SORGHUM BIBLIOGRAPHY 1982

ICRISAT

SORGHUM AND MILLETS INFORMATION CENTER

Sorghum Bibliography 1982

Compiled by

R.G. NAIDU

P.K. SINHA

ICRISAT

Sorghum and Millets Information Center

International Crops Research Institute for the Semi-Arid Tropics

Patancheru, Andhra Pradesh 502 324, India

April 1986

The International Crops Research Institute for the Semi-Arid Tropics is a nonprofit scientific educational institute receiving support from donors through the Consultative Group on International Agricultural Research. Donors to ICRISAT include governments and agencies of Australia, Belgium, Canada, Federal Republic of Germany, Finland, France, India, Italy, Japan, Netherlands, Nigeria, Norway, People's Republic of China, Sweden, Switzerland, United Kingdom, United States of America, and the following international and private organizations: Arab Bank for Economic Development in Africa, Asian Development Bank, International Development Research Centre, International Fertilizer Development Center, International Fund for Agricultural Development, The European Economic Community, The Ford Foundation, The Leverhulme Trust, The Opec Fund for International Development, The Population Council, The Rockefeller Foundation, The World Bank, and the United Nations Development Programme. Information and conclusions in this publication do not necessarily reflect the position of the aforementioned governments, agencies, and international and private organizations.

Correct citation: ICRISAT (International Crops Research Institute for the Semi-Arid Tropics), Sorghum and Millets Information Center. 1986. Sorghum Bibliography 1982. Patancheru, A.P. 502324, India: ICRISAT.

ISBN 92-9066-117-8

CONTENTS

PREFACE

This bibliography is the fifth in the series of sorghum bibliographies compiled and published by the Sorghum and Millets Information Center (SMIC). The bibliography includes literature published during 1982 and is annotated. The annotations are generally based on the author's abstract or summary. In some cases. abstracts have been prepared specially for this bibliography.

The sources used in compiling this bibliography, are 600 primary periodicals received at ICRISAT* and secondary sources such as the abstracting journals of the CAB, Biological Abstracts. Bibliography of Agriculture. Agrindex. Dissertation Abstracts International. Indian Science Abstracts. etc. In addition* the bibliography also includes items of literature generated within ICRISAT, and non-conventional literature that SMIC collects from its contacts with research centers* libraries and documentation centers in India. Africa* and Latin America. Computer output from data bases such as the AGRIS, AGRICOLA. BIOSIS. Science Citation Index, has also been monitored in identifying entries for the bibliography.

Entries are arranged by broad subject groups indicated in the table of contents. Within each subject group* entries are arranged in alphabetical order by authors. Titles in languages other than English have been translated into English and AGRIS abbreviations have been used to designate languages other than English. The titles of periodicals are cited in full. However, only the acronyms of well known organizations have been used rather than their names in full. A list of acronyms is included in the preliminary pages of the bibliography.

The bibliography has an author and a subject index. The subject index is based on a technique called Pragmatic Approach to Subject Indexing (PASI) developed at SMIC. A guide to the subject index is provided in the preliminary pages of the bibliography.

All components of this bibliography have been produced on the VAX-11/780 computer system using software developed at SMlC. The software integrates data entry, editing. sorting* production of indexes, and formatting required for the production of a bibliography. The programs have been written by P.K. Sinha of SMIC.

The collection, compilation and editing work for the bibliography has been done by R G Naidu and P K Sinha. The data-entry for the bibliography was done by R Laxmipathi. The overall responsibility for the bibliography including its computerisation has been that of P K Sinha.

The publication of the bibliography has been made possible by the financial assistance received from the International Development Research Centre (IDRC) for the SMIC Project.

L J Haravu
Manager
Library and Documentation Services
ICRISAT

GUIDE TO SUBJECT INDEX

The computer produced subject index is based on the Pragmatic Approach to Subject Indexing (PASI) system developed at SMIC. The original sequences of keywords provided by the indexer are the logical entries and convey subject content of documents unambiguously. Other entries are generated by rotating the logical entries to enable access from all the keywords• Thus for the title "Seedling emergence in sorghum under varying soil temperature" (Document No, 198) the logical index entryis-

Sorghum,
Genotypes, Seedlings, Emergence.
Soiltemperature, Effect 0198

The entries obtained by the rotation of keywords are:-*

Genotypes.
Seedlings, Emergence, Soil temperature.
Effect; Sorghum. 0198

Seedlings,
Emergence, Soil temperature.
Effect; Sorghum, Genotypes. 0198

Emergence.
Soil temperature, Effect; Sorghum.
Genotypes, Seedlings. 0198

Soil temperature.
Effect; Sorghum, Genotypes,
Seedlings, Emergence, 0198

The cross reference entry through Soil temperature is:-

Temperature see also.
Soil temperature

It is always possible to rebuild the logical entry from any entry if keywords are read starting from the first keyword after the semicolon in an anti-clockwise direction.

Certain keywords are considered in combination because of the close relationship existing between them. The symbols used to depict the relationships are colon (:), slash (/), and parentheses. The (,) acts as a separator between the keywords.

Common and botanical names have been used in the subject index. The choice of keywords has largely been made using the AGROVOC and CAB thesauri. Cross references have been provided wherever required.

LIST OF ACRONYMS

AICSIP	All India Coordinated Sorghum Improvement Project
BARC	Bhabha Atomic Research Centre
CAB	Commonwealth Agricultural Bureaux
CIAT	Centro Internacional de Agriculture Tropical
CILSS	Comite permanent Interetats de Lutte contre la Secheresse dans le Sahel
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
CNRA	Centre National de Recherchee Agronomiques
CSIRO	Commonwealth Scientific and Industrial Research Organization
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuaria
ESIP	Ethiopian Sorghum Improvement Project
FAO	Food and Agriculture Organization of the United Nations
IBPGR	International Board for Plant Genetic Resources
ICAR	Indian Council of Agricultural Research
ICARDA	International Center for Agricultural Research in Dry Areas
IDRC	International Development Research Centre
IICA	Instituto Interamericano de Ciencias Agricolas
ILCA	International Livestock Centre for Africa
INRA	Institut National de la Recherche Agronomique
INTSORMIL	USAID Title XII Collaborative Research Support Program on Sorghum and Pearl Millet(USA)
IRAT	Institut de Recherches Agronomiques Tropicales et des Cultures Vivrieres
IRRI	International Rice Research Institute
ISRA	Institut Senegalais de Recherches Agricoles
OCDE	Organisation de Cooperation et de Developpement Economique

PKV	Punjabrao Krishi Vidyapeeth
SABRAO	Society for the Advancement of Breeding Researches in Asia and Oceania
SIDA	Swedish International Development Authority
UNBP	United Nations Environment Programme

LANGUAGE CODES USED IN ENTRIES

Af	Afrikaans	It	Italian
Ar	Arabic	Ja	Japanese
Bg	Bulgarian	Ko	Korean
Ch	Chinese	Nl	Dutch
De	German	PI	Polish
En	English	Pt	Portuguese
Es	Spanish	Ro	Romanian
Fr	French	Ru	Russian
Hu	Hungarian	Sh	Serbo-croat
In	Indonesian	Sk	Slovak

GENERAL

0001 ALL INDIA COORD RES PROJ DRYLAND AGRIC. 1982. A decade of dryland agricultural research in India. 1971-80. Hyderabad. A.P.. India. 252 pp.

0002 ALL INDIA COORDINATED SORGHUM IMPROVEMENT PROJECT. 1982. Annual progress reports 1981-82. Hyderabad, A.P., India: Andhra Pradesh Agricultural University. 45 pp.

0003 ALL INDIA COORDINATED SORGHUM IMPROVEMENT PROJECT. 1982. Annual report 1981-82. Udaipur, Rajasthan, India: University of Udaipur. 64 pp.

0004 ALL INDIA COORDINATED SORGHUM IMPROVEMENT PROJECT. 1982. Progress report, 1981-82. New Delhi, India: ICAR.

0005 ALL INDIA COORDINATED SORGHUM IMPROVEMENT PROJECT. 1982. Report for 1981-82. Paper presented at the Sorghum Workshop 17-19 May 1982, Pune, India. 31 pp.

