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Abstracts on Field Beans
(*Phaseolus vulgaris* L.)

Centro Internacional de Agricultura Tropical

ABSTRACTS ON FIELD BEANS

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Abstracts on Field Beans

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Vol. IX | No. 3 | December, 1984

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INTRODUCTION

This journal of analytical abstracts, which replaces the former combination of abstract cards and yearly cumulative volumes, is designed to provide a specialized guide to the world's literature on field beans (*Phaseolus vulgaris* L.) disseminating research results and ongoing activities related to the crop.

The abstracts report condensed information from journal articles, booklets, mimeographed reports, theses, manuals and other conventional and nonconventional material, categorized into broad disciplinary fields to facilitate rapid scanning. Additionally, abstracts are author and subject indexed to enable more comprehensive consultation.

When retrospective or exhaustive coverage of a topic is desired, mechanized bibliographic searches of the entire document collection can be provided by CIAT's Documentation Center. Abstracts of all articles that match the topic of interest are provided to users who request this search service. The full text of every article abstracted by the Documentation Center is also available, through the photocopy service.

CIAT's Documentation Center also publishes journals of analytical abstracts on cassava (*Manihot esculenta* Crantz) grown under tropical conditions, and on tropical pastures. Other CIAT publications dedicated to keeping users aware of research developments in their respective fields include: Pages of Contents, Cassava Newsletter, Pastos Tropicales - Boletín Informativo, and Hojas de Fríjol.

COMPONENTS OF AN ABSTRACT

Sequential number in the journal (for use of indices)

Authors

Year of publication

Accession number (for photocpy requests)

[19421 ABATE, T.; NEGASI, A. 1981. 0113 Chemical control of American bollworm (Heliothis armigera) (Hubner) with ultra-low-volume sprays. Ethiopian Journal of Agricultural Science 3(1):49-55. Engl., Sum. Engl., 11 Refs.
[Inst. of Agricultural Research, P.O. Box 2003, Addis Ababa, Ethiopia]

Original title

Additional notes

Author address

Source

Pages

Language of paper

Language of summary

Phaseolus vulgaris. Injurious insects. Lepidoptera. Heliothis armigera. Insect control. Chemical control. Ethiopia.

Descriptors

Expt. consisting of ultralow vol. formulations of endosulfan (500 and 750 g a.i./ha), cypermethrin (150 g a.i./ha), fenitrothion (960 g a.i./ha), profenofos (750 g a.i./ha), and an untreated check were conducted for 2 consecutive yr against Heliothis armigera on haricot beans at the Awassa and Nazareth Expt. Stations of the Institute of Agricultural Research (IAR), Ethiopia. The treatments were replicated 5 times in a randomized complete block design on 20 x 20 m plots. Of the insecticides used, single application of cypermethrin gave a more consistent and significant control than the check in both seasons at both stations. A new product, cypermethrin/profenofos 166[R], substituted for fenitrothion at Nazareth in the 1980 season, gave promising results to warrant further testing. Endosulfan, a recommended insecticide against the American bollworm in the past, was not as satisfactory as cypermethrin in its control of H. armigera on haricot beans. (Author's summary) F01

Abstract

Abstractor and/or translator

Subject categories

HOW TO USE THE INDEXES

The numbers listed under each entry in the author and subject indexes correspond to the abstract's sequential number, found above each abstract within the journal.

The last issue of the year contains cumulative author and subject indexes for the year.

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The Author Index can be used to find abstracts when the personal or corporate authors are known. The Author Index, which is alphabetically arranged, lists *all* author and co-author names cited in the publication.

Subject Index

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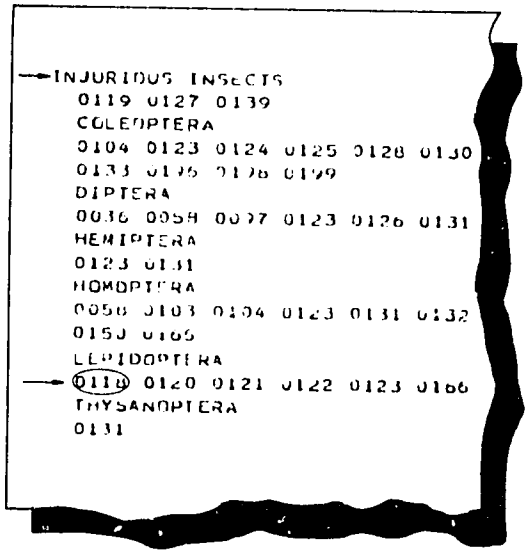
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6. UNESCO coupons, available at UNESCO offices all over the world

B00 PLANT ANATOMY, MORPHOLOGY AND CITOLOGY

0389

20916 FLOOR-DREES, E.M. 1984. Number of stomata on the adaxial and abaxial leaf surface of Phaseolus vulgaris L. and Phaseolus acutifolius A. Gray. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. 2p. Engl., 2 Refs. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Leaves. Stomata. Cultivars. Irrigation. Kenya.

Top leaflets were taken from well-watered beans in the pod-filling stage, grown in the field during the 1982 and 1982-83 seasons in Thika, Kenya. The no. of stomata on small areas of the adaxial and abaxial leaf surfaces were counted under the microscope. In 1982, 10 observations were made on 4 leaves of 15 Phaseolus vulgaris cv. and 1 P. acutifolius cv. In 1982-83, 24 observations were made on 6 leaves of 5 P. vulgaris cv. Although there were significant differences in the no. of adaxial and abaxial stomata between the cv. of P. vulgaris, P. acutifolius had a larger no. of adaxial stomata than any of these cv. However, its no. of abaxial stomata was in the same range as that of P. vulgaris. (Summary by J.R.) B00

C00 PLANT PHYSIOLOGY

C01 Plant Nutrition

0390

20049 ARVY, M.-P. 1983. Transport and redistribution of selenium in the bean plant (Phaseolus vulgaris). Physiologia Plantarum 58:75-80. Engl., Sum. Engl., 23 Refs., Illus.

Phaseolus vulgaris. Nutrient uptake. Nutrient solution. Plant nutrition. Nutrient transport. Minerals and nutrients. Mineral content. Roots. Plant development. Growth. Se. USA.

After incubation for 3 h with (^{75}Se) selenate, the Se distribution in the plants of bean cv. Contender through a 29-day period showed an uneven distribution: roots and trifoliate leaves were richer in ^{75}Se than stem and primary leaves. The high Se concn. of roots resulted from the retention of selenate by the root cells: at the end of the 29-day period about 60% of the radioactivity was always ethanol-soluble, and when analyzed by paper chromatography, proved to be selenate. By contrast, much of the radioactivity of the leaves was ethanol-insoluble, ^{75}Se being quickly captured in metabolic processes which immobilize it. During plant development, a portion of the total Se remains mobile and is continually mobilized to the younger organs which display a rapid growth rate. This delivery results from a progressive liberation of selenate retained by mature organs, especially the roots, and from turnover in older leaf tissues, especially the trifoliate leaves. (Author's summary) C01

0391

21771 BIGOT, J.; LE SAOS, J.; BINET, P. 1983. Effects du NaCl sur la composition cationique de quelques fractions subcellulaires des racines de haricot et de Cochlearia anglica. (Effects of NaCl on cation composition in some subcellular fractions of roots of bean and

Cochlearia anglica). Physiologie Végétale 21(1):3-13. Fr., Sum. Fr., Engl., 28 Refs., Illus. [Laboratoire de Physiologie Végétale, Université de Caen, 14032 Caen Cedex, France]

Phaseolus vulgaris. Salinity. Nutrient solution. Ca. Mg. K. Cell walls. Mineral content. Roots. Adaptation. Resistance. France.

Contents of parietal material and of Ca ions in cell walls and membranes of roots were higher in the halophyte Cochlearia anglica than in Phaseolus vulgaris grown for 42 days in nutrient solution containing 0, 43, 85, or 171 mM NaCl. In P. vulgaris increasing salinity reduced fixation of Ca, Mg, K, and Na ions whereas cation fixation in C. anglica remained stable. Membrane contents of Ca ions increased in C. anglica and decreased in P. vulgaris with increasing salinity. The implications for adaptation and salt tolerance are discussed. (Summary by Soils and Fertilizers Abstracts) C01

0392

21328 COWLING, D.W.; KOZIOL, M.J. 1982. Mineral nutrition and plant response to air pollutants. In Unsworth, M.H.; Ormrod, D.P., eds. Effects of gaseous air pollution in agriculture and horticulture. London, Butterworth Scientific. pp.349-375. Engl., 100 Refs., Illus. [Grassland Research Inst., Hurley, Maidenhead, Berks SL6 5LR, England]

Phaseolus vulgaris. Nutrient uptake. SO_2. Ozone. Air pollution. Growth. England.

The role of nutrition in determining the response of plants to air pollutants, especially their sensitivity to chronic and acute injury, is discussed and the possibility that pollutant gases may fulfill a role in nutrition is examined. Influence of mineral nutrition on plant sensitivity to SO_2, HF, O_3, hydrogen sulphide, ammonia, and NO_2 is tabulated for lucerne, Fagopyrum esculentum, oilseed rape, oats, barley, red clover, wheat, sunflower, tobacco, Phaseolus vulgaris, maize, tomato, gladiolus, spinach, and radish. (Summary by Field Crop Abstracts) C01

0393

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

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

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

0394

21063 OLIVEIRA, I.P. DE; MALAVOLTA, E. Uso de ^{32}P nos testes de sensibilidade do feijoeiro ao aluminio. (Use of ^{32}P in sensitivity tests on aluminum sensitivity in beans). Pesquisa Agropecuária Brasileira

18(2):91-104. Port., Sum. Port., Engl., 16 Refs., Illus. [Centro Nacional de Pesquisa de Arroz e Feijao, 74.000 Goiania-GO, Brasil]

Phaseolus vulgaris. Nutrient solution. P. Nutrient uptake. Cultivars. Resistance. Al. Plant nutrition. Brazil.

In greenhouse trials, 6 Phaseolus vulgaris cv. were classified as Al-tolerant or Al-sensitive on the basis of DM yield at the end of 30 days in 0-24 ppm Al solution. Uptake of ^{32}P by roots was determined in plants grown for 30 days in complete nutrient solution and transferred to Al-containing solution. Rate of ^{32}P uptake was higher in Al-tolerant cv. (Mulatinho Paulista, Ricobaio 1014, Roxo 750) than in Al-sensitive cv. (Jamapa, Rio Tibagi, and Tambo) and an increase in external ionic concn. increased ^{32}P absorption in the presence of 48 ppm Al. (Summary by Field Crop Abstracts) C01

0395

21019 SCHMITT, H.A.; WEAVER, C.M. 1980. Chromium-zinc interaction in accumulation of minerals by bush beans. Proceedings of the Indiana Academy of Science 90:125-128. Engl., 9 Refs., Illus.

Phaseolus vulgaris. Nutrient solution. Nutrient uptake. Cr. Zn. Yields. USA.

Zn and Cr uptakes by Phaseolus vulgaris grown in nutrient solution were studied. Cr uptake was slightly enhanced in the presence of Zn but Zn uptake was greatly depressed in the presence of Cr. It was thought that the levels of Cr (2.2×10^5 cpm/l) used in this study were toxic to the roots and so depressed Zn uptake; visual toxicity symptoms were also observed. (Summary by Soils and Fertilizers Abstracts) C01

0396

22127 SHADDAD, M.A.; HEIKAL, M.M. 1982. Interactive effect of gibberellic acid and salinity on kidney bean. Bulletin of the Faculty of Science (Egypt) 11(1):65-81. Engl., Sum. Engl., Ar., 34 Refs. [Botany Dept., Faculty of Science, Assiut Univ., Egypt]

Phaseolus vulgaris. Transpiration. Stomata. Growth. Plant pigments. Mineral content. Salinity. Inhibitors. Plant growth substances. Egypt.

The changes in transpiration rate, stomatal frequency, growth, pigment content, and mineral composition were studied for kidney bean var. Harvester plants grown in water cultures at different levels of salinity (0-80 meq/l NaCl). In addition, the interaction between GA_3, applied as a foliar spray in concn. of 50 and 100 ppm, and salinity was also studied. Generally, a significant reduction in all the studied parameters of kidney bean was induced by salinization. Spraying with GA_3 was very effective in overcoming the inhibitory effect of salinity on transpiration, stomatal frequency, growth, photosynthetic pigments, and the content of some nutrients (K, Ca, P, and N). (Author's summary) C01

0397

20048 TIMPO, E.E.; NEYRA, C.A. 1983. Expression of nitrate and nitrite reductase activities under various forms of nitrogen nutrition in Phaseolus vulgaris L. Plant Physiology 72:71-75. Engl., Sum. Engl., 26 Refs., Illus.

Phaseolus vulgaris. N. Urea. Ammonium sulphate. Fertilizers. Plant nutrition. Mineral content. Plant physiology. Dry matter. Biochemistry. Nutrient uptake. Leaves. Roots. Plant vascular system. Enzymes. USA.

The effect of different N sources on plant growth, N accumulation, and on the expression of nitrate reductase activity in Phaseolus vulgaris leaves was studied. Plants were grown under greenhouse conditions (15-25 kilolux; 16/8 h day/night cycles) in plastic pots filled with perlite:vermiculite (1:1) and watered daily with a minus N solution (N_2 plants) or supplemented with either KNO_3, $(NH_4)_2SO_4$, or urea as combined N sources. Significant levels of nitrate reductase activity in trifoliolate leaves of N_2-, NH_4^+-, urea-, or NO_3^--dependent plants was demonstrated. Leaves from the urea- or NH_4^+-grown plants accumulated NO_2^- in the dark but not in the light when NO_3^- was supplied by vacuum infiltration. These results indicated that the potential for reduction of NO_3^- or NO_2^- was not impaired by growing the plants on NH_4^+ or urea and, in addition, provided evidence for the occurrence of a nonnitrate-inducible nitrite reductase. The nitrate reductase activities associated with N_2-, NH_4^+-, or urea-dependent plants are tentatively regarded as 'constitutive' to differentiate from the widely occurring NO_3^--inducible nitrate reductase activity. Plants grown on NO_3^- or urea accumulated significantly larger amounts of reduced N and DM as compared with NH_4^+- and N_2-dependent plants. Regardless of N treatment, or size of plants, about 50% of the N accumulated by the plant was allocated to the leaves. (Author's summary) C01

0398

19885 WALLACE, G.A.; WALLACE, A. 1983. Phytotoxicity of high levels of iron chelates on bean plants in nutrient solution. Journal of Plant Nutrition 6(6):461-463. Engl., Sum. Engl., 6 Refs.

Phaseolus vulgaris. Nutrient solution. Fe. Mineral deficiencies. Toxicity. Nutrient uptake. Nutritional requirements. USA.

Bush bean plants of cv. Improved Tendergreen were grown for 14 days in a glasshouse in 3700 ml nutrient solutions containing 5×10^{-4}, 10^{-3}, 4×10^{-3}, and 10^{-2} M Fe as EDDHA, EDTA, or DTPA plus a control with 5×10^{-5} M FeEDDHA. The solutions otherwise were complete. The FeEDTA showed phytotoxicity at 5×10^{-4} M, while FeEDDHA and FeDTPA showed phytotoxicity at 4×10^{-3} M. Plants with FeEDTA were dead at 10^{-3} M. Plants with 10^{-2} M FeEDDHA were not dead but were stunted and leaves were red because of the amount of FeEDDHA present in the leaves. Fe was available from the chelate sources and there were small effects only of the Fe chelates on Mn, Cu, and Zn concn. in leaves. (Author's summary) C01

See also 0422 0424

C02 Plant Development

0399

21061 CARMI, A.; HESKETH, J.D.; ENOS, W.T.; PETERS, D.B. 1983. Interrelationships between shoot growth and photosynthesis, as affected by root growth restriction. Photosynthetica 17(2):240-245. Engl., Sum. Engl., 23 Refs., Illus. [Inst. of Soils & Water, Agricultural Research Organization, Volcani Center, Bet Dagan, Israel]

Phaseolus vulgaris. Rooting. Growth. Photosynthesis. Dry matter. Leaf area. USA.

Restricting root growth by growing bean plants in small pots led to the development of dwarf plants, compared with control plants with unrestricted root systems. Shoot growth was suppressed in dwarf plants in spite of a greater production of DM/unit leaf area or fresh matter as indicated by the NAR. No indication to a possible regulation of photosynthesis by the growth rate of sink organs was found. Rates of photosynthesis (P_N) and ribulose bisphosphate carboxylase activities were significantly higher in primary leaves of dwarf plants, compared with those in the control, on both a leaf area and fresh matter basis. This difference in P_N had occurred in spite of the fact that the leaf stomatal resistance (r_s) of the dwarf plants was considerably higher than that of the control plants over most of the growth period. The primary leaves senescence of the dwarf plants was slower in comparison with that of the control. The proportional decrease in chlorophyll concn. and increase in r_s, over the period of 15-21 days from planting, were considerably greater in the control plants. Thus the restriction of root growth somehow delays the senescence processes in the primary leaves; growth and P_N may not be correlated, due to different effects of roots on each of these 2 processes. (Author's summary) CO2

0400

21015 CHEAH, C.H.; LIM, E.S. 1982. Mutation breeding of Phaseolus vulgaris L.: studies on the effects of irradiation dosage to resolve a suitable procedure of handling M_1 and M_2 generations. Pertanika 5(2):184-191. Engl., Sum. Engl., Mal., 9 Refs., Illus. [Dept. of Agronomy & Horticulture, Faculty of Agriculture, Univ. Pertanian Malaysia, Serdang, Selangor, Malaysia]

Phaseolus vulgaris. Mutation. Seeds. Germination. Irradiation. Growth. Malaysia.

Seedling growth studies on gamma-irradiated seeds of Phaseolus vulgaris were conducted in the greenhouse and the field. Exposure to 100 krads, however, was letbal to the apical meristem. Growth of the epicotyl under greenhouse conditions was the most affected by gamma radiation. Based on these results, it is recommended that: (a) The most suitable level of gamma radiation to use in a mutation breeding program is 30 krads. (b) M_1 seeds should be field-planted at double the planting density of the control. (c) M_1 plants should be harvested such that the B_s (single seed bulk) population be used for screening of the mutants. (Extracted from author's summary) CO2

See also 0421 0427 0447 0448 0544 0553 0584

C03 Chemical Composition, Methodology and Analyses

0401

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

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

Thiamin, ascorbic acid, and vitamin B-6 retention were determined in pouched and canned green beans immediately after processing and after storage at 24-26° or 38°C. Ascorbic acid and vitamin B-6 retention were

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

0402

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

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

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

0403

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

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

Conditions which will result in complete fermentation of sugars in green beans by heterolactic acid bacteria are defined. The time course of substrate and product changes during fermentation is analyzed in detail. Only Lactobacillus cellobiosus, among 8 strains of heterofermentative lactic acid bacteria, removed all fermentable sugars from green beans. Proper blanching of beans was required to prevent growth by natural lactic acid bacteria. An inoculum of 10 colony forming units L. plantarum/ml and 10^6 colony forming units L. cellobiosus/ml resulted in formation of twice as much lactic acid as inoculation with L. cellobiosus alone. A max. of 3.74% sugar was metabolized by L. cellobiosus in bean juice containing 2.5% NaCl and 0.08% acetic acid. Fructose was nearly quantitatively reduced to

mannitol with a concomitant accumulation of acetic acid. Ethanol was not observed until most of the fructose was metabolized. L. cellobiosus-fermented beans had a more mild acid flavor than beans fermented with L. plantarum. (Author's summary) C03

0404

21317 DESHPANDE, S.S.; SALUNKHE, D.K. 1982. Interactions of tannic acid and catechin with legume starches. Journal of Food Science 47(6): 2080-2081. Engl., Sum. Engl., 7 Refs. [Dept. of Food Science, 104 Dairy Mfg., Bldg., Univ. of Illinois, Urbana, IL 61801, USA]

Phaseolus vulgaris. Starch content. Protein content. Temperature. Phenols. USA.

Model system interactions between 5 different legume starches (azuki red bean, split yellow pea, small red bean, bush bean, and California kidney bean), potato starch, amylose and amylopectin and 2 phenolic compounds, tannic acid and catechin, were investigated. The amounts of tannic acid and catechin associated with different starches and starch fractions at room temp. (21°C) ranged, resp., from 261 to 652 and 123 to 586 micrograms catechin equivalents/100 mg starch. Heating the systems at 95°C for 30 min decreased the quantities of tannic acid and catechin associated with different starches (151-417 and 147-378 micrograms catechin equivalents of tannic acid and catechin/100 mg starch, resp.). Bound tannic acid and catechin decreased the in vitro digestibility of the starches. (Author's summary) C03

0405

19746 MOTILVA, M.J.; MARTINEZ, J.A.; ILUNDAIN, A.; LARRALDE, J. 1983. Effect of extracts from bean (Phaseolus vulgaris) and field bean (Vicia faba) varieties on intestinal D-glucose transport in rat in vivo. Journal of the Science of Food and Agriculture 34(3):239-246. Engl., Sum. Engl., 27 Refs.

Phaseolus vulgaris. Seeds. Phenolic content. Laboratory animals. Glucose. Spain.

Saline extract solutions from seeds of both Phaseolus vulgaris and Vicia faba var. were prepared and tested for their total polyphenolic content and effect on intestinal D-glucose transport across rat ileum in vivo. Intestinal D-glucose transport was significantly reduced ($P < 0.001$) by the presence of seed extracts in the intestinal loop, regardless of the source of the extract. The order of potency (P. vulgaris var. artropurpurea more than V. faba var. caballar more than V. faba var. minor more than P. vulgaris var. albus) is closely related to the polyphenolic content. Clear differences in the mode of action of the extracts were also observed. Extracts with appreciable polyphenolic content caused both a reversible and a lasting inhibitory effect on glucose transport, while extracts with negligible polyphenolic content only induced a reversible inhibition. Polyamide treatment of the extracts decreased their ability to inhibit glucose transport, but their inhibitory effect was not completely abolished by the treatment, further suggesting the presence of some other antiabsorptive factor(s) in the seeds. (Author's summary) C03

0406

19963 VAN DER CAMMEN, J.C.J.M.; GOEDHEER, J.C. 1982. Fluorescence lifetime spectra measured after illumination of etiolated bean leaves at low temperatures. Photobiochemistry and Photobiophysics 4(3):145-152. Engl., Sum. Engl., 13 Refs., Illus.

Phaseolus vulgaris. Photosynthesis. Leaves. Light. Illumination. Temperature. Netherlands.

Fluorescence lifetime and intensity spectoscopy were used to study the changes that occur in etiolated bean leaves upon illumination at temp. between 77-213 K. The results obtained in the present expt. are in agreement with the existence of the protochlorophyll(ide) form PP(639,642) which can be reduced to PC(678,684). To explain the results of these and other studies a scheme containing 3 parallel pathways for the reduction of protochlorophyll was made. Fluorescence lifetime spectra recorded at 213 K appear to be almost flat as a result of peak broadening. This may indicate that the spectral lifetime technique, when used for in vivo studies at room temp. would merely yield the mean lifetime of the pigment system. (Author's summary) C03

See also 0391 0396 0407 0451

D00 AGRONOMY

D01 Soil, Water, Climate and Fertilization

0407

22126 ABDEL-RAHMAN, A.M. 1982. Salt-stress and growth in Phaseolus vulgaris L. Bulletin of the Faculty of Science (Egypt) 11(1):105-117. Engl., Sum. Engl., Ar., 39 Refs. [Dept. of Botany, Faculty of Science (Sohag), Assiut Univ., Egypt]

Phaseolus vulgaris. Cultivars. Irrigation. Salinity. Dwarf beans. Growth. Nutrient solution. Leaves. Mineral content. N. Na. P. K. Egypt.

The effect of irrigation with saline nutrient solutions on the growth and mineral composition of 2 dwarf bean var., Balady and Black Valentine, sown in clay pots was studied to determine critical irrigation water salinity. Saline culture solutions were prepared by adding NaCl to Pfeffer's nutrient solution. Salinity, especially at 20 meq^{-1} NaCl, promoted the main stem growth of Balady, whereas that of Black Valentine was promoted at the level of 60 meq^{-1} NaCl. The growth of lateral shoots was enhanced with the salinity level 20 meq^{-1} NaCl for Balady and up to 80 meq^{-1} NaCl for Black Valentine. Total N and Na contents of leaves of both var. were increased, whereas P and K contents were progressively decreased by salinity. (Author's summary) D01

0408

22501 AWAD, F.; AZIZ, M.A.; OMAR, M.S. 1982. Interaction of phosphorus fertilization and soil moisture depletion on kidney bean (Phaseolus vulgaris L.). 1. Yield of seeds and their N,P,K and protein contents. Egyptian Journal of Soil Science 22(2):135-142. Engl., Sum. Engl., Ar., 20 Refs. [Soils & Water Use Laboratory, National Research Centre & Soils Dept., Faculty of Agriculture, Ain Shams Univ., Cairo, Egypt]

Phaseolus vulgaris. Fertilizers. P. Irrigation. Yields. Mineral content. N. K. Protein content. Egypt.

The effects of superphosphate fertilizer at 75, 150, and 225 kg/feddan (1 feddan = 0.42 ha) and soil moisture depletion at 75, 50, and 25% of available water were investigated in field expt. using Phaseolus vulgaris. With increasing fertilizer rates seed yield and P content increased, and N, K, and CP contents improved. Highest seed yields were obtained by

irrigating at 50% soil moisture depletion. Decreasing soil moisture depletion had a favorable but insignificant influence on N, P, K, and CP contents. Optimum yields and quality were attained when plants were irrigated at 50% soil moisture depletion and given 225 kg superphosphate/ feddan. (Author's summary) D01

0409

21959 DEVOS, P.; VAN DURME, J.; KABENGELE, K. 1983. Phaseolus beans, a staple food in Burundi. Tropicultura 1(2):43-46. Engl., Sum. Engl., Fr., 9 Refs. [Inst. des Sciences Agronomiques du Burundi, B.P. 795, Bujumbura, Burundi]

Phaseolus vulgaris. Climatic requirements. Soil requirements. Production. Cultivars. Isariopsis griseola. Rar 'ar'a phaseoli. Bean common mosaic virus. Bean yellow mosaic virus. Bean rugose mosaic virus. Uromyces phaseoli. Rhizoctonia phaseoli. Colletotrichum lindemuthianum. Ascochyta phaseolorum. Ophiomyia phaseoli. Aphids. Acanthoscelides obtectus. Zabrotes subfasciatus. Maruca testulalis. Empoasca kraemeri. Injurious mites. Agricultural projects. Selection. Burundi.

The cultivation of beans, the most important food crop in Burundi, is reviewed. Principal areas of cultivation are indicated. Data are included on climate, annual production and cultivation area, cultural practices, utilization, and var. diversity. Major pests and diseases are mentioned. Taking into account these considerations, a strategy for bean research was established. Main emphasis was given on var. selection, establishing multilocation trials at different alt. over several seasons. Based on the results from the 1st series of trials, 2 dwarf bean var. were released: var. Karama 1/2 for the 800-1200 m alt. range, and Diacol Calima for alt. between 1200-1900 m. (Author's summary) D01

0410

22117 EDJE, O.T.; AYONOADU, U.W.U.; MUGHOGHO, L.K. 1971. Effects of fertilizer on the yield of beans under rain-fed and irrigated conditions. Lilongwe, Malawi, Bunda College of Agriculture. Research Bulletin no.2. pp.20-28. Engl., Sum. Engl., 8 Refs.

Phaseolus vulgaris. Fertilizers. Irrigation. Rainfall. N. P. K. Yields. Yield components. Malawi.

Twenty-two determinate bean cv. were planted under rainfed conditions at Bunda, Malawi, and 4 cv. under irrigated conditions at Makanga to determine the effect of different levels of a compound fertilizer on yields. Fertilizer levels at Bunda were 0, 224.2, 448.4, and 672.6 kg of compound B (4-18-15)/ha and 0, 336.3, and 672.6 kg of a fertilizer mixture (7-19-15)/ ha at Makanga. Generally, yield increased with increase in fertilizer level at both locations. Yield of the rainfed beans expressed as a % of the irrigated beans ranged from 27.5 to 61.8%, with a mean of 44.9%. The lower yield under rainfed conditions was attributed, among other factors, to the incidence of diseases and pests. Plant height, no. of pods/plant, and no. of seeds/pod also increased with increasing fertilizer levels. (Author's summary) D01

0411

20918 FLOOR, J. 1984. Effect of soil acidity on dry bean yields in western Kenya. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. 2p. Engl., Illus. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Soil fertility. pH. Ca. P. K. Mg. Yields. Kenya.

Fertilizer expt. were carried out in farmers' fields in the Kisii and Kakamega Districts of western Kenya over 4 wet seasons to find out if soil acidity affected dry bean production. Although the soil conditions in both districts differed from each other, the av. soil pH values were the same, and correlated significantly with the amount of available nutrients and the amount of exchangeable acidity in the soils. However, the av. amount of a nutrient was always higher in Kisii than in Kakamega District. This was generally found to be the case for the soil OM content as well. Av. yields in Kisii were 350 kg/ha higher than those in Kakamega District. (Summary by J.R.) D01

0412

20917 FLOOR, J.; STOETZER, H.A.I.; OKONGO, A.O. 1984. Increased tolerance of dry beans to bean fly as a result of fertilizer application. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. 2p. Engl., 2 Refs. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Fertilizers. P. Ophiomyia phaseoli. Plant injuries. Flowering. Yields. Kenya.

In a fertilizer trial at Kissi, Nyanza Province, Kenya, var. GLP-2, susceptible to the bean fly (Ophiomyia phaseoli), was planted. No significant differences in plant stand were initially observed, but at flowering bean fly attack caused heavy plant losses, especially in the unfertilized beans. An av. yield of 370 kg/ha with 132,000 affected plants was obtained in the check treatment in comparison with 751 and 870 kg/ha and 71,000 and 77,000 affected plants for the treatments with 160 and 240 kg single superphosphate and triple superphosphate/ha, resp. Differences in the no. of affected plants between fertilized and unfertilized beans amounted to 30-50%, confirmed by visual scores. (Summary by I.B.) D01

0413

20919 FLOOR-DREES, E.M. 1982. Draft report on a field experiment to screen promising bean cultivars for drought resistance. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. Internal Report. 47p. Engl., 6 Refs., Illus. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Irrigation. Water stress. Cultivars. Phaseolus acutifolius. Selection. Resistance. Drought. Yields. Kenya.

A field trial was carried out in Thika, Kenya, during the July-Oct. dry season, 1982, to study yield, yield reduction, development rate, and growth characteristics of 15 Phaseolus vulgaris cv. and 1 P. acutifolius cv. under 2 irrigation treatments: (1) no stress (weekly irrigation) and (2) moisture stress (no irrigation from 4 wk. after planting onwards). A split plot design was used. Results indicated that cv. GLP-X.806, GLP-288, GLP-X. 1127(a), GLP-2, and GLP-X.92 performed relatively well under dry conditions, while P. acutifolius, GLP-X.1130, GLP-X.1126, and GLP-77 performed relatively poor. In general, large-seeded var. had better yields. The influence of stress on yield components and characteristics was not clear due to the large variation between cv. These significant cv. differences also occurred for the no. of stomata on the adaxial and abaxial sides of the leaves. (Summary by J.R.) D01

0414

20915 FLOOR-DREES, E.M. 1984. The influence of drought stress on flowering and abscission of Phaseolus vulgaris L. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. 2p. Engl. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Irrigation. Flowering. Yield components. Water stress. Abscission. Cultivars. Kenya.

In 2 field expt. carried out during the 1982 and 1982-83 seasons in Kenya, the effect of drought stress on the no. of pods/plant and the abscission of flowers and pods was studied in 8 bean cv. (GLP-2, GLP-1004, GLP-288, GLP-x.1124, GLP-x.1127a, GLP-x.92, GLP-x.806, and GLP-x.1131). In the 1st expt. treatments were continuous irrigation (high level) and irrigation discontinued 3 wk. after planting (low level). In the 2nd expt. a low and high level of irrigation was established as from 42 days after planting. The total no. of flowers and pods were recorded for 4 randomly chosen plants, and the % abscission/plant calculated. The results showed that drought stress influenced the flowering and abscission of beans, and that cv. differed in their sensitivity to it. The actual effect of the stress, however, depended on its timing. (Summary by J.R.) D01

0415

21709 KENYA. MINISTRY OF AGRICULTURE. 1978. Grain Legume Project. Thika, National Horticultural Research Station. Interim Report no.12. Short Rains 1977/78. 55p. Engl., Sum. Engl.

Phaseolus vulgaris. Fertilizers. Dung. Intercropping. Yields. Cultivars. Spacing. Planting. Adaptation. Technology evaluation. Protein content. Crossbreeding. Selection. Resistance. Pseudomonas phaseolicola. Kenya.

Activities in agronomy, breeding, and selection during the short rains season of 1977-78 in Kenya are reported. Encouraging results were obtained with diammonium phosphate and FYM. In mixed cropping trials at Thika and Embu, low nutritional status of the soils could not support the high mixed cropping plant populations. At Thika, bean yields were 68% higher with Katumani composite maize than with hybrid maize. In density trials, cv. GLP-2 and GLP-24 had a similar performance, compared with Rose Coco K 74, and 2 rows of beans between the maize rows showed a clear advantage. The critical period for weed competition in mixed cropping seems to be shorter than in pure stands of beans. GLP-2 confirmed its outstanding yield potential in the wetter areas and GLP-24 in the medium rainfall zones, although its yields were disappointing in Embu and Thika. Local cv. Mwezi moja performed well at Katumani. A statistically significant interaction was observed between cropping system and cv. at the 3 locations. Protein contents showed significant location, cv., cropping system, and location x cv. effects. These effects were not significant for oil content. Bean/maize crops scored lower in disease symptoms than monocrops. The germplasm collection was expanded to 995 accessions. Crosses were made to improve halo blight (Pseudomonas phaseolicola) resistance of local material. A sublethal combination of 2 dominant factors caused severe stunting, leaf curling, and necrosis in F_1, F_2, and backcross generations of GLP-12 x GLP-3. (Summary by I.B.) D01

0416

20860 KENYA. MINISTRY OF AGRICULTURE. 1981. Grain Legume Project. Thika, National Horticultural Research Station. Interim Report no.19. Long Rains 1981. 113p. Engl., Sum. Engl.

Phaseolus vulgaris. Fertilizers. P. Yields. Dung. Weeding. Herbicides. Isariopsis griseola. Pseudomonas phaseolicola. Resistance. Selection. Cultivars. Kenya.

Results of the Long Rains 1981 program of the Grain Legume Project (Thika, Kenya) are presented. In fertilizer trials, diammonium phosphate gave better results than other single P-fertilizers on a dry bean yield wt. basis in Katumani, Embu, and Thika, but not in Kisii and Kakamega. Yield responses to rates, times, and methods of FYM application were not conclusive. Results of chemical weed control trials were not encouraging. At Thika, Embu, and Kisii, bean yields were clearly affected by maize remaining in the field longer than 6 wk. Major diseases were angular leaf spot (Isariopsis griseola) at most locations, BCMV in Kakamega, and halo blight (Pseudomonas phaseolicola) in Kisii. However, the screening of halo blight resistant material from USA at Kisii was successful. Only simple, not labor intensive, disease scoring methods were feasible. Cv. GLP-X.92, GLP-X.380, and possibly GLP-X.806 have been considered for release. Out of 86 different red haricot var., 16 were identified as superior in performance and as potential candidates for a national red haricot performance trial. (Summary by I.B.) DOI

0417

21783 LUMSDEN, R.D.; LEWIS, J.A.; MILLNER, P.D. 1983. Effect of composted sewage sludge on several soilborne pathogens and diseases. Phytopathology 73(11):1543-1548. Engl., Sum. Engl., 28 Refs. [Soilborne Diseases Laboratory, Plant Protection Inst., Beltsville, MD 20705, USA]

Phaseolus vulgaris. Manures. Disease control. Rhizoctonia solani. Pythium. Thielaviopsis basicola. USA.

The effect of composted sewage sludge (compost) on several soilborne pathogens and diseases was tested in the greenhouse. Aphanomyces root rot of peas; Rhizoctonia root rot of bean, cotton and radish; Sclerotinia drop of lettuce; Fusarium wilt of cucumber; and Phytophthora crown rot of pepper were significantly decreased by addition of 10% compost to soil. Other diseases, Pythium damping-off of pea and bean, Fusarium root rot of pea, and Thielaviopsis root rot of bean and cotton were not affected or were increased by compost. Suppression of diseases caused by Pythium and Rhizoctonia spp. was enhanced by increasing the time between soil amendment and planting. Survival of S. minor, R. solani, and Pythium spp. was not decreased by the compost, but the activity of these pathogens in soil may be affected by an increase in microbial activity stimulated by addition of compost to soil. (Author's summary) DOI

0418

21729 MAGEHEMA, O.S.; NDUNGURU, B.J. 1983. Comparative growth studies of beans (Phaseolus vulgaris L.) under different fertilizer regimes. Morogoro, Tanzania, University of Dar es Salaam. Department of Crop Science. 21p. Engl., 28 Refs., Illus. [Univ. of Dar es Salaam, Dept. of Crop Science, P.O. Box 3005, Chuo Kikuu, Morogoro, Tanzania]

Paper presented at the Bean Workshop, 2nd., Morogoro, Tanzania, 1983.

