0437 0454 0471

SEED PRODUCTION
0131 0148 0211 0214 0215 0219 0221
0228 0301 0482

SEED TRANSMISSION
0215 0216 0219 0258 0262 0278 0280
0292 0284 0303 0306 0350 0357 0368

SEED TREATMENT
0272 0340 0480

SEEDS
0101 0105 0213

SELECTION
0035 0096 0189 0194 0202 0221 0332
0381 0467
PLANT BREEDING
0188 0213 0421 0430 0440 0449 0477

SHOOTS
0044 0078

SODIUM
0054 0061 0062 0070 0084
FERTILIZERS
0073

SOIL ANALYSIS
0060 0062 0068 0103 0134 0136 0152
0153 0154 0162 0199

SOIL CONSERVATION PRACTICES
0137 0191 0192

SOIL FERTILITY
0068 0103 0134 0136 0147 0152 0153
0154 0156 0162 0199 0201

SOIL REACTIONS
0139 0145 0215

SOIL REQUIREMENTS
0060 0062 0145 0147 0149 0154 0162
0201 0210 0477

SOIL TEMPERATURE
0057 0063 0124 0131 0461

SOIL WATER
0063 0124 0133 0138 0145 0148 0163
0396

SOLAR RADIATION
0131 0160

SOLUBLE CARBOHYDRATES
0032 0047 0049 0461

SPACING
0126 0127 0149 0170 0171 0185
PRODUCTIVITY
0199 0200
YIELDS
0035 0089 0125 0128 0129 0130 0142
0179 0197 0199 0200 0204 0209 0236
0239 0240 0252 0485

SPAIN
0014

SPODOPTERA FRUGIPERDA
0419

STARCH CONTENT
0006 0007 0103 0120

STATISCAL ANALYSIS
0006 0050 0062 0065 0091 0122 0129
0135 0146 0147 0153 0158 0159 0162
0164 0187 0190 0193 0194 0195 0210
0241 0243 0244 0245 0250 0254 0262
0305 0310 0323 0414 0426 0433 0437
0445 0476 0480 0483 0485 0486

STEMS
0006 0044 0110 0276 0285 0292 0306
0357
GROWTH
0068 0094
MINERALS AND NUTRIENTS
0040 0061 0068 0070 0072 0076 0079
0084
NUTRIENT ABSORPTION
0070 0072 0076
TRANSLOCATION
0061

STERILITY
0429

STIGMA
0111 0432

STOMATA
0426 0477

STORAGE
0149 0170 0171 0191 0192 0224 0225
0231 0232 0455 0473
DISEASES AND PATHOGENS
0089 0126 0215 0256 0262 0319
INJURIOUS INSECTS
0089 0126
TEMPERATURE
0263

STORED GRAIN PESTS
0255 0256 0419 0487 0488 0489 0490
0491 0492 0493 0494 0496 0497 0498
0499 0500

SUGARS

0032 0120

SYMBIOSIS
0463
NODULATION
0011 0117 0148 0459 0461 0462 0464
0465 0466 0467 0468
MINERALS AND NUTRIENTS
0462 0465 0468
PHOSPHORUS
0462

SYMPTOMATOLOGY
0276 0285 0293 0297 0305 0338 0345
0352 0357 0358 0360 0385 0399

TANNIN CONTENT
0101 0454

TECHNOLOGY EVALUATION
0192 0463 0474 0480

TECHNOLOGICAL PACKAGE
0191 0192 0231 0232 0233 0480

TEMPERATURE
0050 0063 0067 0080 0082 0092 0094
0148 0151 0160 0220 0294 0332 0335
0365 0396
GROWTH
0057 0460
PLANT INJURIES
0155 0395 0448
SOLUBLE CARBOHYDRATES
0461
YIELDS
0029 0057 0124 0131 0144 0165 0208