0006 ARIYANAYAGAM, R.P. 1982. Manual for sorghum research and production in Mozambique, genetic improvement. (Pt). Nampula, Mozambique. 62 pp. (FAO-AGO-MOZ/75/009).

0007 BRAZIL:UNID EXECU PESQUI AMBITO ESTAD PELOTAS. 1982. Annals of the 11. Technical yearly Meeting of Sorghum. (Pt). Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estatual de Pelotas. 162 pp.

0008 CUMMINGS, R.W. 1982. Institutional considerations as related to sorghum improvement in the 80s. Pages 33-37 In Sorghum in the eighties: Proceedings of the International Symposium on Sorghum. 2-7 November 1981. Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

0009 DOGGETT, H. 1982. A look back at the 70s. Pages 15-23 In Sorghum in eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 8 ref.

0010 FAO. 1982. Report on the fifth FAO/SIDA Training Course on Maize, Sorghum and Millet for Africa and the Near East. Rome, Italy: FAO. 96 pp.

0011 GEBREKIDAN, B. 1982. Overview of ESIP. Pages 18-23 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

Presents information on the centralized activities in the ESIP at Nazreth, Ethiopia like planning and seed preparation, crossing, off-season nursery, evaluation and selection, data handling, coordinating national sorghum research etc.

0012 GRAND-PIERRE, C. 1982. Experimental procedures for grain crops research on the Brumdec project. Kingston, Jamaica: IICA. 17 pp. (No. 318). (ISSN 0534-5391).

0013 GRAND-PIERRE, C. 1982. Third quarterly report of the short term production oriented sorghum (Sorghum bicolor) research programme, October 15, 1981 - January 14, 1982. Kingston, Jamaica: IICA. 20 pp. (No. 326).

0014 HOUSE, L.R. 1982. A look ahead into the 1980s. Pages 61-68 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981.

Patancheru, A.P.. India. Patancheru, A.P., India:ICRISAT.

0015 ICRISAT. 1982. International cooperation. Pages 311-344 In Annual report. 1981. Patancheru, A.P., India: ICRISAT.

Presents information on ICRISAT's cooperative program research on sorghum in Burkina Faso, Mali, Niger, Nigeria, Sudan, Senegal and other African countries. Cooperation with CIMMYT and ICARDA is also presented.

0016 ICRISAT. 1982. Sorghum in eighties: proceedings of the International Symposium on Sorghum. 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India. 2 v.: ICRISAT. 783 pp.

0017 ICRISAT. 1982. Sorghum. Pages 25-26 In Annual report, 1981. Patancheru, A.P., India: ICRISAT.

Presents information on insect pests, diseases, physical environment, food quality, population improvement, development of hybrids and international trials and nurseries. Future plans of sorghum research at ICRISAT are also indicated.

0018 ICRISAT: MALI COOPERATIVE PROGRAM. 1982. ICRISAT Mali report for the 1982 season. Bamako, Mali: ICRISAT. 195 pp.

ICRISAT/Mali sorghum and millet improvement activities carried out during 1982 crop season are reported.

0019 ICRISAT:SORGHUM AND MILLETS INFORMATION CENTER. 1982. Directory of sorghum and millets research workers. Patancheru, A.P., India: ICRISAT. 174 pp.

0020 ICRISAT:SORGHUM AND MILLETS INFORMATION CENTER. 1982. Sorghum bibliography, 1970-73. Patancheru, A.P., India: ICRISAT. 138 pp. 3414 ref.

0021 ICRISAT:UPPER VOLTA COOPERATIVE PROGRAM. 1982. Annual report, 1981. Ouagadougou, Burkina Faso: ICRISAT. 180 pp.

Sorghum and millet research activities during 1981 crop season in Burkina Faso are reported.

0022 ICRISAT:UPPER VOLTA COOPERATIVE PROGRAM. 1982. Annual report, 1982. Ouagadougou, Burkina Faso: ICRISAT. 73 pp.

Presents a summary of the 1982 research activities in Kamboinse and farmers[1] fields. Topics discussed include sorghum and millet improvements: and economic, anthropological, and soil and water management studies.

0023 INDIA: G B PANT UNIV AGRIC TECH. 1982. Sorghum research at Pantnagar, 1981. Presented at the Annual Workshop of All India Coordinated Sorghum Improvement Project, 17-19 May 1982, Pune, Maharashtra, India. 57 pp.

0024 INDIA: TAMIL NADU AGRICULTURAL UNIVERSITY. 1982. Sorghum research in Tamil Nadu: annual report 1981-82. Coimbatore, Tamil Nadu, India.

0025 INDIA:UNIVERSITY OF AGRICULTURAL SCIENCES. 1982. Sorghum research in Karnataka: annual report, 1981-82. Dharwad. Karnataka, India. 125 pp.

0026 IRAT. 1982. Sorghum. (Fr). Pages 73-87 In IRAT annual report 1981. Paris, France: IRAT.

Research on sorghum cultivars in Senegal, Mauritania and Burkina Faso, control of insect pests and diseases, cultivations, fertilizer application, sowing methods and irrigation in Burkina Faso and Libya is reported.

0027 JAPAN :TRQPIGAL

AGRICULTURE RESEARCH CENTER. 1982. Sorghum. Pages 19-21 In TARC ten-year review. Yatabe, Japan: Tropical Agriculture Research Center.

0028 LENG, E.R. 1982. Progress in collaborative international sorghum/millet research. Agronomy Abstracts: 46-47.

Eight U.S. universities formed a consortium. "INTSORMIL" to conduct collaborative international research on sorghum and millet. Research is organized into about thirty projects, and collaborative activities are underway in some 12 developing countries. Emphasis is placed on the development of appropriate technologies and breeding material which can be expected to have a relatively short-term impact on improving food production, quality and utilization in those countries where sorghum and millets are important in the human nutritional cycle. One of the early findings is that grain sorghum types with high food quality and high yield can be produced by utilizing a combination of tropical germplasm with high-yielding materials developed originally for temperate zone use.

0029 RAO, N.G.P. 1982. Transforming traditional sorghums in India. Pages 39-59 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 42 ref.

0030 ROTAR, P.P. 1982. Sorghum. Pages 5-6 In Crop improvement in Hawaii: past, present and future. Honolulu, Hawaii, USA: University of Hawaii. 4 ref. (Miscellaneous publication 180)•

0031 SEHENE, C. 1982. Status of sorghum research in Rwanda. Pages 109-114 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa, 17-21 October 1982, Nazreth and Debre zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0032 TATTERSFIELD, J.R. 1982. The role of research in increasing food crop potential in Zimbabwe. Zimbabwe Science News 16(1): 6-10.

0033 THOMAS, W.C. 1982. Project agriculture: An experience in the southern hemisphere. Agroborealis 14: 7-9.

0034 WAAIJENBERG, H. 1982. A cross section of Mijikenda agriculture in the coastal uplands of Kenya. I. Some sorghum experiments during the short rains 1981. Wageningen, Netherlands: Department of Tropical Crops. 21 pp. 15 ref. (Tropical Crops Communication, 2).

0035 WADE, L.J. 1982. A new sorghum program in the SAT in Australia. Page 757 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

A research program is to investigate sorghum productivity in the Capricornia region of Queensland, Australia. This region of expanding dryland sorghum production is characterized by heavy cracking clay soils in the SAT where antecedent soil moisture is important and rainfall irregular. There is enormous potential for the crop in this region but performance of existing cultivars has been disappointing so far. Initial experimentation will be directed to defining the exact nature of limitations to productivity in this environment. Other work will involve phenology, crop establishment and growth analysis, which are likely to be important in this region.

ANATOMY AND MORPHOLOGY

0036 ATKIN, D.S.J., and HAMILTON, R.J. 1982. Surface of sorghum bicolor. Plant Cuticle 10: 231-236.

0037 ZELEZNAK. K., and VARRIANO-MARSTON, E. 1982. Pearl millet (Pennisetum americanum (L.) Leeke) and grain sorghum (Sorghum bicolor (L.) Moench) ultrastructure. American Journal of Botany 69(8): 1306-1313. 29 ref.