Phaseolus vulgaris. Cultivars. Growth. Fertilizers. N. P. Manures. Yields. Nodulation. Nitrogen fixation. Leaf area. Yield components. Tanzania.

An expt. was carried out at the Faculty of Agriculture, Forestry, and Veterinary Science, Morogoro, Tanzania, to determine the growth patterns of bean var. Selian Wonder and Kabanima. A split plot design was used with 4

replications; main plots corresponded to the var. and subplots to 4 fertilizer treatments (T_1 - check; T_2 - 60 kg each of N and P/ha, T_3 - 20 t FYM/ha; T_4 - a combination of 10 t FYM + 30 kg each of N and P/ha). Samples of 5 plants were taken from each subplot at weekly intervals beginning 14 days after planting. The following data were recorded for each sample: diameter of 1st internode of main stem, no. of primary branches, leaf area, and no. of pods/plant. N fixation activity was estimated by the acetylene reduction technique. During the initial stages of growth there were few significant differences between var. Differences in vegetative growth during pod production were sufficiently large to account for varietal differences in seed yield. Nodulation and N fixation are inhibited with the application of N in early stages of growth. The application of fertilizer significantly increased the diameter of the 1st internode, the no. of primary branches, plant wt., leaf area, total dry wt., and no. of pods/plant, but did not affect the no. of nodes in all var. For Morogoro conditions, fertilizer increases seed yield in Selian Wonder, but reduces it in Kabanima. (Summary by F.G. Trans. by L.M.F.) DOI

0419

21552 MAYONA, C.M. 1982. Nitrogen and phosphorus fertilization in Phaseolus vulgaris L., in the Southern Highlands: a progress report. Mbeya, Tanzania, Uyole Agricultural Centre. 8p. Engl., 5 Refs. [The Uyole Agricultural Centre, P.O. Box 400, Mbeya, Tanzania]

Report presented at a Bean Researchers' Meeting, Morogoro, 1982.

Phaseolus vulgaris. N. P. Fertilizers. Bo. Cu. Zn. Mo. Mg. Cultivars. Yields. Yield components. Tanzania.

During the 1981-82 growing season, a fertilizer trial was conducted in 5 locations in Tanzania (Nkundi, Mbimba, Magamba NAFCO Maize Farm in Mbozi, Uyole, and Mitalula) to determine the effect of 3 dosages of N (0, 50, and 100 kg/ha) and 5 of P (0, 50, 100, 150, and 200 kg/ha) and their interaction in bean cv. Kabanima and T_3. A systematic design with 4 replications was used. Both fertilizers were broadcasted and then incorporated into the soil prior to planting. Bo, Cu, Zn, Mo, and Mg were also applied. At Mbozi and Uyole, combined N and P fertilization produced the highest responses in no. of pods and seed/ha compared with P or N alone. Data for the other sites are not included. Kabanima was more responsive to N and P fertilization than T_3. Higher responses to N and P were reported at Uyole and Mbozi, resp. (Summary by I.B.) DOI

0420

21733 MISANGU, R.N.; DOTO, A.L. 1982. Character association among bean varieties. Morogoro, Tanzania, University of Dar es Salaam. 10p. Engl., Sum. Engl.

Phaseolus vulgaris. Cultivars. Irrigation. Planting. Timing. Yields. Yield components. Technology evaluation. Germplasm. Production. Tanzania.

Fifty local bean cv. were evaluated for grain yield potential, disease and pest resistance, and other agronomic characters under 2 spraying regimes and 2 planting dates at Morogoro, Tanzania. The data obtained was then subjected to both variance and covariance analyses. From the components of variance and covariance, phenotypic and genotypic correlation coefficients between pairs of characters were derived and subsequently path analysis was carried out using selected characters. Early planting and spraying increased no. of pods/plant, wt. of pods/plant, grain wt./plant, no. of pods/plot, and finally grain yield/unit area. Planting date x accession,

spraying regime x accession as well as planting date x accession x spraying regime interactions were significant for some characters. Considerable variation was found among the accessions evaluated for all characters except for the no. of harvested plants/plot and no. of pods damaged by insects/plot. Thus, the material represents some valuable germplasm for future exploitation. Standard var. Selian Wonder was outperformed by a no. of accessions in various desirable characters but it was among the outstanding entries in seed size. Accession no. TMO 101 was outstanding in various attributes and it could therefore be considered for release as an improved var. after purification and further testing. Path analysis suggested that grain yield was more influenced by the no. of pods/plant, seed size, and pod length. Information emerging from correlation analysis further indicated that grain yield was positively correlated with most of the characters studied except with the no. of grains/pod, days to 50% flowering, plant height, and CP content. The results obtained are discussed in relation to bean improvement possibilities at Morogoro. (Author's summary) D01

0421

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

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

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

0422

21506 QURESHI, J.N. 1979. Critical levels of N and P in bean leaves and the removal of some macro and micro nutrients by a bean crop. Nairobi, Kenya, National Agricultural Laboratories. 8p. Engl., Sum. Engl., 5 Refs.

Paper presented at the Annual General Meeting of the Soil Science Society of East Africa, 5th., Mjoro, Kenya.

Phaseolus vulgaris. Fertilizers. N. P. Mineral content. Leaves. Cultivars. Yields. Ca. Mg. Mn. S. Fe. Zn. Cu. Nutrient uptake. Kenya.

Beans were grown in the field under rainfed conditions at Kabete, Kenya, during 1978-80 to evaluate critical levels of N and P in beans and estimate amounts of some major and micronutrients removed by various components of the bean plant. Var. Mwezi moja was grown the 1st 2 yr and K74 the last year. Six increasing rates of N and P were applied separately. Critical levels of N and P were estimated in leaves, sampled just before flowering.

Values of 3,82% for N in Mwezi moja and 0.42 and 0.31% for P in K74 were obtained. Mwezi moja beans responded significantly to N (1978 only) and P fertilization. Application of 40 kg P/ha doubled grain yields over the control in both yr. Fertilizer response in K74 was lost due to bean rot infection. Nutrient removal from the soil by various components of the bean plant was also estimated. N and K were removed in greatest amounts followed by Ca, Mg, P, S, Fe, Mn, Zn, and Cu in that order. Grains remove most N, P, Mg, and S. K is removed in about equal amounts by grains and hulled pods. Ca and the trace elements Cu, Mn, and Fe occur mostly in hulled pods and stems while Zn is mostly in grains and stems. (Author's summary) D01

0423

21558 RHEENEN, H.A. VAN; OMUNYIN, M.E.; MUIGAI, S.G.S. 1981. The leather leaf character of beans (Phaseolus vulgaris L.). Its inheritance and effect on hail damage. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. 7p. Engl., Sum. Engl., Fr., Germ., 2 Refs. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Climatic requirements. Plant injuries. Leaves. Inheritance. Mutation. Kenya.

Dark green plants with shiny, thick, and wrinkled leaves were found in a field planted to bean var. GLP-2 at Mwea, Kenya, during 1978. The character, likely the result of a mutation, is controlled by 1 recessive gene and provides a measure of resistance to hail. It is proposed to assign the symbol ll to this leather leaf character. Its possible use in breeding programs is discussed. (Author's summary) D01

0424

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

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

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

0425

21719 TANZANIA. MINISTRY OF AGRICULTURE. 1978. Report of research results of National Grain Legume Research Programme, 1977-78. Tanzania, Ilonga Agricultural Research Institute. 33p. Engl., Illus.

Phaseolus vulgaris. Fertilizers. N. P. Yields. Income. Intercropping. Spacing. Planting. Zea mays. Tanzania.

Results of expt. carried out on beans, cowpeas, and soybeans at Ilonga and other research stations and on-farm test sites in 1977-78 in Tanzania are

summarized. Significant bean yield responses to N and P applications were obtained in the regions of Iringa (4 sites) and Mbeya (4 sites); in Iringa, the N x P interaction was significant as well and a 250% yield increase was obtained with the application of 60 kg of N and P/ha, compared with the unfertilized control. No response to K was obtained at either location. An economic analysis method is briefly described. Although the high rate of application (60 kg of both N and P) would be the most economically attractive alternative, the analysis indicates that still higher rates might be recommendable as the marginal rate of return on the last increment in capital is 340%. For Mbeya, the best treatment would be 30 kg of both N and P/ha. Further research is needed. Population effects were studied in bean/maize intercropping. Bean yields were found to be controlled by both bean and maize densities and ranged from 30 to 70% of monocropped bean yields. A productivity plateau was reached at higher densities of either or both crops and only their proportions in the total yields varied. (Summary by I.B.) D01

0426

19733 TAPIA B., H. 1983. Criterios útiles para la recomendación y uso de variedades mejoradas de maíz y fríjol común. (Useful criteria for recommending and using improved maize and common bean varieties). Managua, Nicaragua, Ministerio de Desarrollo Agropecuario y Reforma Agraria. SR-2. 1983. 12p. Span., 10 Refs. [Dirección General de Técnicas Agropecuarias, Ministerio de Desarrollo Agropecuario y Reforma Agraria, Managua, Nicaragua]

Phaseolus vulgaris. Temperature. Rainfall. Cultivation. Soil fertility. Cultivars. Technological package. Nicaragua.

The criteria that should be taken into account to recommend improved maize and bean var. in Nicaragua are presented. The 1st consideration refers to the identification of appropriate regions based on climatic and edaphic factors (temp., rainfall, and soil texture); the 2nd refers to consumption patterns; the 3rd, to production systems prevailing in the regions and breeding for those specific systems; the 4th, resources available to the farmer (edaphic, climatic, and biotic ones, var., and technical education). Based on these criteria, bean and maize var. are recommended for the different levels of technology and ecological conditions. (Summary by EDITEC) D01

0427

20844 VILLIERS, V. DE; NEL, P.C.; HAMMES, P.S. 1974. Die invloed van temperatuur op die groei en ontwikkeling van droebone (Phaseolus spp.). (The effect of temperature on the development and reproduction of dry beans). Crop Production 3:7-11. Afr., Sum. Afr., Engl., 7 Refs.

Phaseolus vulgaris. Temperature. Germination. Cultivars. Growth. Plant reproduction. Leaf area. Flowering. South Africa.

In controlled environment studies to investigate the effects of day/night temp. of 35/25, 30/20, and 25/15°C on the germination, development, and reproduction of up to 11 bean cv., those with large- and medium-sized seeds germinated more slowly than those with small seeds and germination rate increased in all cv. with increase in temp. No. of leaves, total leaf area, and dry root wt./plant were greatest at 30/20°C. Root growth was very sensitive to high temp. (35/25°C) during the early growth stages, but during flowering, top growth was more seriously affected than root growth, the sugar bean (Phaseolus lunatus) cv. being most sensitive. Flowering began earlier at low than at higher temp. and the no. of flowers/plant and % pod set were generally highest at 30/20°C. (Summary by Field Crop Abstracts) D01

0428

21365 VITTI, G.C.; FORNASIERI FILHO, D.; FERREIRA, M.E.; RAGAZZI, D.; HING, L.T. 1982. Efeito de doses de gesso na cultura do feijoeiro (Phaseolus vulgaris L.). (Effects of levels of gypsum on the cultivation of beans). Revista de Agricultura (Brasil) 57(3):119-132. Port., Sum. Port., Engl., 16 Refs. [Faculdade de Ciencias Agrárias e Veterinárias de Jaboticabal, 14.870 Jaboticabal-SP, Brasil]

Phaseolus vulgaris. Agricultural lime. Yields. Brazil.

Phaseolus vulgaris cv. Carioca was sown in a dark red latosol sandy phase in Jaboticabal, Brazil, in 1978 and given 0-300 kg gypsum/ha. There was a positive linear correlation between rate of gypsum application and Ca and sulphate ions in the soil. Seed production was 11.05, 12.98, 15.34, and 16.01 t/ha for 0, 50, 100, and 150 kg gypsum/ha, resp., but above this rate there was no further significant increase. (Summary by Horticultural Abstracts) D01

See also 0389 0433 0435 0442 0443 0444 0454 0462 0520 0535 0540 0542 0549

D02 Cultivation Practices: Planting, Weed Control and Harvesting

0429

21912 ACLAND, J.D. 1971. Beans. Phaseolus vulgaris. In _____. East African crops: and introduction to the production of field and plantation crops in Kenya, Tanzania and Uganda. London, Longman Group Ltd. pp.20-25. Engl., 5 Refs., Illus.

Phaseolus vulgaris. Agronomic characters. Climatic requirements. Land preparation. Planting. Spacing. Timing. Inoculation. Rhizobium. Weeding. Harvesting. Yields. Ophiomyia phaseoli. Heliothis zea. Maruca testulalis. Aphis fabae. Acanthoscelides obtectus. Uromyces phaseoli. Colletotrichum lindemuthianum. Pseudomonas phaseolicola. Isariopsis griseola. Uses. Kenya. Tanzania. Uganda.

Data are presented on area planted to beans in Kenya, Tanzania, and Uganda (approx. 400,000, 12,000, and 270,000 ha, resp.). Bean plant characteristics, its ecology and var. used are briefly discussed. Cultural practices briefly described include seedbed preparation, planting, planting time and spacing, seed inoculation, use of fertilizers, weed control, and harvesting. Current yields are low (220-670 kg/ha) but with improved var., good husbandry, and good pest and disease control, yields of 1000 kg/ha can be expected. Major bean pests are discussed: Ophiomyia phaseoli, Heliothis armigera, Aphis fabae, Acanthoscelides obtectus (the main storage pest). Diseases such as bean rust (Uromyces phaseoli), anthracnose (Colletotrichum lindemuthianum), halo blight (Pseudomonas phaseolicola), and angular leaf spot (Isariopsis griseola), are probably the main cause of crop losses in beans and of yield fluctuations in East Africa. Several forms of utilization are described. (Summary by I.B.) D02

0430

21338 AREVALO V., V. 1983. Informe preliminar de la encuesta sobre la producción de frejol en la zona de Pimampiro en Imbabura. (Preliminary report of the survey on bean production in the Pimampiro region in Imbabura). Quito, Ecuador, Instituto Nacional de Investigaciones Agropecuarias. 47p. Span., Illus.

Phaseolus vulgaris. Cultivation. Rotational crops. Ecuador.

A preliminary report of a survey carried out to identify bean production systems and limiting socioeconomic and agricultural factors in the Pimampiro region, Imbabura, Ecuador, is presented. Results are given in terms of land use, crop rotations, bean var., seed supply, selection and renovation, cropping systems, planting dates, cultural practices (soil preparation, planting methods, fertilization, weeding, pesticide applications, irrigation, harvesting and threshing, yields). Biotic factors limiting bean production include weeds, insect pests (Empoasca kraemeri and Agrotis sp.) and diseases (Oidium sp. and Uromyces phaseoli). Also detailed are aspects on the use of inputs (fertilizers, fungicides, insecticides), labor, storage, and marketing. The region is characterized by small and medium farmers. The prevailing production system is uniform across the region, and is intermediate between the traditional and modern systems. The crop rotation pattern is generally bean-bean-cereal (maize, wheat, barley). Monocropped beans is the most common production system (only 38.23% plant beans in association). Var. Cargabello, Bola, and Magola are the preferred types. Most of the production is consumed in the Colombian market. Research is recommended on the use of chemical inputs, supply stabilization, planting and weed control methods, and seed production on farmers' fields. (Summary by EDITEC) D02

0431

21340 ARIAS M., I.A. 1979. Distancias de siembra en caraota (Phaseolus vulgaris L.) en las vegas inundables del río Orinoco. (Planting distances of bean in the flooding fertile lowlands of the Orinoco river). Agronomía Tropical (Venezuela) 29(4):341-347. Span., Sum. Span., Engl., 4 Refs.

Phaseolus vulgaris. Spacing. Planting. Yields. Yield components. Venezuela.

Seven sowing densities (30, 40, 50, 60, 70, 80, and 100 cm interrow) of beans were compared in the flooding zone of fertile lowlands of the Orinoco river, Cabruta, Venezuela, during the dry season of 1977. Production indices analyzed included no. of pods/plant, seed yield/plant, plant density/ha, and seed yield/ha. Interrow distance appears to be the determining factor in seed yield/plant and per hectare. When plants were sown with 30 cm between rows, seed yield/plant was the lowest (5.7 g) but seed yield/ha was the highest (2664 kg). When the distance between rows was increased to 100 cm, seed yield/plant was highest (10.6 g) but due to the low plant density, seed yield/ha was significantly reduced (1747 kg). Under the excellent ecological conditions of this area, production may be increased by increasing crop density with obvious benefits for the producer. (Author's summary) D02

0432

21056 ASHWORTH, S.; HARRISON, H. 1983. Evaluation of mulches for use in the home garden. HortScience 18(2):180-182. Engl., Sum. Engl., 7 Refs., Illus. [Dept. of Horticulture, Univ. of Wisconsin, Madison, WI 53706, USA]

Phaseolus vulgaris. Mulching. Soil temperature. Growth. Snap beans. Yields. Weeding. USA.

Nine mulch treatments—2 organic (bark, straw), 6 synthetic (polypropylene and polyethylene products), and a control—were evaluated for use around 5 vegetable crops (lettuce, cabbage, tomato, cucumber, snap bean cv. Tendergreen) and 2 woody ornamental species (privet and American

arborvitae). Distinct diurnal soil-temp. regimes developed under the mulches resulting in differences in plant growth and yield. No single mulch performed best for all species. Bark mulch produced the highest snap bean yield; this mulch followed the opaque synthetic mulches in remaining intact throughout the summer and thus provided effective weed control. Bark mulch provided the most satisfactory appearance since it blended in with the surrounding soil. (Author's summary) D02

0433

20903 BEAN CULTIVATION in Mauritius. Mauritius, Department of Agriculture. Bulletin no.96. 4p. 1965. Engl.

Phaseolus vulgaris. Planting. Spacing. Fertilizers. P. Yields. Intercropping. Saccharum officinarum. Ophiomyia phaseoli. Nacoleia praeteritalis. Maruca testulalis. Injurious mites. Chemical control. Insect control. Mauritius.

Recommendations on the cultivation of several dwarf French bean var. grown in Mauritius are briefly mentioned: drilling at a spacing of 75 x 10-15 cm or planting at 38 x 38 cm with 2 seeds/hole, using seed treated with a fungicide; application of 140 kg single superphosphate (or 56 kg triple superphosphate) plus 56 kg potassium sulphate/ha at planting, followed 15 days later by top-dressing with 56 kg ammonium sulphate/ha on poor soils. Yields of 7800 kg green pods or 900 kg beans/ha are common. Beans may be planted between sugarcane rows, attaining 25% of the yield of a pure stand. Several fungal diseases should be preventively controlled by weekly sprayings with 0.015% zineb or maneb. Main pests are the bean fly (Melanagromyza phaseoli), the caterpillars of Nacoleia praeteritalis and Maruca testulalis, and red spider mites; chemical control of these pests is indicated. (Summary by Abstracts on Tropical Agriculture) D02

0434

21923 COERTZE, A.F.; VAN DEN BERG, A.A. 1981. Planting density in bush beans. Bean Improvement Cooperative. Annual Report 24:1. Engl.

Phaseolus vulgaris. Planting. Spacing. Snap beans. Yields. Yield components. South Africa.

A trial was conducted in 1980 at the Horticultural Research Institute (Pretoria, South Africa) to evaluate the effect of 10 plant densities (from 59,492 to 555,327 plants/ha) on seed yield of snap bean cv. Rolito. No significant difference in yield was found at densities of 138,827 plants/ha and above. The no. of pods/plant and the mass of plants increased at low density planting. The no. of pods/plant varied from 44 at the lowest to 8 at the highest density planting. Plant height, height at which the pods were borne, and the effect on weeds were better at high than at low density plantings. (Summary by T.F.) D02

0435

20811 DURAN P., A. 1983. Evaluación de la fórmula de producción para el cultivo de fríjol en el centro y sur de Veracruz. (Evaluation of the bean production process in southern and central Veracruz). Tesis Ing.Agr. México, Universidad de Guadalajara. Escuela de Agricultura. 172p. Span., Sum. Span., 43 Refs., Illus.

Phaseolus vulgaris. Land preparation. Cultivars. Fertilizers. Pest control. Weeding. Technology evaluation. Mexico.

In the spring-summer cycles of 1980 and fall-winter cycles of 1980-81, 15 expt. using black beans were established in the central and southern zones of the state of Veracruz, Mexico, to evaluate the partial and total effects of the factors that compose the production process and to determine the optimum economic production process for beans. For the central zone the traditional and technified systems were assessed for the following factors: land preparation, var., fertilization and pests; for the southern area, land preparation was eliminated and weed control was added instead. In the central Veracruz, factors affecting bean yield were, in descending order of importance: var., land preparation, and fertilization; pests did not have a significant effect. In all cases where the effect was significant, the increase corresponded to the technified level. According to the economical analysis optimum treatments were: (a) technified land preparation, improved var., no fertilizer or pest control; (b) traditional land preparation, improved var., no fertilizer or pest control. Factors affecting bean yield in the southern Los Tuxtlas in spring-summer were, in descending order of importance: var., fertilization, weeds, and pests. The effects of the technified level were significant at 2 sites for var. but in one, the traditional var. was superior in yield to the improved var. Technified fertilization significantly increased yield and traditional pest and weed control was the best. Results of the economical analysis indicated that optimum treatments were: (a) improved var. (Jamapa), without fertilizer or pest control, and 2 weedings; (b) improved var. (Negro Veracruz) without fertilizer, with pest control and 1 weeding. In southern Los Tuxtlas in fall-winter, the factor most affecting bean yield of importance, was var. followed by weeds; the factors fertilization and pests did not show significant effects. Improved var. Negro Veracruz and 2 weedings increased yields. Results of the economic analysis indicated that the optimum treatment was improved var. (Jamapa), without fertilizer or pest control, and 1 weeding. In southern Los Tuxtlas in fall-winter and for relay cropping with maize, the factor most affecting bean yield was var. followed by fertilization. Pest and weeds did not have a significant effect. Factors that positively influenced yield were those of the technified level. The economic analysis indicated that the optimum treatment was improved var. (Jamapa), with fertilizer, without pest control, and 1 weeding. In southern Cuenca Baja del Papaloapan in fall-winter, the factors most affecting bean yield was fertilization followed by var. Pests and weeds did not have significant effects. Optimum treatment proved to be improved var. (Jamapa) with fertilizer, without pest control, and 1 weeding. (Extracted from author's summary. Trans. by L.M.F.) D02

0436

20975 EDJE, O.T. 1984. Effects of planting patterns on bean yield. Bean Improvement Cooperative. Annual Report 27:147-148. Engl. [Bunda College of Agriculture, P.O. Box 219, Lilongwe, Malawi]

Phaseolus vulgaris. Planting. Spacing. Cultivars. Yields. Yield components. Malawi.

Studies were carried out at Bunda College of Agriculture, Lilongwe, Malawi, to evaluate the effects of planting patterns on bean yields. The trial involved 4 determinate cv. (253/1, 1196, P692, and P402) and 3 planting patterns (single row, 2 rows, and hill planting). Seed yield, pooled over cv., was 1741, 1891, and 1727 kg/ha for 1 row, 2 rows, and hill planting, resp. The no. of pods/m^2 for the 3 planting patterns was 101.0, 107.1, and 101.0, resp. (Summary by T.F.) D02

0437

20927 EDJE, O.T. 1984. Effects of trellis height on seed yield and quality of dry beans. Bean Improvement Cooperative. Annual Report

27:142-144. Engl., 1 Ref. [Bunda College of Agriculture, P.O. Box 219, Lilongwe, Malawi]

Phaseolus vulgaris. Indeterminate cultivars. Yields. Stake. Yield components. Seed characters. Seed production. Malawi.

A vigorous indeterminate dry bean cv., 499/5, was planted at Bunda College of Agriculture, Lilongwe, Malawi, during the 1982-83 crop season to evaluate the effect of trellis height on seed yield and quality. Trellis treatments were: control (plants trained among themselves on the ridge), and trellis 1, 2, 3, and 4 m tall. Canopy height, DM, LAI, leaf fall, yield and yield components, seed quality and seed germination were determined. Seed quality was assessed visually into 3 groups (high, medium, and low). Seedling evaluation was done according to the rules of International Seed Testing Association. Seed yield increased significantly with trellis height. The correlation coefficients between trellis height and seed yield and between pods/m^2 and seed yield were 0.91 and 0.96, resp., indicating that 82.8% of the difference in seed yield could be attributed to differences in trellis height. Seed quality also increased with trellis height due to the higher pod clearance above the ground and the more opened canopy. (Summary by T.F.) D02

0438

22118 EDJE, O.T.; MUGHOGHO, L.K.; AYONOADU, U.W.U. 1971. Effects of row width and plant spacing on the yield of canning beans. Lilongwe, University of Malawi. Bunda College of Agriculture. Research Bulletin no.2. pp.29-36. Engl., Sum. Engl., 7 Refs., Illus.

Phaseolus vulgaris. Planting. Spacing. Yields. Agronomic characters. Dry matter. Yield components. Diseases and pathogens. Malawi.

Yield, agronomic characters, DM accumulation and distribution of canning bean cv. No. 1196 were studied at 3 row widths (30, 45, and 60 cm) and at 3 spacings (5, 10, and 15 cm) between plants in a trial carried out at Bunda, Malawi. Yield increased with decrease in row width and also with decrease in plant spacing. Plant height decreased with increased row width and plant spacing. However, the contrary was true for both the no. of pods/plant and the no. of seeds/pod. There was a highly significant interaction between row width and plant spacing. The narrowest row width and the closest plant spacing had the highest yield (997.9 kg/ha). Generally, DM increased with increase in row width and with time after planting, while the contrary was true for plant spacing. Yield was not maximized in this expt. due to disease and pest attack, mainly anthracnose (Colletotrichum lindemuthianum), rust (Uromyces appendiculatus), and angular leaf spot (Isariopsis griseola). (Author's summary) D02

0439

21374 O FEIJAO no programa da extensao rural de Angola. (Beans in the Angolan rural extension program). Reordenamento no.33:26-29. 1974. Port., Illus.

Phaseolus vulgaris. Intercropping. Land preparation. Planting. Spacing. Cultivars. Fertilizers. Weeding. Uromyces phaseoli. Colletotrichum lindemuthianum. Angola.

Beans are an important crop in the Central High Plains of Angola. Yields are low, averaging about 150-250 kg/ha. Recommendations are presented on the growing of beans, including the choice of good var., the use of fertilizers, and the practice of crop rotation. The most important diseases

and their control are mentioned. (Summary by Abstracts on Tropical Agriculture) D02

0440

19943 GONZALEZ, A.R.; EDWARDS, K.M. 1980. Harvesting beans at the semi-dry stage. Arkansas Farm Research 29(4):4. Engl.

Phaseolus vulgaris. Harvesting. Timing. Water content. Seeds. Cultivars. Processing. Storage. USA.

The feasibility of harvesting, handling, and processing Phaseolus vulgaris seeds before they reach dry stage and become susceptible to rainfall-induced deterioration was investigated; factors considered were shelling of the pods, postharvest handling, processing quality, and consumer acceptability. Kidney bean cv. Redkloud, pinto bean cv. UI-111, and small white bean cv. Aurora were tested; these shelled well at the semidry stage, and when harvested semidry could be stored for 24 h at 27°C before processing, without affecting quality. Beans harvested semidry could not generally be stored so well as dry beans but the need to soak dry beans prior to processing could be eliminated. (Summary by Field Crop Abstracts) D02

0441

21727 KAREL, A.K. 1982. Investigations on the effect of time of planting on insect pests and yield of common beans, Phaseolus vulgaris L. Morogoro, Tanzania, University of Dar es Salaam. Department of Crop Science. 4p. Engl., 4 Refs. [Univ. of Dar es Salaam, Dept. of Crop Science, P.O. Box 643, Morogoro, Tanzania]

Paper presented at the Tanzanian Bean Researchers' Meeting at the Faculty of Agriculture, University of Dar es Salaam, Morogoro, 1982.

Phaseolus vulgaris. Planting. Timing. Plant injuries. Ootheca bennigseni. Maruca testulalis. Heliothis zea. Thysanoptera. Leaves. Pods. Yields. Growth. Tanzania.

An expt. was carried out at the Faculty of Agriculture Crop Museum, Morogoro, Tanzania, to determine the optimum time of planting of beans. Var. Selian Wonder was used in a randomized block design with 4 replications. Planting was done on 6 different dates at weekly intervals starting April 7, 1982. Damage by Ootheca bennigseni, thrips (Taeniothrips sjostedti), and pod borers (Maruca testulalis and Heliothis armigere) was assessed. Damage to leaves by Ootheca was heavier in beans planted on the 1st dates compared with those planted on later dates. Infestation by flower thrips was moderate during the 1st 2 plantings; however, in later planted beans infestation was high. Damage to pods by pod borers was low in early planted beans but higher in later planted beans, reducing pod and seed yields. Pod and seed yields for the 1st 2 planting dates were good (754 and 826 kg seed/ha and 1061 and 1174 kg pods/ha, resp.). Seeds yields of beans planted on later dates were drastically reduced. In general, the best time for planting beans should be within 15 days from the onset of rains. (Summary by F.G. Trans. by L.M.F.) D02

0442

21712 KENYA. MINISTRY OF AGRICULTURE. 1975. Bean production. Bean Research Project. Thika, Crop Advisory Leaflet no.2. 5p. Engl.

Phaseolus vulgaris. Cultivars. Land preparation. Planting. Timing. Spacing. Fertilizers. N. P. Weeding. Harvesting. Threshing. Marketing. Seed treatment. Kenya.

Recommendations are given on bean cultivation in Kenya and include the following aspects: locations; cv.; land preparation; planting time, depth, and density; amount of seed and seed treatment; fertilizers; weed and disease control; harvesting; threshing; and marketing. Large-scale production costs of Mexican 142 beans are compared (in table form) with those of wheat in marginal wheat areas. (Summary by F.G. Trans. by L.M.F.) D02

0443

21713 KENYA. MINISTRY OF AGRICULTURE. 1970. Bean Research Project. Advisory leaflet for growing Mexican 142 beans. Thika. 2p. Engl.

Phaseolus vulgaris. Land preparation. Planting. Timing. Spacing. Seed treatment. Fertilizers. N. P. Weeding. Harvesting. Threshing. Marketing. Yields. Kenya.

Recommendations are given on the cultivation of Mexican 142 beans in Kenya and include the following aspects: locations; land preparation; planting time, density, and depth; amount of seed and seed treatment; fertilizers; weed control; pests and diseases; harvesting; threshing; marketing; and yield. (Summary by F.G. Trans. by L.M.F.) D02

0444

21394 KENYA. MINISTRY OF AGRICULTURE. 1975. Grain Legume Project. Thika, National Horticultural Research Station. Interim Report no.7. Long Rains 1975. 28p. Engl., 9 Refs.

Phaseolus vulgaris. Planting. Timing. Spacing. Fertilizers. N. P. K. Herbicides. Weeding. Uromyces phaseoli. Disease control. Selection. Resistance. Cultivars. Colletotrichum lindemuthianum. Kenya.

Results of expt. carried out in different zones of Kenya (Katumani, Kisii, Kakamega, Lanet, Embu, Thika, and Tigoni) are presented. Trials included planting time and density, fertilization, weeding, use of herbicides, control of anthracnose (Colletotrichum lindemuthianum), lab. screening for cv. resistant to anthracnose. A bean survey was conducted to identify production problems. Optimum plant density appeared to be between 200,000-300,000 plants/ha in Embu and Lanet. At Thika, Mex. 142 outyielded K 74 and there was no clear response to plant density; however, at Kakamega, a significant response to spacing was reported. K 74 outyielded Mex. 142 in Kakamega and Tigoni. The advantage of planting beans at the onset of the rainy season was clearly demonstrated. A significant response to N was reported. Responses to K and P were not significant and, at some sites, yield depressions were observed. Fungicide treatment suppressed the development of anthracnose (40 vs. 75% infection in the control). Its effectiveness, however, was not reflected in yields. Line YCT 3 was resistant to 4 isolates of C. lindemuthianum with undifferentiated physiotypes. (Summary by I.B.) D02

0445

21022 MASAYA S., P.N. 1981. El cultivo del fríjol en el suroriente de Guatemala. (Growing beans in southeast Guatemala). Cámara del Agro (Guatemala) 3(8):10-12,14-15. Span., 1llus. [Inst. de Ciencia y Tecnología Agrícola, Guatemala City, Guatemala]

Phaseolus vulgaris. Production. Intercropping. Yields. Cultivars. Land preparation. Spacing. Planting. Fertilizers. Weeding. Bemisia tabaci. Empoasca. Apion godmani. Insect control. Technological package. Guatemala.

Recommendations are given for bean growing in SE Guatemala, including production problems, intercropping systems, soil and water requirements, sowing, spacing, soil preparation, fertilizer application, and control of pests and weeds. (Summary by Food Science and Technology Abstracts) D02

0446

21553 MAYONA, C.M. 1982. Weeding intensity in Phaseolus beans: progress report. Mbeya, Tanzania, Uyole Agricultural Centre. 6p. Engl., 4 Refs. [The Uyole Agricultural Centre, P.O. Box 400, Mbeya, Tanzania]

Report presented to the Bean Researchers' Meeting, Morogoro, 1982.

Phaseolus vulgaris. Weeding. Timing. Yields. Cultivars. Tanzania.

In 1981-82 a study was initiated to determine the critical stage of weed competition in the Southern Highlands of Tanzania (Mbimba, Uyole, and Mitalula), as well as optimum and economical weeding schedules for higher bean yields. A split plot design was used, with 14 weeding regimes as main plots, 2 cv., Kabanima and T3, as subplots, and 3 replications. Partial data are given. Yield differences between treatments were marked. A single weeding at 30 days after emergence produced 260 and 320 kg seed/ha more than 3 weedings started from day 28 after emergence, for Kabanima and T3, resp. Early weeding from 7 to 14 days after emergence (at weekly intervals) gave the highest yields at Uyole: Kabanima yielded 2130 and 2400 and T3, 1960 and 1950 kg/ha, resp., for these 2 weeding treatments. Weeding after 30 days from emergence gave low yields irrespective of cv. and frequency. At Uyole, frequency of weeding is important for high yields provided it is done earlier than 21 days after emergence. (Summary by I.B.) D02

0447

21551 MOSHA, C.J.; MOLLEL, S.L.; SAMBAI, L.M. 1980. Weed control in beans (Phaseolus vulgaris L.) by herbicides. Arusha, Tanzania, Tropical Pesticides Research Institute. Miscellaneous Report no.985. 9p. Engl., Sum. Engl., 8 Refs.

Phaseolus vulgaris. Weeding. Herbicides. Yields. Growth. Weeds. Tanzania.

Three preemergence, 1 postemergence, and 1 preplant herbicides were applied to beans at the Tropical Pesticides Research Institute farm during the long rains of 1978 to assess their effect on weed density and crop yield. EPTC preplant incorporated at a rate of 2.0 and 4.0 kg a.i./ha gave the best performance in weed control. Both rates caused some stunting of the bean plants which recovered after some time. EPTC treatments, however, gave poor bean yields. Alachlor at 1.5 kg a.i./ha, pendimethalin at 1.0 kg a.i./ha, and dinitroamine at 0.6 kg a.i./ha gave fair performance in weed control. No herbicide controlled Argemone mexicana satisfactorily. (Author's summary) D02

0448

20814 QUINTERO F., E. 1982. Respuesta del rendimiento y sus componentes al espaciamiento de siembra en fríjol. (Phaseolus vulgaris L., var. ICA-Tuí). (Response of yield and yield components to planting distance in bean var. ICA-Tuí). Centro Agrícola 9(2):9-25. Span., Sum. Span.,

Engl., 19 Refs., Illus. [Facultad de Ciencias Agrícolas, Univ. Central de las Villas, Santa Clara, Las Villas, Cuba]

Phaseolus vulgaris. Spacing. Planting. Yields. Yield components. Leaf area. Growth. Cuba.

In Jan. 1980 an expt. was carried out at the U. Central de Las Villas, Cuba, to determine the response of bean var. ICA-Tui when planted at different distances. A split plot design was used with 4 treatments. Distances of 90, 70, 45, and 35 cm between furrows and of 30, 20, 10, and 5 cm between plants were used, 1 or 2 seeds being sown per site. Planting distances affected yield and yield components and growth parameters. Highest yields were obtained at the 5- and 10-cm distance with 1 seed/site and with any of the planting distances used with 2 seeds/site. Each one of these aspects is analyzed in detail. (Author's summary) D02

0449

20055 SCHOONHOVEN, A. VAN 1981. Summary of country reports. In Regional Workshop on Potential for Field Beans in Eastern Africa, Lilongwe, Malawi, 1980. Proceedings. Cali, Colombia, Centro Internacional de Agricultura Tropical. pp.201-206. Engl.