TETRANYCHUS DESERTORUM
0419

TETRANYCHUS TELARIUS
0417

THIELAVIOPSIS BASICOLA
0293

THYSANOPTERA
0401 0409

TISSUE CULTURE
0016

TOBACCO MOSAIC VIRUS
0370

TOXICITY
0099 0137 0140 0155 0396
MINERALS AND NUTRIENTS
0047 0060 0076 0164

TRACERS
0077

TRADE
0471 0481

TRANSLOCATION
0030 0032 0042 0047 0061 0069 0426

TRANSPIRATION
0020 0045 0048 0084 0163 0182

TRYPSIN
0451

TRYPTOPHANE
0112 0454 0456

TYROSINE
0112

URBANUS PROTEUS
0419

UREA
FERTILIZERS
0152 0154 0157 0183 0465

UROMYCES PHASEOLI
0258 0259 0260 0307 0314 0330 0346
DISEASE CONTROL
0255 0256 0261 0345
CHEMICAL CONTROL
0255 0345
ELECTRON MICROSCOPY
0311
ETIOLOGY
0308 0345
HOST-PLANT RESISTANCE
0255 0289 0295 0296 0300 0302 0315
0327 0336 0345 0347 0430
HOSTS AND PATHOGENS
0311 0327
RACES
0296 0300 0302 0345 0347

USA
0008 0009 0012 0017 0026 0029 0035
0036 0042 0043 0050 0054 0062 0066
0069 0070 0077 0083 0090 0092 0096
0100 0105 0108 0113 0114 0120 0140
0142 0156 0183 0199 0213 0240 0241
0262 0263 0264 0274 0283 0288 0292
0300 0304 0308 0316 0329 0332 0364
0388 0393 0394 0397 0398 0406 0424
0426 0437 0438 0456

VAGINULUS PLEBEIUS
0419

VALINE
0112

VECTORS
0255 0348 0350 0351 0356 0358 0360
0365 0368 0377 0379 0399 0402 0415

VENEZUELA
0205 0328 0454 0474 0485

VIGNA SINENSIS
0453

VIROSES
0215 0252 0255 0257 0260 0261 0348
0349 0350 0352 0354 0355 0356 0357
0358 0359 0360 0361 0362 0363 0365
0366 0367 0368 0369 0370 0371 0372
0373 0374 0375 0376 0377 0378 0379
0380 0381 0402 0415 0424

VIRUS INHIBITION
0363 0364 0366

WATER ABSORPTION
0008 0018 0019 0122 0208 0473

WATER CONTENT
0030 0039 0105 0108 0122 0145 0159
0169 0176 0220 0222 0223 0455 0476

WATER REQUIREMENTS (PLANT)
0138

WATER STRESS
0030 0056 0065 0138 0151 0155 0165

WEEDING
0048 0092 0130 0149 0168 0171 0172
0173 0174 0175 0177 0178 0182 0184
0185 0191 0198 0199 0209 0239

WEEDS
0178 0199 0348
HERBICIDES
0172 0173 0174 0175 0183 0184 0198
0209

WHETZELINIA SCLEROTIORUM
0286 0318 0322 0328 0329
DISEASE CONTROL
0255 0256 0288 0292 0304 0338 0340
CHEMICAL CONTROL
0255 0288 0292 0304 0338 0340

WILTING
0292

XANTHOMONAS PHASEOLI
0259 0260 0267 0274 0283
DISEASE CONTROL
0215 0255 0256 0261 0270 0282 0285
HOST-PLANT RESISTANCE
0255 0262 0275 0281 0285 0430
PLANT BREEDING
0262 0275 0281 0430
SEED TRANSMISSION
0215 0262 0282 0284

XANTHOMONAS PHASEOLI VAR FUSCANS
0283 0284
DISEASE CONTROL
0285

ZABROTES SUBFACIATUS
0149 0258 0417 0419

ZEA MAYS
0046 0047 0057 0060 0062 0063 0064
0068 0069 0075 0076 0103 0139 0406
0456
INTERCROPPING
0184 0186 0187 0188 0189 0190 0191
0192 0193 0194 0195 0196 0197 0198
0199 0202 0203 0204 0205 0206 0208
0209 0231 0233 0472 0480