Ultrastructural features of pearl millet (Pennisetum americanum) and grain sorghum (Sorghum bicolor) caryospses were investigated with thin sections of the dry, mature grain in the transmission electron microscope, and fractured kernels in the scanning electron microscope. The pericarp of those grains is comprised of three distinct layers: epicarp, mesocarp of parenchyma cells, and endocarp of compressed cross and tube cells. Mesocarp cells of grain sorghum contain starch granules embedded in a cytoplasmic matrix. The major constituent of sorghum and millet aleurone cells are aleurone grains (protein bodies) and lipid bodies. Subaleurone cells contain a much higher proportion of protein bodies than starch granules, and the protein bodies are structurally distinct from those in the aleurone. The germ scutellar ultrastructures of the two grains were similar; protein bodies, lipid bodies, epidermal cells and parenchyma cells of the germ are described.

TAXONOMY AND GEOGRAPHIC DISTRIBUTION

0038 IVANYUKOVICH, L.K.. and DORONINA YU A. 1982. A review of species of section Caffra of the genus Sorghum (Poaceae). (Ru). Botanicheskii Zhurnal 67(7): 982-985. 3 ref.

A description is given of the morphological characteristics of Sorghum nigricans, S. coriaceum, S. dulcicaule, S. caffrorum and S. caudatum. The keys are also provided for their identification.

PHYSIOLOGY AND BIOCHEMISTRY

0039 ANONYMOUS. 1982. Phytotoxicity of three insecticides to grain sorghum hybrids (Louisiana).Pages 121-123 In Report of Projects, Department of Agronomy, Louisiana Agricultural Experiment Station, USA.

0040 ABD-EL-RAZEK, A. A. 1982. Interrelationships between some nutrient elements in soil and plant under different levels of alkalinity. Ph.D. thesis, Azhar University, Cairo, Egypt. 130 pp.

0041 ABDALLA, A.B. 1982. Base temperature for germination and its relation to tropical and temperate adaptation in sorghum (Sorghum bicolor (L.) Moench). Ph.D. thesis, Texas A & M University, College Station, Texas, USA.

0042 ABDALLA. A.B., and MILLER, F.R. 1982. Temperate response for germination in sorghum genotypes with temperate and tropical zone. Sorghum Newsletter 25: 133-134.

The objectives of this study were to determine the base temperature for tropically adapted (TA) hybrids and temperately adapted (TE) hybrids and their parents of Sorghum bicolor. A thermogradient plate was used to determine the base temperature for these genotypes. ATx623 x RTx415, which is a TA x TE hybird, gave the lowest base temperature of 6.2 deg C and Sumac, which is a TE line, had the highest base temperature. Taking the means the TE x TA hybrids had the lowest base temperature (7.12 deg C) followed by TA x TE (7.28 deg C) and TA x TA. The TE x TE hybrids had the highest base temperature (8.5 deg C) within the hybrids. As for the parents, the TAs were about 2.3 deg C lower than the TEs. Generally hybrids showed lower base temperature than their parents. These results are consistent with previous findings by Miller and Thomas (1978) who first showed that tropically adapted lines have a lower base temperature than their temperately adapted lines and that hybrids germinated significantly higher than their parents under low temperature extremes.

0043 AFRIA, B.S., and MUKHERJEE, D. 1982. Protein and ascorbic acid changes in shoot of certain C3 and C4 plants in relation to light and dark. Proceedings of the Indian National Science Academy 48(5): 681-684. 13 ref.

0044 AFRIA. B.S., and MUKHERJEE, D. 1982. Studies of peroxidase activity during early seedling growth in light and dark. Plant Physiology & Bdochemistry 9(1): 18-21.

Changes in peroxidase activity have been studied in endosperm/cotyledons, shoot and root of barley, sweet pea, maize and sorghum during early seedling growth in light and dark. The highest peroxidase activity in most of the samples was found in shoot followed by root and endosperm/cotyledons. Among the light-grown seedlings, root and shoot of maize recorded maximum activity, while in dark it was Lathyrus odoratus. In general, light-grown seedlings had a higher peroxidase activity than those in dark at most of the comparable stages.

0045 AISIEN, A.O. 1982. Enzymic modification of sorghum endosperm during seedling growth and malting. Journal of the Science of Food and Agriculture 33(8): 754-759. 14 ref.

Modification in the sorghum grain endosperm during seedling growth and malting was found to be associated mainly with increased activities of alpha-amylase, endo-Beta-glucanase, limit dextrinase and endoprotease. The major starch-degrading enzyme was alpha-amylase. The activity of endo-Beta-glucanase. limit dextrinase and endoprotease were comparatively higher in the endosperm than in the embryo during seedling growth. Endo-Beta-glucanase activity appeared to be relatively low during seedling growth. The low activity of this enzyme might be partially responsible for the limited degradation of the cell walls in the endosperm of the malted grain.

0046 AISIEN. A.O. 1982. Utilization of soluble carbohydrates during sorghum germination and seedling growth. Journal of the Institute of Brewing 88(3): 164-166. 13 ref.

Sucrose, raffinose, glucose and fructose levels were determined in the scutellum of intact and excised sorghum seedling during growth. In the scutellum of the intact grain embryo, sucrose and raffinose levels declined sharply over the germination phase but increased at post-germination (i.e., root emergence) as hexose sugars from the modifying endosperm passed into the scutellum. Although sucrose and raffinose also declined in the germinating excised embryo scutellum, the former recovered at post-germination while the latter remained low. Maltose, maltotriose and glucose were the main products of the enzymic modification of the endosperm during seedling development, which is a post-germination event. The growing axis of the embryo, with its higher invertase activity showed greater capacity for sucrose metabolism than the scutellum.

0047 AL-ANI, A., LEBLANC. J.M., RAYMOND, P., and PRADET, A. 1982. Effect of oxygen partial pressure on the rate of germination of fatty and starchy seeds: role of fermentative metabolism. (Fr)• C.R. Acad Sc. Paris 295(27): 271-274. 9 ref. (Summary:En)•

The effect of oxygen partial pressure (p02) on the rate of germination of 12 cultivated species was studied. The fatty seeds did not germinate below 1 K Pa (1% oxygen)• The starchy seeds were able to germinate at oxygen partial pressure about two orders of magnitude lower. In both cases the rate of germination increased as the p02 was raised from the lower values which only allows the protrusion of the rootlet to normal concentration of oxygen. Preliminary results indicate that it is the active fermentative metabolism which allows the germination at very low p02.

0048 AL-RAMAH, S. 1982. Growth and nutrient uptake of different varieties of Sorghum bicolor in relation to water supply and availability of nitrogen and phosphate. (De). Thesis, Georg-August-Universitat Gottingen, German Federal Republic. 104 pp. (Summary:En)•

Sorghum cultivars from South Africa, Sudan and Ethiopia were grown for seven weeks in pots in the greenhouse with a range of doses of N and P under severe, moderate and no water stress. Dry matter (DM) production (g/pot) increased in all varieties with increase in water supply. Increased in N fertilizer increased DM production in some varieties, the response being greater with higher N applications and higher water supplied than with low. Increases in phosphate application increased dry matter production to a lesser degree. Relative water uptake (m1/g DM) decreased with improved plant growth.

0049 ALAGARSWAMY, G.. and SEETHARAMA, N. 1982. Nitrogen uptake and translocation to the grain in sorghum. Pages 337-340 In Genetic Specificity of Mineral Nutrition of Plants, (ed. M.R. Sariac). Serbian Academy of Science and Arts, Beograd.

A range of variation in total plant nitrogen uptake, trnaslocation and accumulation of nitrogen in the grain is shown in sorghum. Large plants have a higher amount of nitrogen than small ones; high harvest index is correlated with greater transfer of plant nitrogen to the grain. Biomass and harvest index can therefore be used to indicate the extent of nitrogen uptake and translocation to the grain.

0050 ANDERSON. W.B. 1982. Diagnosis and correction of iron deficiency in field crops - an overview. Journal of Plant Nutrition 5(4-7): 785-795. 8 ref.

0051 ARAI, K., and TANAKA, K. 1982. Study on the suitable soil management in plastic greenhouse 7: Cation upt ake characteristic of C4 plants. (Ja). Kyushu Agricultural Research 44: 235.

0052 ARMBRUST, D.V. 1982. Physiological responses to wind and sandblast damage by grain sorghum plants. Agronomy Journal 74(1): 133-135. 26 ref.