Phaseolus vulgaris. Seed characters. Cultivation. Planting. Spacing. Harvesting. Trade. Storage. Colletotrichum lindemuthianum. Ophiomyia phaseoli. Burundi. Kenya. Malawi. Rwanda. Tanzania. Uganda. Zambia.

The 7 country reports (Burundi, Kenya, Malawi, Rwanda, Tanzania, Uganda, and Zambia) are summarized as follows: importance of beans, bean types produced, production environment and system, factors limiting production, and research achievements. It is concluded that to insure a growing population with a steady supply of adequate affordable protein, rapid solutions must be found to overcome the bean production constraints outlined. (Summary by F.G.) D02

0450

21209 ZOEBL, D. 1984. Multiplication ratio of beans and its implication for agronomy trials: Kenyan annotations 1. Bean Improvement Cooperative. Annual Report 27:181-182. Engl., 4 Refs. [Grain Legume Project, National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Yields. Kenya.

The multiplication ratios (total yield of marketable product divided by the planting material wt.) of several important grain crops are given. The multiplication ratio for food beans is about 15 in Kenya for good farmers and only 5 for the av. farmer. The causes of low yield potentials of pulse crops are mentioned and the implication of low multiplication ratio for the analysis of agronomy and density trials is explained. (Summary by T.F.) D02

See also 0420 0426 0453 0454 0456 0532 0535 0536 0541 0543

D03 Cultivation Systems: Intercropping, Rotational Crops

0451

21590 EDJE, O.T.; LAING, D.R. 1982. Physiological aspects of maize and beans in monoculture and in association. Summary. In Keswani, C.L.;

Ndunguru, B.J., eds. Symposium on Intercropping in Semi-Arid Areas, 2nd., Morogoro, Tanzania, 1980. Proceedings. Ottawa, Canada, International Development Research Centre. pp.69-70. Engl.

Phaseolus vulgaris. Intercropping. Zea mays. Climbing beans. Dry matter. Leaves. Stems. Pods. Growth. Yields. Colombia.

The growth of maize and beans in monoculture and in association was studied in a field trial conducted in 1977 at Palmira (Colombia), near CIAT, to obtain information on how these crops compete with each other. A brachytic maize var., ICA H 210, and a climbing bean var., P 589, were used under irrigation in a randomized block design with 4 replications. Treatments were: maize monoculture, bean monoculture, and maize and bean in association on the same plot. Total DM of beans (monoculture or in association) increased almost linearly with time until 86 days after planting; thereafter it declined. DM distribution in leaves, stems, and pods of bean monoculture at 58 days after planting was 41.0, 33.0, and 4.1%, resp., whereas DM distribution was 33.0, 45.0, and 1.5%, resp., for intercropped beans for the same period. Total no. of nodes/m^2 for bean in monoculture and in association was 786 and 618, resp. Bean yields in association with maize were reduced by 51%. (Summary by T.F.) D03

0452

21941 FISHER, N.M. 1974. A comparison of the relative seed yields of eight bean cultivars in pure stand and in mixtures with maize. Bean Improvement Cooperative. Annual Report 17:38-40. Engl.

Phaseolus vulgaris. Cultivars. Intercropping. Zea mays. Yields. Kenya.

An expt. was conducted at the Faculty of Agriculture Field Station (Kabete, Kenya), to evaluate relative seed yields of beans grown in pure stands and in association with maize (Hybrid 511). Eight bean cv. (Masterpiece, Mwezi Moja, Canadian Wonder, Long Tom, Mexican 142, Saxa, Contender, and Top Crop) were used as split plot treatments and the cropping system as the main plot treatment. There were 6 replicates, each subplot consisting of a row of beans 10 m long. The mean yields of all bean cv. in pure stand and in mixed crop were, resp., 2000 and 450 kg/ha. There was no interaction between cv. and cropping system on the basis of seed yield/ha. Cv. Masterpiece, Mwezi Moja, and Canadian Wonder gave the highest yields in both cropping systems, averaging 2300 kg/ha. The results did not suggest any great difference between the relative performance of the cv. in both systems. (Summary by T.F.) D03

0453

20084 GLIESSMAN, S.R.; ALTIERI, M.A. 1982. Polyculture cropping has advantages. California Agriculture 36(7):14-16. Engl., Illus.

Phaseolus vulgaris. Intercropping. Insect control. Weeding. Yields. USA.

Results are given of trials with several vegetables grown either in monoculture or in 2-vegetable polycultures, either kept weed-free for various periods or weedy all season. Collards interplanted with green beans suffered less damage from flea beetles (Phyllotreta cruciferae) and cabbage aphids (Brevicoryne brassicae) than in monocultures, and pest densities were lower in weedy cultures; leaf no./m^2, however, were highest with weed-free polyculture. Bean yields were highest in monoculture kept weed-free for 2 wk. (Summary by Horticultural Abstracts) D03

0454

21557 HASSELBACH, O.E.; NYANGIRI, E.N. 1978. Intercropping maize and beans: the effect of cultivar, planting date and fertilizers of beans at Kisii, Kenya. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. 7p. Engl., Sum. Engl., 5 Refs.

Phaseolus vulgaris. Intercropping. Zea mays. Cultivars. Yields. Yield components. Fertilizers. Planting. Timing. Spacing. P. Kenya.

The effects of planting beans 12 days before or simultaneously with maize and the use of bean cv. with short growth cycles (Rose Coco K74 and Mwezi moja) were studied in a mixed cropping trial at Kisii, Kenya, to determine if competition influences the no. of bean pods and consequently, yields. Extra fertilizer (40 kg P/ha) was included for beans in one of the treatments and pure stands of beans and maize were planted at different densities to meet the requirements of having pure stands represented at their approx. optimum density. A 40% increase in no. of pods was obtained by planting beans 12 days before maize compared with simultaneous planting of beans and maize. The treatment failed to have a clear impact on LER, possibly due to a negative effect on maize yields. Higher seed wt. at more prolonged competition, possibly due to shade, partly offset lower yields due to fewer pods. Blight incidence was significantly less in mixed than in pure stands. A significant cv. effect was observed, but was regarded with mistrust, since cv. were obtained from different sources. (Author's summary) D03

0455

21945 INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1982. Cultures associees. (Intercropping). In _____. Compte rendu des travaux du Departement des Productions Vegetales. Exercice 1981. Rubona. pp.137-140. Fr.

Phaseolus vulgaris. Dwarf beans. Climbing beans. Intercropping. Yields. Snap beans. Rwanda.

Data are presented on cultural trials carried out with different crop associations at Rubona and Karama, Rwanda, in 1981. Results of intercropping trials at Karama (colluvium soils) and Burenge (transition soils) are given in table form. At Karama and Burenge, resp., av. yields of 1909 and 708 kg/ha (climbing bean) and of 1333 and 600 kg/ha (dwarf beans) were obtained. (Summary by I.B.) D03

0456

22242 INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1983. Les cultures associees. (Intercropping). In _____. Compte rendu des travaux du Départment Production Végétale en 1982. Rubona. pp.160-175. Fr.

Phaseolus vulgaris. Intercropping. Zea mays. Yields. Spacing. Planting. Irrigation. Seed production. Rwanda.

Results of yield trials with different intercrops carried out in 3 regions of Rwanda (A, Central-South region; B, Bugesera; and C, the high alt. region) are given. In A, highest yields were obtained by sowing maize at the beginning of Sept., followed by dwarf bean in mid-Sept. and sweet potato at the beginning of Oct. Intercropping a single row of each crop (maize, climbing beans, soybean, and sweet potatoes) had an advantage over 2-3 rows of each crop, but not over the monocrops. In B, beans monocropped at 30 x 20 cm yielded 1067 kg/ha and sorghum yields were 1848 kg/ha vs.

1818 kg/ha in monoculture when intercropped with beans (289 kg/ha). All bean var. were economically favored when intercropped with maize var. Katumani, in relation to monocropped beans. Bean cv. Munyu seemed to be the best adapted. Best spacings were 30 cm between bean plants and 55 cm between bean-maize rows, and 20 cm between bean plants and 70 cm between bean-maize rows; maize yields were 2167 and 2021 kg/ha and bean yields, 833 and 908 kg/ha, resp. In C, yields were higher in sweet potato-bean-maize intercropping (LER = 2.9). In a comparative var. trial under irrigation, the 10 bean var. tested did not differ significantly from the control (Bayo 158); yields were close to 3500 kg/ha in the 1st season of 1982. Highest yields in the 2nd cropping season were for var. 6887, 7095, and Yosephina (4662, 4192, and 3877 kg/ha, resp.). A table on seed production and release is included. (Summary by I.B.) D03

0457

21913 MANSFIELD, J.E. 1982. Mixed cropping in Tabora region. Summary. In Keswani, C.L.; Ndunguru, B.J., eds. Symposium on Intercropping in Semi-Arid Areas, 2nd., Morogoro, Tanzania, 1980. Proceedings. Ottawa, Canada, International Development Research Centre. pp.158-159. Engl.

Phaseolus vulgaris. Snap beans. Intercropping. Yields. Tanzania.

Upland annual rainfed crops grown within Tabora region (Tanzania) are mentioned. French beans and other legumes are found in mixed croppings which vary in combination from year to year. It is a highly flexible system that has developed over the years and it is highly resistant to changing to monocropping as far as family food crop production is concerned. Yields show a high C.V. (Summary by I.B.) D03

0458

21911 OKIGBO, B.N. 1973. Grain legumes in the farming systems of the humid lowland tropics. In IITA Grain Legume Improvement Workshop, 1st., Ibadan, Nigeria, 1973. Proceedings. Ibadan, International Institute of Tropical Agriculture. pp.211-223. Engl., 12 Refs., Illus.

Phaseolus vulgaris. Uses. Seed. Relay crops. Rotational crops. Nigeria.

The place of legumes in traditional farming systems of tropical Africa, especially Nigeria, is discussed. Prevailing farming systems are: shifting cultivation, bush fallow, rudimentary sedentary cultivation, intensive sedentary cultivation as compound farming or terrace farming. The importance of legumes in the av. diets of the population is stressed. Phaseolus vulgaris seeds are utilized as food; they are a minor crop. New potential uses would be as livestock feed, green manure, and for control of erosion. Beans are intercropped in relay or multiple cropping patterns with or without overlapping growing periods, or as a sole crop in rotational cropping. Problems in realizing the full potentialities of grain legumes in the humid tropics are outlined. (Summary by I.B.) D03

0459

22503 OKIGBO, B.N. 1983. Plants and agroforestry in land use systems of West Africa. In Huxley, P.A., ed. Plant research and agroforestry; proceedings of a Consultative Meeting. Nairobi, Kenya, International Council for Research in Agroforestry. pp.25-41. Engl., Sum. Engl., 9 Refs. [IITA, Oyo Road, P.M.B. 5320, Ibadan, Nigeria]

Phaseolus vulgaris. Cultivation systems. Africa.

The characteristics of the farming systems found in West Africa are briefly outlined and the shortcomings of current land development strategies noted. These include inadequate emphasis on food production research resulting in a continuing expansion of the area under cultivation at the expense of forest resources which are, themselves, increasingly needed for timber and, especially fuel wood. A solution is to develop integrated land use systems which involve both woody perennials and herbaceous crops and/or grasses. Some suggestions are made on how existing land use systems can be improved in this way. (Author's summary) D03

0460

21799 RAO, Y.P.; MUGHOGHO, L.K.; EDJE, O.T.; MSUKU, W.A.B. 1977. Disease filtration in beans. Bean Improvement Cooperative. Annual Report no.20:54-57. Engl., 2 Refs.

Phaseolus vulgaris. Seed production. Irrigation. Pseudomonas phaseolicola. Disease control. Malawi.

The production of disease-free seed under irrigation (disease filtration) is discussed. Three seed lots of bean cv. 253/1 showing different degrees of infection (apparently healthy, apparently infected, and heavily infected) were grown at the Bunda College Farm (Malawi) during the dry season (Aug.-Oct. 1975) in a 20 x 15 m plot with 91 x 10 cm spacing; basal fertilization and flood irrigation were applied. The seeds produced from these original lots (filtered seeds) were planted on Dec. 10th, 1975. The plants in all 6 treatments were free from infection up to 2 wk. from planting. However, by the 3rd wk., nearly all plants in the apparently infected and heavily infected plots showed halo blight (Pseudomonas phaseolicola) infection, with only traces of infection in the apparently healthy plot and virtually no infection in all plots planted with filtered seed. Disease filtration could be one method for production of disease-free bean seed for commercial purposes. (Summary by I.B.) D03

0461

22504 REDHEAD, J.F.; MAGHEMBE, J.A.; NDUNGURU, B.J. 1983. The intercropping of grain legumes in agroforestry systems. In Huxley, P.A., ed. Plant research and agroforestry; proceedings of a Consultative Meeting. Nairobi, Kenya, International Council for Research in Agroforestry. pp.117-124. Engl., Sum. Engl., 12 Refs. [Division of Forestry & Dept. of Crop Science, Univ. of Dar es Salaam, Morogoro, Tanzania]

Phaseolus vulgaris. Intercropping. Tanzania.

Results of trials carried out in Morogoro, Tanzania, to try out grain/legume intercropping are examined. Potential legume species include bean, cowpea, groundnut, pigeon pea, and soybean among others. Trees species should have one or more of the following characteristics: fast growth, leaf shedding during the wet season, straight form and dominant leader growth, high value crop, use as fodder, and ability to fix N. Trials carried out in 1978 assessed the intercropping of Eucalyptus melliodora with maize, sorghum, and beans, and in 1980, E. camaldulensis, Acacia albida, and Leucaena leucocephala were each intercropped with maize and beans at different tree spacings. Future research proposals in this area are also presented. (Summary by L.M.F.) D03

0462

20187 STOETZER, H.A.I.; OMUNYIN, M.E. 1984. Microclimatological observations in bean mono-crops and associations with maize. Bean Improvement Cooperative. Annual Report 27:96-97. Engl., 2 Refs. [Grain Legume Project, National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Relative humidity. Temperature. Diseases and pathogens. Intercropping. Zea mays. Kenya.

The effect of microclimatological factors on the incidence of diseases in beans in monoculture and in association with maize was studied at Thika, Kenya, during the long rains of 1981 and the short rains of 1981-82. RH and temp. were recorded with thermohydrographs placed between the bean rows. The results showed that the higher RH and more moderate temp. in the bean environment of the mixed cropping system do not explain the lower incidence of a no. of diseases, which should be favored by these environmental conditions of beans in association with maize. Antagonistic factors may therefore delay the attack and spread of diseases. (Summary by T.F.) D03

See also 0415 0425 0439 0535 0540 0543 0546

D04 Seed Production

0463

20082 CACKETT, K.E. 1965. Winter production of seed beans in the lowveld. Rhodesia Agricultural Journal 62(3):1-5. Engl., 4 Refs., Illus.

Phaseolus vulgaris. Seed production. Seed color. Cultivars. Fertilizers. N. Nodulation. Spacing. Irrigation. Ophiomyia phaseoli. Insect control. Chemical control. Uromyces phaseoli. Rhodesia.

Beans for seed production are an important winter crop of irrigated land in Rhodesia. The seed is exported, demand being primarily for white seed. Results of research conducted in the Sabi Valley are given: some white-seeded var. were found to yield as much as colored var.; N fertilizer should be applied at planting; optimum plant populations vary from 250 to 375,000/ha at a high yield level to 375-625,000/ha under poor conditions. Overhead irrigation is preferable to surface irrigation; when the entire root zone is wetted to field capacity at planting, the crop requires an additional 300 mm of water until maturation. Melanagromyza phaseoli was controlled by seed treatment with endrin or dieldrin. The major disease observed was rust (Uromyces phaseoli); however, other diseases may become troublesome under certain conditions. (Summary by Abstracts on Tropical Agriculture) D04

0464

21706 THE SEEDS (regulation of standards) Act, 1973. The Gazette of the United Republic of Tanzania 57(7):39-72. 1976. Engl.

Phaseolus vulgaris. Seed production. Seed characters. Legal aspects. Tanzania.

Seed regulations for 1976 (Tanzania) are presented: interpretation of terminology, exemptions, grades, grade names, and standards set out in schedules; restrictions, marking and labelling, inspection, sampling. For Phaseolus vulgaris data is given on min. wt. for submitted sample, purity

analysis, and examination for noxious weed seed and foreign matter (1000, 700, and 1000 g, resp.). The following standards for basic, registered, and certified bean seed are mentioned: min. pure seed, 98% for all 3 grades; total weed seeds, 0, 2, and 4/kg; other seeds, 0, 0, and 2/kg; inert matter, 2.0% for all 3 grades; other var. or classes, 0.01, 0.05, and 0.10%, resp. Max. % of prohibited noxious weeds is 0 for all 3 grades. Min. germination is 80.0% for all 3 grades. Max. % of bacterial blight (Xanthomonas phaseoli) and anthracnose (Colletotrichum lindemuthianum) is 0 for all 3 grades. BCMV % are 0, 0.5, and 0.5, resp., and halo blight (Pseudomonas phaseoli) % are 0, 0.5, and 1.0, resp. (Summary by I.B.) D04

0465

21545 TANZANIA. OFFICIAL CERTIFICATION AGENCY. 1978. Rules, regulations and certification procedures. Dar es Salaam. 28p. Engl.

Phaseolus vulgaris. Seed production. Legal aspects. Cultivation. Tanzania.

Rules, regulations, and seed certification procedures of the Tanzania Official Certification Agency are presented, including: definition of seed certification; purpose of certification; seed production committee; elegibility requirements for certification of crop var.; elegibility, qualification, and responsibilities of growers; definition of seed grades; limitations of generations; establishment of source of seed; deadline dates for applications and procedures; field management and isolation; fees and charges; handling of crop prior to inspection; field inspection; weeds; off-types; field and seed standards for maize, wheat, oats, barley, sorghum, soybeans, rice, millet; harvesting, threshing, drying, labelling and storing; processing of seed; sampling lots and storage of processed seed; seed analysis for certification; bagging requirements; tagging, labelling and sealing; misuse of certification privileges, and inter-agency certification. Standards applicable to beans regarding certified % grade are: pure seed (min. of 98%); total weed seeds (4/kg); other crop seeds (2/kg); inert matter (2.0); other var. or classes (0.10); prohibited noxious weeds (none); restricted noxious weeds (none); moisture (12.0); germination (min. of 80.0); bacterial blight-infected seed (none); anthracnose-infected seed (1.0); and common bean mosaic infected-seed (5.0). (Summary by I.B.) D04

E00 PLANT PATHOLOGY

0466

21326 ORMROD, D.P. 1982. Air pollutant interactions in mixtures. In Unsworth, M.H.; Ormrod, D.P., eds. Effects of gaseous air pollution in agriculture and horticulture. London, Butterworth Scientific. pp.307-331. Engl., 78 Refs. [Univ. of Guelph, Ontario, Canada N1G 2W1]

Phaseolus vulgaris. Air pollution. Plant physiological disorders. Plant injuries. Mechanical damage. Plant habit. Enzymes. Metabolism. Photosynthesis. Plant tissues. Leaves. Roots. Composition. Biochemistry. Water absorption. Canada.

Air pollution mixtures in the atmosphere including SO_2 + NO_2, O_2 + N_2, CO_2 + NO_2, HF + SO_2, and SO_2 + NH_3, their concn. and effects on tobacco, lucerne, brome grass, soybean, oats, peas, Kentucky bluegrass, groundnut, sunflower, cocksfoot, Italian ryegrass, timothy, Phaseolus vulgaris, and 10 horticultural plants are tabulated. Plant and cv. comparisons, additivity,

synergism and antagonism to mixtures, duration and pattern of exposure, visible injury symptoms, growth and yield responses, root effects, environment interactions, influence of leaf age and growth stage and modes of action including enzymes and metabolism, chemical composition, photosynthesis, tissue permeability, plant water status and stomata, histology, anatomy, and morphology are reviewed. (Summary by Field Crop Abstracts) E00

0467

21560 STOETZER, H.A.I.; ODHIAMBO, G.W. 1983. How to control plant disease. Kenya Farmer 1983:23-24. November 1983. Engl., Illus. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Diseases and pathogens. Disease control. Kenya.

Guidelines to controlling plant diseases by field management techniques and/or chemicals are given. Several general principles and methods of disease control are highlighted. The following disease control practices are briefly analyzed: use of disease-free planting material, crop rotation, field sanitation, seed treatment, chemical control, and use of resistant or tolerant cv. (Summary by I.B.) E00

E02 Bacterioses

0468

22134 ALLEN, D.J. 1982. Bean diseases. In _____. The pathology of tropical food legumes; disease resistance in crop improvement. New York, Wiley & Sons. pp.150-187,301-395. Engl., 180 Refs., Illus.

Phaseolus vulgaris. Etiology. Symptomatology. Disease control. Crop losses. Uromyces phaseoli. Colletotrichum lindemuthianum. Isariopsis griseola. Pseudomonas phaseolicola. Xanthomonas phaseoli. Xanthomonas phaseoli var. fuscans. Bean common mosaic virus. Bean golden mosaic virus. Resistance. Plant breeding. Integrated control. Africa.

The evolution, adaptation, and production of Phaseolus are discussed. The importance of pathogens in the production of beans, and the potential for increased crop yield through disease management are emphasized. The etiology, geographical distribution, and relative economic importance of fungal and viral diseases are summarized in table form. Symptomatology, potential losses, and control of major bean diseases are analyzed in detail: rust (Uromyces phaseoli), anthracnose (Colletotrichum lindemunthianum), angular leaf spot (Isariopsis griseola), BCMV, BGMV, halo blight (Pseudomonas phaseolicola), common blight (Xanthomonas phaseoli), and fuscous blight (X. phaseoli var. fuscans). Disease resistance and improvement of beans are discussed. The best strategy for the successful management of pathogens in tropical subsistence agriculture is likely to be integrated control which involves the production of clean seed, use of good husbandry (including crop rotation), and the exploitation of genetic diversity. (Summary by I.B.) E02

0469

21013 EBBELS, D.L.; ALLEN, D.J. 1979. A supplementary and annotated list of plant diseases, pathogens and associated fungi in Tanzania. Kew, Surrey, England, Commonwealth Mycological Institute. Phytopathological Paper no.22. 89p. Engl., Illus.

Phaseolus vulgaris. Isariopsis griseola. Alternaria. Xanthomonas phaseoli. Xanthomonas phaseoli var. fuscans. Bean common mosaic virus. Fusarium oxysporum. Corticium rolfsii. Mycovellosiella phaseoli. Symptomatology. Tanzania.

An updated checklist of plant diseases caused by fungi, viruses, bacteria, algae, and nematodes found in Tanzania is given. Information on disease symptoms, distribution, alt. range, and seasonal occurrence is provided as well as lists of known collections. Relevant literature is indicated where possible. Included in this list are the diseases that attack Phaseolus vulgaris: angular leaf spot (Isariopsis griseola), leaf spot (Alternaria sp.), common bacterial blight (Xanthomonas phaseoli), fuscous blight (X. phaseoli var. fuscans), root rot (Corticium rolfsii), BCMV, white leaf spot (Mycovellosiella phaseoli), and wilt (Fusarium oxysporum). (Summary by J.R.) E02

0470

20047 HALE, C.N.; SHANKS, J.C. 1983. The halo blight bacterium inhibits nodulation of dwarf beans. Plant Science Letters 29:291-294. Engl., Sum. Engl., 13 Refs., Illus.

Phaseolus vulgaris. Pseudomonas phaseolicola. Rhizobium phaseoli. Strains. Inoculation. Nitrogen-fixing bacteria. Nitrogen fixation. Nodulation. Roots. New Zealand.

Infection of dwarf bean cv. Seminole with a toxin-producing strain of the halo blight organism, Pseudomonas syringae pv. phaseolicola, severely reduces nodulation by Rhizobium phaseoli, whereas infection with a toxin nonproducing mutant does not. In vitro tests suggest that phaseolotoxin produced by the pathogen does not have a direct effect on the rhizobia. (Author's summary) E02

0471

20073 SOUTH AFRICA. DEPARTMENT OF AGRICULTURAL TECHNICAL SERVICES. 1970. Beans. In _____. The Horticultural Research Institute. Pretoria. p.6. Engl.

Phaseolus vulgaris. Snap beans. Cultivars. Selection. Pseudomonas phaseolicola. Xanthomonas phaseoli. Xanthomonas phaseoli var. fuscans. Disease control. Uromyces phaseoli. South Africa.

A brief overview of different aspects related to green bean research and production in South Africa is presented. Cv. trials concentrate on evaluating the materials most suitable for the main growing areas and particular attention is given to yield, stringiness, pod color and shape, and resistance to anthracnose (Colletotrichum lindemuthianum), common blight (Xanthomonas phaseoli), and rust (Uromyces appendiculatus). Only government certified seed is recommended for planting as halo blight (Pseudomonas phaseolicola), common blight (X. phaseoli) and fuscous blight (X. phaseoli var. fuscans) are all seed-transmissible. These diseases can be prevented by planting early or late in the season; spraying with copper oxychloride is also effective. Var. Seminole and Contender are resistant to both halo and common blights. If rust symptoms appear before flowering, plants should be dusted with a mixture of dithiocarbamate and S. (Summary by EDITEC) E02

See also 0409 0429 0477 0538 0552 0554

E03 Mycoses

0472

21377 AHI, M.A. 1980. Glasshouse experiment on seedling blight of fasulia caused by Macrophomina phaseoli (Maubanc) Ashby. In Ed-Damer, Sudan. Hudeiba Research Station. Annual Report 1973-1974. Ed-Damer. pp.93-94. Engl.

Phaseolus vulgaris. Macrophomina phaseoli. Isolation. Inoculation. Symptomatology. Sudan.

The Hudeiba Research Station (Sudan) received samples of bean seedlings infected with ashy stem blight from the research substation at Khashm El Girba in Oct. 1972. All isolates from these samples gave Macrophomina phaseoli. Twelve pots were filled with Gezira soil and then sterilized at 160°C for 3 h; 6 of these pots were infected with cultures of M. phaseoli and 6 were left as controls. Each pot was planted with 5 sterilized bean seeds in Nov. 1972 and the expt. was repeated in Jan. and April of 1973. Typical symptoms of ashy stem blight were observed in infected pots. (Summary by F.G. Trans. by L.M.F.) E03

0473

22124 ALLEN, D.J. 1973. Breeding for stable resistance to rust of beans (Phaseolus vulgaris L.). Lilongwe, University of Malawi. Bunda College of Agriculture. Research Bulletin no.3. p.33. Engl., 1 Ref.

Phaseolus vulgaris. Uromyces phaseoli. Cultivars. Resistance. Selection. Crossbreeding. Plant breeding. Malawi.

Research work carried out by the U. of Cambridge, England, on the identification of bean cv. resistant to rust (Uromyces appendiculatus) is briefly mentioned. Six cv. were selected and used as rust-resistant parents in 10 successful reciprocal crosses with 2 susceptible cv. Field performance was assessed in Malawi. (Summary by F.G. Trans. by L.M.F.) E03

0474

21796 MARAMBA, P. 1982. Damping-off disease. Zimbabwe Agricultural Journal 79(5):157-158. Engl.

Phaseolus vulgaris. Pythium debaryanum. Pythium ultimum. Rhizoctonia solani. Etiology. Symptomatology. Disease control. Chemical control. Zimbabwe.

The etiology, symptomatology, and control measures recommended for damping-off (Pythium debaryanum, P. ultimum, and Rhizoctonia solani), reported in Zimbabwe, are briefly analyzed. A table is included that lists the chemical products and dosages used to control this disease depending on the crop affected. More than 40 host plants, including beans, of these pathogens have been found in Zimbabwe. (Summary by F.G. Trans. by L.M.F.) E03

0475

21734 SHAO, F.M. 1981. Research on bean diseases in the Southern Highlands of Tanzania (a progress report). Mbeya, Tanzania, Bean Improvement Programme at Uyole. 8p. Engl., 5 Refs.

Phaseolus vulgaris. Cultivars. Colletotrichum lindemuthianum. Isariopsis griseola. Uromyces phaseoli. Disease control. Chemical control. Yields. Tanzania.

Projects carried out by the Bean Improvement Program at Uyola, in collaboration with the plant protection dept., during the 1981-82 season in the Southern Highlands of Tanzania are reported. The 1st project aimed at measuring yield losses due to rust (Uromyces phaseoli), anthracnose (Colletotrichum lindemuthianum), and angular leaf spot (Isariopsis griseola). A split plot design was used with 4 replications. Main plots consisted of var. T_8 (highly susceptible to anthracnose), Sumbawanga C (moderately susceptible to anthracnose), and Mexican 142 (moderately susceptible to rust). In one of the subplots each disease was controlled while in the other it was allowed to develop. Seed yields of all 3 var. were higher in disease-controlled plots. The 2nd project was carried out to find a chemical capable of suppressing major bean leaf diseases during the rainy season. Four different chemicals were used, namely fentin acetate, captafol, carbendazim, and benomyl, in addition to a check, as well as 3 var. (T_8, T_3 susceptible to rust, and Canadian Wonder susceptible to angular leaf spot and to most foliar diseases) in a split plot expt. with 4 replicates. Significant differences were observed in diseas incidence and seed yield regarding the chemicals used. Benomyl efficiently controlled anthracnose. (Summary by F.G. Trans. by L.M.F.) E03

0476

21754 SINGH, D.B.; REDDY, P.P.; SHARMA, S.R. 1981. Effect of root-knot nematode Meloidogyne incognita on Fusarium wilt of French beans. Indian Journal of Nematology 11(1):84-85. Engl., 5 Refs. [Indian Inst. of Horticultural Research, Bangalore-80, India]

Phaseolus vulgaris. Meloidogyne incognita. Inoculation. Fusarium oxysporum. Snap beans. Plant injuries. India.

Simultaneous inoculation of Phaseolus vulgaris with Meloidogyne incognita and Fusarium oxysporum f. solani or inoculation of M. incognita prior to Fusarium inoculation, gave max. % wilting, indicating that Fusarium wilt is increased in French beans in the presence of M. incognita. (Summary by Plant Breeding Abstracts) E03

0477

21393 STOETZER, H.A.I.; ZOEBL, D.; OMUNYIN, M.E. 1983. Brief information on major pests and diseases of beans in Kenya. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. 4p. Engl., Illus. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Macrophomina phaseoli. Elsinoe phaseoli. Uromyces phaseoli. Isariopsis griseola. Whetzelinia sclerotiorum. Colletotrichum lindemuthianum. Pseudomonas phaseolicola. Heliothis zea. Acanthoscelides obtectus. Ophiomyia phaseoli. Bean common mosaic virus. Symptomatology. Insect biology. Insect control. Disease control. Plant injuries. Kenya.

Symptoms, conditions for development, life cycle, and control are briefly described for the following diseases and pests of beans in Kenya: ashy stem blight (Macrophomina phaseolina), scab (Elsinoe phaseoli), bean rust (Uromyces appendiculatus), angular leaf spot (Phaeosariopsis griseola), white mold (Sclerotinia sclerotiorum), anthracnose (Colletotrichum lindemuthianum), BCMV, halo blight (Pseudomonas phaseolicola), seeds infected by various fungal and bacterial agents, American bollworm (Heliothis armigera), bruchids (Acanthoscelides obtectus), and the bean fly

(Ophiomyia phaseoli). Color photographs showing the damage caused by these diseases and pests are included. (Summary by T.F.) E03

See also 0409 0417 0429 0444 0468 0469 0471 0518 0527 0528 0529 0534 0535 0536 0538 0539 0540 0543 0547 0552

E04 Viroses

0478

21781 CARR, R.J.; KIM, K.S. 1983. Evidence that bean golden mosaic virus invades non-phloem tissue in double infections with tobacco mosaic virus. Journal of General Virology 64(11):2489-2492. Engl., Sum. Engl., 12 Refs., Illus. [Dept. of Plant Pathology, Univ. of Arkansas, Fayetteville, AR 72701, USA]

Phaseolus vulgaris. Tobacco mosaic virus. Bean golden mosaic virus. Epidemiology. Symptomatology. Plant injuries. Etiology. USA.

Leaves of bean cv. Cherokee Wax that had been doubly infected systemically with the legume strain of tobacco mosaic virus (CP-TMV), an RNA virus with rod-shaped particles. and BGMV, an isometric, DNA-containing geminivirus, were studied ultrastructurally. Virus particles and the cytopathological changes associated with each virus in single infections occurred within the same cell when plants were doubly infected, indicating that individual systemically infected host cells can multiply viruses of different nucleic acid composition. Although the cytopathic effects induced by BGMV are limited to phloem-associated cells in singly infected plants, the same effects were found in most leaf cell types in mixedly infected plants. (Author's summary) E04

0479

22132 FAUQUET, C.; THOUVENEL, J.C. 1980. La mosaique deformante du vigna/ southern-bean mosaic virus. In _____. Maladies virales des plantes cultivées en Cote d'Ivoire. Paris, Office de la Recherche Scientifique et Technique Outre-Mer. Initiations-Documentations Techniques no.46. pp.105-108. Fr., Engl., 4 Refs., Illus.

Phaseolus vulgaris. Bean southern mosaic virus. Symptomatology. Disease control. Disease transmission. Epidemiology. Etiology. Ivory Coast.

Data on the BSMV are outlined: symptomatology; natural hosts (which include bean); geographical distribution; transmission; stability in sap; purification; particle structure; biophysical, biochemical, and serological properties; field control. A map of its distribution on the African continent is included. (Summary by I.B.) E04

0480

19890 HAMPTON, R.O.; SILBERNAGEL, M.J.; BURKE, D.W. 1983. Bean common mosaic virus strains associated with bean mosaic epidemics in the northwestern United States. Plant Disease 67(6):658-661. Engl., Sum. Engl., 7 Refs.

Phaseolus vulgaris. Cultivars. Bean common mosaic virus. Isolation. Pathogenicity. Resistance. USA.

Several bean cv. considered to be resistant to indigenous strains of BCMV were attacked in varying degrees during a bean common mosaic epidemic throughout the NW USA in 1977. Using bean cv. standard for differentiating BCMV strains, the strains associated with these epidemics were identified as members of strain groups II, III, and IV; one strain approximated strain group VII (approx. VII). Two of these strain groups, III and approx. VII, were previously unknown in the USA. Strain group I (type strain) was isolated only from bean cv. lacking any BCMV resistance. Only strain group V (NY-15 strain) was detected in Pinto UI 114 in the 1981 epidemic. Greenhouse isolates of each strain tended to be somewhat less virulent than the field cultures from which they originated. At least part of this difference appeared to result from a reduction in innate infective capacity of the virus during cultural subtransfers. Three BCMV isolates were readily seed-transmitted in the most susceptible cv., but cv. susceptibility to infection did not predetermine susceptibility to seed transmission of BCMV. (Author's summary) E04

See also 0409 0468 0477 0518 0529 0538 0548

E05 Nematodes

0481

22247 KENYA. MINISTRY OF AGRICULTURE. 1978. Nematodes in beans. In _____. Crain Legume Project. Progress report May, 1975-July, 1977. Thika, National Horticultural Research Station. 3p. Engl., 7 Refs.

Phaseolus vulgaris. Nematodes. Plant injuries. Nematode control. Chemical control. Cultivars. Resistance. Rotational crops. Agricultural projects. Kenya.

The extent of the nematode problem in Kenya is briefly assessed in order to establish the collaborative responsibilities of the Grain Legume Project (GLP). Reported bean yield reductions vary from 50 to 100%; however, a representative damage % for Kenya is not known. Control measures such as nematicides, sources of resistance/tolerance, and crop rotation are briefly mentioned. The possibility of a joint program between the Kenyan Agricultural Research Institute (KARI) and GLP, with Swedish assistance, is stated. (Summary by I.B.) E05

0482

21087 McSORLEY, R.; PARRADO, J.L. 1983. Control of nematodes on snap bean with soil fumigants. Fungicide and Nematicide Tests 38:1. Engl. [Univ. of Florida, Agricultural Research & Education Center, 18905 S.W. 280 Street, Homestead, FL 33031, USA]

Phaseolus vulgaris. Snap beans. Rotylenchulus reniformis. Helicotylenchus dihystera. Quinisulcius acutus. Nematode control. Yields. USA.

Application of ethylene dibromide or ethylene dibromide + chloropicrin to Phaseolus vulgaris in a field expt. near Homestead, Florida, USA, significantly reduced populations of Rotylenchulus reniformis, Helicotylenchus dihystera, and Quinisulcius acutus. Yields were not significantly increased. (Summary by Helminthological Abstracts) E05

See also 0476

E06 Physiological Disorders

0483

21963 BENNETT, J.P.; BARNES, K.; SHINN, J.H. 1980. Interactive effects of H_2S and O_3 on the yield of snap beans (Phaseolus vulgaris L.). Environmental and Experimental Botany 20(2):107-114. Engl., Sum. Engl., 11 Refs., Illus. [Dept. of Vegetable Crops, Univ. of California, Davis, CA 95616, USA]

Phaseolus vulgaris. Snap beans. Ozone. H_2S. Yield components. Leaf area. Plant injuries. Leaves. Air pollution. Plant physiological disorders. USA.