LIST OF ABBREVIATIONS

A	Angstrom(s)
ABA	Abscisic acid
ac	Acre(s)
a.i.	Active ingredient
alt.	Altitude
AMD	Cassava African mosaic disease
AMV	African mosaic virus, 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 oxygen 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)
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
COD	Chemical oxygen demand
concd	Concentrated
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
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
expt	Experiment
exptl	Experimental
°F	Degrees Fahrenheit
ft-ca	Foot candles (10.76 lux)
FYM	Farmyard manure
g	Gram(s)
G	Giga (10^9)
GA	Gibberellic acid
gal	Gallon(s)
GE	Gross energy
GERs	Glucose entry rates
GLC	Gas-liquid chromatography
govt	Government
govtl	Governmental
h	Hour(s)
ha	Hectare(s)
HCN	Hydrocyanic acid
HDP	Hydroxypropyl distarch phosphate (modified cassava starch)
HI	Harvest index
IAA	Indoleacetic acid
IBA	Indolebutyric acid
in.	Inches

i.e.	That is
IU	International unit
J	Joule
kat	Katal(amount of enzymatic activity that converts 1 mole of substrate/s)
kcal	Kilogram-calorie(s)
kg	Kilogram(s)
Kj	Kilojoule
km	Kilometer(s)
KNap	Potassium naphthenate
kR	Kiloroentgen(s)
l	Liter(s) (only in combination with no.)
LAD	Leaf area duration
LAI	Leaf area index
lat.	Latitude
lb	Pound(s)
LD_{50}	Mean lethal dose
LER	Land efficiency ratio
LPC	Leaf protein concentrate
lx	Lux
M	Mega
M	Molar
m	Meter(s)
max	Maximum
MC	Moisture content
ME	Metabolizable energy
meq	Milliequivalent(s)
met	Methionine
mg	Milligram(s)
mho	Reciprocal ohm
min	Minimum, minute(s)
ml	Milliliter(s)
mm	Millimeter(s)
mo	Month
mol wt	Molecular weight
mp	Melting point
NAA	α-Napthalene 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	Probability
Pa	Pascal(s)
PAN	Pexoxyacetic nitrate
PCNB	Pentachloronitrobenzene
PDA	Potato dextrose agar
PER	Protein efficiency ratio
pH	Hydrogen ion concentration
pphm	Parts per hundred million
ppm	Parts per million
PSA	Potato sucrose agar
pv.	Pathovar.
resp.	Respective(ly)
Rf	Retardation factor-chromatography
RGRs	Relative growth rate
RH	Relative humidity
RNA	Ribonucleic acid
S	Svedberg unit of sedimentation coeff. (10^{-13} s)
s	Second
$S_{20,w}$	Sedimentation coefficient corrected to water at 20°C
SBM	Soybean meal
SCN	Thiocyanate
SCP	Single cell protein
SDS	Sodium dodecyl sulfate
sp.	Specie
spp.	Species
SSL	Sodium stearyl-2-lactylate
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
VFA	Volatile fatty acids
vol	Volume
VPD	Vapor pressure deficit
vpm	Volume per million
W	West
wk	Week
WP	Wettable powder
wt	Weight
YFEL	Youngest fully expanded leaves
yr	Year(s)
α	*alpha*
β	*beta*
γ	*gamma*
δ	*delta*
ε	*epsilon*
λ	*lambda*
π	*pi*
ψ	*psi*
/	Per
μ	Micro

%	Percent(age)	±	Plus or minus
>	More than, greater than	Ø	Diameter
<	Less than	≪	Much less than
≤	Equal to or less than	≫	Much greater than
≥	Equal to or greater than		