Physiological responses of growth chamber grown RS 626 grain sorghum to injury by wind (13.4 m/sec), wind plus sand (10, 20, 30, 40, 50, 60, and 70 kg), and partial defoliation were evaluated. Wind and wind plus sand treatments were conducted in a wind tunnel. Net photosynthesis, dark respiration, total chlorophyll, dry weight. and leaf area were determined 1. 3, and 7 days after treatment. Dry weight production increased at low sand levels (1/4 30 kg) and decreased with higher sand exposure. Reduced growth of sandblasted grain sorghum is caused by loss of viable leaf tissue and physiological changes, which are mainly reduced photosynthesis and increased repiration.

0053 ATKIN. D.S.J.. and HAMILTON. R.J. 1982. The changes with age in epicuticular wax of Sorghum bicolor. Journal of Natural products 45(6): 697-703. 34 ref.

At four growth stages, epicuticular wax from sorghum cultivar CSH1 and ISI082 was sampled. Hydrocarbons with chain length variation of C14 to C37 increased in chain length and composition of high molecular weight homologues with increasing plant maturity. Esters ranging from C34 to C58 in equivalent chain length showed fluctuations in the composition of individual components with no specific trend. Ester hydrolysis products showed increases in high molecular weight homologues and longer chain alcohols on aging.

0054 ATKIN* D.S.J., and HAMILTON, R.J. 1982. The effect of plant waxes on insects. Journal of Natural Products 45(6): 694-696.

The epicuticular wax from two varieties of Sorghum bicolor at four stages of growth have been presented to Locusta migratoria migratoioides in a bioassay which showed that the wax from younger plants is more deterrent. The wax was fractionated to give a hydrocarbon and an ester fraction of which only the esters showed some deterrent activity.

0055 AWAD. A.M.* and SOLTANPOUR* P.N. 1982. Effect of some treatments on iron availability to sorghum plants grown in an iron-deficient soil. Agronomy Abstracts: 201.

Greenhouse studies were carried out to evaluate several treatments for correcting iron chlorosis of sorghum plants. Manure or sewage sludge amendment at a rate of 4% (w/w) corrected iron chlorosis and increased yield. Addition of iron chelate (Fe-EDDHA) corrected chlorosis and increased yield. Acid treatment (changes soil pH from 7.7 to 6.5) corrected chlorosis and improved yield. In a manure-treated soil, an unaerobic treatment increased soil iron availability and corrected chlorosis but without manure it was not effective. MECO Iron Fertilizer increased soil iron availability at a rate of 0.1%. Foliar sprays with a solution of iron sulfate did not correct chlorosis in this extremely deficient soil.

0056 BAPAT, D.R., SHINDE. M.D., and PADHYE, A.P. 1982. Genotypic difference for grain hardness in sorghum. Sorghum Newsletter 25: 16.

Grains of 22 genotypes were sun-dried and five grains of each genotype were tested for their hardness by a pocket grain hardness tester. Statistical analysis revealed highly significant genotypic differences. CSH-6 was the hardest genotype while SPV-102 was the softest. The genotypes like SPV-107. HD-10-9, SPV-247. and 168 also appeared to be promising since hardness in these genotypes ranged from 6.15 to 6.45 and were on par with CSH-6.

0057 BASTOS, C., and GOURLEY. L. 1982. Rapid screening of sorghum seedlings for tolerance to low pH and aluminum. Page 742 In Sorghum in eighties: proceedings of the International Symposium on sorghum, 2-7 November 1981. Patancheru, A.P. , India. Patancheru, A.P., India: ICRISAT. (Abstract).

A rapid screening procedure for evaluating sorghum seedlings for tolerance to aluminum (22 micro M) at low pH (4.0) using a modified Steinburg nutrient solution is described. The parameter measured is the rate of seminal root elongation observed after a 6-day treatment period. Seeds were germinated and transferred to the treatment nutrient solutions after 3 days. Twenty-seven of 158 genotypes were found to equal or exceed the laboratory tolerance level of SC-175-14 (IS-12666C). a genotype with good tolerance to low pH-high aluminum soils. Genetic studies and additional screenings of lines from the World Collection of sorghum are under way. All genotypes tolerant to low pH and aluminum will be screened for tolerance to manganese in nutrient solution and field evaluated in soils of pH 4.0 with an aluminum saturation greater than 64% of the C.E.C.

0058 BOWMAN. R.A., and OLSEN. S.R. 1982. Effect of calcium sulfate on iron and zinc uptake in sorghum. Agronomy Journal 74(5): 923-925. 11 ref.

A greenhouse factorial experiment was designed using two levels of P. sulfate, and CaC03 in a Nunn loam soil with sorghum as the test plant. Plants were grown for 60 days, and then sectioned into top leaves, bottom leaves, and stems. Data collected included dry matter, and P, Fe, and Zn concentrations in the various parts. Dry matter yields and P concentrations were increased with added P treatments. Phosphorus with added CaC03 resulted in the lowest Fe and Zn concentrations in the top leaves while P with added sulfate resulted in the highest. These treatment effects were generally reversed in the bottom leaves. Phosphorus, and Fe and Zn. showed different mobility relationships. Total Fe uptake was increased 20% and Zn uptake also tended to increase with added sulfate. Apparently, the top leaves were supplied with Fe through internal transfer of Fe from botton to top leaves. and external transfer (soil)» while the Zn transfer was largely through internal transfer processes.

0059 BUENO, A.. and ATKINS, R.E. 1982. Growth analysis of grain sorghum hybrids. Iowa State Journal of Research 56(4): 367-381. 13 ref.

Relationships among growth parameters determined from sorghum experiments which spanned a range of genotypes and planting arrangements were examined from early-vegetative to mature-plant stages of growth. Average crop growth rates (CGR) increased continuously from the early vegetative stage and reached maximum values just before anthesis. The hybrids tested accumulated vegetative dry-matter at essentially the same rate* but they differed in rate of dry matter accumulation during grain filling. Differences in CGR associated with variations in row spacings, plant densities. and height genotypes tended to be greater during the vegetative stages of growth. Net assimilation rate (NAR). specific leaf weight (SLW), leaf area index (LAI) , and leaf area duration were examined.

0060 BUTLER. L.G. 1982. Relative degree of polymerization of sorghum tannin during seed development and maturation. Journal of Agricultural and Food Chemistry 30(6): 1090-1094. 26 ref.

The degree of polymerization of the tannin extractable from several high-tannin, bird-resistant, sorghum cultivars remains constant and relatively low throughout seed development in the field. After the seeds are dried, even in grain samples that are quite immature, the relative degree of polymerization increases severalfold to values characteristic of mature dry grain. Other parameters related to the degree of polymerization change similarly on drying. These results suggest that bird repellency, which is maximal in immature undried grain, may be due to relatively short oligomers as well as nontannin phenolics. If this is the case, a significant improvement in the nutritional quality of high-tannin sorghum might be observed if it were possible to inhibit the polymerization during drying of the seed.

0061 CAMARGO, C.P. 1982. Some genotypic variation in sorghum (Sorghum bicolor (L.) Moench) seed related to germination temperature and water absorption. Ph.D. thesis, Mississippi State University, Mississippi, USA.

An evaluation of seeds of thirty six forms for their response to germination temperatures ranging from 10 to 42 deg C showed that IS1166C and SC175-14 were equal to or better than all the other forms. Within the same range of seed size there was genotypic variation both in the rate of moisture absorption and the time required for radicle emergence.

0062 CARMAN. J.G. 1982. A non-destructive stain technique for investigating root growth dynamics. Journal of Applied Ecology 19(3): 873-879. 8 ref.

A non-destructive stain technique for quantifying root growth was developed. Red, blue and yellow chlorotriazinyl dyes are individually applied as a soil drench at three infrequent intervals. The dye is leached from the rooting medium after a brief exposure. At the end of the growth period, the roots are washed and increments of root growth are differentiated by colour. The technique was developed by growing seedlings of sorghum in sand and determining the effect of different staining procedures on subsequent plant growth. Procedures which permitted normal growth were identified. Seminal and adventitious root length and dry weight of shoots and roots did not differ significantly (P1/4 0.05) between stained and non-stained plants. While application of this technique is generally limited to plants grown in porous media, the technique can be sued to quantify root growth parameters which cannot be quantified by destructive methods.