Field grown plants of Phaseolus vulgaris cv. GV 50 were fumigated with 0.046-0.127 ppm O_3 and 0.3-7.0 ppm H_2S in several combinations for 4 h/day from emergence of the 1st trifoliate leaf until pod set (day 40). Pod yield, total plant wt., leaf area, branch, raceme and pod no. were measured at 55 days after emergence. During vegetative growth there was a significant dose-response relationship for visible leaf injury to H_2S but no interaction with O_3. Plants treated with the highest H_2S + O_3 dose and harvested at 55 days showed 58% decrease in pod fresh wt. Plants harvested at 62 days had recovered from the treatment and showed a 1% reduction in pod fresh wt./plant. (Summary by Field Crop Abstracts) E06

0484

21330 MUKAMMAL, E.I.; NEUMANN, H.H.; HOFSTRA, G. 1982. Ozone injury to white bean (Phaseolus vulgaris L.) in southwestern Ontario, Canada: correlation with ozone dose, pan evaporation, plant maturity and rainfall. In Unsworth, M.H.; Ormrod, D.P., eds. Effects of gaseous air pollution in agriculture and horticulture. London, Butterworth Scientific. pp.470-471. Engl., 1 Ref. [Atmospheric Environment Service, Downsview, Ontario, Canada]

Phaseolus vulgaris. Ozone. Plant injuries. Evapotranspiration. Rainfall. Plant physiological disorders. Air pollution. USA.

Observed O_3 injury in fields of Phaseolus vulgaris was poorly correlated either with O_3 concn. on the previous day or with accumulated O_3 up to that day. For 1 cv., Seafarer, nearly all injury variability could be related to a combination of environmental factors. Maize heat units were used to construct a weighted equation to determine injury levels incorporating O_3 concn., plant age, pan evaporation, and rainfall. (Summary by Field Crop Abstracts) E06

0485

21759 STAN, H.-J.; SCHICKER, S. 1982. Effect of repetitive ozone treatment on bean plants—stress ethylene production and leaf necrosis. Atmospheric Environment 16(9):2267-2270. Engl., Sum. Engl., 18 Refs., Illus. [Inst. for Food Chemistry, Technical Univ. of Berlin, Müller-Breslau-Strabe 10, D-1000 Berlin 12, Federal Republic of Germany]

Phaseolus vulgaris. Ozone. Timing. Plant injuries. Plant physiological disorders. Ethylene production. Germany Federal Republic.

In a greenhouse study, Phaseolus vulgaris cv. Saxa plants were exposed to 150, 300, or 500 ppb O_3 for varying exposure times (15-120 min) on 4-6 successive days. A series of successive short episodes of O_3 exposure was more damaging than continuous exposure to the same concn. for the same total time. Single exposures to 300 ppb O_3 for up to 3 h caused no damage

but with exposure for 30 min on successive days high stress ethylene production and necrosis were observed after 1.5 h exposure. Implications for assessing 'no effect' pollution levels are discussed. (Summary by Field Crop Abstracts) E06

0486

21329 TAYLOR JUNIOR, G.E.; McLAUGHLIN, S.B.; SHRINER, D.S. 1982. Effective pollutant dose. In Unsworth, M.H.; Ormrod, D.P., eds. Effects of gaseous air pollution in agriculture and horticulture. London, Butterworth Scientific. pp.458-460. Engl., 1 Ref., Illus. [Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830, USA]

Phaseolus vulgaris. Ozone. SO_2. Plant physiological disorders. USA.

Ambient vs. effective dose implications, variation in flux, and its relevance to establishing acute and chronic phytotoxicity rankings and physiochemical mechanisms of injury are discussed with reference to Phaseolus vulgaris. (Summary by Field Crop Abstracts) E06

0487

21325 TINGEY, D.T.; TAYLOR JUNIOR, G.E. 1982. Variation in plant response to ozone: a conceptual model of physiological events. In Unsworth, M.H.; Ormrod, D.P., eds. Effects of gaseous air pollution in agriculture and horticulture. London, Butterworth Scientific. pp.113-138. Engl., 169 Refs., Illus. [US Environmental Protection Agency, Corvallis Environmental Research Laboratory, Corvallis, OR 97330, USA]

Phaseolus vulgaris. Ozone. Leaves. Plant physiological disorders. Plant injuries. USA.

The effects of environment and genotype on a physiological state of plants and therefore its response to O_3 are reviewed. A common progression of events is proposed based on the many physiological mechanisms responsible for the response: O_3 conductance (gas and liquid phase), perturbation, homeostasis, and finally injury. On the basis of this conceptual model, gas-phase conductance would be the decisive factor controlling injury only if it were the rate-limiting step. Plants referred to include tobacco, Phaseolus vulgaris, soybean, cotton, lucerne, rice, maize, pepper, and tomato. (Summary by Field Crop Abstracts) E06

0488

20089 TONNEIJCK, A.E.G. 1983. Foliar injury responses of 24 bean cultivars (Phaseolus vulgaris) to various concentrations of ozone. Netherlands Journal of Plant Pathology 89:99-104. Engl., Sum. Engl., 11 Refs., Illus. [Research Inst. for Plant Protection, P.O. Box 9060, 6700 GW Wageningen, Netherlands]

Phaseolus vulgaris. Ozone. Air pollution. Plant physiological disorders. Mechanical damage. Plant injuries. Cultivars. Netherlands.

In the summer of 1981, symptoms on leaves of field grown beans were noticed suggesting O_3 injury. In order to determine their relative sensitivity primary leaves of 24 bean cv. were exposed to various concn. of O_3. Differences in foliar injury responses between cv. were affected by O_3 concn. Cv. Pros/Gitana and Stratego were the most sensitive, whereas Berna and Narda were the most insensitive. The symptoms observed in practice may

be attributed to O_3. Sensitivity of Stratego primary leaves clearly depended on plant age. This cv. will be tested as an indicator plant for O_3. (Author's summary) E06

See also 0392 0398

F00 PEST CONTROL AND ENTOMOLOGY

0489

22133 EL-GUINDY, M.A.; ABO-ELGHAR, M.R.; ABDEL-FATTAH, M.I.; ISSA, Y.H. 1979. Laboratory mass rearing of the bollworm, Heliothis armigera Hbn., on natural and artificial diets. Bulletin de la Societé Entomologique d'Egypte no.62:161-174. Engl., Sum. Engl., 13 Refs.

Phaseolus vulgaris. Heliothis zea. Insect biology. Snap beans. Egypt.

Following several years of severe damage to cotton by Heliothis armigera in different parts of Egypt, lab. investigations were made on natural and artificial diets for this pest to obtain information on its nutritional requirements and biology. The duration of the larval instars and whole stage, pupal stage, larval and pupal wt., head-capsule width, adult emergence rate, preoviposition period, adult life span and fecundity, duration of egg stage, and hatch rate were used to evaluate the relative development of H. armigera on castor leaves and on 3 artificial diets, of which 2 were based on snap beans and 1 on horse beans (Vicia faba). The insects were reared on the 2nd and 3rd diet for 6 generations, and the results indicated that the 2nd diet was the most suitable, followed by the horse bean diet, castor and the 1st snap bean diet (on which H. armigera did not survive beyond the 2nd generation). (Summary by Review of Applied Entomology) F00

0490

21788 IHEAGWAM, E.U. 1982. Effects of host plants (legumes) on life and population parameters of Clavigralla tomentosicollis (Hemiptera, Coreidae). Revue de Zoologie Africaine 96(4):912-920. Engl., Sum. Engl., 23 Refs., Illus. [Dept. of Zoology, Univ. of Nigeria, Nsukka, Nigeria]

Phaseolus vulgaris. Clavigralla tomentosicollis. Insect biology. Nigeria.

The effects of 3 food plants, Cajanus cajan, Vigna unguiculata, and Phaseolus vulgaris, on the life and population parameters of Clavigralla tomentosicollis were investigated in the lab. in Nigeria at 25°C. Populations declined by 50% in 13 wk. on pigeon pea and 11 wk. on cowpea and bean. On the 3 food plants, resp., the preoviposition period averaged 5.8, 11.0, and 19.3 days. The max. age-specific fecundity rate (m_x) was reached much earlier in adult life when the coreid fed on pigeon pea or cowpea than on bean. The intrinsic rate of increase (r_m) ranged from 0.049 on bean to 0.095 on pigeon pea. (Author's summary) F00

F01 Injurious Insects, Mites and their Control

0491

21066 ABATE, T.; GEBREMEDHIN, T.; ALI, K. 1982. Arthropod pests of grain legumes in Ethiopia. Their importance and distribution. Addis Abeba,

Ethiopia, Institute of Agricultural Research. 56p. Engl., Sum. Engl., 137 Refs., Illus.

Phaseolus vulgaris. Heliothis zea. Ophiomyia phaseoli. Tetranychus. Ethiopia.

Results of a survey carried out between 1979-82 on the arthropod pest complex in many of the grain legume producing regions of Ethiopia are reported. Nearly 120 arthropod species were found, 14 of which are implicated in the transmission of viruses or virus-like diseases elsewhere. Extensive literature surveys were made on many of the pests observed. References were made to aid future work on the management of the mentioned pests. (Author's summary) F01

0492

22113 ABUL-NASR, S.; ASSEM, M.A.H. 1966. Some ecological aspects concerning the bean-fly, Melanagromyza phaseoli (Tryon). Bulletin de la Societé Entomologique d'Egypte 50:163-172. Engl., Sum. Engl.

Phaseolus vulgaris. Ophiomyia phaseoli. Symptomatology. Host range. Cultivars. Resistance. Yields. Egypt.

Infestation with the bean fly (Ophiomyia [Melanagromyza] phaseoli) was found to occur in all regions of Egypt. Symptoms of damage are described in detail. The seedling stage was observed to be very sensitive to infestation. Plants became more resistant as they grew. Cultivation of different leguminous plants has shown that in Egypt, lima beans, 2 cultivated var. of cowpeas, and soybeans are the only host plants for the bean fly. Other leaf miners, may attack some of the leguminous plants. Soybean was the least affected host plant, followed by lima bean. The 2 cowpea var. tested had a similar degree of infestation and were more susceptible to infestation than bean. Susceptibility of 4 bean var. (Monte-calm, Seminole, Contender, and Swiss Blanc) was estimated by determining the mean no. of larvae and pupae/plant. Course of infestation was not the same in the 4 tested var., yet there was no significant difference in the degree of infestation. There was no relation between the degree of infestation by the bean fly and yield. Two crops (July 30 and Aug. 14) had the highest % of infestation, yet gave the best yield. The earliest crop (July 15) and the latest (Aug. 29) were less infested, yet had the lowest yields. (Author's summary) F01

0493

20158 BRITO, C. 1981. Strategies in the control of the principal pests of Cape Verde. In International Conference on Biological Control of Pests: Its Potential in West Africa, Dakar, Senegal, 1981. Proceedings. Dakar, USAID Regional Food Crop Protection Project. pp.216-217c. Engl.

Phaseolus vulgaris. Biological control. Integrated control. Bemisia tabaci. Cosmopterix. Nezara viridula. Aphidoidea. Tetranychus telarius. Cape Verde.

The Crop Protection Department of the Ministry of Rural Development (Senegal) has developed a plan for integrated pest management. Biological and integrated control measures are outlined. Satisfactory results have been obtained in the control of Bemisia tabaci. A list of pests and their host plants is included. Some pests reported attacking beans are: Cosmopterix sp., Nezara viridula, Aphidoidea, Tetranychus spp., T. cinnabarinus. (Summary by I.B.) F01

0494

20636 CALIL, A.C.P.; CHANDLER, L. 1982. Ataque ao feijoeiro (Phaseolus vulgaris L.) por scolitídeos (Coleoptera, Scolytidae). Um grupo novo de pragas potenciais. [Bark beetles (Coleoptera,Scolytidae) attacking bean. A new group of potential pests]. Revista Ceres 29(165):533-537. Port., Sum. Engl., 16 Refs. [Depto. de Fitotecnia, Univ. Federal de Vicosa, 36.570 Vicosa-MG, Brasil]

Phaseolus vulgaris. Developmental stages. Seedlings. Hypothenemus. Elasmopalpus lignosellus. Coccotrypes. Plant injuries. Brazil.

In crop life table research at Vicosa, MG, Brazil, during the 1980-81 agricultural yr, to determine the relationships between growing seasons of bean and pest populations, adults of 2 species of Scolytidae (Coleoptera) were found to attack planted seeds, seedlings, and plants throughout the vegetative to reproductive stages. Hypothenemus sp. (but not H. hampei) attacked and killed seedlings, the damage being similar to that caused by Elasmopalpus lignosellus. This species also attacked plants in the vegetative-reproductive stages, either causing plant mortality (0.3-1.0%) or failure to produce flowers. Attacks of Coccotrypes sp. were confined to the planted seeds with adults boring one or more galleries/seed thus damaging the cotyledon. Seeds in all 6 planting dates were attacked by this species with mortality ranging from 2.3 to 5.4%. The use of the crop life tables is specially valuable to identify and quantify loss factors. Pest impact can be specifically evaluated; the sum of the damage by minor or secondary pests can be shown to be significant in total mortality considerations. Associated plantings of beans with coffee might reveal an increased loss by Hypothenemus sp. (Author's summary) F01

0495

21901 DECELLE, J. 1981. Bruchidae related to grain legumes in the Afro-tropical area. In Labeyrie, V., ed. International Symposium on the Ecology of Bruchids Attacking Legumes (Pulses), Tours, France, 1980. Proceedings. The Hague, Junk. Series Entomologica v.19,pp.193-197. Engl.

Phaseolus vulgaris. Acanthoscelides obtectus. Zabrotes subfasciatus. Epidemiology. Plant injuries. Africa.

Fifteen Bruchidae species detrimental to grain legumes are mentioned that either originated from the Afrotropical area or colonized it after being introduced. Acanthoscelides obtectus is essentially distributed in the eastern mountainous areas of Uganda, Zaire, Rwanda, Burundi, Kenya, and Tanzania, South Africa, Angola, Zimbabwe, Madagascar, and La Reunion; its attack starts in the fields on almost dry pods of Phaseolus vulgaris and, it is carried on in stored seeds; Zabrotes subfasciatus is of neotropical origin and seems to have settled and spread considerably during the past 20-25 yr. It is detrimental to bean crops in Angola, Lower Zaire, and East Africa (Kenya, Uganda, Tanzania, Burundi, and Ethiopia) as well as in Madagascar and the Mascareigne Islands. A. obtectus and Z. subfasciatus are considered among the most harmful species. (Summary by I.B.) F01

0496

22293 DE PURY, J.M.S. 1968. Stem and shoot-boring flies and seed eaters. In _____. Crop pests of East Africa. Nairobi, Kenya, Oxford University Press. pp.90-92. Engl., Illus.

Phaseolus vulgaris. Ophiomyia phaseoli. Insect biology. Plant injuries. Insect control. Chemical control. Seed treatment. Kenya.

The biology, host plants, plant damage, and control of the bean fly (Ophiomyia [Melanagromyza] phaseoli) are briefly described. A diagram illustrating the movement of the insect on the plant is included. (Summary by F.G. Trans. by L.M.F.) F01

0497

22109 EL KIFL, A.H.; WAHAB, A.E.A.; ASSEM, M.A.H.; METWALLY, A.A. 1974. List of insects, mites and pests associated with leguminous crops in Egypt. Bulletin de la Societe Entomologique d'Egypte 58:297-302. Engl., Sum. Engl., 5 Refs.

Phaseolus vulgaris. Injurious mites. Diptera. Hemiptera. Lepidoptera. Orthoptera. Thysanoptera. Egypt.

A list of the main harmful, visiting, and beneficial insects found in samples of bean, broad bean, cowpea, soybean, and sweet pea plants collected in Egypt at 2-wk. intervals during 1969-72 is presented. Determination work was based on specimens already identified in the existing entomological collections. For bean, species of harmful insects and mites of the orders Acarina, Diptera, Hemiptera, Lepidoptera, Orthoptera, and Thysanoptera are mentioned. (Summary by F.G. Trans. by L.M.F.) F01

0498

21966 GREATHEAD, D.J. 1975. Biological control of the beanfly, Ophiomyia phaseoli (Dipt.:Agromyzidae), by Opius spp. (Hym.:Braconidae) in the Hawaiian Islands. Entomophaga 20(3):313-316. Engl., Sum. Engl., Fr., 4 Refs., Illus.

Phaseolus vulgaris. Ophiomyia phaseoli. Biological control. Melanagromyza spencerella. Predators and parasites. Insect control. USA.

Attention is drawn to the transfer of the bean flies Melanagromyza phaseoli (Tryon) and M. spencerella Greathead to the genus Ophiomyia Braschnikov by Spencer (1973). The confusion over the nomenclature of the Opius spp. parasites is discussed and it is shown that the names Opius phaseoli Fischer and O. importatus Fischer should be used. Their introduction into Hawaii and establishment is briefly discussed in relation to their effectiveness as biological control agents. Both species show a high degree of consistency of parasitism which has resulted in an acceptable degree of control of Ophiomyia phaseoli although there is no evidence that they act in a density dependent manner. (Author's summary) F01

0499

22081 HARAKLY, F.A.; ASSEM, M.A.H. 1978. Ecological studies on the truely pests of leguminous plants in Egypt. 1. Biting and chewing pests. In Conference on Pest Control, 4th., Cairo, Egypt, 1978. Proceedings. Cairo, National Research Centre. pp.233-236. Engl., Sum. Engl., 5 Refs.

Phaseolus vulgaris. Ophiomyia phaseoli. Liriomyza. Spodoptera littoralis. Egypt.

During a 1-yr survey on pests attacking leguminous crops in Egypt, many species of different orders (Orthoptera, Dictyoptera, Lepidoptera, Diptera, and Collembola) were recorded. The most injurious ones attacking Phaseolus beans were (Ophiomyia [Melanagromyza] phaseoli and Liriomyza bryoniae of order Diptera, and Spodoptera littoralis of order Lepidoptera. (Extracted from author's summary) F01

0500

22080 HARAKLY, F.A.; ASSEM, M.A.H. 1978. Ecological studies on the truely pests pests of leguminous plants in Egypt. 2. Piercing and sucking pests. In Conference on Pest Control, 4th., Cairo, Egypt., 1978. Proceedings. Cairo, National Research Centre. pp.237-242. Engl., Sum. Engl., 6 Refs.

Phaseolus vulgaris. Thysanoptera. Bemisia tabaci. Icerya purchasi. Aphis gossypii. Aphis compositas. Empoasca decipiens. Asymmetrasca decedens. Tetranychus cucurbitacearum. Plant injuries. Egypt.

During a 1-yr survey on piercing and sucking pests of leguminous crops in Egypt, the most injurious ones which were also recorded on Phaseolus beans, were: Thrips tabaci, Bemisia tabaci, Icerya purchasi, Aphis gossypii, A. compositas, Empoasca decipiens, Asymmetrasca decedens (Paoli), and Tetranychus cucurbitacearum. Their seasonal abundance was carefully studied. (Author's summary) F01

0501

21562 JACK, R.W. 1913. The bean stem maggot. Rhodesia Agricultural Journal 10:545-553. Engl., Illus.

Phaseolus vulgaris. Insect biology. Host range. Plant injuries. Cultivars. Resistance. Ophiomyia phaseoli. Predators and parasites. Insect control. Cultural control. Rhodesia.

The importance, distribution, life cycle, damage to the plant, and host plants (Vigna and Phaseolus) of the bean stem maggot (Agromyza fabalis) and resistant var. are described. Natural enemies (a Braconid wasp) and allied species attacking cowpeas are reported. Possible control measures are mentioned: removal of stems and the use of a trap crop (a few rows of cowpea). (Summary by I.B.) F01

0502

21728 KAREL, A.K. 1982. The effect of insecticide and plant populations on the insect pests and yield of common bean (Phaseolus vulgaris L.). Morogoro, Tanzania, University of Dar es Salaam. Department of Crop Science. 16p. Engl., Sum. Engl., 13 Refs. [Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3042, Morogoro, Tanzania]

Phaseolus vulgaris. Ootheca bennigseni. Thrips. Maruca testulalis. Heliothis zea. Chemical control. Plant injuries. Yields. Yield components. Flowers. Pods. Tanzania.

An expt. was conducted to study the effect of plant populations, with and without insecticide application, on the insect pests and yield of common beans in Tanzania. A split plot design was used with sprayed and unsprayed plots as the main treatment and 4 plant populations (100,000, 200,000, 300,000, and 400,000 plants/ha as P1, P2, P3, and P4, resp.) as subtreatments. Incidence of and damage caused by Ootheca bennigseni were significantly higher in unsprayed than in sprayed plots. Foliar damage was less at P2 than at P1, P4, and P3. Flower thrips (Taeniothrips sjostedti) counts were low in sprayed plots as compared with unsprayed ones. However, these counts were not significantly different at different plant populations although the insect counts increased with increasing plant populations. Unsprayed plots had more flower and pod damage caused by pod borers Maruca testulalis and Heliothis armigera. P2 and P3 had comparatively less flower and pod damage by larvae of the 2 pod borer species. Insecticide applications effectively controlled the insect pests

in the sprayed plots. Seed yield was significantly higher in sprayed plots than in unsprayed ones. Av. seed yield in sprayed plots was 1275 kg/ha. Seed yield was low at P1, increased with P2, and then decreased with P3 and P4. P2 had the highest seed yield (1238 kg/ha), no. of pods/plant, no. of seeds/pod, and seed size. Possible reasons for reduced seed yield beyond population P2 are discussed. Positive correlations between seed yield and no. of pods/plant (r = 0.56), no. of seeds/pod (r = 0.73), and seed size (r = 0.25) were found, indicating that an increase in these yield components also increases seed yield. Moreover, a negative correlation coefficient was found between seed yield and flower damage (r = -0.843), and pod damage (r = -0.804), indicating that the higher the flower and pod damage by pod borers, the lower the seed yield. (Author's summary) F01

0503

21725 KAREL, A.K. 1982. Effect of insecticide applications on insect pests and yield of common beans, Phaseolus vulgaris L., in Tanzania. Morogoro, Tanzania, University of Dar es Salaam. Department of Crop Science. 5p. Engl., 7 Refs. [Univ. of Dar es Salaam, Dept. of Crop Science, P.O. Box 643, Morogoro, Tanzania].

Paper presented at the Tanzanian Bean Researchers' Meeting at the Faculty of Agriculture, University of Dar es Salaam, Morogoro, 1982.

Phaseolus vulgaris. Ootheca bennigseni. Ophiomyia phaseoli. Thysanoptera. Maruca testulalis. Insect control. Chemical control. Heliothis zea. Yields. Tanzania.

During the 1981 cropping season the effect of DDT (800 g a.i./500 l of water/ha), applied at different growth stages of bean plants, was studied at the Faculty of Agriculture Crop Museum, Morogoro, Tanzania. Var. Selian Wonder was used in a randomized block design with 4 replications and 6 treatments: 2, 3, 4, 5, and 6 applications at 20, 40; 15, 30, 45; 15, 30, 45, 60; 15, 30, 40, 50, 60; and 15, 25, 35, 45, 55, 65 days after planting, resp., and a check. Damage by Ootheca bennigseni was as high in plots with 2 or 3 applications as that of the check. Plant damage by the bean fly Ophiomyia phaseoli was more or less the same in all plots. Thrip (Taeniothrips sjostedti) counts were low in plots treated more than 3 times and pod damage by Maruca testulalis was also low in plots treated with 6 applications. It was concluded that 5 applications of an effective insecticide at 15, 30, 40, 50, and 60 days after planting could effectively control bean pests and therefore increase seed yield. (Summary by T.F.) F01

0504

21726 KAREL, A.K. 1982. Insect pest complex of common beans Phaseolus vulgaris L. in Tanzania. Morogoro, Tanzania, University of Dar es Salaam. Department of Crop Science. 4p. Engl., 5 Refs., Illus. [Univ. of Dar es Salaam, Dept. of Crop Science, P.O. Box 643, Morogoro, Tanzania]

Paper presented at the Tanzanian Bean Researchers' Meeting at the Faculty of Agriculture, University of Dar es Salaam, Morogoro, 1982.

Phaseolus vulgaris. Ophiomyia phaseoli. Aphis fabae. Thysanoptera. Maruca testulalis. Heliothis zea. Acanthoscelides obtectus. Ootheca bennigseni. Acanthomia horrida. Plant injuries. Developmental stages. Tanzania.

Insects were surveyed and collected from unsprayed plots in various bean producing areas of Tanzania to determine major insect pests. Incidence and duration of their peak activity on var. Canadian Wonder and Selian Wonder were recorded. A total of 43 insect species were recorded feeding on beans

in different parts of Tanzania during the 1980-82 cropping seasons. Of these pests, the following 8 are economically important: bean fly (Ophiomyia phaseoli), aphids (Aphis fabae), flower thrips (Taeniothrips sjostedti), pod borers (Maruca testulalis and Heliothis armigera), bruchids (Acanthoscelides obtectus), Ootheca bennigseni, and Acanthomia horrida. A table on time of occurrence and peak activity of these pests is included as well as a list of all of the insect pests of beans in Tanzania. (Summary by F.G. Trans. by L.M.F.) F01

0505

21323 KAREL, A.K. 1981. Integrated pest control in beans, Phaseolus vulgaris, in Tanzania. In International Congress of Plant Protection, 10th., Brighton, England, 1983. Proceedings of a conference; plant protection for human welfare. London, British Crop Protection Council. v.3,p.955. Engl. [Dept. of Crop Science, Univ. of Dar es Salaam, Sub-Post Office, P.O. Box 3005, Morogoro, Tanzania]

Phaseolus vulgaris. Ophiomyia phaseoli. Ootheca bennigseni. Insect control. Chemical control. Biological control. Yields. Thysanoptera. Maruca testulalis. Plant injuries. Tanzania.

In an attempt to reduce the use of insecticides and to minimize the long-term effect of their continual use on beans, an expt. was carried out at the U. of Dar es Salaam, Morogoro (Tanzania) in 1982, using cv. Kabanima, moderately resistant to the bean fly Ophiomyia phaseoli and to the foliar beetle Ootheca bennigseni. A randomized block design was used with 4 replications and 6 treatments (several applications of insecticides and/or several applications of Bacillus thuringiensis commercial w.p. formulation at 16 x 10^6 I.U.) and a control. The foliar beetle caused a high level of damage in treatments in which no control measures were taken during the preflowering stage. Two applications of insecticide produced significantly lower Ootheca damage. Five applications of insecticide gave best control of flower thrips (Taeniothrips sjostedti), although counts were not significantly different from other treatments. Flower and pod damage by Maruca testulalis was higher in the control. B. thuringiensis was effective in controlling pod borer larvae. Three applications of insecticides + 2 applications of B. thuringiensis produced highest yields (1308 kg dry seed/ha). (Summary by I.B.) F01

0506

21550 KAREL, A.K.; QUENTIN, M.E. 1983. Potentials of integrated pest management in agriculture. Morogoro, Tanzania, University of Dar es Salaam. Department of Crop Science. 27p. Engl., 30 Refs. [Dept. of Crop Science, Univ. of Dar es Salaam, P.O. Box 3005, Morogoro, Tanzania]

Paper presented at a Workshop on Resource-Efficient Farming Methods for Tanzania, Morogoro, 1983.

Phaseolus vulgaris. Integrated control. Biological control. Cultural control. Chemical control. Resistance. Pest control. Tanzania.

A detailed literature review on the need to incorporate an integrated pest management program into cultivated areas is presented. The following aspects were highlighted: definition, justification, operation, tools used (host plant resistance; biological, cultural, physical, mechanical and chemical control), the achievements and obstacles to integrated pest management programs. Governmental support is fundamental for this program implementation, as well as the development of an information system and adequate coordination at a national and regional level. (Summary by F.G. Trans. by L.M.F.) F01

0507

21988 LIMA, C.P.F. DE 1976. Beans. Bean aphid. Aphis fabae Scopoli (Hemiptera:Aphididae). In _____. A guide to the biology and control of the pests of field crops and stored produce in Kenya. Kenya, Ministry of Agriculture. National Agricultural Laboratories. 2p. Engl.

Phaseolus vulgaris. Aphis fabae. Plant injuries. Insect biology. Host range. Insect control. Chemical control. Kenya.

Symptoms of attack, pest status, life history, natural enemies, alternative hosts, and control of the bean aphid (Aphis fabae) are briefly described. A list of insecticides with dosages and spraying times to control the pest is included. (Summary by T.F.) F01

0508

21989 LIMA, C.P.F. DE 1976. Beans. Bean fly. Melanagromyza phaseoli (Tryon) (Diptera:Agromyzidae). In _____. A guide to the biology and control of the pests of field crops and stored produce in Kenya. Kenya, Ministry of Agriculture. National Agricultural Laboratories. 2p. Engl.

Phaseolus vulgaris. Ophiomyia phaseoli. Entomology. Insect control. Host range. Cultural control. Chemical control. Insect biology. Predators and parasites. Kenya.

Symptoms of attack, life history, natural enemies, alternative hosts, cultural and chemical control of the bean fly (Ophiomyia [Melanagromyza] phaseoli) are briefly described. A list of insecticides and dosages to control the bean fly is presented. (Summary by T.F.) F01

0509

20696 LIN, C-S.; MITCHELL, W.C. 1981. Host selection of the bean fly (Ophiomyia phaseoli (Tryon). Quarterly Journal of the Taiwan Museum 34(3-4):233-236. Engl., Sum. Engl., 6 Refs., Illus.

Phaseolus vulgaris. Ophiomyia phaseoli. Host range. Insect biology. Leaves.

The biophysical and biochemical causes of host selection to the bean fly (Ophiomyia phaseoli) were studied. The degree of preference to the bean fly were correlated with the amount of attractant, and the amount of antifeedant, and pubescence. These factors may affect the constant chain of host selection process of the bean fly. The schematic patterns of interaction of the leaf components on the preference to the bean fly are presented. (Author's summary) F01

0510

19757 MATERU, M.E.A. 1971. Population dynamics of Acanthomia spp. (Hemiptera, Coreidae) on beans and pigeon peas in the Arusha area of Tanzania. East African Agricultural and Forestry Journal 36(4):361-383. Engl., Sum. Engl., 4 Refs., Illus.

Phaseolus vulgaris. Acanthomia tomentosicollis. Acanthomia horrida. Predators and parasites. Tanzania.

Field expt. and observations were conducted on beans and pigeon peas between 1966-67 in the Arusha area of Tanzania to assess field population densities of Acanthomia tomentosicollis and A. horrida. The sampling and analysis methods are explained and their shortcomings pointed out. The data from these expt. showed that the distribution of both species in the field

is uneven, especially so on beans. A. tomentosicollis occurred on both beans and pigeon peas, but A. horrida was found on beans and rarely on pigeon peas. Higher densities of A. tomentosicollis were recorded on pigeon peas than on beans. The methods of sampling and analysis used proved inadequate in supplying accurate information on the duration and survival of the instars. Nevertheless, the duration of the instars in the field appeared to be about the same as in the lab. at comparable temp. For accurate information daily sampling is recommended. These species maintain themselves throughout the year by changing plant hosts, from beans to pigeon peas to Dolichos lablab and back to beans. Two parasites, one of A. tomentosicollis (and possibly A. horrida) eggs and one of A. horrida adults were found. Hadronotus gridus (egg parasite) was widespread and appeared to be more numerous when A. tomentosicollis population was low and concentrated in small areas than when the population was high and spread over large areas. (Author's summary) F01

0511

21910 RAHEJA, A.K. 1973. A report on the insect pest complex of grain legumes in northern Nigeria. In IITA Grain Legume Improvement Workshop, 1st., Ibadan, Nigeria, 1973. Proceedings. Ibadan, International Institute of Tropical Agriculture. pp.295-301. Engl., 1 Ref., Illus.

Phaseolus vulgaris. Yields. Insect control. Ootheca bennigseni. Coryna. Thysanoptera. Homoptera. Chemical control. Nigeria.

Research on insect pests of grain legumes, in particular cowpea, at the Institute for Agricultural Research, Samaru, Zaria (Nigeria) is presented. A table with yields and observations made of different legume crops, including beans (Phaseolus vulgaris), cultivated in Samaru in 1971-72, is included. Beans yielded 221 and 136 kg/ha, sprayed with DDT/BHC and unsprayed, and 62 and 37 kg/ha (sprayed and unsprayed, resp.), during the 2 yr. Ootheca and Coryna damage was heavy during 1st 6 wk. Flowering took place during the 4th wk., and pod formation in the 5th. A heavy thrip attack was reported. Harvesting was done during wk. 8-9. In 1972 substantial aphid damage was observed. (Summary by I.B.) F01

0512

21965 REDDY, A.R.; VENKATESWARLU, S.; VAID, K.L.; SINGH, R.M. 1983. Evaluation of the germplasm of rajmash with special reference to bean fly infestation. Indian Journal of Entomology 45(2):184-189. Engl., 1 Ref. [Dept. of Genetics & Plant Breeding, Inst. of Agricultural Sciences, Vanaras Hindu Univ., Vanarasi-221 005, India]

Phaseolus vulgaris. Cultivars. Selection. Resistance. Ophiomyia phaseoli. Plant injuries. Symptomatology. Germplasm. India.

During a study carried out in India in the rabi (cool) season of 1979, 99 germplasms of rajmash (Phaseolus vulgaris) were screened for resistance to infestation by Ophiomyia phaseoli. None of the lines was free from attack, and the susceptibility index ranged from 5.4% in No. 79251 to 96.23% in No. 79003. Infestation started at the beginning of March and continued until the crop was mature. Larvae attacked the lower part of the stem just below the soil surface and, in the most severe cases, up to the nodal region. The highest rate of infestation was observed in the late-maturing lines. A method is given for susceptibility grading, using 9 grades. (Summary by Review of Applied Entomology) F01

0513

21052 SCHAEFER, P.W.; DYSART, R.J.; FLANDERS, R.V.; BURGER, T.L.; IKEBE, K. 1983. Mexican bean beetle (Coleoptera:Coccinellidae) larval parasite Pediobius foveolatus (Hymenoptera:Eulophidae) from Japan: field release in the United States. Environmental Entomology 12(3):852-854. Engl., Sum. Engl., 8 Refs. [Beneficial Insects Research Laboratory, Agricultural Research Service, U.S. Dept. of Agriculture, Newark, DE 19713 USA]

Phaseolus vulgaris. Epilachna varivestis. Predators and parasites. Insect control. USA.

A Japanese race of the parasite Pediobius foveolatus, with its origin in Okayama Prefecture, Honshu, was released in 1980 against the Mexican bean beetle, Epilachna varivestis, at 43 sites (31 in Indiana) in 8 U.S. midwestern states to test for parasite overwintering. Postrelease reproduction was confirmed at 19 sites in 6 states. In 1981, there was no evidence of successful parasite overwintering. This was attributed to the unavailability of suitable host stages or inability of adults to survive the winter months. (Author's summary) F01

0514

22110 SINGH, S.R.; EMDEN, H.F. VAN 1979. Insect pests of grain legumes. Annual Review of Entomology 24:255-278. Engl., 167 Refs.

Phaseolus vulgaris. Empoasca kraemeri. Insect biology. Plant injuries. Insect control. Aphis fabae. Ophiomyia phaseoli. Epilachna varivestis. Apion godmani. Heliothis zea. Maruca testulalis. Laspeyresia. Thysanoptera. Empoasca fabae. Africa. America.

The production of grain legumes in the tropics is divided into 4 groups; Phaseolus vulgaris belongs to the group of grain legumes grown in the cooler conditions of medium and high altitudes and is the predominant legume of South and Central America (especially Mexico, Costa Rica, El Salvador, Guatemala, Panama, and Brazil) and is also grown extensively in East Africa and Asia. Insect pests are probably the main factor limiting grain legume yields in the tropics. Distribution, damage, life cycle, and control measures are discussed for leafhoppers, aphids, bean flies, beetles, Lepidoptera, thrips, and pod sucking bugs. Pests reported attacking common beans are Empoasca spp., Aphis fabae, Ophiomyia phaseoli, Melanagromyza spp., Epilachna varivestis, Apion godmani, Heliothis armigera, Maruca testulalis, Nezara viridula, among others. A future strategy for pest control is discussed. (Summary by I.B.) F01

0515

20494 STOETZER, H.A.I.; OMUNYIN, M.E. 1984. Trapping of aphids in bean mono-crops and associations with maize. Bean Improvement Cooperative. Annual Report 27:97-99. Engl., 2 Refs. [Grain Legume Project, National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Intercropping. Zea mays. Thysanoptera. Insect control. Cultural control. Kenya.