0063 CHAMBERLIN, R.J., and WILSON, G.L. 1982. Development of yield in two grain sorghum hybrids. I. Dry weight and carbon-14 studies. Australian Journal of Agricultural Research 33(6): 1009-1018. 14 ref.

Growth and development of two grain-sorghum hybrids (De Kalb E57 and Texas 610) were examined under glasshouse conditions by sequential harvesting and the use of 14C. The grain yield per plant of Texas 610 was higher than of E57, with higher total biological yield and similar harvest indices. The contribution to grain weight at maturity, of carbon assimilated prior to anthesis, was about 10% for each hybrid. The leaves were the main source of this material. After anthesis, dry weight data indicated that temporary storage of assimilates before retranslocation to the grain was of greater importance in Texas 610 than E57. This storage was largely in the leaves (including sheaths), upper internodes, and roots. A high grain-growth rate was maintained for longer by Texas 610 than by E57. Total dry weight production after anthesis in both hybrids was, at all stages examined, more than sufficient to maintain grain growth.

0064 CHANNAKESHAVA, B.C. 1982. Influence of seed sizes and seed treatments on growth and yield of CSH-5 sorghum hybrid (Sorghum bicolor (L.) Moench). M.Sc. thesis, University of Agricultural Sciences, Dharwad, India. 107 pp.

A field experiment was conducted during kharif 1978 to study the influence of seed sizes (medium and small) and seed treatments (unsoaked. soaked. in water and in solutions of glucose. GA and supplied additional dose of nitrogen) on plant growth and yield of CSH-5 sorghum hybrid. In the early stages of crop growth, plant height* LAI and dry matter production in plant parts significantly increased in plants emerged from medium sized seeds over those from small seeds. However. the size of seed had no significant influence on the yield and yield components. These growth parameters were significantly influenced by soaking the seeds in water. glucose and GA and also due to the supply of additional nitrogen at top dressing. Soaking the seeds in water increased the yield from 28.15 to 36.68 q/ha and the yield produced by the medium seeds soaked in water was at par with that obtained by the use of certified seeds.

0065 CHAUDHURI* U.N.. and KANEMASU, E.T. 1982. Agronomic performance of sorghum (Sorghum bicolor L.) and pearl millet (Pennisetum americanum (L.) Leeke). Agronomy Abstracts: 117.

A field study during 1981 growing season was conducted at Manhattan (Kansas) to determine the genotypic differences in grain sorghum and pearl millet. The four sorghum hybrids and four millet hybrids were tested for soil moisture, leaf and air temperatures, stomatal resistance and leaf-water potential. The grain yield of sorghum was about 38% greater than millet. whereas. for the total dry matter yield was only 3%. The seed weight and head weight of pearl millet were less than for sorghum, but the number of heads were greater for the millet. The average cumulative water use under well watered conditions for millet (60.5 cm) was higher than for sorghum hybrids (56.2 cm). The water use efficiency (WUE) for total dry matter for millet was about 3.8 times higher than for the grain. whereas 2.5 times higher for sorghum. The WUE for grain of sorghum was more than twice that of millet. Xylem and stomatal resistance of sorghum were lower than those of pearl millet* but millet was slightly cooler than sorghum.

0066 CHAUDHURI. U.N.. and KANEMASU, E.T. 1982. Effect of water gradient on sorghum growth* water relations and yield. Canadian Journal of Plant Science 62(3): 599-607. 20 ref. (Summary:Fr).

A field study was conducted during the 1980 growing season to determine the effects of soil moisture gradient on sorghum water relationships, growth, and yield of four hybrids sorghum[1] G-623 GBR.[1] 'RS 626,' 'RS 671' and 'A 28+'. June to September was warmer than normal (2.3-4.8 deg C) with precipitation of only 16.2 cm during the cropping season. Plant height, dry mater, and leaf area index (LAI) decreased as watering level decreased. Higher leaf diffusive resistance and lower water potentials were associated with decreasing plant height and decreasing LAI. Canopy temperature (Tc) of the water-stressed sorghum was generally 3.2-3.7 deg C warmer than canopy temperatures of well-watered plants. Canopy temperature also correlated well with water use by all hybrids. The average canopy minus air temperature (Tc - Ta) was positive for all hybrids receiving less than 25 cm of irrigation and precipitation during the growing season, which corresponds to soil moisture values of 0.32 maximum available. Increasing the watering levels increased the WUE for total dry matter and grain yield.

0067 CHUKWURA, E.N.. and MULLER. H.G. 1982. Effect if tannic acid on a low tannin African sorghum variety in relation to carbohydrate and amylase. Journal of Food Science 47: 1380-1381.

The effect of concentrations of 0-3% tannic acid on root growth. starch. soluble carbohydrate and alpha and beta amylase was determined during germination of a low tannin sorghum variety. At higher concentrations of tannic acid root growth was suppressed. Starch degradation and accumulation of soluble carbohydrates were reduced and both alpha and beta amylase synthesis was decreased. This suggests that tannins retard starch degradation indirectly by inhibiting the synthesis of starch hydrolytic enzymes during germination.

0068 CLARK. L.E., ROSENOW. D.T., GBUR. E.E., and GERARD, C.J. 1982. Screening sorghum for drought tolerance and yield response under moisture gradient system. Agronomy Abstracts: 62.

Inbred lines and hybrids of sorghum were grown under a moisture gradient created by a line source sprinkler. The system provided greater moisture near the line, decreasing to rain fed conditions away from the line. Moisture stress under rain fed conditions occurred primarily during the pre-flowering stage of development. Lines and hybrids with known reaction to pre- and post-flowering drought stress, as well as material with unknown reaction were evaluated for yield and panicle development. Best-fit curves for yield versus distance from the line were plotted, and area under the curves were calculated for the wet, intermediate, and dry one-third of each row on each side of the line. Significant differences in yield among lines and hybrids occurred under the three moisture conditions, but more discreet mean separations were obtained under more favourable moisture conditions. Lines susceptible to pre-flowering were among the lowest yielding lines, but hybrids with one of these lines as a female parent were among the highest yielding hybrids under all moisture conditions.

0069 CLARK. R.B. 1982. Iron deficiency in plants grown in the Great Plains of the U.S. Journal of Plant Nutrition 5(4-7): 251-268. 6 ref.

Iron (Fe) deficiency is a major problem limiting growth and production of many crop plants grown in the Great Plains. The soils of this area are generally neutral or alkaline and usually have underlying calcareous deposits. Water supply is usually limited in this area, so crops like sorghum and soybeans are often grown. With some exceptions, the Fe dif iciency problem generally appears to increase from north to south and is most severe in sorghum and soybeans. Sorghum and soybeans cannot be grown in many areas because of their susceptibility to Fe deficiency. Over 90% of the sorghum production in the U.S. is in the Great Plains, thus Fe deficiency in sorghum is important. Alleviation of Fe deficiency is expensive and difficult. Practical, economical and longlasting or permanent solutions for overcoming the problem are needed. Information on existing problems, on research now being conducted, and on future research needs for Fe deficiencies in plants grown in the Great Plains has been presented.

0070 CLARK. R.B. 1982. Mineral nutritional factors reducing sorghum yields: micronutrients and acidity. Pages 179-190 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum. 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 56 ref.

0071 CLARK. R.B. 1982.

Nutrient solution growth of sorghum and corn in mineral nutrition studies. Journal of Plant Nutrition 5(8):1039-1057. 24 ref.

The growth of plants in nutrient solutions is an invaluable tool for mineral nutrition studies. Successful growth of plants in nutrient solutions require special attention and consideration. Details and helpful ideas for the growth of plants in nutrient solutions are often omitted in publications where techniques like these are used. The objective of this report is to focus on some of the concerns, successes, experiences, and problems noted for growth of sorghum and corn in nutrient solutions. Topics discussed are nutrient solution composition, pH of nutrient solutions, phosphorus concentrations, sources of Fe in solutions, plus several suggestions and comments for successful growth of sorghum and corn in nutrient solutions.

0072 CLARK, R.B., FURLANI, P.R.. DE FRANCA, G.E., FURLANI, A.M., and YUSUF, Y. 1982. Screening sorghum genotypes for tolerances to mineral element deficiencies and toxicities. Page 742 in Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

Plants that can tolerate and grow well under mineral element deficiency and toxicity conditions need to be identified and developed, so that they can be grown successfully on marginal lands and with fewer or limited fertiliser/soil amendment inputs. A relatively simple and inexpensive method for screening sorghum genotypes for tolerance to mineral element deficiencies and toxicities in nutrient solutions was developed. This method has been used successfully to screen sorghum genotypes for differences in tolerance to low levels of N, P, and Fe, and to toxic levels of Al. The method consists essentially of growing a fairly large number of plants (60-125) in the same container with relatively low volumes (50-100 ml/plant) of nutrient solution containing limited amounts of the element of concern or with added elements/compounds to induce a deficiency or toxicity.

0073 CLARK, R.B., YUSUF, Y., ROSS, W.H., and MARANVILLE, J.W. 1982. Screening for sorghum genotypic differences to iron deficiency. Journal of Plant Nutrition 5(4-7): 587-604.

Different nutrient solutions were tested to determine which treatments were best suited for screening sorghum genotype tolerance to Fe deficiency conditions. Iron deficiencies were induced by growing seedlings in nutrient solutions with higher than normal levels of phosphorus (P); added calcium carbonate ($CaCO_3$); nitrate (NO_3), ammonium (NH_4), and ($NO_3^- + NH_4^+$) as sources of nitrogen (N); and in Fe deficient, calcareous soils in controlled environmental chambers. Regardless of the screening method, sorghum genotypes differed in their response to Fe deficiency conditions. Larger differences in Fe deficiency were noted among genotypes when NO_3^- or high P were used. Differences in dry matter yields were greater when the genotypes were grown on soils with low available Fe than when grown in nutrient solutions. Many genotypes grown in Fe deficient soils did not respond the same as they did in nutrient solutions.

0074 CREELMAN. R.A., MILLER, F.R., and MONK, R. 1982. Lodging resistance in high energy sorghum. Sorghum Newsletter 25: 31.

0075 DAMASCENO, G. DE S., MOREIRA, S.M.C., and FORTES, M. 1982. A simple method for evaluating isotherm equations and enthalpies of water sorption and vaporization in biological materials. (Pt). Revista Brasileira de Armazenamento 7(2): 69-80. 13 ref. (Summary:En).

0076 DATIN, C.L.. and WESTERMAN. R.L. 1982. Effect of phosphorus and iron on grain sorghum. Journal of Plant Nutrition 5(4-7): 703-714.

0077 DICKINSON. T.E.. and MAUNDER. A.B. 1982. Four phase drought study. Sorghum Newsletter 25: 132-133.

A field study was designed to examine four phases of drought on 27 sorghum hybrids and lines that contain various drought traits. The different phases included looking at dormancy, heat resistance or tolerance, diffusive resistance and leaf water loss, and root development.

0078 DU. S.H.. and FANG, S.C. 1982. Uptake of elemental mercury vapor by C3 and C4 species. Environmental and Experimental Botany 22(4): 437-443. 13 ref.

Uptake of Hg vapor was measured for seven gramineous species. Uptake increased with Hg vapor concentration, and increasing temperature and illumination. Under various environmental conditions, an inverse linear correlation was observed between the logarithm of mesophyll resistance. rM. Hg, and Hg vapor uptake. Stomatal and biochemical controls for such uptake were demonstrated. The Hg vapor uptake was higher in C3 plants than in the C4 plants under similar conditions. Greater responses to both temperature and illumination were found in C3 plants than in the C4 plants. The binding site for Hg vapor was rather specific and its subsequent conversion was probably mediated by an oxidative enzyme.

0079 DUNCAN. R.R. 1982. Categorization of sorghum genotypes for tolerance or susceptibility to acid soil stress environments. Sorghum Newsletter 25: 24-25. 3 ref.

Twenty-one B and R lines of sorghum were grown in the field on a Dyke clay loam (Typic Rhodudult) with a pH 4.9 for three years. Plant nutritional profile (concentration of Ca, Mg. K, P. Cu, Mn. Fe. Zn, A1) was monitored by analysis of leaf samples. Total above-ground plant dry weight at physiological maturity was measured. An acid soil field tolerance rating system was developed to evaluate the relative acid soil tolerance/susceptibility of the different genotypes.

0080 EBERT, E. 1982. The role of waxes in the uptake of metolachlor into sorghum in relation to the protectant CGA 43089. Weed Research 22(6): 305-311. 14 ref. (Summaries:De, Fr).

The metolachlor which is especially effective against wild millets, inhibits the formation of epicuticular waxes on sorghum leaves. The metolachlor protectant CGA 43089 prevents the depletion of the waxes on the leaves of metolachlor-treater sorghum plants. as demonstrated by scanning electron microscopy. This alteration of the plant surface polymers also changes their permeability to the herbicide. 14C-metolachlor uptake into isolated coleoptiles and first leaves of sorghum which had been pretreated with the herbicide was increased. Incubation with added protectant reduced the uptake of 14C-metolachlor. It is postulated that (1) the selectivity observed against sorghum and millet grasses could occur because of an increased uptake of metolachlor through cuticles which are particularly sensitive to the structural changes caused by the herbicide, since the composition of the plant waxes is very species-specific (2) the loss of cuticular integrity is prevented by the protectant CGA 43089. which greatly reduces penetration of metolachlor.

0081 EINHELLIG, F.A., and NELSON, L.S. 1982. Effects of ferulic and p-coumaric acid addition to soil on grain sorghum. Proceedings of the South Dakota Academy of Science 61: 127-133. 29 ref.

A silty-calay soil was amended with 250, 500 or 1,000 ppm FA or pCA (w:w, air dried soil) to determine their inhibitory action after entry into the soil medium. Phenolic acids in the soil did not alter grain sorghum germination but seedling growth was reduced in all amended soils. Growth effects were greater from additions by solution, and root growth was inhibited more than shoots. Concentration dependent effects were not apparent. Growth suppression from FA was highest with 250 ppm additions. While some complexing or inactivation apparently occurs, especially at higher levels, FA and pCA in soil retard seedling growth.

0082 EINHELLIG, F.A., SCHON, M.K., and RASMUSSEN, J.A. 1982. Synergistic effects of four cinnamic acid compounds on grain sorghum. Journal of Plant Growth Regulation 1(4): 251-258. 31 ref.

Experiments tested the allelopethic effects of trans-cinnamic acid (tCnA), caffeic acid (CA), p-coumaric acid (pCA), and ferulic acid (FA) separately and in combination on grain sorghum. The data showed different levels for inhibitory effects among the four compounds, differential sensitivity of plant processes, and more inhibition with combinations of these compounds. The most toxic compound at equimolar concentrations was tCnA. Seed germination, radicle elongation, and seedling growth had different thresholds for inhibition by the phenolic acids, with increasing sensitivity of these plant processes in the order indicated. Concentrations of 0.1 mM FA, 0,1 mM CA, 0.1 mM pCA, and 0.04 mM tCnA were slightly below the threshold for inhibition of seedling growth. Synergistic inhibitory effects occurred when the phenolic acids were applied in combinations of two, three, and the four together. Such synergistic effects are important in understanding allelopathy.

0083 EL-TUHAMI, M.M.K. 1982. Development of tannin in different parts of the sorghum plant (Sorghum bicolor L. Moench). Sorghum Newsletter 25: 100.

Twenty varieties of grain sorghum (10 Egyptian and 10 U.S.A.) were grown under Minia conditions in 1979 and 1980 to study the development of tannin in stem and leaves, roots, and glumes at milk, dough and mature stages of grain development. The results revealed that: (a) Tannin increased progressively in stem and leaves, roots and glumes as the plant moved toward maturity. The percentage of tannin reached its maximum at maturity. (b) The Egyptian varieties had much less tannin content in stem and leaves, root and glume than the American ones. This was true in all stages in both years. (c) Maximum accumulation of tannin in stem and leaves and roots occurred from dough to mature stage, while in glume, it happened from milk to dough. (d) Positive and significant correlation coefficients were found between stages and between plant organs in the percentage of tannin.

0084 EL-TUHAMI, M.M.K. 1982. Tannin development in grain sorghum (Sorghum bicolor (L.) Moench). Sorghum Newsletter 25: 100.