To evaluate the incidence of aphids in beans, yellow aphid traps (plastic bowls with a diameter of 16 cm) were placed between bean plants in monocrop and in association with maize, during the long rains of 1982 at 4 locations in Kenya (Katumani, Embu, Thika, and Kakamega). Three or 4 traps were placed at the midwhorl stage of the maize and kept at canopy level of the

beans. A higher no. of aphids was generally trapped in the bean monocrop, except at Katumani, where the incidence of aphids was low in both monocropped and intercropped beans. (Summary by T.F.) F01

See also 0412 0429 0433 0435 0441 0449 0463 0477 0518 0528 0531 0538 0583 0584 0585 0586 0587 0588

G00 GENETICS AND PLANT BREEDING

0516

21344 SAVOVA, N.P. 1981. [Hybridization of the species Phaseolus vulgaris L. and P. coccineus L. 3. Fertility of F_2 hybrids]. Genetika i Selektsiya 14(5):338-345. Russ., Sum. Russ., Engl., 7 Refs.

Phaseolus vulgaris. Phaseolus coccineus. Hybridizing. Hybrids. Yield components. Plant fertility.

Twelve hybrid combinations were studied. It was established that pollen viability in F_2 varies within wide ranges in all combinations and is not related with plant productivity. The % of sterile plants is high. The genotype of the cv. of the female parent species Phaseolus vulgaris has a certain influence on the % of sterile plants. The extent of incompatibility between the 2 species is still quite high in F_2. An index of that is the wide range of variation observed in the elements of productivity: no. of pods and seeds/plant and the high % of pods containing only one seed. In this way data on the fertility of the hybrids grown under varying ecological conditions could be compared. (Summary by Genetic Abstracts) G00

G01 Breeding, Selection and Germplasm

0517

21548 ATTERE, A.F. 1983. Crop genetic resources in eastern Africa. In Chang, J., ed. Agricultural research in Rwanda: assessment and perspectives, Kigali, Rwanda, 1983. Report of a seminar. Hague, Netherlands, International Service for National Agricultural Research. pp.113-115. Engl. [International Laboratory for Research on Animal Diseases, Nairobi, Kenya]

Phaseolus vulgaris. Germplasm. Storage. Plant breeding. Genetics. Africa.

The role, priorities, and activities of the International Board for Plant Genetic Resources (IBPGR) are briefly described. To date, a great deal of progress has been achieved in the collection and conservation of important food crops. By late 1982, more than 38,000 samples had been collected during 50 expeditions in about 26 countries of Africa. Phaseolus samples are ca. 3000. Important efforts are being carried out in conservation, evaluation, and documentation. Two types of conservation centers are recognized: base storage centers for long-term conservation and active storage centers for medium-term conservation, evaluation, documentation, and general seed exchange. In Africa, there are 2 fully operational base storage centers: IITA (Nigeria) and PGRCE (Ethiopia). National centers and programs are considered as essential operating units in the future. In Rwanda, areas are being identified where priority action should be taken. (Summary by I.B.) G01

0518

22290 BEAN/COWPEA COLLABORATIVE RESEARCH SUPPORT PROGRAM. U.S.A. 1983. Breeding beans for disease and insect resistance and determination of economic impact on smallholder farm families. In _____. 1983. Annual Report. East Lansing, Michigan State University. pp.130-138. Engl.

Also in Spanish.

Phaseolus vulgaris. Cultivars. Yields. Adaptation. Resistance. Bean common mosaic virus. Uromyces phaseoli. Isariopsis griseola. Ophiomyia phaseoli. Epinotia opposita. Acanthoscelides obtectus. Seed treatment. Agricultural projects. Tanzania.

Objectives of a project between the U. of Dar es Salaam (Tanzania) and Washington State U. (USA) are given: (1) develop through a breeding program high yielding, widely adapted bean cv. for small farmers which are also resistant to BCMV, rust (Uromyces phaseoli), angular leaf spot (Isariopsis griseola), and insects such as the bean fly (Ophiomyia phaseoli), pod borers (Epinotia opposita), and bruchids (Acanthoscelides obtectus); (2) determine the economic viability of the new cv. and the impact of the role played by women in the production, consumption, and marketing process. Cv. Kabanmina had the highest yields at cool, high elevation sites. Growing mixed beans reduces rust and angular leaf spot incidence and severity and increases yields by 24%. Cleaning seed lots reduces seed transmission of diseases and increases yields by 17%. Seed treatment with oil reduces bruchid attack during storage; natural plant extracts (neem, pepper) may be efficient alternatives to controlling the pod borer. Local cv. were tested with breeding lines from CIAT and Prosser and the best of these will be included in yield trials carried out at a national level in 1984 together with the best performing lines at Morogoro and Uyole. Results of training programs are also mentioned (3 people received training at CIAT for 3 mo.) in addition to professional linkages and institutional resources that contributed to the project, constraints to achieving objectives and progress towards them, and future research plans. (Summary by F.G. Trans. by L.M.F.) G01

0519

22289 BEAN/COWPEA COLLABORATIVE RESEARCH SUPPORT PROGRAM. U.S.A. 1983. Genetic, agronomic and socio-cultural analysis of diversity among bean land-races in Malawi. In _____. 1983. Annual Report. East Lansing, Michigan State University. pp.91-99. Engl.

Also in Spanish.

Phaseolus vulgaris. Hybrids. Germplasm. Seed color. Heterozygosis. Agricultural projects. Yields. Malawi.

Main objectives of a project on genetic, agronomic, and sociocultural analysis of diversity among bean landraces in Malawi are given: (1) secure baseline data on the proportion of various seed types appearing in farmers' fields in Malawi; (2) assess the frequency of heterozygosity in samples of the Malawian gene-pool; (3) compare hybrids and parents for ability to leave viable progeny in a competitive environment; (4) compare complex mixtures with monotypic var. for yield and yield stability; (5) determine the % of natural crossings; (6) estimate av. genetic distances within and between landraces of beans in Malawi; (7) determine the sociocultural factors that affect the variability in the Malawian gene-pool and which contribute to the acceptability of a specific cv. Training outputs,

professional and organizational linkages established, institutional resources that contributed to the project, and constraints to the achievement of objectives are also described. There were 62 different color combinations; however, all sites presented monocolored and variegated seeds. Approx. 20,000 plants from 7 sites have been scored and the % of outcrossing has been estimated at 0-2.5% (uncorrected for differential flower production and non-overlap of flowering period). In addition to seed variability, some collections also showed variability in physiological and phenological parameters. For most of the trials results have not yet been obtained. Future research plans are included. (Summary by F.G. Trans. by L.M.F.) G01

0520

22288 BEAN/COWPEA COLLABORATIVE RESEARCH SUPPORT PROGRAM. U.S.A. 1983. Improvement of drought and heat tolerance of disease resistant beans in semiarid regions of Kenya. In _____. 1983. Annual Report. East Lansing, Michigan State University. pp.86-90. Engl.

Also in Spanish.

Phaseolus vulgaris. Cultivars. Resistance. Drought. Temperature. Technology evaluation. Abscission. Yields. Agricultural projects. Kenya.

Main objectives of a project of improvement of drought and heat tolerance of disease-resistant beans of semiarid regions of Kenya were to: (1) establish collaborative relationships between Kenyan scientists at the U. of Nairobi and at other locations and USA scientists; (2) carry out a pilot project on the effects of environmental stress on flower and pod abscission and yield in California; (3) develop screening techniques for characteristics that improve drought and heat adaptation of beans at the U. of California at Davis; (4) introduce and exchange germplasm between Kenya and the USA; (5) identify Kenyan students and/or technicians for training in the USA; (6) initiate a bean/Phaseolus acutifolius var. latifolius breeding program for improving yield potential of beans in the U. of California at Riverside. Techniques to establish beans x tepary plants were obtained in addition to 11 cv. tolerant to heat and to drought, and data on growth parameters related to yield and abscission. Personnel is being trained in the USA. Professional and organizational linkages were established, among others, with CIAT, Tanzania/Washington State U., and Senegal/U. of California. Massive screening trials were carried out in Kenya and at the U. of California to identify disease resistance and drought and heat tolerance in bean cv. from seed obtained from CIAT, Tanzania, Washington State U. and Arizona (USA), and Kenya. The following aspects are also analyzed: institutional resources contributed to the project, progress towards objectives and constraints to their achievement, literature search on the crop and its storage, and future research plans. (Summary by F.G. Trans. by L.M.F.) G01

0521

21906 BROCKMAN, F.E. 1975. Grain legume improvement in Tanzania. In Luse, R.A.; Rachie, K.O., eds. TITA Collaborators' Meeting on Grain Legume Improvement, Ibadan, Nigeria, 1975. Proceedings. Ibadan, International Institute of Tropical Agriculture. pp.150-152. Engl.

Phaseolus vulgaris. Agricultural projects. Adaptation. Ophiomyia phaseoli. Homoptera. Uromyces phaseoli. Isariopsis griseola. Plant breeding. Tanzania.

With USAID support the International Institute of Tropical Agriculture has launched a national maize and grain legume research and training program in Tanzania, which comprises research, production, and training in grain legumes. Plans include: (1) initially, investigation of var. and management factors under controlled conditions at the Agricultural Research Institute, Ilonga; (2) extensive testing of the findings of initial trials, at regional farm testing sites; (3) introduction of a production package to farmers through production demonstration plots on farmers' fields. In Tanzania, French beans are widely grown at elevations above 1000 m. They are grown for the dry seed and the young tender leaves. Major insect pests are the bean fly (Ophiomyia phaseoli) and aphids. Bean rust (Uromyces phaseoli) and angular leaf spot (Isariopsis griseola) cause great loss in the high elevation production areas. (Summary by I.B.) G01

0522

19754 BURKE, D.W. 1982. Registration of pea bean NW-395 (Reg.No.33). Crop Science 22(4):898. Engl. [ARS-USDA, Western Region, Irrigated Agricultural Research & Extension Center, Prosser, WA 99350, USA]

Phaseolus vulgaris. Cultivars. Maturation. Plant habit. Seed characters. Resistance. Curly top virus. Bean common mosaic virus. Yields. USA.

The var. NW-395 of Phaseolus vulgaris is an F_1 selection from a cross between Miluno, a small white-seeded var. from Chile, and t-1-2204, a breeding line with resistance to curly top and mosaic viruses. NW-395 is short and is the earliest maturing var. (approx. 90 days) of its class in most localities. Av. seed size is similar to that of Sanilac, but more variable. It is similar to popular var. in canning quality. It has a high level of resistance to curly top virus and carries the dominant 1 gene for hypersensitive resistance to all known strains of BCMV. Yields are similar to those of other small white-seeded var. in the absence of curly top virus, but superior when the virus is present. (Summary by Plant Breeding Abstracts) G01

0523

21731 DEVOS, P.; KABENGELE, K.; NZIMENYA, I.; AUTRIQUE, A. 1983. Amelioration de la culture du haricot: aspect variétal et production de semences. (Bean improvement: varietal aspect and seed production). Bujumbura, Institut des Sciences Agronomiques du Burundi. 17p. Fr., Sum. Fr., 4 Refs., Illus.

Phaseolus vulgaris. Cultivars. Yields. Resistance. Selection. Diseases and pathogens. Protein content. Hybridizing. Technology evaluation. Burundi.

A research methodology is presented and phytotechnical data are given for 4 bean var. tested by the Legume Group of Institut des Sciences Agronomiques du Burundi between 1979-83, and currently proposed for release: Karama ½ (800-1200 m.a.s.l.), Calima (1200-1900 m.a.s.l.), Kirundu and Urubonobono (1200-1900 m.a.s.l. and above). Research criteria (acceptability, yield, disease resistance, and protein content), research schemes (screening trials, preliminary trials, multilocation trials, and hybridization), and results of var. improvement work are described. The seed production process is outlined. Background information on the var. used is included. (Summary by I.B.) G01

0524

21334 DUE, J.M.; ANANDAJAYASEKERAM, P.; MDOE, N.S.; WHITE, M. 1984. Beans in the farming systems in Langali and Kibaoni villages, Mgeta area, Morogoro region, Tanzania: a report. Tanzania, University of Dar es

Salaam. Department of Rural Economy. Technical Report no.2. 58p. Engl., Sum. Engl., 7 Refs., Illus. [Univ. of Illinois at Urbana-Champaign, 305 Mumford Hall, 1301 West Gregory Drive, Urbana-IL 61801, USA]

Phaseolus vulgaris. Cultivars. Economics. Technology evaluation. Intercropping. Prices. Income. Consumption. Selection. Adaptation. Tanzania.

Farming systems in the villages of Kibaoni and Langali, Tanzania, were studied to evaluate the economic impact of new higher yielding bean var., resistant to drought and diseases found in Tanzania, on small-scale family farms. A sample of 60 farm families was drawn from each of 2 major bean growing areas of the Mgeta division and socioeconomic data collected from the sample of families selected. The implications of the data found are analyzed. Families farmed, on the av., 4 separate parcels of land (shambas), predominantly on steep and undulating hillsides. In both villages beans and maize were grown by all families sampled, being commonly intercropped. The 1st bean crop is intercropped with maize in Nov./Dec. whereas the 2nd is monocropped in April/May. Intercropping was reportedly practiced to reduce risk and uncertainty in production, to minimize the effects of land shortages, to increase production/unit of land to enable family members to attend to both crops at the same time, as a means of soil erosion control and to improve soil nutrient content. A cut in current bean prices by 1/2 would cause all 58 families who responded to maintain current levels of bean hectarages so as to meet family food requirements, although the sample data indicates that 66% of bean production was sold. Data also were collected for the value and quantity of total production, consumption, and family income in the Mgeta sample area. Total crop production was slightly higher in Langali both in terms of amount and value. Beans provided 21% of income from sale of crops in Kibaoni while the corresponding figure for Langali was 27%. For the av. family, bean consumption as a % of total bean production amounted to 47 and 24% in Kibaoni and Langali, resp. Beans accounted for 14% of total value of crop production in Kibaoni and 15% in Langali. For the area as a whole, 33% of beans produced was consumed at home and the remaining 67% sold. Regressions were computed to determine those factors which contributed most to variations in value of total crop production (VTP) in each area. From those regressions it was found that total labor equivalents exerted a statistically significant effect on VTP in Kibaoni (R^2 = 0.14) but not in Langali. When the total labor equivalents were disaggregated by sex neither male nor female labor equivalents had any significant effect on VTP in Kibaoni but female labor equivalents were significant in Langali. Farm operating costs and total hectarage had a significant and positive effect on VTP in Kibaoni and Langali, resp. Food consumption as a variable affecting VTP was positive and significant in both villages. Other variables, including no. of years farming and years of formal education, had no significant effect on VTP in either of the sampled areas. Major problems with respect to bean cultivation in the Mgeta area were insect damage and drought. The most preferred bean var. were Kebwebwe (yield and storage) and Kenya (palatability and marketability). In the majority of cases, husbands and wives together decide on types of seeds to be planted, so that if new var. are introduced, it is of vital importance that both be informed of their characteristics and performances. More detailed information on resource use patterns, especially labor utilization by sex and utilization of the end-use patterns of the household, is needed as well as on-farm trial data. (Extracted from author's summary) G01

0525

22116 EDJE, O.T.; AYONOADU, U.W.U.; MUGHOGHO, L.K. 1971. Bean variety trial under rain-fed and irrigated conditions. Lilongwe, Malawi, Bunda College of Agriculture. Research Bulletin no.2. pp.15-19. Engl., Sum. Engl., 2 Refs.

Phaseolus vulgaris. Irrigation. Rainfall. Cultivars. Yields. Diseases and pathogens. Malawi.

Yield potential of bean cv. planted in var. trials conducted at Bunda and Makanga (Malawi), under rainfed and irrigated conditions, resp., was determined as part of a bean improvement project. Of the 98 cv. planted at Bunda, 23 yielded over 1000 kg/ha, 39 between 800-999 kg/ha, 27 between 600-779 kg/ha, and only 7 yielded below 600 kg/ha. Yields at Makanga ranged between 1600-2500 kg/ha. Diseases such as anthracnose (Colletotrichum lindemuthianum), angular leaf spot (Isariopsis griseola), Fusarium root rot (Fusarium solani), and common bacterial blight (Xanthomonas phaseoli), and pod borers caused considerable reduction in yield at Bunda. (Author's summary) G01

0526

21376 EL-SHAFFIE, B.E.; BIELY, T.E.; BENNET, C.; KHAIRY, N.M.A. 1978. Snap bean variety trial. In Ed-Damer, Sudan. Hudeiba Research Station. Annual Report 1966-1967. Ed-Damer. p.57. Engl.

Phaseolus vulgaris. Cultivars. Snap beans. Yields. Resistance. Fusarium. Growth. Leaf curly virus. Sudan.

Trials were conducted at Shambat to test introduced and local snap bean var. and evaluate their performance in the province of Khartoum, Sudan. Characters such as yield, disease resistance, and quality were observed. Egyptian Black, Beladi, and White Bean gave the highest yields, 3.15, 3.13, and 2.63 t/feddan (1 feddan = 0.42 ha) resp., and were tolerant to Fusarium wilt, and mosaic and leaf curl viruses. (Summary by L.M.F.) G01

0527

22105 INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1983. Legumineuses: haricot. (Legumes: beans). In _____. Proposition pour un plan quinquennal (septembre 1983-aout 1988) de la recherche agronomique a l'ISABU. Bujumbura. v.1,pp.38-44. Fr.

Phaseolus vulgaris. Plant breeding. Cultivars. Selection. Adaptation. Yields. Protein content. Spacing. Storage. Acanthoscelides obtectus. Intercropping. Resistance. Isariopsis griseola. Colletotrichum lindemuthianum. Ascochyta. Ramularia phaseoli. Burundi.

A 5-yr plan for the improvement of bean in Burundi is proposed and covers 4 research areas. The 1st, var. improvement, is the research area where most rapid progress can be attained, within a research scheme comprising the following factors: alt., tutoring, fertilization, sources of germplasm (rural areas and CIAT), and diseases. Selection criteria for improvement are acceptability, yields, seed quality and adaptation, disease resistance, and protein content. Selection and planning stages include screening trials, preliminary trials, definitive trials, new screening trials, and artificial hybridization. The 2nd involves trials with var. mixtures to determine the influence of plant architecture, density, growth cycle of components, acceptability of mixtures, and optimal no. of component var. The 3rd consists of the reduction of stock losses, especially by Acanthoscelides obtectus, and the 4th, intercropping. (Summary by I.B.) G01

0528

22112 INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1983. Légumineuses: le haricot. (Legumes: beans). In _____. Rapport Annuel (septembre 1982-aout 1983). Bujumbura. pp.59-93. Fr., Illus.

Phaseolus vulgaris. Cultivars. Technology evaluation. Dwarf beans. Selection. Genotypes. Climatic requirements. Resistance. Colletotrichum lindemuthianum. Isariopsis griseola. Uromyces phaseoli. Ramularia phaseoli. Ophiomyia phaseoli. Adaptation. Climbing beans. Yields. Inoculation. Rhizobium. Crossbreeding. Burundi.

Research carried out on beans at the Institut des Sciences Agronomiques du Burundi during 1980-83 is reported. A total of 533 var. were evaluated: 4 proposed for release, 89 of a total of 206 accessions from screening trials, 10 Kenyan var., and 430 CIAT lines and var. In a bush bean multilocation trial, 10 var. (Karama 1/2, Doré de Kirundo, Bataaf, 0688 Colorado, Calima, Jaune Pointillé or Urubonobono, Línea 25, BAT 44, Aroana, and Carioca) were assessed along with a mixture of 6 var. at 9 different sites with alt. ranging from 800 to 2200 m. Based on var. x site interaction, 4 var. are recommended for release: Karama 1/2 (for poor soils and low alt.), Calima (for a broad range of environmental conditions, except for alt. higher than 2000 m and excessive rainfall), Urubonobono (alt. from 1200 to 1900 m), and Kirundo which is apt for high alt. due to its resistance to antracnose (Colletotrichum lindemuthianum). The performance of the var. selected under farmers' conditions was verified at 4 different sites. Bush bean var. (103) were tested at 4 different sites with soil of intermediate fertility and without fertilizer. The 74 best var. were selected for their resistance to diseases caused by Isariopsis griseola, C. lindemuthianum, Uromyces phaseoli, Ramularia phaseoli, adaptability, and tolerance to the bean fly (Ophiomyia phaseoli). The selection threshold was fixed at 100% of the check var. Calima. When screening climbing bean, 32 var. were tested at 2 sites and 39 at another 2 sites, using Cuarentino 817 as check. Nineteen var. were selected for their vigor and pod size. International Bean Yield and Adaptation Nursery var. trials (1981) were carried out with 6 red bean var. from CIAT and local checks Kirundo and Calima. These latter var. had higher yields than CIAT var. Sixty-five bush bean var. from CIAT were compared with Calima (check) during the replication of the preliminary trial (EP). CIAT var. flowered and matured later and 29 of them yielded less than 100 g/m^2. Several combinations of 2 bush bean var. were tested to determine genotypic influence; no positive interaction was observed. The use of mixtures showed that a great elasticity exists at different sites, but the interaction is only positive when the no. of var. in the mixture is 6 or more. Inoculation trials carried out in collaboration with the FAO did not give positive results due to the high no. of indigenous strains of Rhizobium in the soil and to root rot by Sclerotium rolfsii. Ten F_3 lines from natural crosses of resistant x adapted var. and of adapted x adapted var. for disease resistance were selected and grouped into lines according to their grain characteristics. (Summary by M. de W. Trans. by L.M.F.) G01

0529

22240 INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1983. Legumineuses: haricot (Phaseolus vulgaris L.). (Legumes: beans). In _____. Compte rendu des travaux du Département Production Végétale en 1982. Rubona. pp.1-12. Fr.

Phaseolus vulgaris. Germplasm. Cultivars. Climbing beans. Dwarf beans. Selection. Yields. Resistance. Bean common mosaic virus. Colletotrichum lindemuthianum. Spacing. Plant breeding. Thielaviopsis basicola. Rwanda.

Results of research on plant production at Rubona, Rwerere, and Karama, Rwanda, during 1982 are presented. In germplasm evaluation, 68 climbing, 20 semiclimbing, and 38 dwarf bean var. will pass to general selection trials

in 1983. Most of CIAT's var. (75) were disease resistant but showed hypersensibility to local strains of black root rot (Thielaviopsis basicola). In breeding trials, 34 crosses were made for screening for BCMV and anthracnose (Colletotrichum lindemuthianum) resistance. In screening trials, the best dwarf bean var. showed intermediate reaction to BCMV and high tolerance to anthracnose. At Rubona, Nsuzumirurushako outyielded other semiclimbing bean var.; hypersensibility to viroses was observed in the best climbing bean var. Comparative trials showed that Rubona 5, Var. 11, Mutiki 2, Tostado, and Bataaf had higher tolerance to BCMV and anthracnose. Semiclimbing var. Caru 27 and Ikinimba Blanc outyielded other var. over the 2 seasons. Results of International Bean Yield and Adaptation Nursery trials carried out in collaboration with CIAT are presented as well as others on seed density and tutoring, crop protection and on-farm activities and seed multiplication. (Summary by I.B.) G01

0530

22241 INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1983. Vulgarisation agricole. (Agricultural diffusion). In _____. Compte rendu des travaux du Département Production Végetale en 1982. Rubona. pp.150-159. Fr.

Phaseolus vulgaris. Cultivars. Yields. Technology evaluation. Adaptation. Rwanda.

Agricultural development in Gatovu, Mont-Rubona, Geranium, Kirwa, Kinazi, and Muhero (Rwanda) is reported. During the 1st cropping season bean var. Tostado, Var. 11, Mutiki, Bataaf, Emma, Wulma, Kicaro, Melange Jaune, and C 10 were released at Gatovu and at Mont-Rubona, Bataaf yielded 1129 kg/ha and Kicaro, 511 kg/ha. At Gitovu (low terrains), var. Bataaf, Emma, Kicaro, and Melange Jaune yielded 900, 1400, 1050, and 400 kg/ha, resp. Selected bean seeds were given out. Bean Var. 11 outyielded the control (Bataaf) in a local adaptation trial at Gatovu (1247 vs. 1198 kg/ha), during the 1st season. (Summary by I.B.) G01

0531

21549 KAREL, A.K. 1982. Evaluation of bean varieties from CIAT for yield and adaptability in Tanzania. Morogoro, Tanzania, University of Dar es Salaam. Department of Crop Science. 3p. Engl., 2 Refs. [Dept. of Crop Science, Univ. of Dar es Salaam, P.O. Box 643, Morogoro, Tanzania]

Paper presented at the Bean Research Meeting at the Faculty of Agriculture, University of DSM, Morogoro, 1982.

Phaseolus vulgaris. Cultivars. Adaptation. Yields. Transfer of technology. Plant injuries. Ootheca bennigseni. Maruca testulalis. Heliothis zea. Pods. Leaves. Tanzania.

A trial was conducted at the Faculty of Agriculture Crop Museum, Morogoro, Tanzania, to evaluate the yield and adaptation of 6 CIAT cv. (BAT 1230, BAT 1296, BAT 1297, Linea 22, Linea 23, and Linea 24) together with 2 local var. (Selian Wonder and Masonga). A randomized complete block design with 3 replications was used. Leaf damage by Ootheca bennigseni on a visual scale of 0-5, and pod damage by pod borers Maruca testulalis and Heliothis armigera were assessed. The leaf damage by Ootheca was moderate to high. Cv. BAT 1296, BAT 1297, and var. Selian Wonder showed less leaf damage. The % of pod damage by pod borers was moderate to high in most cv. with the exception of Linea 22 and BAT 1297. CIAT's Linea 22 gave the highest seed

yield (1501 kg/ha). CIAT cv. gave av. yields of 800 kg/ha. The lowest yield was obtained with local var. Masonga (574 kg/ha). (Summary by F.G.) G01

0532

21710 KENYA. MINISTRY OF AGRICULTURE. 1978. Grain Legume Project. Progress report May, 1975-July, 1977. Thika, National Horticultural Research Station. 27p. Engl., 7 Refs.

Phaseolus vulgaris. Agricultural projects. Intercropping. Planting. Spacing. Weeding. Timing. Fertilizers. Germplasm. Agronomic characters. Adaptation. Cultivars. Selection. Resistance. Diseases and pathogens. Nematodes. Kenya.

A report of the 1975-77 research activities carried out by the National Horticultural Research Station in Thika (Kenya) is presented. A section is reserved to summarize the main results of the project's 1st phase which covered the agronomy, breeding, quality, yield, and plant protection programs. The main purpose of the project 2nd phase was to contribute to the improvement of the food bean production in Kenya. Personnel situation, main results of the research programs, cooperation with other institutions, and suggestions for future research priorities are described. The extent of the nematode problem in beans is also analyzed. Reports prepared by the project during 1975-77 are listed. (Summary by T.F.) G01

0533

21331 LEPIZ I., R. 1980. Programa Nacional de Fríjol. Plan de Investigación. (National Bean Program. Research Plans). México, Secretaría de Agricultura y Recursos Hidraúlicos. Instituto Nacional de Investigaciones Agrícolas. 93p. Span., 7 Refs., Illus.

Phaseolus vulgaris. Agricultural projects. Plant breeding. Production. Yields. Mexico.

The National Research Plan of the Interdisciplinary Bean Program, Mexico, is reviewed. Research is aimed at the different ecologic zones prevailing in the country: warm region with a dry rainy season, warm humid region, temperate humid region, temperate semiarid region, and warm arid region. A general description of each zone is given, including the different breeding objectives proposed, evaluation sites, and staff requirements. Data on area, production, and yields are also given. (Summary by EDITEC) G01

0534

21532 MACARTNEY, J.C. 1966. The selection of haricot bean varieties suitable for canning. East African Agricultural and Forestry Journal 32(2):214-219. Engl., Sum. Engl., 7 Refs., Illus.

Phaseolus vulgaris. Snap beans. Selection. Cultivars. Canned beans. Resistance. Uromyces phaseoli. Seed characters. Agronomic characters. Yields. Tanzania.

A program was initiated in 1959 at the Northern Research Centre (Tengeru, Arusha, Tanzania) aimed to select haricot bean var. to meet commercial canning requirements. (Seed should soak 100% when left in tap water for 16 h, and have suitable size, shape and flavor for canning.) Introductions of var. acceptable for canning were made from USA, Central and South America, Ethiopia, Kenya, Uganda, Tanzania, Japan, Belgium, France, Puerto Rico, and Australia. Observations were made on resistance to 6 rust (Uromyces

phaseoli) races, soakability trends (soil, climate and storage effects), seed quality (size, color, purity, MC, and soaking limits), and agronomic factors. Tangeru no. 8 was highly resistant to all bean rust races. Tangeru no. 8, 22, and 46 were representative of the 3 soakability trends. Tangeru no. 8, 9, 15, and 16 with av. yields of 2289, 2227, 1654, and 1366 kg/ha were finally recommended for canning. Oversized bean var. no. 8, 14, and 19 have a market in the grocery trade. (Summary by T.F.) G01

0535

21730 MADATA, C.S. 1983. Phaseolus beans improvement project at U.A.C. Breeding programme, progress report for 1982/1983 season. Mbeya, Tanzania, Uyole Agricultural Research Centre. 12p. Engl.

Phaseolus vulgaris. Cultivars. Adaptation. Technology evaluation. Yields. Agronomic characters. Resistance. Uromyces phaseoli. Isariopsis griseola. Colletotrichum lindemuthianum. Planting. Timing. Intercropping. Zea mays. Fertilizers. Tanzania.

Results of trials carried out by the Phaseolus bean improvement program at the Uyole Agricultural Research Centre (UAC) in Tanzania during the 1982-83 season are briefly analyzed. In the bean uniform cv. trial, the performance of 16 lines was assessed at 6 localities (UAC, Ismani, Mbimba, Nkundi, Ndengo and Sulutl) to determine their yield potential. For the trials at UAC and Mbimba, significant differences were found in yield among lines and among sites. At UAC, breeding lines FB/GP 246-3 and P.304 gave the highest yields. In the preliminary yield trial, the yield, agronomic characteristics, and reaction to diseases of 30 promising bean lines were evaluated at 3 sites (UAC, Ismani, and Mbimba). At UAC, line EAI 2521 gave the highest yield (3727 kg/ha), followed by P.304 (2781 kg/ha); at Mbimba, line P.304 gave the highest yield (1127 kg/ha). Av. yield for both sites was 1860 and 788 kg/ha, resp. The performance of 20 bean lines, mainly from CIAT, was evaluated regarding yield, agronomic characteristics, and resistance to rust (Uromyces phaseoli), angular leaf spot (Isariopsis griseola), anthracnose (Colletotrichum lindemuthianum), and viruses during 2 planting seasons. The performance of 6 bean var. planted in monoculture and in association with maize var. H6302 was also studied at UAC and significant differences were found among bean var. in monoculture and in association. Yields of beans in monoculture and in association were 1856 and 1267 kg/ha, resp. The performance of released var. Kabanima and T3 was tested under field conditions with 2 local var., Masusu and Kablanketi, and 2 replications (with and without fertilizer). Differences were observed between var. and between replications. (Summary by F.G. Trans. by L.M.F.) G01

0536

22111 MADATA, C.S.; MKUCHU, M.M. 1983. Phaseolus beans improvement programme. Progress report (1981/82) and proposed projects (1982/83). Mbeya, Tanzania, Uyole Agricultural Centre. 12p. Engl., 1 Ref.

Report presented to the Bean Researchers Meeting at the Faculty of Agriculture, Forestry and Veterinary Sciences, Morogoro, 1982.

Phaseolus vulgaris. Cultivars. Technology evaluation. Yields. Resistance. Isariopsis griseola. Uromyces phaseoli. Colletotrichum lindemuthianum. Agronomic characters. Planting. Timing. Agricultural projects. Tanzania.

Results of research carried out during the 1981-82 cropping season at the Uyole Agricultural Centre (UAC), Mbeye, Tanzania, are given. In the bean uniform cv. trial, the performance of 16 cv. was evaluated at 2 sites (UAC

and Nkundi) regarding: yield; resistance to angular leaf spot (Isariopsis griseola), rust (Uromyces phaseoli), and anthracnose (Colletotrichum lindemuthianum); and consumer acceptability. Breeding lines P.304 and Kabanima yielded over 3 t/ha at UAC and local var. Masusu and Kablanketi had low yields. In the preliminary yield trial, the performance of 44 promising lines that were under observation was compared with that of 6 check var. Kabanima gave the highest yield (6 t/ha); CIAT GO 5746 and local line FB/GP 246-3 also gave high yields (4.0 and 4.8 t/ha, resp.). Agronomic characteristics, yield, and resistance to diseases of 69 lines from CIAT germplasm, more than 600 progenies of the UAC germplasm collection, and 2 checks were assessed in a single row trial. Several of the 69 CIAT lines gave higher yields than Kabanima and were also resistant to most of the diseases. In the trial to determine the most adequate planting times, cv. Canadian Wonder, T3, and Kabanima were evaluated for 4 planting times spaced at 2-wk. intervals. There were significant differences in yield among the 3 cv. and among the 4 planting times for Kabanima and T3. Cv. Canadian Wonder (early maturing) should be planted in March-Feb. and cv. Kabanima (late maturing) in Feb. The research projects proposed for the 1982-83 season are listed. (Summary by F.G. Trans. by L.M.F.) G01

0537

21915 MUGHOGHO, L.K.; EDJE, O.T.; AYONOADU, U.W.U. 1972. Bean Improvement Programme in Malawi. Bean Improvement Cooperative. Annual Report 15:69-71. Engl.

Phaseolus vulgaris. Germplasm. Cultivars. Canned beans. Plant breeding. Insect control. Ophiomyia phaseoli. Aphis fabae. Weeding. Agricultural projects. Malawi.

A bean improvement program started in 1969 at Bunda College of Agriculture, Lilongwe, used the collection of 4000 lines obtained from all parts of Malawi as a basis for breeding high yielding, disease-resistant bean var. suitable for canning, and also studied bean production under irrigation. The program also evaluated the germplasm collection as well as the agronomy, physiology and crop protection, and breeding programs. Material and information is exchanged with the Grain Legume Research Units at Mekereke (Uganda), Cambridge U. (England), and the International Institute of Tropical Agriculture (Nigeria), among others. (Summary by T.F.) G01

0538

22291 MUIGAI, S.G.S.; NJUGUNA, S.K.; MUKUNYA, D.M.; NGUGI, D.N. 1983. Current bean research programme in Kenya. Thika, Kenya, National Horticultural Research Station. 19p. Engl., 21 Refs.

Paper presented at the Workshop to Develop a Collaborative Project for Bean Research in Eastern Africa, Cali, Colombia, 1983.

Phaseolus vulgaris. Agricultural projects. Nitrogen fixation. Resiatance. Bean common mosaic virus. Colletotrichum lindemuthianum. Pseudomonas phaseolicola. Isariopsis griseola. Uromyces phaseoli. Ophiomyia phaseoli. Drought. Seed treatment. Cultivars. Kenya.

The current situation of the bean research program in Kenya is reported. Its main objective is to increase protein production and consumption through improvement of Phaseolus vulgaris, Vigna unguiculata, and Cajanus cajan. Research objectives for beans are analyzed in detail for the areas of: agronomy; soil fertility; symbiotic dinitrogen fixation; farming systems economy and extension; resistance to drought, diseases [BCMV,

anthracnose (Colletotrichum lindemuthianum), halo blight (Pseudomonas phaseolicola), angular leaf spot (Isariopsis griseola), and rust (Uromyces phaseoli)]; the bean fly (Ophiomyia phaseoli); production of disease-free seed and seed treatments. Future outlook on bean research in Kenya includes: (1) continuation of research activities to provide recommendations for the small farmer; (2) breeding and selection programs; (3) assistance from collaborators in Bean/Cowpea Collaborative Research Support Program; (4) obtainment of improved lines in collaboration with CIAT and other bean research organizations; and (5) training of local scientists. (Summary by F.G. Trans. by L.M.F.) G01

0539

21909 MUKUNYA, D.M. 1975. Sources of resistance to bean anthracnose and bean rust in Kenya local dry beans (Phaseolus vulgaris). Bean Improvement Cooperative. Annual Report 18:49-51. Engl.

Phaseolus vulgaris. Cultivars. Selection. Resistance. Uromyces phaseoli. Colletotrichum lindemuthianum. Germplasm. Kenya.

The U. of Nairobi Bean Research Project has concentrated on screening for resistance to bean anthracnose (Colletotrichum lindemuthianum) and bean rust (Uromyces appendiculatus) among other important diseases. To assess resistance to anthracnose, 20 different isolates of the causal organism were inoculated into each of 9 lines (NB 510, NB 511, NB 518, NB 522, NB 524, NB 526, NB 528, NB 529, and NB 533). Bean rust resistance was evaluated for most of the 500 lines of the Project's collection; the disease occurred through natural infestation. Anthracnose resistance was identified in 6 lines for all isolates tested. Lines NB 524 and NB 528 were found to be resistant to both C. lindemuthianum and U. appendiculatus. (Summary by T.F.) G01

0540

22294 THE NATIONAL Bean Programme in Uganda. Uganda. 5p. 1983. Engl.

Paper presented at the Workshop to Develop a Collaborative Project for Bean Research in Eastern Africa, Cali, Colombia, 1983.