Twenty varieties (10 local and 10 imported) were grown at Minia University Farm in 1979 to 1981. In 1980, the 10 imported varieties and 2 local varieties were grown at Assiut University Farm, The tannins were assessed in the kernel at 3 stages of grain development. Results revealed that: (1) Progressive increase in the percentage of grain tannins was observed as the kernel developed. Pecentage of tannins reached its maximum by maturity. (2). There were significant differences between varieties every year. The high tannin varieties level were always high while the low tannin varieties were always low. (3) Years and locations and a significant effect on the amount of grain tannins. (4) A high heritability value and a considerable genotypic variation in tannins were detected. (5) A significant positive relationship was found between percentage of grain tannins in the milk, dough amd mature stages.

0085 EVANS, R.C., TINGEY, D.T., GUMPERTZ, M.L.. and BURNS. W.F. 1982. Estimates of isoprene and monoterpene emission rates in plants. Botanical Gazette 143(3): 304-310. 23 ref.

A range of plant species, including crops, shrubs, herbs and trees, was surveyed to determine the magnitude of isoprene emissions. In studies to determine if plants emitted isoprene, greenhouse-grown plants were encapsulated in impermeable plastic bags and kept in a growth chamber for 2 h at 30 C and a photosynthetic photon flux density of ca, 350 micro E m-2s-l. To estimate emission rates, greenhouse-grown plants were conditioned in a growth chamber and transferred to a controlled-environment gas-exchange chamber. Gas samples from either the encapsulation bags or gas-exchange chamber were collected, concentrated cryogenically, and analyzed by gas-liquid chromatography. The occurrence of isoprene and monoterpenes was confirmed by combined gas chromatography-mass spectrometry. Of the 54 plant species tested, 37 emitted isoprene. Isoprene emission rates (28 C and 1,000 micro E m-2s-1) for 16 species ranged from 0 to 38.5 micro g carbon g-1 h-1. The encapsulation technique permitted rapid identification of species that emitted isoprene.

0086 FINDENEGG, G.R., SALIHU, M., and ALI, N.A. 1982. Internal self-regulation of H+-ion concentration in acid damaged and healthy plants of Sorghum bicolor (L.) Moench. Pages 174-179 In Proceedings, ninth International Plant Nutrition Colloquium, vol. 1, 22-27 August 1982, Warwick University, England, U.K. Slough, U.K.: CAB. 5 ref.

Sorghum plants were grown on nutrient solutions with different levels of N applied (between 25 and 2500 micro M/l) at three pH-levels 3.7, 4.8 and 6.5; frequently readjusted. After three weeks the plants were harvested and roots and shoots were analysed separately for mineral constituents, organic acids, and 'tissue pH' as measured in suspensions of dry plant material in deionized water under standardized conditions. Plants supplied with high NH4+ levels at low pH showed damage symptoms and growth inhibition when compared with the respective plants grown at high pH (pH 6.5) or with N03. The damage symptoms were probably due to root injury by the too low pH of the growth medium. The affected plants contained lower levels of organic acids, lower cation excess (C-A) and had a lower tissue-pH than healthy plants. From these parameters tissue-pH is thought to be primarily affected, the others being decreased subsequently.

0087 FRAGA. A.C. 1982. Seed dormancy, (pt). Informe Agropecuario 8(91): 62-64. 8 ref.

Information is given with reference to sorghum on types of seed dormancy (primary and secondary), causes of dormancy, substances promoting or inhibiting germination and methods for breaking dormancy.

0088 FRANKENBERGER, W.T. JR., and TABATABAI, M.A. 1982. Amidase and urease activities in plants. Plant and Soil 64(2): 153-166. 22 ref.

0089 FURBANK, R.T., and BADGER, M.R. 1982. Photosynthetic oxygen exchange in attached leaves of C4 monocotyledons. Australian Journal of Plant Physiology 9(5): 553-558.

Photosynthetic 02 evolution, 02 uptake and C02 uptake by intact leaves from plants of the three C4 decarboxylation types were examined using mass-spectrometric gas-exchange and stable isotope techniques. All species showed a relative insensivity of 02 uptake to C02 concentration. The uptake rates observed were between 0.2 and 1 mmol 02 cm-2 s-1 at the C02 compensation point. At ambient external C02, NADP-malic enzyme type species showed the lowest average 02 uptake, phosphoenolpyruvate carboxykinase types the highest values, and NAD-malic enzyme types showed intermediate values for 02 uptake. These results are discussed in relation to the contributions to 02 uptake of ribulosebisphosphate oxygenase and photoreduction of oxygen.

0090 GARRITY, D.P., SULLIVAN, C.Y., and ROSS, W.M. 1982. Alternate approaches to improving grain sorghum productivity under drought stress. Pages 339-356 In Drought resistance in crops with emphasis on rice. Los Banos, Laguna, Philippines: IRRI. 37 ref.

The approaches discussed are: (i) the physiological approach that involves introduction of specific traits into superior genetic backgrounds, and (ii) the performance approach, involving direct selection under water stress environments.

0091 GAY, M., and CASSAGNES, P. 1982. Contribution to the study of the development of tannins in the sorghum panicles and in grains during maturation. (Fr). Pages 460-466 In International workshop and general assembly of the groupe polyphenols. Narbonne, France: Groupe polyphenols.

0092 GERBERMANN, A.H., EVERITT, J.H., and GAUSMAN, H.W. 1982. Reflectance of litter accumulation levels at five wavelengths within the 0.5-to 2.5 micro m waveband. Journal Rio Grande Valley Horticultural Society 35: 19-25.

Reflectance was measured for 1-m2 range grass plots with two canopy treatments (standing and clipped) and four levels of litter accumulation and for grain sorghum with two canopy treatments. Reflectance was significantly higher at the 0.65 - to 1.65, and 2.20 micro m wavelengths for both grass and grain sorghum canopies when the canopies were clipped and the resulting litter was removed. The natural accumulation of litter under the grass canopy did not significantly affect reflectance. The 1.65-and 2.20 micro m wavelength reflectances of the live grass and the intact litter were 21.8% and 16.2%, respectively, and those of grain sorghum were 21.8% and 16.5%, respectively.

0093 GORBUNOV, N.I., ZARUBINA, T.G., and KUTSYKOVICH. M.V. 1982. X-Ray diffractometric method of studying plant tissues. (Ru). Pochvovedenie 3: 113-116.

0094 GUERRIER, G. 1982. Relation between sorghum root system and aluminium toxicity. Journal of Plant Nutrition 5(2): 123-136. 21 ref.

The effects of different concentrations of aluminium and pH on

Sorghum dochna seed growth and mineral nutrition have been studied. An acid nutritive solution favours absorption of oligoelements and calcium, whereas a basic medium promotes uptake of phosphorus, nitrogen, magnesium and potassium. Moreover, aluminium whether absorbed by seminal roots or adventitious roots has a strong inhibitory effect on calcium, independent of pH. The marked sensitivity of the plant to A1+++ ions more than H+ ions is explainable by the localization of calcium and lipids which are only slightly membrane bound in adventitious roots, and by the low intracellular chelating capacity of organic acids for the trivalent element.

0095 HAMILTON. R.I., BALASUBRAMANIAN, V., REDDY, M.N., and RAO, C.H. 1982. Compensation in grain yield components in a panicle of rainfed sorghum. Annals of Applied Biology 101(1): 119-125. 13 ref.

In a field experiment with rainfed grown sorghum hybrid CSH-6, various proportions of spikelets from the apex, base or random regions of the panicles were removed at the time of anthesis and the yield compensation in grain number and grain size within a panicle was investigated. The distribution of grain number and grain yield in a control panicle from apex to base was parabolic while grain size showed a progressive linear decrease. Full grain yield compensation occurred due to an increase in grain number and size when the panicles lost upto 20% of their portions at the base or at random. No grain number compensation was however, recorded at the apical region. Irrespective of the number of spikelets retained, the size of grains in the upper part of the panicle was always larger than those in the lower part. The grain number compensation, which occurred when spikelets were removed at the time of anthesis and the decreasing grain size from apex to base of the panicle would suggest hormonal involvement in the determination of potential grain number and size.