Phaseolus vulgaris. Snap beans. Cultivars. Maturation. Yields. Resistance. Uromyces phaseoli. Agricultural projects. Fertilizers. N. P. Agricultural lime. Intercropping. Zea mays. Viroses. Uganda.

Bean research needs in Uganda are briefly analyzed regarding the areas of breeding, agronomy, pathology, entomology, and nutrition. An inventory of research work carried out by the National Bean Program in Uganda is made. A table with data on no. of days to maturity, yield (kg/ha), and diseases recorded for the var. K_{130}, K_{113}, K_{112}, K_{119}, K_{121}, K_{116}, and K_{20} is included. A breeding program of haricot and dry beans for resistance to rust (Uromyces phaseoli) has been undertaken. The effect of N, P, and lime on beans in monoculture and in association with maize and cotton is being studied. Existing resources (personnel and infrastructure) are listed. A regional center for beans and cowpeas should be formed in Uganda to monitor the progress and achievements of national research programs. (Summary by F.G. Trans. by L.M.F.) G01

0541

22108 NATIONAL CROP RESEARCH PLANNING COMMITTEE. 1979. Grain legume agronomy report for 1978-79. Tanzania, Ilonga Agricultural Research Institute. 23p. Engl.

Phaseolus vulgaris. Cultivars. Yields. Technology evaluation. Spacing. Planting. Tanzania.

Results on trials carried out with cowpea and soybean, and on double cropping and legume/cereal crop rotation in Tanzania during 1978-79 are given. Data collected from village trials are also presented in which promising bean var. were evaluated. At Nyamboge, T_8 yielded 1394 kg/ha, which was significantly higher than yields obtained by T_3, Sumbawanga, and Canadian Wonder, but the same as Mexican 142. At Bwanga and Nkongore there were no significant var. differences. The optimum planting density for Canadian Wonder was determined. Plant populations were: 400,000, 333,333, 266,667, 200,000, and 133,333 plants/ha. The highest yield was obtained with 266,667 plants/ha and disease incidence was higher with 400,000 plants/ha. (Summary by I.B.) G01

0542

22107 NATIONAL CROP RESEARCH PLANNING COMMITTEE. 1979. Grain legume breeding report for 1978-79. Tanzania, Ilonga Agricultural Research Institute. 22p. Engl.

Phaseolus vulgaris. Cultivars. Technology evaluation. Yields. Adaptation. Selection. Plant breeding. Tanzania.

Breeding work done in Tanzania during 1978-79 to develop high yielding and widely adapted var. of cowpea, soybeans, beans, and green gram is briefly described. An uniform bean cv. trial was conducted at Ismani, Gairo, Tengeru, Maruku, and Lyamungu to evaluate 20 cv. which had been found promising in previous years. The relative ranking of var. differed with locations: GN Valley EA1272U ranked 1st at Ismani, P692-A at Gairo, and P311-A-L at Tengeru. This last var. performed consistently better at all sites and had the highest mean yield, followed by YC-2, P692-A, and T-6. Forty-eight bean lines/var. were evaluated at Lyamungu, Maruku, Ismani, and Tengeru with Canadian Wonder as check. A randomized block design with 4 replications was used. Eighteen var. yielded significantly higher than Canadian Wonder; Santa Anna was the highest yielder (2590 kg/ha), followed by P-323 (2584 kg/ha), PR-15-R-52 (2568 kg/ha), and P-512 (2566 kg/ha). (Summary by I.B.) G01

0543

21561 NYABYENDA, P.; NDAMAGE, G. 1980. Resultats de recherches sur haricot au Rwanda durant les 10 dernieres annees. (Results of bean research in Rwanda over the last ten years). Rwanda, Institut des Sciences Agronomiques du Rwanda. 34p. Fr.

Phaseolus vulgaris. Cultivars. Adaptation. Yields. Planting. Spacing. Intercropping. Irrigation. Colletotrichum lindemuthianum. Soil amendments. Agricultural projects. Rwanda.

Research data and results are presented for var. selection (introduction, screening and selection, comparative trials, and release), genealogical selection, and selection by induced mutation at the Institut des Sciences Agronomiques du Rwanda. Bean var. Wulma and C 10 had outstanding performance at Rubona; var. 1/2, No. 11, Bayo 158, and var. 54 confirmed their superiority at Karama, and Urunyumba 12 and Gisenyi 6 were the best var. at Rwerere. Dark teguments caused some var. to be rejected. The mutation of the dark tegument of var. Wulma was possible using ethyl methanesulphonate. Cultural trials reported included planting distance and seed density for both dwarf and climbing beans, tutoring, irrigation, and

effects of intercropping on harvest yields and incidence of anthracnose (Colletotrichum lindemuthianum). Higher productivities of nonamended beans were obtained during the 1st season at Rubona (2340 kg/ha) and at Rwerere (3950 kg/ha), and during the 2nd season at Karama (3790 kg/ha). Guidelines of a future bean research program are presented. (Summary by I.B.) G01

0544

21559 OLUOCH, P.O.; GASTEL, A.J.G. VAN; MORRENHOF, J. 1980. Dry beans: morphological descriptions. Nakuru, Kenya, National Seed Quality Control Service. 21p. Engl.

Phaseolus vulgaris. Plant habit. Cultivars. Seed characters. Pods. Leaves. Flowering. Kenya.

The characteristics and scales used by the National Seed Quality Control Service in Kenya to give a morphological description of different bean var. are listed. A description is included for var. ST 33, ST 49, ST 102, ST 352, FS 23, FS 44, FS 176, FS 438, FS 442, FS 520, GLP x 92, GLP 24, GLP 2, and GLP 1004 for the following parameters: (1) plant – growth type, density of foliage, central leaflet size, leaf color, flower color, days to 50% flowering; (2) pod – length, degree of curvature, tip, length and shape of beak, constrictions, ground color, and degree of mottling; (3) seed – size, shape, color, and color of corona. A diagram is also presented in which the var. are schematically arranged according to some of the most conclusive characters. (Summary by F.G. Trans. by L.M.F.) G01

0545

21555 OLUOCH, P.O.; GASTEL, A.J.G. VAN 1981. Dry beans 1980: report on the national performance trials. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. External Report no.61. 52p. Engl., 6 Refs. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Cultivars. Adaptation. Flowering. Maturation. Yields. Yield components. Protein content. Kenya.

The data collected in the trials conducted over the long rains of 1980 and the short rains of 1980-81 in Kenya are presented. Six sites representing major bean growing areas (Lanet, Thika, Embu, Kakamega, Kisii, and Katumani) were selected. These sites represent areas of medium, high, and marginal agricultural potentials. Technical data are included for 11 potential var. tested (S.T. 33, S.T. 49, S.T. 92, S.T. 102, S.T. 302, F.S. 23, F.S. 44, F.S. 176, F.S. 438, F.S. 442, and F.S. 520) and for the standard var. GLP 2, GLP 24, and GLP 1004. A split plot design with 4 replications was used in both expt. General remarks on the sites are presented. Plant characters such as vegetative vigor, days to 50% flowering, days to maturity, diseases, pod clearance, pods/plant, no. of seeds/pod, plant count, seed yield, hundred-seed wt., and % of CP and crude oil are discussed and are given in table form for the different areas and var. tested. (Summary by I.B.) G01

0546

21522 OLUOCH, P.O.; GASTEL, A.J.G. VAN 1982. Dry beans 1981: report on the national performance trials. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. External Report no.65. 40p. Engl.

Phaseolus vulgaris. Cultivars. Technology evaluation. Selection. Yields. Intercropping. Zea mays. Kenya.

Data collected in trials conducted both in the long rains of 1981 and the short rains of 1981-82 are presented. Eleven potential var. were tested against standard var. (GLP 2, GLP 24, or GLP 1004) in the 1st season; of 11 new var. entered during the 2nd season, only var. S.T. 92, F.S. 438, and F.S. 520 were retained for further testing. In both expt. a split plot design was used with 4 replications. Main treatments were pure and mixed cropping systems (medium, late maturing, and Katumani maize var.), and the subplots were 12 and 16 bean var. for the 2 seasons, resp. Data are given for individual sites and characters. F.S. 44 gave the highest yield in pure and mixed stands during the long rains over all sites, GLP-288 in pure stand and GLP-1004 in mixed stand during the short rains (over all sites). S.T. 92 was the 2nd highest yielding var. and the most likely to be considered for release. (Summary by I.B.) G01

0547

22229 ONIM, J.F.M. 1983. Mutation breeding for disease resistance in food beans and cowpea in Kenya. In Research Co-ordination Meeting on the Induced Mutations for Disease Resistance in Crop Plants, 2nd., Denmark, 1981. Proceedings. Vienna, FAO/IAEA Division of Isotope and Radiation Applications of Atomic Energy for Food and Agricultural Development. pp.193-199. Engl., Sum. Engl., 3 Refs. [Dept. of Crop Science, Univ. of Nairobi, Nairobi, Kenya]

Phaseolus vulgaris. Plant habit. Mutation. Flowering. Flowers. Leaves. Resistance. Colletotrichum lindemuthianum. Isariopsis griseola. Uromyces phaseoli. Stems. Pods. Kenya.

Ionizing radiation was used to obtain more disease-resistant variants of bean, cowpea, and pigeon pea. Seed from M_1 bean plants of cv. Canadian Wonder was bulk harvested and the M_2 generation was planted at the U. Farm at Kabete, Kenya. At flowering, the control and exptl. M_2 material were compared to establish frequencies of variants for certain characters such as flower color, dark-green leaves, and growth habit. In M_2 populations large genetic variation for morphological and physiological characters was observed as well as differences in resistance to anthracnose (Colletotrichum lindemuthianum), angular leaf spot (Phaeisariopsis griseola), and rust (Uromyces appendiculatus). Plants with purple stems and pods seem to have a good level of general disease resistance. Association between these characters and disease resistance will be tested again in the M_3 and M_4 generations. The no. of mutants in cowpea was smaller than in bean. (Summary by L.M.F.) G01

0548

21380 SALIH, S.H. 1979. Haricot beans (fasulia). In Ed-Damer, Sudan. Hudeiba Research Station. Annual Report 1974-1975. Ed-Damer. pp.47-49. Engl.

Phaseolus vulgaris. Cultivars. Snap beans. Yield components. Seed production. Technology evaluation. Sudan.

Two var. trials were conducted at Hudeiba Research Station (Sudan) in 1979: one for snap beans and the other for curly top resistant selections. Significative differences were found in all characters tested, except no. of seeds/pod, in a trial which included 9 snap bean cv. replicated 5 times. Yields ranged between 38.8-332.2 kg/feddan (1 feddan = 0.42 ha) for cv. HRS 423 and HPS 435, resp. Low yields were partly attributed to poor soils. A significative correlation was found between yield and no. of pods/plant; 1000-seed wt. and no. of days to flowering were negatively and significatively correlated at the 1% level. Significative differences were

found in all characters except for yield and no. of pods/plant when 9 curly top resistant selections were tested with RO/2/1 and Red Mexican. Yields ranged from 318 to 518 kg/feddan; pods/plant from 5.8 to 8.6; seeds/pod from 3.3 to 4.9; 1000 seed wt. from 217 to 312 g; days to flowering from 38 to 48; and days to maturity from 89 to 96. Thirty-one navy bean collections were propagated in a large area to obtain seed for future preliminary yield trials. (Summary by I.B.) G01

0549

20901 SMIT, J.J.; STOETZER, H.A.I.; OMUNYIN, M.E. 1983. Improvement of dry bean production in Kenya. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. 19p. Engl., 30 Refs. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Paper presented at the Tanzania/CRSP Bean Workshop, 2nd., Morogoro, 1983.

Phaseolus vulgaris. Fertilizers. Nitrogen fixation. Resistance. Drought. Bean common mosaic virus. Colletotrichum lindemuthianum. Pseudomonas phaseolicola. Isariopsis griseola. Uromyces phaseoli. Cultivars. Seed treatment. Plant breeding. Kenya.

Since 1971 the Kenyan Ministry of Agriculture, with financial and expert assistance from the Netherlands' Government, has operated a Grain Legume Project which coordinates most of the national bean research and aims at improving both the yield and the quality of Kenyan dry beans. Research has been carried out on fertilizers, symbiotic dinitrogen fixation, drought resistance, pests, and diseases. The latter problem, a major constraint in Kenyan bean production, is being overcome through breeding for resistance to 5 major diseases, namely, BCMV, halo blight (Pseudomonas phaseolicola), anthracnose (Colletotrichum lindemuthianum), rust (Uromyces phaseoli) and angular leaf spot (Isariopsis griseola), and through the production of disease-free seed and seed dressings. (Summary by J.R.) G01

0550

22188 STANTON, W.R. 1963. A note on work in progress in northern Nigeria with special reference to grain legumes. Genetica Agraria (Italia) 18:279-286. Engl., Sum. Engl., Fr., Span., 6 Refs.

Phaseolus vulgaris. Plant breeding. Agricultural projects. Economics. Cultivation. Nigeria.

As a result of recent changes in demand for foodstuffs in northern Nigeria breeding efforts aim at conserving the indigenous cv. and acquiring all possible information on their social and biological environments and to developing a research program which will be able to cope with any further changes in demand. Conservation projects have concerned the main staple crops such as maize, sorghum, and millet, and more recently grain legumes such as Phaseolus vulgaris. A survey on grain legumes is currently carried out using standard punch card form, devised for making entries at the sampling site, and providing a picture of variation from province to province of individual legumes, their importance, and the agronomic practices associated with them. A sample punch card is presented, its characteristics being discussed in detail. (Author's summary) G01

0551

21905 STEELE, W. 1966. Techniques for grain legume improvement. In Stanton, W.R. Grain legumes in Africa. Rome, Food and Agriculture Organization of the United Nations. pp.134-158. Engl., 15 Refs., Illus.

Phaseolus vulgaris. Plant breeding. Technological package. Africa.

Detailed descriptions are provided for grain legume improvement techniques in Africa. The following aspects of research are briefly analyzed: survey, agronomy, plant breeding, entomology (field and storage pests), pathology, and coordination of research. Practical techniques include the survey of existing legume crops using punched cards questionnaires and bags for seed sampling. Other sources of seed for collection are imported cv. and exotic species. A strict routine must be established for the acquisition, handling, storage, and maintenance of the collection which should include an accession book and a seed storage ledger. Conditions the store should have are listed. Techniques for field studies should consider: nursery, breeding system, site selection, plot layout, labels, field plan, planting, fertilizer application, statistical design of field trials, design choice, plot size and shape, discards to avoid edge effects, management of expt., field observations and record keeping. References books suitable for the design and analysis of replicated field trials are listed. Careful evaluation and maintenance of the identity of seed lines is stressed. (Summary by I.B.) G01

0552

20911 STOETZER, H.A.I.; WAITE, B.H. 1983. Evaluation of bean diseases in the Grain Legume Project trials, Katumani Research Station. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. 43p. Engl., Sum. Engl., 28 Refs., Illus. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Pseudomonas phaseolicola. Xanthomonas phaseoli. Colletotrichum lindemuthianum. Phoma. Elsinoe phaseoli. Isariopsis griseola. Uromyces phaseoli. Rainfall. Germplasm. Resistance. Cultivars. Kenya.

The incidence of 7 major diseases in the semiarid regions of Kenya, namely halo blight (Pseudomonas phaseolicola), common blight (Xanthomonas phaseoli), anthracnose (Colletotrichum lindemuthianum), Phoma leaf spot or black node disease (Phoma exigua var. diversispora), scab (Elsinoe phaseoli), angular leaf spot (Isariopsis griseola), and rust (Uromyces phaseoli), was assessed in trials at the National Dryland Farming Research Station at Katumani. During the 14 seasons (short rains 1976/77 to long rains 1983), the total amounts of rainfall and its distribution within the season were variable. Five seasons were relatively wet (250-300 mm) to very wet (more than 300 mm), 3 seasons had medium rainfall (200-250 mm), while 6 seasons were dry (150-200 mm) to very dry (less than 150 mm). Mean disease scores are given for the 7 diseases under evaluation. Halo blight was rather severe during 2 wet seasons with an even rainfall distribution. Common blight was observed during 6 seasons, but disease severity was low to very low. Angular leaf spot was severe during only 2 seasons, while it was observed at a very low severity during 3 other seasons. Rust severity was always low, except during 1 season when a medium score was obtained. Scab was severe during 1 wet season with evenly distributed rainfall and a fairly high mean temp. Black node disease showed up during only 1 season with rather severe scores. This season was rather cool compared with the 14 yr mean. Anthracnose was observed only during 1 very wet season, and the incidence was low. In general, in the drier seasons there appeared to be lower disease incidences for all bean diseases, with the possible exception of ashy stem blight (Macrophomina phaseolina). Resistant germplasm is indicated for halo blight, common blight, angular leaf spot, rust, scab, and black node disease. The reactions of entries to halo blight, scab, and angular leaf spot are grouped according to region of origin and seed types. (Author's summary) G01

0553

20514 STOETZER, H.A.I. 1984. Natural cross-pollination in bean in Ethiopia. Bean Improvement Cooperative. Annual Report 27:99-100. Engl., 3 Refs. [Grain Legume Project, National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Crossbreeding. Cultivars. Pollination. Ethiopia.

A program was initiated in 1974 at the Awasa Expt. Station (Sidamo, Ethiopia) to produce white haricot beans with horizontal resistance to all locally important diseases. Random polycrosses were made between 60 colored bean cv. and 75 white bean cv., planted in alternating single rows. Insects were expected to do the natural cross-pollination. One colony of honeybees (Apis mellifera) was taken to the bean plot during flowering and its efficiency to cross-pollinate the beans was tested by placing an insect-proof cage of 17.5 m^2 over 3 white and 4 colored bean rows. One beehive was included in the enclosure. Carpenter bees (Xylocopa spp.) and other wild bees were observed to visit the cv. Cross-pollination was estimated at 4.8 $\pm$ 1.1% for the main field and only 0.1% for the enclosure. It was concluded that Carpenter bees and/or other wild bees were likely to have cross-pollinated the beans. (Summary by T.F.) G01

0554

20912 STOETZER, H.A.I.; ODHIAMBO, G.W.; RHEENEN, H.A. VAN 1983. A virulent strain of Pseudomonas syringae pv. phaseolicola from Kisii, Kenya. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. 2p. Engl., 2 Refs. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Paper presented at the Biennial Conference of the Bean Improvement Cooperative, Minneapolis, Minnesota, 1983.

Phaseolus vulgaris. Pseudomonas phaseolicola. Cultivars. Germplasm. Resistance. Kenya.

Since 1975 the Grain Legume Project has carried out trials at the Nyanza Agricultural Research Station at Kisii, Kenya. Each season halo blight of beans (Pseudomonas syringae pv. phaseolicola) has been present, sometimes causing complete crop failure. During the long rains of 1981 and 1982 and the short rains of 1982-83 halo blight-resistant germplasm and 3 Kenyan standard cv. were tested under field conditions at the Kisii research station. Results were reasonably consistent over the 3 seasons. Most Great Northern var. were classified as susceptible with the exception of GN Nebraska no. 1 sel. 27 and GN Tara, which were resp. highly resistant and resistant. Other entries categorized as highly resistant were: GLP-X.92, OSU 10183, WIS HBR72, and 79-8625N(HLR). GLP-16, OSU 1604, and PI 150414 were resistant, although the latter 2 were susceptible during the 1981 long rains. (Summary by J.R.) G01

0555

22079 TANZANIA. MINISTRY OF AGRICULTURE. 1978. Beans (Phaseolus vulgaris). In _____. Grain Legume Improvement Report 1975-1978. Dar es Salaam, Tanzania. pp.62-75. Engl.

Phaseolus vulgaris. Snap beans. Cultivars. Adaptation. Yields. Insect control. Fertilizers. Selection. Plant breeding. Tanzania.

Results of grain legume improvement trials carried out in 1975-78 in Tanzania are presented. In French bean var. trials, severe attacks of

Xanthomonas phaseoli were reported in 1975-76. Cv. Naz gave the highest yields (862 kg/ha) in 1976. Cv. maturity varied between 62-70 days. In the Tanzania Bean Var. Trial (1977), cv. Monroe gave the highest yield (1457 kg/ha). Most cv. were susceptible to at least one major disease. In preliminary field trials at Lyamungu moisture stress affected the expt. In International Bean Yield and Adaptation Nursery trials, cv. P-458, P-402, P-392, and P-755 outyielded local check Canadian Wonder. A total of 300 new germplasm lines from EAAFRO (currently the Kenyan Agricultural Research Institute-KARI) were evaluated at Ilonga and 746 lines from CIAT were evaluated at Ilonga, Mbeya, and Lyamungu. From these, 125 were selected for further testing in 1978. In the Uniform Cv. Trial (1978), P311-A-L had the highest yield at Lyamungu and Gairo (2818 and 2260 kg/ha, resp.). In the Preliminary Yield Trial, 50 outstanding lines were selected. Single plant selections from 60 bean crosses from CIAT were evaluated and promising ones are being multiplied. About 90 kg of purified Canadian Wonder seed has been given to Arusha Seed Farm for multiplication. Insect control and fertilizer trials are reported (1975-77). Tables with data on all trials conducted are included. (Summary by I.B.) G01

0556

21899 VERMEULEN, W.J. 1984. Kamberg. A new small white bean for South Africa. Bean Improvement Cooperative. Annual Report 27:202. Engl. [Oil & Protein Seeds Centre, Private Bag X1251, 2520 Potchefstroom, Republic of South Africa]

Phaseolus vulgaris. Cultivars. Crossbreeding. Resistance. Uromyces phaseoli. Yields. Plant breeding. South Africa.

Overall results of the 1982-83 summer season trials conducted in the major bean producing areas of South Africa are briefly reported. A new small white bean var., Kamberg, was released after the results became available. The new var. is compared with NEP 2 and Swan Valley. Kamberg is the result of selection (pedigree method) from the cross NEP 2 x PC43-C1 and is resistant to shattering and rust (Uromyces appendiculatus). Yields obtained were 1983, 1475, and 1685 kg/ha for the var. Kamberg, NEP 2, and Swan Valley, resp. (Summary by T.F.) G01

0557

21381 YASSIN, T.E.G. 1979. Fasulia (Phaseolus vulgaris). (Beans). In Ed-Damer, Sudan. Hudeiba Research Station. Annual Report 1971-1972. Ed-Damer. pp.27-28. Engl.

Phaseolus vulgaris. Cultivars. Technology evaluation. Yields. Yield components. Adaptation. Maturation. Snap beans. Sudan.

In trials conducted at Hudeiba and Shendi (Sudan), in a randomized block design with 3 replicates, var. Red Mexican, RO/2/1, R1/13, R1/5, R1/7, R1/25, and Great Northern No. 35 presented yields of 774 and 921, 659 and 780, 669 and 767, 473 and 752, 613 and 748, 761 and 728, and 582 and 724 kg/feddan (1 feddan = 0.42 ha), resp., at both sites. Nine lines selected for curly top resistance, and RO/2/1 and Red Mexican, were grown in randomized blocks with 5 replications. Significant differences were observed in seeds/pod, seed wt., days to 50% flowering and to maturity. Recently acquired snap bean material was completely killed at the seedling stage, which may have been due to the high salt content of the plot. (Summary by I.B.) G01

0558

21379 YASSIN, T.E.G. 1977. Fasulia (Phaseolus vulgaris L.): regional variety trials. In Ed-Damer, Sudan. Hudeiba Research Station. Annual Report 1970-1971. Ed-Damer. pp.15-16. Engl.

Phaseolus vulgaris. Cultivars. Yields. Yield components. Adaptation. Technology evaluation. Sudan.

Seven bean var. were tested at Shendi and Hudeiba (Sudan) in a randomized block design replicated 5 times. Seed yield was satisfactory at Hudeiba but poor at Shendi due to disease incidence at the latter. Four introduced navy bean var. and the standard var. RO/2/1 were tested at Hudeiba in a 5 x 5 Latin square design. RO/2/1 gave highest yields [ca. 100 kg/feddan; (1 feddan = 0.42 ha) more than the best introduced var.] and also had significantly more seeds/pod; however, it was a late maturing var. and had lighter seeds. RO/2/1, used as control, also outyielded 5 var. of the pea-bean type when tested at Hudeiba in a 6 x 6 Latin square design, by about 200 kg/feddan. RO/2/1 had much heavier seeds than the other var. Nine selections from RO/2/1 and Beladi were also grown for observations and seed multiplication. (Summary by I.B.) G01

See also 0400 0409 0415 0416 0418 0426 0444 0452 0492 0512

H00 NUTRITION

0559

21774 ADDO, R.A.; HILL, M.A. 1982. An investigation into a dye-binding procedure for measuring available lysine in raw and cooked beans. Journal of Plant Foods 4(4):183-189. Engl., Sum. Engl., 21 Refs. [Dept. of Food Science & Nutrition, Queen Elizabeth College, Campdem Hill Road, London W8 7AH, England]

Phaseolus vulgaris. Cooking. Protein content. Lysine. Water content. Heat treatment. Processing. England.

CP and available lysine were estimated in raw and cooked blackeye (Vigna unguiculata) and red kidney beans. Open cooking in water for 3 h under mild heat showed a slight increase in CP and available lysine content, whereas dehulling, grinding, and steaming for 1 h showed a slight loss of CP and available lysine. Available lysine was estimated by dye-binding with acid orange 12 dye, before and after treatment with propionic anhydride. (Author's summary) H00

0560

21741 CHEN, K.-H.; McFEETERS, R.F.; FLEMING, H.P. 1983. Stability of mannitol to Lactobacillus plantarum degradation in green beans fermented with Lactobacillus cellobiosus. Journal of Food Science 48(3):972-974, 981. Engl., Sum. Engl., 13 Refs., Illus. [United States Dept. of Agriculture, P.O. Box 5578, Raleigh, NC 27650, USA]

Phaseolus vulgaris. Fermentation. pH. Snap beans. USA.

Mannitol, in fermented green bean juice, was converted to lactic acid by Lactobacillus plantarum when initial pH was raised to 3.9. However, at pH 3.5, mannitol was stable to anaerobic degradation by a 10^6 colony forming units/ml inoculum of 19 strains of L. plantarum and 4 isolated homofermentative lactobacilli. Several strains were capable of limited mannitol degradation at initial pH 3.7. Completely fermented beans were microbiologically stable for at least 6 mo. under anaerobic conditions at 27°C. It is possible that heterolactic acid-fermented vegetables are

microbiologically stable provided fermentable sugars are removed and pH is lowered below 3.7. (Author's summary) H00

0561

21962 DURAN, L.; CALVO, C. 1982. Calidad de alubias blancas en conserva. 1. Selección de los parámetros que definen su calidad sensorial. (Quality of canned white beans. 1. Selection of sensory quality parameters). Revista de Agroquímica y Tecnología de Alimentos 22(2):271-281. Span., Sum. Span., Engl., 19 Refs., Illus. [Inst. de Agroquímica y Tecnología de Alimentos, Jaime Roig, 11, Valencia-10, España]

Phaseolus vulgaris. Seed characters. Canned beans. Spain.

Sensory parameters to define quality of canned white beans were selected. With this aim a panel for sensory descriptive analysis was selected and trained. A score sheet with nonstructured scales and a descriptive list with definitions of attributes were developed. Based on acceptance data, obtained with an untrained panel, the parameters that best define total sensory quality were selected: hardness, skin consistency, graininess, adhesiveness, flavor intensity, and off-flavor. (Author's summary) H00

0562

21743 MONTVILLE, T.J.; CONWAY, L.K. 1982. Oxidation-reduction potentials of canned foods and their ability to support Clostridium botulinum toxigenesis. Journal of Food Science 47(6):1879-1882. Engl., Sum. Engl., 22 Refs., Illus. [U.S. Dept. of Agriculture, Eastern Regional Research Center, Plant Science Laboratory, 600 E. Mermaid Lane, Philadelphia, PA 19118, USA]

Phaseolus vulgaris. Canned beans. Snap beans. Inoculation. Clostridium botulinum. Toxins. USA.

Oxidation-reduction potentials (Eh) of canned foods ranged from -18 to -438 mV. Foods packed in glass had higher redox potentials than those packed in cans. Only 4 out of 26 products tested reached positive redox values after exposure to air for 24 h at 4°C. Each product was inoculated with a suspension containing 10^5 heat shocked (80°C, 10 min) spores of Clostridium botulinum. Inoculated containers of mushrooms, whole corn, cream corn, asparagus, beef gravy, kidney beans, green beans, cream of mushroom soup, cheddar cheese soup, and lima beans supported toxin production by C. botulinum; potatoes and beets did not. (Author's summary) H00

H01 Foods and Nutritive Value

0563

21772 BRESSANI, R. 1983. Research needs to up-grade the nutritional quality of common beans (Phaseolus vulgaris). Qualitas Plantarum Plant Foods for Human Nutrition 32(2):101-110. Engl., Sum. Engl., 27 Refs., Illus. [Division of Food & Agricultural Sciences, Inst. of Nutrition of Central America and Panama, Guatemala, Guatemala]

Phaseolus vulgaris. Nutritive value. Protein content. Lysine. Cooking. Digestibility. Timing. Guatemala.

Some of the nutritionally important factors in common beans which are relatively well defined and may serve as a basis for recommendations for

further study and for establishing nutritional objectives for breeding are briefly reviewed. (Author's summary) H01

0564

20683 BUTTERWORTH, M.H.; CHINTSANYA, N.C.C.; PHIRI, K.M.J.; MITENGO-GAMA, P.W.S. 1984. Stall-feeding beef cattle with agricultural by-products in Malawi. Tropical Agriculture (Trinidad) 61(1):25-28. Engl., Sum. Engl., 11 Refs. [International Livestock Center for Africa, PO Box 5689, Addis Ababa, Ethiopia]

Phaseolus vulgaris. Uses. Animal nutrition. Nutritive value. Malawi.

The operation of the stall-feeding scheme for beef production in Malawi is described. Four trials were carried out to determine the effects of various rations of locally available agricultural by-products on the growth rate of cattle. In one of the trials, 12 animals were allocated to groups of 3 on the basis of wt. and breed and the groups received at random one of the following treatments: (1) chopped maize ad libitum + 2 kg bean haulms/head/day; (2) same as in (1) + 2 kg maize hominy feed (madeya); (3) same as (1) + 3.5 kg madeya; (4) as in (3) + 200 g meat-and-bone meal + 60 g bone meal. The trial lasted 110 days. Treatments 2, 3, and 4 were superior to treatment 1. The bean straw used in this trial contained 10.0% CP. The potential of bean haulms as a strategic supplement during the dry season is stressed. (Summary by I.B.) H01

0565

19959 CHANDAN, R.C.; UEBERSAX, M.A.; SAYLOCK, M.J. 1982. Utilization of cheese whey permeate in canned beans and plums. Journal of Food Science 47(5):1649-1653. Engl., Sum. Engl., 1 Refs.

Phaseolus vulgaris. Canned beans. Processing. USA.

Navy and kidney beans were hydrated in water, then canned in brines designated as control, whey permeate (WP), and hydrolyzed lactose whey permeate (HP). Hunter Lab Color Difference and Kramer Shear texture analyses indicated general darkening and increased firmness in permeate-treated beans. Total solids and ash increased significantly in the treated samples. There was a significantly lower preference for beans treated with permeate fractions than for control beans. (Author's summary) H01

0566

21904 DOUGHTY, J.; ORRACA-TETTEH, R. 1966. The contribution of legumes to African diets. In Stanton, W.R. Grain legumes in Africa. Rome, Food and Agriculture Organization of the United Nations. pp.9-32. Engl., 60 Refs., Illus.

Phaseolus vulgaris. Human nutrition. Nutritive value. Diets. Africa.

In relation to food and nutrition in Africa, 5 major factors must be considered: (1) seasonal food shortages; (2) nutritional deficiencies; (3) food storage and transport; (4) ignorance of nutrition; (5) effects of growing cash crops and of urbanization. The nutritive value of legumes, which lies primarily in their high protein content (20- 25%), is discussed. Legumes also make an important contribution of Fe, thiamine, and nicotinic acid to the diet. The nutritive values of some typical African legumes and other foods are given and African food patterns are described. The quantity of legumes consumed varies with agricultural practices, climate, season, and tribal custom. Results of surveys are given. The most widely eaten

legume in Africa is cowpea. Phaseolus vulgaris, introduced from the Americas, has become increasingly popular. The distribution of food within the family and traditional eating beliefs are discussed as well as the preparation of legumes. Almost everywhere in Africa legumes are eaten as one of the ingredients in the thick soup accompanying the main dish. The problem of calorie and protein deficiency is outlined. Increased production of legumes would have a marked effect on solving these problems. Education of both producer and consumer is emphasized. (Summary by I.B.) H01

See also 0573

I00 MICROBIOLOGY

0567

20660 KREMER, R.J.; PETERSON, H.L. 1983. Field evaluation of selected Rhizobium in an improved legume inoculant. Agronomy Journal 75(1):139-143. Engl., Sum. Engl., 30 Refs. [Dept. of Agronomy, Univ. of Missouri, Columbia, MO 65201, USA]

Phaseolus vulgaris. Rhizobium phaseoli. Inoculation. Nodulation. Yields. Nitrogen fixation. Nitrogen-fixing bacteria. USA.

In field trials in 1978 and 1980 at the Plant Science Research Center, near Starkville, Mississippi (USA), Phaseolus vulgaris cv. Commodore, cowpea cv. Mississippi Silver, and groundnut cv. Florunner were inoculated with 10^8 Rhizobium cells on a peat or vegetable oil carrier and sown in a Vertic Haplaquept soil containing more than 10^3 cowpea Rhizobia and more than 10^2 R. phaseoli/g soil and a Typic Paleudalf containing more than 10^2 R. phaseoli/g soil. More nodules developed with the oil-based than with the peat-based carrier. Seed yields of P. vulgaris increased to 5.62 and 3.37 t/ha with oil and peat based carriers, resp. These expt. indicate that an improved inoculant provided high no. of effective Rhizobium at planting. Through subsequent effective nodulation, oil-base inoculants increased yields and N fixation by the legumes due to increased nodulation by the superior N_2-fixing strains of Rhizobium. (Summary by Field Crop Abstracts) I00

I01 Rhizobium spp., Nitrogen Fixation and Nodulation

0568

20864 EL NADI, M.A; HAMDI, Y.A.; LOTFI, M.; NASSAR, S.H.; FARIS, F.S. 1971. Response of different varieties of common beans to certain strains of Rhizobium phaseoli. Agricultural Research Review (Egypt) 49(2):125-130. Engl., Sum. Engl., 8 Refs.

Phaseolus vulgaris. Cultivars. Inoculation. Rhizobium phaseoli. Strains. Nodulation. Egypt.

Nine Phaseolus vulgaris var. (Seminole, Contender, Giza 3, Triumph, Processor, Tender Long, Resistant Tender Green, Perla, and Regalfin) were inoculated with Rhizobium phaseoli strains 402, 403, 405, and D-400. Inoculated seeds were planted in sterile Nile silt. Plants were grown for 50 days under greenhouse conditions, after which examination for nodulation took place. All var. nodulated with strain 402 except Tender Long. Var.

Seminole, Triumph, Resistant Tender Green, Tender Long, and Regalfin did not nodulate with strain 403. Strain 404 failed to nodulate var. Seminole and Tender Long. Strain 405 was noninfective to var. Seminole and Perla. (Author's summary) I01

0569

21392 ISHAG, H.M. 1977. Haricot beans. In Ed-Damer, Sudan. Hudeiba Research Station. Annual Report 1970-1971. Ed-Damer. pp.11-12. Engl.

Phaseolus vulgaris. Snap beans. Seeds. Inoculation. Rhizobium. Fertilizers. N. Growth. Yields. Nodulation. Sudan.

Seeds of haricot bean var. RO 2/1 were inoculated with local strains of rhizobia designated as S (Sudanese strain). Treatments were: control, N, Rhizobium, and Rhizobium + N. A randomized block design was used with 4 replicates. Six-wk.-old plants showed no effect of inoculation but after 12 wk., growth of root and shoot increased as a result of the inoculation. Highest yield was obtained with the combination of Rhizobium and N (8% more than control). (Summary by T.F.) I01

0570

18769 QUINTO, C.; DE LA VEGA, H.; FLORES, M.; FERNANDEZ, L.; BALLADO, T.; SOBERON, G.; PALACIOS, R. 1982. Reiteration of nitrogen fixation gene sequences in Rhizobium phaseoli. Nature 299(5885):724-726. Engl., Sum. Engl., 20 Refs., Illus.

Phaseolus vulgaris. Nitrogen fixation. Nitrogen-fixing bacteria. Rhizobium. Strains. DNA. Genes. Hybridizing. Mexico.

Strains of Rhizobium phaseoli of different geographical origin, selected for their ability to fix N in Phaseolus vulgaris, had a common pattern of organization of DNA sequences homologous with nif sequences of Klebsiella pneumoniae. Initial characterization of these sequences revealed the presence of stable reiterations of sequences including nif sequences. The sequences appeared to be located on a large plasmid which differed in size between R. phaseoli strains. (Summary by Plant Breeding Abstracts) I01

0571

21053 SILVA, D.M.; RUSCHEL, A.P.; MATSUI, E.; NOGUEIRA, N. DE L.; VOSE, P.B. 1981. Determination of potential N_2-fixing activity of bacteria in sugar-cane roots and bean nodules using tritiated acetylene reduction technique and electron microautoradiography. In Vose, P.B.; Ruschel, A.P., eds. Associative N_2-Fixation. Boca Raton, Florida, CRC Press. v.2,pp.145-151. Engl., 8 Refs., Illus. [Centre de Energia Nuclear na Agricultura, Piracicaba-SP, Brasil]

Phaseolus vulgaris. Nitrogen fixation. Nitrogen-fixing bacteria. USA.

A direct method of confirming N_2-fixation within the root has been developed. The method uses tritium labelled acetylene combined with high resolution microautoradiography to record the activity of potentially N_2-fixing bacteria. A preliminary expt. was carried out using sugarcane roots and bean nodules and 1st results seem promising. Bean nodules were used as control, showing a smaller no. of silver grains and only from bacterial cells of Rhizobium, indicating that in nodules not all the bacteria are active at the same time. It also suggests that bean nodule silver grains are directly related to N_2-fixation. (Author's summary) I01

0572

21378 SUDAN. MINISTRY OF AGRICULTURE. 1951. Seed inoculation of legumes. In _____. Annual Report of the Research Division 1948/49. Sudan. pp.60-61. Engl.

Phaseolus vulgaris. Inoculation. Nitrogen-fixing bacteria. Nodulation. Yields. Growth. Seed. Sudan.

Two field expt. were carried out in Sudan to test whether inoculation of legumes with appropriate nodule bacteria would increase vegetative growth and yields. In the 1st, local strains of bacteria isolated from root nodules of legumes were used for inoculating groundnut, pigeon pea, lubia, cowpea, lucerne, and soybean. No significant increases were recorded. Inoculated haricot beans appeared to be superior to noninoculated ones, but the difference was not significative. Nodule development and plant wt. of legumes grown from inoculated and untreated seed were studied in the 2nd expt. Probably, nodule bacteria from widely cultivated legumes such as groundnut, lubia, and cowpea are widespread in Gezira soil and no benefit is obtained from inoculation. Inoculation of haricot beans resulted in extensive and significant increases in nodule formation and plant wt. It is advisable to inoculate legumes newly introduced into Sudan or those being grown for the 1st time in any particular area. (Summary by I.B.) I01

See also 0470 0528

J00 ECONOMICS AND DEVELOPMENT

0573

19882 BLAKESLEE, J.A. 1979. Development of feed and food production systems for subsistence Ecuadorian Indian culture. Ph.D. Thesis. Gainesville, University of Florida. 223p. Engl., Sum. Engl., 55 Refs., Illus.

Phaseolus vulgaris. Cultivation. Intercropping. Animal nutrition. Human nutrition. Ecuador.

Production systems capable of satisfying the subsistence requirements of a tribal family of 6 and the nutritional needs of their Rhode Island Red chicken flock containing 45 hens and 90 young meat birds were developed as part of a study conducted in Ecuador's NE region around Limoncocha, located in the continuously moist, humid Amazon river basin. Preliminary screening of crop kinds and cv. was accomplished at Limoncocha. Surveys were conducted to describe indigenous agricultural practices. Demonstration plots in tribal areas were planned using information generated at Limoncocha. These plots were designed to introduce new crops to the Indians and observe their response to them. Ten human and 10 poultry diets were formulated to create systems available for selection by farmers. The crops used were known to grow in the area. Rows in the linear programming matrix were designed for the computer to calculate the levels of 20 nutrients in each of the diets which, when meeting standards, would insure adequate nutrition. Values representing levels of nutrients in 1 kg of each crop were placed in the columns of the linear program matrix to satisfy the needs of chickens and humans and maximize nutrient production from the farm. Nutrient producing land was the limiting resource. The matrix was also designed to evaluate a production unit containing one poultry and one human diet the farmer might select. Common beans under indigenous management produced 40 g/m^2, dry seeds weighing 20 g/100 seeds. Cowpeas

were observed to be more disease resistant and vigorous than common beans. The computer calculations showed 2 plantings each year of 1 ha of land area will adequately feed a family of 6 and a flock of 135 chickens. Nutrient production from the farm can be maximized by producing jackbean (Canavalia spp.), soybean, or peanuts. Nutrients can be produced in adequate quantities and proper ratios to meet the needs of humans and chickens within the subsistence agricultural pattern of Ecuadorian Indian culture. (Author's summary) J00

0574

21732 DUE, J.M.; MANDAY, E.A. 1982. Beans in the farming systems in Hanang and Arumeru Districts, Arusha Region, Tanzania. Morogoro, Tanzania, University of Dar es Salaam. 63p. Engl., Sum. Engl., 8 Refs., Illus. [Univ. of Illinois at Urbana-Champaign, 305 Mumford Hall, 1301 West Gregory Drive, Urbana-IL 61801, USA]

Phaseolus vulgaris. Labour. Cultivation systems. Agricultural projects. Tanzania.

Farming systems in 2 bean producing districts in Arusha Region in Tanzania, namely Hanang and Arumeru, are discussed. Characteristics of these farming systems regarding major crops grown, labor utilization by crop, capital investment, farm operating costs, off-farm earnings, and family living expenditures are discussed. Problems farmers faced in the 1982 cropping season are also discussed. Farmers' preference for bean var. grown in the region is indicated. From the reported findings, it appears important for policy makers and bean research collaborators to plan their research to meet the expressed needs of farmers (recommendations on pest and disease control, improved seed, more palatable var., and improved storage). A farming systems approach to the development of bean production in the region and other ecologically similar zones is considered possible. (Author's summary) J00

0575

22257 DUE, J.M.; MANDAY, E.; WHITE, M.; ROCKE, T. 1984. Beans (Phaseolus vulgaris) in the farming systems in Arusha Region, Tanzania, 1982. Morogoro, Tanzania, University of Dar es Salaam. Department of Rural Economy. Technical Report no.3. 64p. Engl., Sum. Engl., 4 Refs., Illus. [Univ. of Illinois at Urbana-Champaign, 305 Mumford Hall, 1301 West Gregory Drive, Urbana-IL 61801, USA]

Phaseolus vulgaris. Cultivation. Economics. Cultivars. Yields. Prices. Consumption. Tanzania.

The farming systems of 85 farm households (7.8 ac. av.; 22% allocated to beans) located in Hanang and Arumeru (mono- and bimodal rainfall patterns, resp.), Tanzania, were studied to provide socioeconomic and agricultural background data necessary to develop higher yielding, drought-, disease-, and pest-resistant var. and new technologies. Beans were found to be grown by 98% of the families sampled, and to provide 21% of gross value of crop production; 39 and 30% of the bean crop was sold in Hanang and Arumeru, resp. Insect damage was the main factor affecting bean yields in Hanang and excess rainfall in Arumeru. In terms of yields, var. Red Colored, Masai Red, and Canadian Wonder are preferred. Information is given on the most desired traits for bean var., storage, losses, harvesting, consumption (leaves, green beans, dried beans), preparation, and reaction of respondents to changing prices and to yield increases. (Summary by I.B.) J00

0576

21333 DUE, J.M.; ANANDAJAYASEKERAM, P. 1982. Two contrasting farming systems in Morogoro region, Tanzania: a report. Urbana, University of Illinois at Urbana-Champaign. Department of Agricultural Economics. 87p. Engl., Sum. Engl., 13 Refs., Illus. [Univ. of Illinois at Urbana-Champaign, 305 Mumford Hall, 1301 West Gregory Drive, Urbana-IL 61801, USA]

Phaseolus vulgaris. Production. Consumption. Yields. Economics. Prices. Income. Socio-economic aspects. Tanzania.

The farming systems in the Kilosa and Mgeta areas of Morogoro region (Tanzania) were studied as part of an interdisciplinary attempt to develop new higher yielding bean var. Data and results are presented for samples of 60 families drawn from each of these areas. In Kilosa, beans accounted for 8% of total value of production (65% consumed and 35% sold). Acreage planted to beans would change with changing prices. Highest gross return/ac came from rice, followed by beans. Sex differences in labor distribution were reported; women put in more labor in beans and rice. In Mgeta, beans (av. acreage 1.4) were grown by every family sampled, except one. On the av. 47% of the beans were consumed and 46%, sold. Differences between villages, production data, yields, and sales are given. Av. value of total production (VTP) was almost identical for the 2 areas. Beans contributed 15% of total value of production and 15% of total consumption/family. Regressions were computed to determine those factors contributing most to variation in value of total production in each area. (Summary by I.B.) J00

0577

21332 DUE, J.M.; MUDENDA, T.; MILLER, P.; WHITE, M. 1984. Women's contributions made visible: of farm and market women to farming systems and household incomes in Zambia, 1982. Urbana, University of Illinois at Urbana-Champaign. Department of Agricultural Economics. Illinois Agricultural Economics Staff paper no.84E-285. 45p. Engl., Sum. Engl., 11 Refs., Illus. [Univ. of Illinois at Urbana-Champaign, 305 Mumford Hall, 1301 West Gregory Drive, Urbana-IL 61801, USA]

Phaseolus vulgaris. Economics. Labour. Income. Development. Costs. Prices. Socio-economic aspects. Zambia.

Labor contributions of farm and market women in Zambia (1982) are documented. A sample of 112 farm and 30 market families was chosen in 3 areas, Mpika, Mazabuka, and Mumbwa, which differ in their level of agricultural development. Farm size ranged from 2 to 25 ac. Monogamous and female-headed households were selected. Socioeconomic characteristics of farm families were discussed in addition to allocation of labor inputs, crops grown, decision-making, operating expenses, off-farm income, living expenditures, savings and use of credit, income generation by sex, women's savings associations, and level of well-being. Av. bean production, consumption, and sales for the 3 areas were 61, 7, and 54 kg; 31, 31, and 0 kg; and 134, 80, and 54 kg, resp. Multiple and bivariate regressions were calculated. For market women, socioeconomic profiles, labor inputs, crops produced (beans cultivated on an av. 0.2 ac), earnings, decision-making, expenses, income, expenditures, and use of earnings and credit are discussed. Farm women spend 6.6 h/day in agriculture and men, 5.7 h/day. The major food staple, maize, was grown by all farm families, in addition to a variety of crops including beans. On the av. 41% of crop production is consumed and 59%, sold. Use of oxen and plows is expanding acreage. Recommendations are given for improving Zambian agricultural policies. (Summary by I.B.) J00

0578

20842 GONZALEZ M., W. 1982. Estudio exploratorio económico y tecnológico del cultivo del fríjol (Phaseolus vulgaris L.) en el cantón de Upala. (Economic and technological study on bean cultivation in the Upala canton). Alajuela, Universidad de Costa Rica. Facultad de Agronomía. Estación Experimental Agrícola Fabio Baudrit M. Boletín Técnico 15(2): 29-36. Span., Sum. Span., 11 Refs. [Sección Estudios Económicos, Estación Experimental Agrícola Fabio Baudrit M., Apartado 183, Alajuela, Costa Rica]

Phaseolus vulgaris. Economics. Costs. Yields. Income. Cultivation systems. Costa Rica.

An economic and technological diagnosis of bean cultivation in the region of Upala, Costa Rica, was conducted. Information was obtained through a stratified sampling of 27 farmers, in which each stratum consisted of a different cropping system (mechanized, hill plot planting, and covered). The size of the stratum was determined by a distribution proportional to the resp. population size. Production cost/ha were ₡4698.45, ₡3655.40, and ₡3069.85 and yields obtained were 585.58, 510.60, and 464.60 kg/ha for the mechanized, hill plot planting, and covered cropping systems, resp. The index of income return was negative for all systems; net margen was negative for the mechanized cropping system. (Author's summary. Trans. by L.M.F.) J00

0579

22106 INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1983. Cultures vivrieres: haricot. (Food crops: beans). In _____. Proposition pour un plan quinquennal (septembre 1983-aout 1988) de la recherche agronomique a l'ISABU. Bujumbura, Burundi. v.2,p.172. Fr.

Phaseolus vulgaris. Agricultural projects. Ecology. Diseases and pathogens. Seed production. Burundi.

The aims of agricultural research (1983-88) at the Institut des Sciences Agronomiques du Burundi are outlined. With reference to beans, the main food crop of the country, the study of ecological aspects and incidence of diseases (fungal, bacterial, viral) and pests, at different alt., will help determine their relative importance and selection criteria, and identify sites for basic seed production. The influence of intercropping and the factors determining high aphid populations (15% in the dry season, 50% yield loss) will be studied. (Summary by I.B.) J00

0580

21097 NTEZILYAYO, A. 1983. Problems of agricultural development at the national level. In Chang, J., ed. Agricultural research in Rwanda: assessment and perspectives, Kigali, Rwanda, 1983. Report of a seminar. The Hague, Netherlands, International Service for National Agricultural Research. pp.21-52. Engl., Sum. Engl. [Ministry of Agriculture and Livestock, Kigali, Rwanda]

Phaseolus vulgaris. Development. Production. Agricultural projects. Yields. Rwanda.

The historic development of the agricultural sector in Rwanda is reviewed through successive national plans. Problems related to agricultural development are discussed: insufficient production, rapid population

growth, weak financial capacity, and the country's lack of access to the sea. The 1950-60 Ten-Year Plan for the Economic and Social Development of Rwanda-Urundi included plant production (beans, 205,200 t; expected production, 246,000 t), silviculture, animal production, fishing, and fish farming. The Interim Emergency Plan of First Five-Year Economic and Social Development was intended to prepare the nation for economic independence, accomodate a growing population, and ensure improved social welfare at a time (1966-70) when everything needed priority. The Second Five-Year Economic, Social and Cultural Development Plan (1977-81) was devoted to reorganizing all sectors of national life. Bean production growth rate during these years was 3.0%. Low yields of beans (750 kg/ha) have restricted total output, in a country where food crops are predominantly starches and the diet is deficient in proteins and lipids. (Summary by I.B.) J00

0581

20904 RHEENEN, H.A. VAN 1983. Progress Report no. 89 - September 1983. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. 5p. Engl. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Development. Research. Economics. Kenya.

A general report is given of the situation at the National Horticultural Research Station, Thika, Kenya, where a grain legume project has been undertaken. The personnel involved in the project are named and both exptl. work and visits that were paid to and by the project are noted. In addition, published works and the allocation and expenditure of money are listed. Among the miscellaneous items is a description of the Second Tanzania/Collaborative Research Support Programme Bean Workshop, which was organized by the Dept. of Crop Science at the U. of Dar es Salaam, Morogoro, Tanzania. (Summary by J.R.) J00

See also 0464 [illegible]4 0533 0550

L00 GRAIN STORAGE

0582

20074 BASS, L.N. 1981. Report of the seed moisture and storage committee working group on seed storage 1977-1980. Seed Science and Technology 9(1):245-248. Engl., Sum. Engl., Fr., Germ.

Phaseolus vulgaris. Seeds. Water content. Storage. Temperature. Timing. Germination. USA.

No unified project is reported, but brief details are given of expt., some of which are still incomplete, carried out by individuals or small groups of workers. Phaseolus vulgaris seeds dried at 38°C for 8 h to 10-11% MC were found to germinate best after sealed storage for 1 yr at 21°C. (Extracted from summary by Field Crop Abstract) L00

See also 0440

L01 Stored Grain Pests

0583

21903 DAVIES, J.C. 1970. Insect infestation and crop storage. In Jameson, J.D., ed. Agriculture in Uganda. New York, Oxford University Press. pp.274-280. Engl., 9 Refs.

Phaseolus vulgaris. Stored grain pests. Acanthoscelides obtectus. Zabrotes subfasciatus. Insect biology. Temperature. Relative humidity. Storage. Insect control. Cultural control. Chemical control. Uganda.

In Uganda food losses due to insects, rodents, and fungi are probably greater than 10%. Factors favoring insect infestation are discussed: temp., RH, MC, poor hygiene, and presence of old stock. Primary infestation can also occur in the growing crop such as the case of Acanthoscelides obtectus in beans. Insects recorded on from stored products (cereals, legumes including beans, oil seeds, dried root crops, and tobacco) in Uganda are listed. Bionomical data are given for some important pests: A. obtectus and Zabrotes subfasciatus both attack stored beans. A brief life history is reported on this last pest. Storage and control measures are described for subsistence farms. (Summary by I.B.) L01

0584

20961 EDJE, O.T. 1984. Effects of storing bean seeds with bean pod ash and other insecticides. Bean Improvement Cooperative. Annual Report 27:145-147. Engl. [Bunda College of Agriculture, P.O. Box 219, Lilongwe, Malawi]

Phaseolus vulgaris. Cultivars. Seeds. Storage. Seed treatment. Acanthoscelides obtectus. Insect control. Germination. Stored grain pests. Malawi.

A study was conducted at Bunda College of Agriculture, Lilongwe, Malawi, to compare the effect of storing bean seeds with groundnut oil, sunflower oil, tobacco dust, pirimiphos-methyl, and bean pod ash used as treatments. Four dry bean cv., 253/1 (tan), 336 (red), 499/5 (black), and P692 (speckled red), were used. Seeds were stored in metal tins with 3 kg/tin for a period of 3 mo. There were 3 tins/treatment and each treatment was replicated 3 times, in a randomized complete block design. Data on the no. of insects/kg seed, weevilled seeds (%), and seed germination were collected on 25% of the seed lot. Sunflower oil was the least effective in reducing bruchid attack. The % of unweevilled seeds with bean pod ash was 92 compared with 50 for the control. The germination % of seeds stored in bean pod ash was 88.7 compared with 50.7 and 34.7 for the control and sunflower oil, resp. (Summary by T.F.) L01

0585

21765 GELOSI, A.; ARCOZZI, L. 1983. Tonchio del fagiolo (Acanthoscelides obsoletus Say). [Bean bruchid (Acanthoscelides obtectus)]. Informatore Fitopatologico 33(4):35-38. Ital., Illus.

Phaseolus vulgaris. Acanthoscelides obtectus. Insect biology. Insect control. Stored grain pests. Predators and parasites. Italy.

Notes are given on the morphology, biology, and control of Acanthoscelides obsoletus (A. obtectus) and on the damage that it causes on peas, chickpeas, lentils, and especially Phaseolus beans, making them unfit for consumption or germination. The 1st generation developed on the seeds in storage, and the adults flew to pulse fields to oviposit on the developing seeds of the growing plants. The 2nd generation within the seeds were harvested with them and the adults emerged in the storehouse, ovipositing on the stored pulses and giving rise to a 3rd generation of which the adults emerged in Nov. and laid the eggs of the 4th (overwintering) generation; these in turn gave rise to adults in the following April or May. Several larvae could develop in a single Phaseolus bean. Adults fed only on flower nectar; consequently, only those that migrated to the field

were able to feed, and they produced more offspring than did the adults of the generations that remained in the storehouse without feeding. Natural enemies comprised the chalcidoid Anisopteromalus calandrae and the mite Pyemotes ventricosus (Pediculoides ventricosus). Chemical control by fields sprays was possible, but fumigation in the storehouse was more effective. Fine wire mesh at storehouse windows is advisable to prevent the passage of adults. (Summary by Review of Applied Entomology) L01

0586

21987 LIMA, C.P.F. DE 1976. Dried bean beetle. Acanthoscelides obtectus (Say) (Coleoptera:Bruchidae). In _____. A guide to the biology and control of the pests of field crops and stored produce in Kenya. Kenya, Ministry of Agriculture. National Agricultural Laboratories. p.II:5. Engl.

Phaseolus vulgaris. Acanthoscelides obtectus. Entomology. Insect control. Chemical control. Insect biology. Stored grain pests. Kenya.

Symptoms of attack, pest status, biology, and life history of the bean bruchid (Acanthoscelides obtectus) are briefly described. Treatment with 0.1% lindane at 100 g/90 kg beans is recommended. (Summary by T.F.) L01

0587

21554 MAGOYA, J.K.; RHEENEN, H.A. VAN; PERE, W.M. 198? Don't let weevils spoil your beans. Thika, Kenya, National Horticultural Research Station. 3p. Engl., Illus. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Phaseolus vulgaris. Acanthoscelides obtectus. Stored grain pests. Insect control. Cultural control. Kenya.

A simple method to control bruchids (Acanthoscelides obtectus) is briefly described. Stored beans will receive good protection if treated with only 2 cm^3 sunflower oil/kg of seed. Bruchid control with malathion or ashes is mentioned. (Summary by T.F.) L01

0588

22078 SKAIFE, S.H. 1918. Pea and bean weevils. South Africa, Department of Agriculture. 32p. Engl., Sum. Engl., Illus.

Phaseolus vulgaris. Stored grain pests. Insect biology. Acanthoscelides obtectus. Plant injuries. Predators and parasites. Insect control. Seed treatment. South Africa.

Several aspects of the weevils that attack peas and beans in South Africa are discussed: distribution, development stages (adult, egg, larva, pupa), damage and natural enemies. Questions on their effects are answered and control measures are described. The common bean weevil [Bruchus (Acanthoscelides) obtectus] is probably the most destructive and infests French or kidney bean, Phaseolus multiflorus, and Vigna catjang. Its attack may begin in the field or in storage, causing severe losses in all bean var. In a test to determine weevil preference, Canadian Wonder showed the highest % of infestation among 15 kinds of beans (30.5). Bruchus petechialis and Pediculoides ventricosus are mentioned as natural enemies of the bean weevil. The Mexican bean weevil (Spermophagus pectoralis) infests common beans but has not been reported in South Africa. A mixture of boiling water (2 parts) and one part at summer air temp. for soaking seed for 5 min gives good weevil control and is recommended for farmers.

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ZOO GENERAL

0589

21957 INTERNATIONAL SERVICE FOR NATIONAL AGRICULTURAL RESEARCH. 1982. A review of the agricultural research system of Malawi. The Hague, Netherlands. Report to the Government of Malawi. ISNAR R8. 88p. Engl., Sum. Engl., Illus.

Phaseolus vulgaris. Agricultural projects. Malawi.

The agricultural research system of Malawi was reviewed in order to advise how it could be improved. Recent performance of the agricultural sector, as well as factors affecting the pattern of agricultural growth, are examined. Major aspects of the current system, including institutions, resources, and linkages with other institutions, are examined. The main problems of the research system are discussed and recommendations are given. Less than 0.5% of the country's agricultural gross domestic product is invested in research. The most critical need is a steady flow of adequate funds for replacing equipment, supplies, and materials, and for internal transportation. Research within the Ministry of Agriculture, at Bunda and Chancellor Colleges, and at each of the 11 research stations is examined in detail. Work on beans (850,000 ha) is being carried out at Chitala, Kasinthula, and Mbawa research stations. (Summary by I.B.) Z00

ABBREVIATIONS AND ACRONYMS

A	Angstrom(s)
ABA	Abscisic acid
ac	Acre(s)
Afr.	Afrikaans
a.i.	Active ingredient
alt.	Altitude
AMV	Alfalfa mosaic virus
approx.	Approximate(ly)
atm.	Atmosphere
ATP	Adenosine 5'-triphosphate
av.	Average
BAP	6-Benzylaminopurine
BBMV	Broad bean mosaic virus
BCMV	Bean common mosaic virus
BGMV	Bean golden mosaic virus
BGYMV	Bean golden yellow mosaic virus
BOD	Biochemical oxigen demand
BPMV	Bean pod mottle virus
BRMV	Bean rugose mosaic virus
BSMV	Bean southern mosaic virus
BV	Biological value
BYMV	Bean yellow mosaic virus
°C	Degrees Celsius (centigrade)
ca.	About (circa)
CAMD	Cassava African mosaic disease
CAMV	Cassava African mosaic virus
CBB	Cassava bacterial blight
CBSD	Cassava brown streak disease
CEC	Cation exchange capacity
CER	CO_2 exchange rate
CF	Cassava flour
CGR	Crop growth rate
CLM	Cassava leaf meal
CLV	Cassava latent virus
CM	Cassava meal
cm	Centimeter(s)
COD	Chemical oxigen demand
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 acid
DM	Dry matter
DNA	Deoxyribonucleic acid
EC	Emulsifiable concentrate
EDTA	Ethylenediaminetetraacetic acid
EEC	European Economic Community
e.g.	For example
ELISA	Enzyme-linked immunosorbent assaye
EMS	Ethyl methane sulfonate
Engl.	English
expt.	Experiment(s)
exptl.	Experimental
°F	Degrees Fahrenheit
Fr.	French
ft-ca	Foot candles (10.76 lux)
FYM	Farmyard manure
g	Gram(s)
G	Giga (10^9)
GA	Gibberellic acid
gal	Gallon(s)
GE	Gross energy
Germ.	German
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
Illus.	Illustrated
in.	Inches
Ital.	Italian
IU	International unit
J	Joule
Jap.	Japanese
kat	Katal(amount of enzymatic activity that converts 1 mole of substrate/s)
kcal	Kilocalorie(s)
kg	Kilogram(s)
Kj	Kilojoule
km	Kilometer(s)
KNap	Potassium naphthenate
kR	Kiloroentgen(s)
l	Liter(s)
LAD	Leaf area duration
LAI	Leaf area index
lat.	Latitude
lb	Pound(s)
LD_{50}	Mean lethal dose
LER	Land efficiency ratio
LPC	Leaf protein concentrate
lx	Lux
M	Mega
M	Molar
m	Meter(s)
Mal.	Malay
max.	Maximum

MC	Moisture content
ME	Metabolizable energy
meq	Milliequivalent(s)
met.	Methionine
mg	Milligram(s)
mho	Reciprocal ohm
min.	Minimum
min	Minute(s)
ml	Milliliter(s)
mm	Millimeter(s)
mo.	Month
mol.wt.	Molecular weight
m.p.	Melting point
NAA	Alpha-naphthalene acetic acid
NAD	Nicotinamide adenine dinucleotide
NADH	Nicotinamide adenine dinucleotide, reduced from
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	Peroxyacetic nitrate
PCNB	Pentachloronitrobenzene
PDA	Potato dextrose agar
PER	Protein efficiency ratio
pH	Hydrogen ion concentration
pphm	Parts per hundred million
PPI	Pre-planting incorporation
ppm	Parts per million
PSA	Potato sucrose agar
pv.	Pathovar.
Ref(s).	Reference(s)
resp.	Respective(ly)
Rf	Retardation factor-chromatography
RGR	Relative growth rate
RH	Relative humidity
RNA	Ribonucleic acid
Rom.	Romanian
Russ.	Russian
s	Second
SBM	Soybean meal
SCN	Thiocyanate
SCP	Single cell protein
SDS	Sodium dodecyl sulfate
Sk.	Slovak
sp.	Species
Span.	Spanish
spp.	Species
SSL	Sodium stearyl-2-lactylate
Sum.	Summary
t	Ton(s)
TDN	Total digestible nutrients
temp.	Temperature
TIA	Trypsin inhibitor activity
TIBA	2,3,5-Triiodobenzoic acid compound with N-methylmethanamine
TLC	Thin-layer chromatography
TMV	Tobbaco 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)
/	Per
%	percent(age)
>	More than, greater than
<	Less than
≤	Equal to or less than
≥	Equal to or greater than
±	Plus or minus

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[illegible]

HOLSTRA, [illegible]
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0507 0512 0514 0588

CUBA
0035 0042 0057 0060 0129 0149 0340
0448
DISEASES AND PATHOGENS
0084 0096 0104
INJURIOUS INSECTS
0058 0104
SEED PRODUCTION
0077 0078 0080

CULTIVARS
0002 0013 0019 0024 0025 0026 0027
0030 0031 0032 0034 0036 0038 0039
0041 0049 0052 0056 0062 0066 0070
0073 0077 0084 0087 0089 0091 0103
0104 0109 0116 0136 0139 0144 0147
0151 0158 0159 0162 0163 0164 0165
0167 0[illegible] 0175 0181 0182 0185 0199
0291 029[illegible] 0293 0297 0310 0313 0315
0318 0319 0322 0326 0331 0333 0334
0335 0349 0355 0358 0363 0368 0369
0370 0389 0394 0402 0407 0409 0413
0414 0416 0418 0419 0422 0426 0427
0435 0436 0439 0440 0442 0444 0445
0446 0452 0454 0463 0471 0473 0480
0481 0488 0492 0501 0520 0522 0523
0525 0526 0534 0536 0538 0540 0541
0544 0546 0548 0549 0553 0556 0568
0575 0584
ADAPTATION
0134 0135 0137 0140 0141 0142 0143
0156 0157 0166 0169 0170 0172 0173
0174 0304 0314 0316 0320 0321 0324
0327 0337 0336 0339 0340 0341 0342
0344 0346 0347 0348 0364 0415 0518
0524 0527 0528 0530 0531 0532 0535
0542 0543 0545 0555 0557 0558
GERMPLASM
0037 0141 0149 0154 0155 0166 0316
0323 0330 0337 0339 0348 0420 0512
0529 0532 0537 0539 0552 0554

CULTIVATION SYSTEMS
0027 0030 0037 0064 0065 0066 0067
0068 0069 0070 0071 0072 0073 0074
0109 0144 0148 0158 0194 0195 0254
0257 0259 0261 0262 0263 0264 0265
0266 0268 0272 0275 0363 0364 0383
0415 0425 0430 0433 0439 0445 0451
0452 0453 0454 0455 0456 0458 0459
0461 0462 0481 0515 0524 0527 0532
0535 0540 0543 0546 0573 0574 0578

CULTURE MEDIA
0153 0184 0403

CYSTINE
0353

CYTOGENETICS
0176

CYTOKININS
0003 0012

CYTOLOGY
0026 0110 0295

DELIA PLATURA
0036 0377
INSECT CONTROL
0131
CHEMICAL CONTROL
0097 0126

DETERIORATION
0198
MECHANICAL DAMAGE
0075

DEVELOPMENTAL STAGES
0020 0113 0214 0278 0494 0504
FLOWERING
0015 0039 0049 0095 0140 0142 0163
0174 0312 0332 0412 0414 0427 0544
0545 0547
GERMINATION
0019 0100 0146 0400 0427 0582 0584
MATURATION
0049 0163 0174 0312 0332 0545

DIABROTICA BALTEATA
INTEGRATED CONTROL
0129
PLANT INJURIES
0125 0129
RESISTANCE
0104

DIETARY VALUE
0178 0180 0345 0352 0357 0563

DIGESTIBILITY
0180 0322 0345 0352 0357 0563

DIPTERA
0036 0058 0076 0123 0258 0283 0318
0330 0331 0377 0409 0412 0429 0449
0491 0492 0497 0499 0504 0509 0512
0518 0521 0528 0538
INSECT CONTROL
0097 0126 0131 0285 0309 0433 0463
0477 0496 0498 0501 0503 0505 0508
0514 0537

DISEASE CONTROL
0268 0467
BACTERIOSES
0036 0037 0083 0084 0085 0087 0283
0284 0285 0460 0468 0471 0477
MYCOSES
0036 0037 0043 0059 0087 0092 0094
0096 0097 0099 0100 0144 0283 0285
0288 0290 0417 0444 0468 0471 0474
0477
VIROSES
0036 0037 0059 0087 0103 0107 0144
0283 0285 0468 0477 0479

DISEASE TRANSMISSION
0084 0290
VIROSES
0104 0294 [illegible]96 0297 0479

DNA
0570

DOMINICAN REPUBLIC
0342

DROUGHT
0019 0027 0034 0338 0413 0520 0538
0549

DRY MATTER
0047 0052 0185 0397 0399 0438 0451

DWARF BEANS
0137 0162 0174 0239 0317 0319 0320
0407 0455 0528
SPACING
0158 0334 0529

ECOLOGY
0028 0037 0045 0145 0167 0183 0185
0186 0233 0252 0326 0333 0369 0370
0568 0569 0579

ECONOMICS
0033 0061 0065 0068 0069 0074 0144
0190 0191 0192 0193 0194 0251 0254
0263 0264 0268 0363 0372 0373 0375
0376 0378 0381 0442 0443 0524 0533
0550 0574 0575 0576 0577 0578 0581

ECUADOR
0361 0430 0573

EGYPT
0053 0359 0396 0407 0408 0489 0492
0497 0499 0500 0568

EL SALVADOR
0134 0367
INJURIOUS INSECTS
0303

ELASMOPALPUS LIGNOSELLUS
PLANT INJURIES
0283 0494

ELSINOE PHASEOLI
0258 0477 0552

EMERGENCE
0019 0100

EMPOASCA FABAE
INSECT CONTROL
0514

INTEGRATED CONTROL
0129
PLANT INJURIES
0129 0514

EMPOASCA KRAEMERI
0409
INSECT CONTROL
0131 0363 0514
PLANT INJURIES
0150 0514
RESISTANCE
0144 0150 0316 0320

ENZYMES
0197 0291 0357 0397 0466

EPILACHNA VARIVESTIS
0128 0133 0296
INSECT CONTROL
0131 0514
BIOLOGICAL CONTROL
0313
PLANT INJURIES
0514
RESISTANCE
0316

ERYSIPHE POLYGONI
DISEASE CONTROL
0037 0283
EPIDEMIOLOGY
0316
RESISTANCE
0037 0316
SYMPTOMATOLOGY
0283

ETIELLA ZINCKNELLA
0121

EXPERIMENT DESIGN
0195 0384

FAT CONTENT
LEAVES
0112
SEED
0023

FERTILIZERS
0027 0028 0031 0033 0037 0038 0042
0044 0045 0047 0049 0051 0053 0058
0059 0062 0064 0065 0069 0071 0072
0076 0088 0144 0154 0159 0183 0339
0359 0364 0366 0368 0397 0408 0410
0412 0415 0416 0418 0419 0421 0422
0424 0425 0428 0433 0435 0439 0442
0443 0444 0445 0454 0463 0532 0535
0540 0549 0555 0569

FIBRE CONTENT
0177
SEED
0023 0355

FLOWERING
0015 0039 0049 0095 0140 0142 0163
0174 0412 0414 0427 0544 0545 0547
GENETICS
0160 0312 0332

FOLIAGE
0084 0219 0259

FRUCTOSE
0403

FUSARIUM OXYSPORUM
0001
DISEASE CONTROL
0096
EPIDEMIOLOGY
0096
ETIOLOGY
0096
INOCULATION
0091 0476
RESISTANCE
0091 0096
SYMPTOMATOLOGY
0096 0469

FUSARIUM SOLANI PHASEOLI
DISEASE CONTROL
0096
EPIDEMIOLOGY
0096
ETIOLOGY
0096
RESISTANCE
0096 0293
SYMPTOMATOLOGY
0096

GENES
0138 0153 0165 0570

GERMINATION
0351 0400 0421 0584
SEED
0019 0146
DISEASES AND PATHOGENS
0083 0100
TEMPERATURE
0427 0582

GERMPLASM
0037 0079 0081 0141 0148 0154 0155
0161 0166 0312 0316 0317 0323 0329
0330 0332 0337 0339 0343 0348 0420
0512 0517 0519 0529 0532 0537 0539
0552 0554

GIBBERELLINS
0003

GLUCOSE
0403 0405

GREEN MANURES
0030 0043 0065 0244

GROWTH
0016 0017 0019 0114 0115 0187 0355
0392 0399 0400 0447 0451 0526 0572
MINERALS AND NUTRIENTS
0015 0148 0183 0390 0407 0418 0421
0569
NUTRIENT SOLUTION
0015 0390 0407
PLANTING
0148 0441 0448
SALINITY
0396 0407
SPACING
0032 0148 0448
TEMPERATURE
0427 0432

GUATEMALA
0013 0049 0071 0159 0314 0351 0357
0563
DISEASES AND PATHOGENS
0103 0152 0321
INJURIOUS INSECTS
0103 0445
MARKETING
0374
PRODUCTION
0374 0445

HARVESTING
0036 0051 0055 0057 0058 0072 0075
0076 0077 0078 0174 0195 0201 0258
0355 0421 0429 0440 0442 0443 0449

HEAT TREATMENT
0161 0178 0352 0354 0559

HELIOTHIS ZEA
0429 0489 0491
INSECT CONTROL
0477 0514
CHEMICAL CONTROL
0503
PLANT INJURIES
0441 0477 0502 0504 0514 0531

HEMIPTERA
0123 0251 0490 0493 0497 0510
INSECT CONTROL
0131

HERBICIDES
0031 0048 0050 0058 0060 0268 0447
DISEASES AND PATHOGENS
0027 0036 0037 0416 0444

HETEROZYGOSIS
0519

HOMOPTERA
0058 0103 0104 0123 0131 0132 0144
0150 0166 0214 0283 0294 0297 0304
0316 0319 0364 0409 0429 0493 0500
0504 0521
INSECT CONTROL
0129 0131 0281 0303 0363 0445 0507
0511 0514 0537

HONDURAS
0033 0134 0157 0163
DISEASES AND PATHOGENS
0313
MARKETING
0380
PRODUCTION
0380

HOT WATER TREATMENTS
0403 0404

HUMAN NUTRITION
0178 0179 0180 0182 0222 0345 0351
0352 0353 0356 0358 0379 0401 0563
0566 0573

HYBRIDIZING
0149 0161 0176 0317 0516 0523 0570

HYBRIDS
0138 0176 0336 0516 0519

INCOME
0033 0061 0065 0068 0069 0074 0144
0191 0192 0194 0372 0375 0425 0524
0576 0577 0578

INDIA
0044 0072 0346
DISEASES AND PATHOGENS
0286 0476
GERMPLASM
0512
INJURIOUS INSECTS
0132 0512

INDOLEACETIC ACID
0001 0003 0017

INDUSTRIALIZATION
0188

INHIBITORS
0012 0197
GROWTH
0016 0017 0396

INJURIOUS INSECTS
0119 0127 0139 0302 0312 0332
COLEOPTERA
0104 0123 0124 0125 0128 0130 0131
0133 0196 0198 0199 0251 0281 0293
0296 0305 0306 0308 0316 0323 0363
0377 0385 0386 0387 0388 0409 0429
0445 0477 0495 0504 0514 0518 0527
0583 0584 0585 0586 0587 0588
DIPTERA
0036 0058 0097 0123 0126 0131 0258
0283 0285 0309 0318 0330 0331 0377
0409 0412 0429 0433 0449 0463 0477
0491 0492 0496 0497 0498 0499 0501
0503 0504 0505 0508 0509 0512 0514
0518 0521 0528 0537 0538
HEMIPTERA
0123 0131 0251 0490 0493 0497 0510
HOMOPTERA
0058 0103 0104 0123 0131 0132 0144
0150 0166 0281 0283 0297 0303 0304
0316 0319 0363 0364 0409 0429 0445
0493 0500 0504 0507 0511 0514 0521
0537
LEPIDOPTERA
0118 0120 0121 0122 0123 0166 0283
0301 0310 0330 0377 0429 0433 0477
0491 0494 0497 0499 0502 0503 0504
0505 0514 0518 0531
THYSANOPTERA
0131 0283 0300 0497 0500 0503 0504
0505 0511 0514 0515

INJURIOUS MITES
0131 0311 0312 0332 0409 0433 0491
0497
POLYPHAGOTARSONEMUS LATUS
0283

INSECT BIOLOGY
0119 0122 0128 0129 0130 0133 0139
0196 0305 0307 0308 0309 0310 0386
0387 0477 0489 0490 0496 0501 0507
0508 0509 0514 0583 0585 0586 0588

INTEGRATED CONTROL
0129 0506
DISEASES AND PATHOGENS
0468

INJURIOUS INSECTS
0493

INTERCROPPING
0037 0065 0070 0072 0109 0363 0364
0415 0433 0439 0445 0453 0455 0457
0461 0524 0527 0532 0543 0573
ZEA MAYS
0027 0064 0066 0067 0068 0069 0071
0073 0144 0148 0158 0194 0195 0425
0451 0452 0454 0456 0462 0515 0535
0540 0546

IRON
0011 0177 0393
LEAVES
0013 0422
MINERAL DEFICIENCIES
0398
PODS
0013
ROOTS
0013 0424
SEED
0032
STEMS
0013

IRRADIATION
0124 0400

IRRIGATION
0035 0039 0046 0047 0053 0056 0058
0059 0061 0074 0076 0148 0158 0169
0170 0172 0231 0251 0389 0407 0408
0410 0413 0414 0420 0456 0460 0463
0525 0543

ISARIOPSIS GRISEOLA
0041 0076 0101 0330 0409 0521
DISEASE CONTROL
0037 0087 0096 0283 0285 0477
CHEMICAL CONTROL
0288
INTEGRATED CONTROL
0458
EPIDEMIOLOGY
0096 0316
ETIOLOGY
0096 0468
INOCULATION
0027 0429 0528
RESISTANCE
0027 0037 0087 0096 0316 0318 0324
0331 0334 0416 0468 0518 0527 0528
0535 0536 0538 0547 0549 0552
SYMPTOMATOLOGY
0096 0283 0285 0468 0469 0477

KENYA
0034 0070 0257 0373 0339 0411 0413
0414 0422 0423 0450 0452 0454 0481
0520 0544 0545 0546 0581
DISEASES AND PATHOGENS
0027 0037 0033 0041 0087 0154 0275
0285 0415 0416 0444 0449 0462 0467
0477 0532 0538 0539 0547 0549 0552
0554
GERMPLASM
0037 0154 0155 0532 0539 0552 0554
INJURIOUS INSECTS
0285 0307 0412 0429 0449 0477 0496
0507 0508 0515 0538 0586 0587

MARKETING
0442 0443 0449
PRODUCTION
0041
SEED PRODUCTION
0027 0154

LAND PREPARATION
0051 0055 0057 0058 0061 0063 0069
0429 0435 0439 0442 0443 0445

LATIN AMERICA
0174 0325 0361
DISEASES AND PATHOGENS
0319 0320
INJURIOUS INSECTS
0319
MARKETING
0378

LEAF AREA
0115 0299 0301 0399 0418 0427 0448
0483

LEAVES
0001 0004 0005 0006 0007 0016 0018
0020 0110 0112 0113 0115 0151 0162
0237 0299 0389 0396 0406 0423 0441
0451 0466 0483 0487 0544
DISEASES AND PATHOGENS
0295 0547
INJURIOUS INSECTS
0509 0531
MINERALS AND NUTRIENTS
0013 0014 0111 0397 0407 0418 0422

LEPIDOPTERA
0121 0122 0123 0166 0283 0301 0310
0330 0377 0429 0441 0489 0491 0494
0497 0499 0502 0504 0518 0531
INSECT CONTROL
0115 0120 0129 0433 0477 0503 0505
0514

LIGHT
0006 0018 0365 0406

LYSINE
0353 0559 0563

MACROPHOMINA PHASEOLI
DISEASE CONTROL
0059 0096 0477
EPIDEMIOLOGY
0096
ETIOLOGY
0096
INOCULATION
0091 0472
RESISTANCE
0059 0091 0096
SYMPTOMATOLOGY
0096 0472 0477

MAGNESIUM
0237 0268 0391 0411 0419
PLANT ASSIMILATION
0009 0013 0422

MALAWI
0108 0410 0436 0564 0589
DISEASES AND PATHOGENS
0041 0438 0449 0460 0473 0525

GERMPLASM
0148 0519 0537

MELOIDOGYNE INCOGNITA
0109 0476

MELOIDOGYNE JAVANICA
0076 0108

METABOLISM
0466

METHIONINE
0353

MEXICO
0030 0043 0046 0061 0136 0168 0169
0170 0172 0173 0361 0367 0435 0570
DISEASES AND PATHOGENS
0090 0171 0323
GERMPLASM
0323
INJURIOUS INSECTS
0304 0305 0323
PRODUCTION
0379 0533

MICRONUTRIENTS
0014 0031 0040 0241 0393 0398 0411
0419 0422 0424

MINERAL CONTENT
0015 0025 0047 0239 0369 0390 0391
0393 0408 0421
LEAVES
0013 0020 0396 0397 0407 0422
PODS
0013 0185
SEED
0002 0023
STEMS
0013

MINERAL DEFICIENCIES
0014 0225 0364 0398

MINERALS AND NUTRIENTS
0225 0242 0243 0244 0252 0262 0267
0276 0390
ALUMINIUM
0394
BORON
0014 0419
CALCIUM
0002 0013 0239 0268 0391 0411 0422
COPPER
0002 0013 0393 0419 0422
IRON
0002 0011 0013 0393 0398 0422 0424
MAGNESIUM
INJURIOUS INSECTS
0449 0537 0584
MARKETING
0449
PRODUCTION
0041
SEED PRODUCTION
0437 0460

MANGANESE
0002 0013 0040 0393 0422 0424

MANURES
0028 0030 0043 0065 0194 0244 0415
0417 0418 0421

MARKETING
0055 0074 0372 0374 0378 0380 0382
0442 0443 0449 0464 0465

MARUCA TESTULALIS
0121 0123 0409 0429
INSECT CONTROL
0514
BIOLOGICAL CONTROL
0505
CHEMICAL CONTROL
0433 0503 0505
INTEGRATED CONTROL
0129
PLANT INJURIES
0129 0441 0502 0504 0505 0514 0531
RESISTANCE
0166

MATURATION
0004 0049 0053 0089 0160 0163 0174
0306 0312 0313 0315 0324 0332 0343
0349 0522 0540 0545 0557

MECHANICAL DAMAGE
0075 0466 0488

MECHANIZATION
0036 0042 0057 0061 0063 0191
0009 0013 0239 0268 0391 0411 0419
0422
MANGANESE
0002 0013 0040 0393 0422 0424
MOLYBDENUM
0419
NITROGEN
0010 0013 0015 0031 0033 0037 0044
0047 0049 0051 0059 0062 0064 0065
0069 0071 0148 0159 0359 0365 0369
0397 0407 0408 0410 0418 0419 0421
0422 0424 0425 0442 0443 0444 0463
0540 0569
PHOSPHORUS
0002 0008 0009 0013 0015 0028 0031
0033 0037 0044 0047 0049 0051 0058
0059 0064 0071 0088 0159 0183 0339
0364 0391 0397 0408 0410 0411 0418
0419 0421 0422 0424 0425 0433 0442
0443 0444 0454 0540
POTASSIUM
0002 0013 0051 0059 0064 0111 0154
0268 0339 0391 0407 0408 0410 0411
0421 0424 0444
SULFUR
0015 0059 0268 0422
ZINC
0002 0013 0040 0393 0395 0419 0422
0424

MOLYBDENUM
0419

MULCHING
0029 0432

MUTATION
0146 0153 0400 0423 0547

MYCOSES
0036 0037 0038 0043 0054 0059 0076
0091 0093 0097 0099 0101 0102 0135
0140 0144 0154 0166 0168 0251 0258
0275 0281 0282 0283 0285 0287 0288

0289 0291 0292 0293 0315 0318 0320
0321 0323 0324 0330 0331 0334 0335
0344 0348 0349 0409 0416 0417 0444
0449 0463 0468 0469 0471 0473 0474
0477 0518 0521 0526 0527 0529 0534
0535 0536 0538 0539 0540 0543 0549
0552 0556
EPIDEMIOLOGY
0092 0095 0096 0316
INOCULATION
0027 0090 0091 0092 0098 0429 0472
0476 0528
ISOLATION
0091 0092 0290 0472
LEAVES
0547
PODS
0093 0547
SEED
0094 0100 0161 0286 0319
STEMS
0547
TEMPERATURE
0041

MYZUS PERSICAE
RESISTANCE
0104

NEMATODES
0076 0103 0109 0476 0532
NEMATODE CONTROL
0481 0482

NEZARA VIRIDULA
0131 0251 0493

NICARAGUA
0134 0426
MARKETING
0382
PRODUCTION
0382

NIGERIA
0458 0550
DISEASES AND PATHOGNES
0297
INJURIOUS INSECTS
0297 0385 0490 0511

NITROGEN
0010 0020 0148 0180 0365 0369 0370
0407
FERTILIZERS
0031 0033 0037 0038 0044 0047 0049
0051 0059 0062 0064 0065 0069 0071
0159 0359 0366 0368 0397 0408 0410
0418 0419 0421 0422 0424 0425 0442
0443 0444 0463 0540 0569
NUTRIENT ADSORPTION
0013
PLANT ASSIMILATION
0013 0397 0422 0424
PROTEIN CONTENT
0015 0025 0408
TRANSLOCATION
0013
NITROGEN FIXATION
0010 0019 0027 0028 0030 0166 0183
0184 0185 0186 0187 0359 0364 0365
0368 0369 0370 0418 0470 0538 0549
0567 0570 0571

NITROGEN-FIXING BACTERIA
0361 0470 0567 0570 0571 0572

NODULATION
0045 0094 0166 0186 0187 0360 0362
0363 0366 0367 0368 0470 0567 0568
0572
HERBICIDES
0037
NITROGEN
0010 0037 0365 0418 0421 0463
0569
PHOSPHORUS
0028 0037 0183 0364 0418 0421

NUCLEIC ACID
RNA
0105

NUTRIENT ABSORPTION
0009 0011 0013 0040 0111

NUTRIENT SOLUTION
0009 0011 0014 0015 0368 0390 0391
0394 0395 0398 0407

NUTRIENT TRANSPORT
0008 0011 0012 0040 0111 0390

NUTRITIONAL REQUIREMENTS
0027 0029 0031 0033 0037 0038 0042
0043 0044 0045 0047 0049 0051 0053
0058 0059 0062 0064 0065 0069 0071
0072 0076 0088 0144 0154 0159 0183
0194 0239 0241 0242 0244 0256 0257
0262 0339 0359 0364 0366 0368 0397
0398 0408 0410 0412 0415 0416 0418
0419 0421 0422 0425 0428 0433 0435
0439 0442 0443 0444 0445 0454 0463
0532 0535 0540 0549 0555 0569

NUTRITIVE VALUE
0059 0178 0182 0328 0336 0345 0351
0352 0353 0358 0401 0563 0564 0566

OOTHECA BENNIGSENI
0166 0441 0502 0503 0504 0505 0511
0531

OPHIMYIA PHASEOLI
0076 0123 0409 0429 0449 0491 0499
0509 0521
INSECT CONTROL
0477 0514 0537
BIOLOGICAL CONTROL
0498 0501 0505 0508
CHEMICAL CONTROL
0433 0463 0496 0503 0505 0508
PLANT INJURIES
0012 0477 0496 0501 0504 0505 0512
0514
RESISTANCE
0492 0501 0512 0518 0528 0538

OZONE
AIR POLLUTION
0112 0114 0299 0392 0483 0484 0486
HOST-PLANT RESISTANCE
0151
PLANT INJURIES
0111 0112 0114 0116 0299 0483 0484
0485 0487 0488
0487 0488

PANAMA
0361
PRODUCTION
0371

PARAGUAY
0361

PERU
0066 0146 0361 0367
DISEASES AND PATHOGENS
0143 0315 0318 0344
INJURIOUS INSECTS
0313
PRODUCTION
0376
SEED PRODUCTION
0143

PH
0041 0167 0298 0357 0411 0424 0560

PHASEOLINS
0165
ANALYSIS
0102

PHASEOLUS ACUTIFOLIUS
0034 0176 0317 0329 0413

PHASEOLUS COCCINEUS
0019 0036 0084 0198 0317 0329 0336
0516

PHASEOLUS LUNATUS
0023 0024 0069 0133 0137 0138 0139
0198 0317 0329 0336

PHENOLIC CONTENT
0405

PHENOLOGY
0333

PHOMA EXIGUA
RESISTANCE
0552

PHOSPHORUS
0002 0008 0015 0027 0028 0031 0033
0037 0038 0044 0047 0049 0051 0058
0059 0064 0071 0088 0159 0183 0339
0407 0408 0410 0411 0412 0416 0418
0419 0421 0425 0433 0442 0443 0444
0454 0540
MINERAL DEFICIENCIES
0364
NUTRIENT ABSORPTION
0009 0013
PLANT ASSIMILATION
0009 0013 0394 0422 0424
TRANSLOCATION
0013

PHOTOPERIOD
0089 0305

PHOTOSYNTHESIS
0007 0010 0018 0115 0399 0406 0466

PHYTOALEXINS
0102 0165 0286

PHYTOHEMAGGLUTININS
0021 0345

PLANT ANATOMY
0001 0004 0014 0090 0153 0162 0225
0312 0332 0389 0390 0466 0544

PLANT ASSIMILATION
0005 0009 0011 0013 0040 0111 0213
0242 0390 0392 0393 0394 0395 0397
0398 0422 0424 0466

PLANT BREEDING
0098 0145 0148 0164 0325 0358 0468
0517 0521 0533 0537 0549 0550 0551
BACKCROSING
0149 0165 0328
CROSSBREEDING
0084 0135 0138 0147 0149 0151 0162
0176 0328 0348 0473 0556
HYBRIDIZING
0149 0151 0176 0317 0516 0523
MUTATION
0146 0400 0423 0547
SELECTION
0135 0137 0149 0165 0315 0317 0328
0338 0347 0348 0473 0523 0527 0529
0542 0555

PLANT DEVELOPMENT
0004 0014 0015 0016 0017 0018 0019
0020 0032 0049 0053 0114 0115 0148
0160 0163 0174 0183 0187 0217 0274
0291 0306 0312 0313 0315 0332 0343
0349 0355 0390 0392 0396 0399 0418
0421 0427 0432 0441 0447 0448 0451
0522 0526 0540 0545 0557 0569 0572

PLANT FERTILITY
0176 0516

PLANT - GROWTH SUBSTANCES
0001 0003 0012 0017 0396

PLANT HABIT
0032 0066 0137 0141 0143 0148 0156
0158 0162 0174 0239 0258 0263 0264
0265 0265 0315 0317 0319 0320 0330
0334 0341 0343 0407 0437 0451 0455
0466 0522 0528 0529 0544 0547

PLANT INJURIES
0090 0110 0111 0113 0116 0119 0122
0125 0129 0150 0283 0296 0301 0302
0306 0309 0310 0385 0412 0423 0441
0476 0477 0478 0481 0485 0494 0495
0496 0500 0501 0502 0504 0505 0507
0512 0514 0531 0588
AIR POLLUTION
0112 0114 0299 0466 0483 0484 0487
0488

PLANT NUTRITION
0009 0010 0014 0088 0390 0393 0394
0397

PLANT PHYSIOLOGICAL DISORDERS
0110 0111 0112 0114 0115 0116 0151
0298 0299 0466 0483 0484 0485 0486
0487 0488

PLANT PHYSIOLOGICAL PROCESSES
0003 0006 0211 0217 0237 0396

ABSCISSION
0007 0520
NUTRIENT TRANSPORT
0008 0011 0012 0040 0111 0390
PHOTOSYNTHESIS
0007 0010 0018 0115 0399 0406 0466
PLANT ASSIMILATION
0005 0009 0011 0013 0040 0111 0213
0390 0394 0395 0397 0398 0422 0424
0466

PLANT PIGMENTS
0018 0217 0396

PLANT REPRODUCTION
0004 0161 0427 0553

PLANT TISSUES
0153
ENZYMES
0466

PLANT VASCULAR SYSTEM
0397

PLANTING
0027 0057 0061 0066 0076 0302 0304
0315 0420 0441 0535 0536
SPACING
0031 0038 0049 0051 0052 0053 0054
0055 0056 0058 0059 0062 0072 0148
0157 0158 0415 0425 0429 0431 0433
0434 0436 0438 0439 0442 0443 0444
0445 0448 0449 0454 0456 0527 0532
0541 0543

PODS
0004 0013 0185 0298 0307 0441 0451
0544
DISEASES AND PATHOGENS
0084 0090 0167 0312 0332 0547
INJURIOUS INSECTS
0130 0306 0312 0332 0502 0531

POLLINATION
0161 0553

POLYPHAGOTARSONEMUS LATUS
PLANT INJURIES
0283

POLYPLOIDY
0176

POTASSIUM
0002 0051 0059 0064 0154 0268 0339
0391 0407 0408 0410 0411 0421 0444
NUTRIENT ABSORPTION
0013 0111
PLANT ASSIMILATION
0013 0111 0424
TRANSLOCATION
0013

PREDATORS
0132 0498 0501 0508 0510 0513 0585
0588

PRICES
0191 0193 0363 0372 0373 0524 0575
0576 0577

PROCESSING
0075 0164 0298 0345 0350 0351 0354
0355 0357 0358 0401 0440 0559 0565

PRODUCTION
0041 0189 0190 0191 0193 0316 0371
0374 0376 0377 0379 0380 0382 0409
0420 0445 0533 0576 0580

PRODUCTIVITY
0069

PROTEIN CONTENT
0015 0024 0025 0182 0336 0345 0353
0402 0404 0408 0415 0523 0527 0545
0559 0563
PODS
0298
SEED
0002 0039 0165 0358

PROTEINS
0105
AMINO ACIDS
0024 0345
ANALYSIS
0024 0025 0026 0345
DIGESTIBILITY
0180 0345 0352 0357

PSEUDOMONAS PHASEOLICOLA
0041 0076 0161
DISEASE CONTROL
0036 0037 0084 0285 0460 0471 0477
CHEMICAL CONTROL
0284
INTEGRATED CONTROL
0468
DISEASE TRANSMISSION
0084
EPIDEMIOLOGY
0084 0315
ETIOLOGY
0468
INOCULATION
0027 0429 0470
RESISTANCE
0027 0037 0084 0147 0168 0171 0316
0331 0348 0415 0416 0468 0538 0549
0552 0554
SYMPTOMATOLOGY
0084 0285 0468 0477

PSEUDOMONAS SYRINGAE
DISEASE CONTROL
0087 0283
RESISTANCE
0087
SYMPTOMATOLOGY
0283

PUERTO RICO
DISEASES AND PATHOGENS
0294

PYTHIUM DEBARYANUM
CHEMICAL CONTROL
0474
ETIOLOGY
0474
SYMPTOMATOLOGY
0474

PYTHIUM ULTIMUM
CHEMICAL CONTROL
0474
ETIOLOGY
0474
SYMPTOMATOLOGY
0474

RADIATION
0153

RAINFALL DATA
0189

RAMULARIA PHASEOLINA
0409
INOCULATION
0528
RESISTANCE
0331 0527 0528

RHIZOBIUM
0010 0185 0186 0187
INOCULATION
0027 0028 0031 0183 0360 0361 0362
0364 0365 0366 0367 0368 0369 0370
0429 0528 0567 0568 0569
STRAINS
0184 0364 0365 0367 0369 0370 0568
0570

RHIZOBIUM LEGUMINOSARUM
INOCULATION
0361

RHIZOBIUM PHASEOLI
0185
INOCULATION
0028 0062 0183 0360 0361 0362 0363
0364 0367 0368 0369 0370 0470 0567
0568
NODULATION
0028 0183 0186 0187 0360 0362 0363
0364 0367 0368 0470 0567 0568
STRAINS
0184 0363 0364 0367 0369 0370 0470
0568

RHIZOCTONIA SOLANI
0054 0076 0409
DISEASE CONTROL
0043 0092 0096 0417
CHEMICAL CONTROL
0094 0144 0290 0474
DISEASE TRANSMISSION
0290
EPIDEMIOLOGY
0092 0096
ETIOLOGY
0092 0096 0290 0474
INOCULATION
0091 0092
RESISTANCE
0091 0096 0144 0286 0318 0323
SYMPTOMATOLOGY
0096 0474

RHIZOSPHERE
0424

RNA
0105

ROOTING
0399

ROOTS
0006 0013 0014 0185 0360 0369 0390
0391 0397 0424 0466 0470

ROTATIONAL CROPS
0074 0430 0458 0481
ZEA MAYS
0069

ROTYLENCHUS RENIFORMIS
NEMATODE CONTROL
0482

RWANDA
0159 0288 0383 0455 0530
DISEASES AND PATHOGENS
0041 0331 0334 0449 0529 0543
GERMPLASM
0330 0529
INJURIOUS INSECTS
0330 0331 0449
MARKETING
0449
PRODUCTION
0041 0580
SEED PRODUCTION
0456

SALINITY
0047 0359 0391
GROWTH
0396 0437
PLANT DEVELOPMENT
0396

SCLEROTIUM ROLFSII
DISEASE CONTROL
0037 0096
EPIDEMIOLOGY
0096
ETIOLOGY
0096
INOCULATION
0091
RESISTANCE
0037 0091 0096
SYMPTOMATOLOGY
0096

SEED
0051 0075 0080 0094 0155 0201 0203
0233 0326 0350 0354 0373 0375 0458
0544
DISEASES AND PATHOGENS
0063 0100 0161 0286 0312 0319 0332
0356 0377
GENETICS
0165 0312 0332
GERMINATION
0019 0083 0100 0146
INJURIOUS INSECTS
0058 0130 0199 0308 0312 0319 0332
0377
MARKETING
0464
PRODUCTION
0377
PROTEIN CONTENT
0002 0039 0165 0358

STORAGE
0023 0199 0356
YIELDS
0019 0039 0134 0165 0322 0339 0341
0342 0355 0377 0572

SEED CHARACTERS
0101 0155 0161 0164 0201 0312 0319
0322 0332 0350 0354 0355 0437 0449
0464 0522 0534 0544 0561
SEEED COLOR
0002 0134 0140 0146 0174 0320 0326
0339 0341 0342 0375 0377 0463 0519

SEED COAT
0146

SEED COLOR
0002 0134 0140 0146 0168 0174 0320
0326 0339 0341 0342 0375 0377 0463
0519

SEED PRODUCTION
0027 0062 0076 0077 0078 0079 0080
0081 0143 0154 0161 0437 0456 0460
0463 0464 0465 0548 0579

SEED TREATMENT
0094 0100 0126 0442 0443 0496 0518
0538 0549 0584 0588

SEEDS
0185 0400 0402 0405 0437 0440 0522
0534 0561 0569 0582 0584

SELECTION
0019 0034 0036 0037 0038 0041 0134
0139 0140 0143 0150 0151 0152 0158
0166 0167 0171 0173 0175 0198 0291
0316 0318 0319 0320 0323 0324 0327
0330 0331 0334 0335 0337 0340 0341
0363 0364 0409 0413 0415 0416 0444
0471 0512 0524 0528 0532 0534 0539
0546
PLANT BREEDING
0135 0137 0149 0165 0315 0317 0328
0338 0347 0348 0473 0523 0527 0529
0542 0555

SHOOTS
0005 0016

SNAP BEANS
0019 0020 0036 0044 0047 0050 0052
0053 0054 0072 0074 0076 0080 0095
0102 0113 0128 0137 0287 0289 0290
0298 0306 0310 0311 0330 0343 0354
0355 0393 0401 0402 0403 0421 0424
0432 0434 0455 0457 0471 0476 0482
0483 0489 0526 0534 0540 0548 0555
0557 0560 0562 0569

SODIUM
0002 0013 0407

SOIL ANALYSIS
0393

SOIL FERTILITY
0041 0043 0148 0365 0411 0426

SOIL REQUIREMENTS
0041 0076 0148 0365 0409 0411 0426
0543

SOIL TEMPERATURE
0029 0432

SOLUBLE CARBOHYDRATES
0113 0403 0405

SPACING
0051 0053 0055 0058 0072 0148 0158
0201 0258 0333 0439 0442 0444 0449
0463 0532
YIELDS
0031 0032 0038 0049 0052 0054 0056
0059 0062 0144 0157 0313 0334 0363
0364 0415 0425 0429 0431 0433 0434
0436 0438 0443 0445 0448 0454 0456
0527 0529 0541 0543

STARCH CONTENT
0020 0404

STATISCAL ANALYSIS
0004 0022 0061 0064 0070 0073 0145
0174 0189 0191 0292 0299 0314 0326
0333 0384

STEMS
0547
GROWTH
0016 0451
MINERALS AND NUTRIENTS
0008 0013
NUTRIENT ABSORPTION
0013
TRANSLOCATION
0013

STOMATA
0003 0007 0115 0151 0389 0396

STORAGE
0055 0077 0078 0081 0345 0351 0352
0372 0440 0517
DISEASES AND PATHOGENS
0027 0356 0449 0527
INJURIOUS INSECTS
0198 0199 0363 0385 0449 0527 0583
0584
TEMPERATURE
0023 0199 0356 0401 0582 0583

STORED GRAIN PESTS
0196 0197 0198 0199 0385 0386 0387
0388 0583 0584 0585 0586 0587 0588

SUCROSE
0403

SUGARS
0021 0113 0184 0403

SULFUR
0015 0059 0268 0422

SYMBIOSIS
0185 0233 0252 0369 0370
NODULATION
0045 0166 0470 0568
MINERALS AND NUTRIENTS
0010 0028 0037 0183 0365 0569
PHOSPHORUS
0028 0037 0183

TANZANIA
0418 0419 0425 0441 0446 0447 0457
0461 0506 0524 0541 0542 0555 0574
0575
DISEASES AND PATHOGENS
0041 0449 0469 0518 0521 0534 0535
0536
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0420
INJURIOUS INSECTS
0120 0127 0429 0449 0502 0503 0504
0505 0510 0518 0521 0531
MARKETING
0449 0464 0465
PRODUCTION
0041 0420 0576
SEED PRODUCTION
0464 0465

TECHNOLOGICAL PACKAGE
0426 0445 0551

TECHNOLOGY EVALUATION
0134 0142 0144 0159 0191 0192 0318
0320 0324 0348 0349 0363 0372 0378
0381 0383 0415 0420 0435 0520 0523
0524 0528 0530 0535 0536 0541 0542
0546 0548 0557 0558

TEMPERATURE
0005 0022 0023 0041 0128 0199 0297
0305 0356 0365 0369 0386 0401 0404
0426 0462 0532 0583
GROWTH
0427 0432
PHOTOSYNTHESIS
0406
SOLUBLE CARBOHYDRATES
0403
YIELDS
0029 0136 0189 0432 0520

TETRANYCHUS TELARIUS
0493

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0401

THIELAVIOPSIS BASICOLA
DISEASE CONTROL
0417
RESISTANCE
0293 0529

THYSANOPTERA
0131 0283 0300 0441 0497 0500 0503
0504 0505 0511 0514 0515

TIMING
0007 0020 0023 0027 0031 0042 0050
0051 0053 0056 0058 0059 0061 0066
0072 0076 0148 0163 0174 0302 0304
0315 0351 0355 0364 0420 0421 0429
0440 0441 0442 0443 0444 0446 0454
0485 0532 0535 0536 0563 0582

TOBACCO MOSAIC VIRUS
EPIDEMIOLOGY
0478
ETIOLOGY
0478
SYMPTOMATOLOGY
0478

TOXICITY
0117 0127
MINERALS AND NUTRIENTS
0398

TRADE
0055 0080 0374 0377 0380 0382 0449
0464 0465

TRANSLOCATION
0011 0013 0040

TRANSPIRATION
0003 0115 0396

TRYPTOPHANE
0181 0353

UGANDA
DISEASES AND PATHOGENS
0041 0343 0449 0540
GERMPLASM
0343
INJURIOUS INSECTS
0123 0429 0449 0583
MARKETING
0074 0449
PRODUCTION
0041

UREA
FERTILIZERS
0397

UROMYCES PHASEOLI
0041 0058 0076 0101 0251 0409 0439
0463 0521
DISEASE CONTROL
0037 0059 0087 0096 0283 0285 0444
0471 0477
INTEGRATED CONTROL
0468
EPIDEMIOLOGY
0096 0316
ETIOLOGY
0096 0287 0289 0468
INOCULATION
0027 0098 0429 0528
RESISTANCE
0027 0037 0038 0059 0087 0096 0098
0135 0140 0168 0292 0315 0316 0318
0320 0321 0324 0331 0335 0344 0444
0468 0473 0518 0528 0534 0535 0536
0538 0539 0540 0547 0549 0552 0556
SYMPTOMATOLOGY
0096 0283 0285 0468 0477

URUGUAY
0361

USA
0039 0047 0050 0056 0111 0112 0151
0162 0165 0237 0239 0298 0322 0354
0355 0358 0360 0367 0390 0395 0397
0398 0399 0401 0402 0403 0404 0432
0440 0453 0482 0483 0484 0486 0487
0513 0560 0562 0565 0567 0571 0582
DISEASES AND PATHOGENS
0054 0095 0106 0147 0167 0295 0296
0356 0417 0478 0480 0522
INJURIOUS INSECTS
0119 0122 0131 0281 0296 0308 0498

INJURIOUS MITES
0131
PRODUCTION
0189 0190

VECTORS
0103 0104 0294 0297

VENEZUELA
0431

VIROSES
0027 0036 0037 0059 0087 0103 0104
0105 0106 0107 0137 0138 0143 0144
0147 0152 0161 0165 0175 0275 0281
0283 0285 0294 0295 0296 0297 0313
0315 0316 0318 0319 0320 0323 0330
0331 0334 0335 0344 0349 0377 0409
0468 0477 0478 0479 0480 0518 0522
0526 0529 0538 0540 0548 0549

VITAMIN CONTENT
0401

WATER ABSORPTION
0012 0466

WATER CONTENT
0002 0020 0022 0025 0440 0559 0582

WATER REQUIREMENTS (PLANT)
0034 0035 0041 0297 0410 0426 0484
0525 0552

WATER STRESS
0034 0039 0047 0237 0359 0413 0414

WEEDING
0027 0030 0037 0048 0050 0051 0057
0058 0060 0154 0201 0258 0268 0416
0429 0432 0435 0439 0442 0443 0444
0445 0446 0447 0453 0532 0537

WEEDS
0059
HERBICIDES
0268 0447

WHETZELINIA SCLEROTIORUM
DISEASE CONTROL
0037 0477
CHEMICAL CONTROL
0099
ETIOLOGY
0099
RESISTANCE
0037 0099
SYMPTOMATOLOGY
0477

XANTHOMONAS PHASEOLI
0076 0161 0343
DISEASE CONTROL
0037 0084 0285 0471
CHEMICAL CONTROL
0083 0085
INTEGRATED CONTROL
0468
DISEASE TRANSMISSION
0084
EPIDEMIOLOGY
0084 0316
ETIOLOGY
0468
RESISTANCE
0037 0038 0084 0089 0167 0168 0171
0316 0319 0319 0320 0324 0335 0468
0552
SYMPTOMATOLOGY
0084 0285 0468 0469

XANTHOMONAS PHASEOLI VAR FUSCANS
DISEASE CONTROL
0084 0471
CHEMICAL CONTROL
0093 0385
INTEGRATED CONTROL
0468
DISEASE TRANSMISSION
0084
EPIDEMIOLOGY
0084
ETIOLOGY
0468
RESISTANCE
0084 0468
SYMPTOMATOLOGY
0084 0468 0469

YIELD COMPONENTS
0004 0031 0039 0045 0047 0049 0054
0062 0125 0304 0322 0324 0327 0340
0410 0414 0418 0419 0420 0431 0434
0436 0437 0438 0448 0454 0483 0502
0516 0545 0548 0557 0558

ZABROTES SUBFASCIATUS
0124 0130 0387 0409
INSECT CONTROL
0131 0363
CHEMICAL CONTROL
0196 0583
INTEGRATED CONTROL
0129
PLANT INJURIES
0129 0385 0495
RESISTANCE
0316

ZAMBIA
0041 0449 0577

ZEA MAYS
INTERCROPPING
0027 0064 0066 0067 0068 0069 0071
0073 0144 0148 0158 0194 0195 0425
0451 0452 0454 0456 0462 0515 0535
0540 0546

ZINC
0002 0013 0040 0393 0395 0419 0422
0424

DOCUMENTATION SERVICES

Susan C. Harris, MLS, Information Specialist, Communications and Information Support Unit, Head
Jorge López S., Documentalist, Supervisor of Documentation Center
Marlene Cárdenas, Bibliographer
Francy González V., Agr. Eng., Documentalist-Beans
Keyttel Gutiérrez de Prieto, Information Input, Production Liaison
Mariano Mejía M., BA, Documentalist-Tropical Pastures
Manuelita Mena de Chacón, Typesetting
Lynn Menéndez F., Editing and Translation, Production Liaison
Gladys Rodríguez de Ramos, Proofreader

BEAN PROGRAM

Aart van Schoonhoven, PhD, Entomology, Coordinator
David Allen, PhD, Plant Pathology (Visiting Scientist)
Stephen Beebe, PhD, Plant Breeding, Central America Bean Project (stationed in Guatemala)
Jairo Castaño, PhD, Plant Pathology (Visiting Scientist)
Jeremy H.C. Davis, PhD, Plant Breeding
Michael Dessert, PhD, Plant Breeding, Great Lakes Project (stationed in Rubona, Rwanda)
Guillermo E. Gálvez, PhD, Plant Pathology, Regional Coordinator, Central America Bean Project (stationed in San Jose, Costa Rica)
Guy Hallman, PhD, Entomology (Postdoctoral Fellow)
Guillermo Hernández-Bravo, PhD, Plant Breeding, Co-leader, Agricultural Extension and Research Project (INIPA), Peru
Judith Kipe-Nolt, PhD, Microbiology (Postdoctoral Fellow)
Francisco Morales, PhD, Virology
James Nienhuis, PhD, Plant Breeding (Postdoctoral Fellow)
Silvio H. Orozco, MS, Agronomy, Central America Bean Project (stationed in Guatemala)
Douglas Pachico, PhD, Economics
Marcial Pastor-Corrales, PhD, Plant Pathology
Nigel Sackville-Hamilton, PhD, Data Management Systems (Visiting Scientist)
Shree P. Singh, PhD, Plant Breeding
Steven R. Temple, PhD, Plant Breeding
Michael D. Thung, PhD, Agronomy (stationed at CNPAF, Goiania, Brazil)
Peter Trutman, PhD, Plant Pathology, Central Africa Bean Project (stationed in Rubona, Rwanda)
Joachim Voss, PhD, Anthropology, Central Africa Bean Project (Postdoctoral Fellow, stationed in Rwanda)
Oswaldo Voysest, PhD, Agronomy
Jeffrey White, PhD, Physiology (Visiting Scientist)
Jonathan Woolley, PhD, Agronomy, Cropping Systems