0096 HANSON, A.D., and HITZ, W.D. 1982. Metabolic responses of mesophytes to plant water deficits. Annual Review of Plant Physiology 33: 163-203. 278 ref.

The effects of drought on the metabolism of mesophytic plants are discused with reference to sorghum, cotton, Phaseolus vulgaris, tobacco, soyabean, maize, tall fescue, and Panicum species.

0097 HASKINS, F.A., GORZ, H.J., and CLARK. R.B. 1982. Influence of radiation level on apparent hydrocyanic acid potential of sorghum seedlings. Crop Science 22(1): 101-105. 8 ref.

The hydrocyanic acid potential (HCN-p) of sorghum and sudangrass seedlings may be estimated by a spectrophotometric procedure that is simple and rapid. As assayed by this procedure, seedlings of a number of lines appeared to have increased HCN-p when grown under increased levels of radiation. It was concluded that seedlings to be assayed by the spectrophotometric method should be grown under radiation levels no higher than 200 micro E.m-2 sec-1 and it was recommended that spectra be scanned and/or ether extraction be used for any entries assaying less than 250 ppm HCN-p by this method.

0098 HERMUS, R.C., FUKAI, S., and WILSON, G.L. 1982. Quantitative studies of water stress in sorghum. Sorghum Newsletter 25: 125. 2 ref.

An experiment was conducted in the field to quantify the effect of water deficits at defined stages of inflorescence growth on subsequent inflorescence development and spikelet number. To enable a study of stress at different growth stages, seven sequential plantings were made during the 1980/81 summer season. Over a period of four weeks which had a high evaporative demand and low rainfalls, a mild water stress occurred at the stages of inflorescence initiation and early inflorescence development. In those plants experiencing stress within the 10 days following inflorescence initiation, the subsequent inflorescence development was hastened. The initial increase in inflorescence development resulted in the stressed plants heading slightly earlier than the control. Even those plants which had experiences stress just prior to inflorescence initiation had faster development. The number of fertile spikelets at anthesis was increased by 14% when mild stress had occurred in early reproductive development. However, there was no significant difference in the grain number at maturity.

0099 HIREL. B.» and GADAL, P. 1982. Glutamine synthetase isoforms in leaves of a CA plant: sorghum. Physiologia Plantarum 54(1): 69-74. 32 ref.

In sorghum (cv. INRA 450) leaves, two isoforms of glutamine synthetase GSl and GS2 were identified by DEAE Sephacel chromatography and polyacrylamide gel electrophoresis. GSl was present both in etiolated and green leaves and its activity remained constant during the greening process. In green leaves another isoform GS2 was identified that was responsible for a 33% increase in total glutamine synthetase activity after light exposure. The two isoforms differed in their heat stability but exhibited similar pH optima and Km values for L-glutamate. The total glutamine synthetase activity was equally distributed between mesophyll and bundle sheath cells, moreover in the two types of cells both GSl and GS2 were present in the proportions of 67% and 33% of the total respectively. In mesophyll cells the two isoforms had a different subcellular distribution: GS2 was localized in the chloroplast and GSl in the cytosol.

0100 HITAKA, N. 1982. On the heading and blooming of grain sorghum. (Ja). Kinki Chugoku Agricultural Research 63: 35-38. 12 ref.

0101 HITAKA, N., and DANJO. T. 1982. Effects of temperature on blooming, pollination and sterility of grain sorghum. (Ja). Kinki Chugoku Agricultural Research 63: 39-43. 13 ref.

0102 HOFMANN, W.C. 1982. The physiology of stressed and non-stressed sorghum (Sorghum bicolor (L.) Moench). Ph.D. thesis, University of Arizona, Tucson, USA.

0103 HOOK, K.T., DIEHL, K.C.. KUNZE, O.R.. SWEAT, V.E., and FAUBIAN, J.M. 1982. Fracture energy of sorghum kernels as affected by temperature, moisture and loading rate. St. Joseph, Michigan: American Society of Agricultural Engineers. (Fiche No. 82-3549).

0104 HOSEL. W., and CONN, E.E. 1982. The aglycone specificity of plant beta-glucosidases. Trends in Biochemical Sciences 7(6): 219-221. 22 ref.

The high degree of specificity which plant beta-glycosidases exhibit for the aglycone moiety of their substrates is not widely appreciated. Numerous examples show that this group of plant enzymes is well adapted for metabolising specific plant glycosides.

0105 HOSHENO. T., and DUNCAN, R.R. 1982. Sorghum tannin content during maturity under different environmental conditions. Japanese Journal of Crop Science 51(2): 178-184. 19 ref. (Summary:Ja).

Tannin content for hybrids grown from the late planting date was higher, especially in 10-day grain, than from the early planting date. The tannin accumulation pattern was significantly different depending on hybrids and planting dates. Tannin content was highest at 10 days after anthesis, rapidly declined at 15 days and continued a gradual decrease until 45 days or 60 days after anthesis in all bird resistant hybrids and under all environmental conditions. Tannin content during the early ripening stage decreased rapidly, while tannin content decreased gradually due to water stress and high temperature conditions during the late ripening stage. Tannin content of grain shaded by paper bags during development was about half that of unbagged grain and the response to shading was significantly different among hybrids.

0106 ISBELL, V.R., and MORGAN, P.W. 1982. Manipulation of apical dominance in sorghum with growth regulators. Crop Science 22(1): 30-35. 27 ref.

The horomonal control of apical dominance in sorghum was studied by applying plant growth regulators to two cultivars-SMlOO and BTx378. In field, SM100 produced an average of 1 tiller per 2 plants before anthesis and BTx378 produced none. Following anthesis, apicl dominance diminished in both cultivars. Spray applications of 0.2 mM gibberelic acid (GA3) during the initial 7 weeks of seedling growth completely inhibited bud outgrowth before anthesis in SM100. Bud outgrowth increased rapidly in both cultivars after termination of GA3 applications. This rapid increase in bud outgrowth was similar to the normal release from apical dominance ocurring in untreated plants following anthesis except that it was earlier, occurred at a more rapid rate, and a larger final number of buds was released.

0107 JAYASURIYA, U., and WILSON, G.L. 1982. A grain yield development in a hybrid sorghum (Texas 610) and its parents. Page 755 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract)•

Grain yield corresponds closely to the storage of carbon assimilated during the grain filling period. In the female parent, the amount of material available for such storage is high, but the small number of grains limits yield. In the male parent, the large number of grains provides adequate storage capacity, but the supply of material for storage limits yield. This is because canopy structure is poor and hence the efficiency of photosynthetic conversion of solar radiation is low. The hybrid combines the desirable features of the two parents; good canopy structure and high grain number*

0108 JENSEN, S.AA., and HELTVED, F. 1982. Visualization of enzyme activity in germinating cereal seeds using a lipase sensitive fluorochrome. Carlsberg Research Communications 47(5): 297-303. 17 ref.

0109 JONES, H.G. 1982. Strategies for a drought tolerance. Page 751 In Sorghum in the eighties proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

The results of calculations using a simple model to investigate the relative advantages of conservative or optimistic strategies of water use for crop productivity in different climates are described. In particular the implications of the fact that the occurrence and amount of rainfall in many semi-arid environments are more or less variable from year to year will be investigated.

0110 JORDAN, W.R.. and SULLIVAN, C.Y. 1982. Reaction and resistance of grain sorghum to heat and drought. Pages 131-142 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7, November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 58 ref.

0111 JOSHI, B.H., and PRAKASH, V. 1982. Naturally occurring pea diamine oxidase inhibitors obtained from Sorghum vulgare during germination. Experientia 38(3): 315-316.

During germination of sorghum seeds, inhibitors of pea diamine oxidase appeared in the embryos. One was heat labile, dialysable and inhibited the enzyme in vitro, while another was heat stable and inhibited the enzyme synthesis when pea seeds were soaked and allowed to germinate in the extract containing the inhibitors.

0112 KAIGAMA, B.K. 1982. Effects of heat and water stress and their interactions on grain sorghum (Sorghum bicolor (L.) Moench). Ph.D. thesis, The University of Nebraska, Lincoln, USA.

0113 KANNAN, S. 1982. Genotypic differences in iron uptake and utilization in some crop cultivars. Journal of Plant Nutrition 5(4-7): 531-542. 14 ref.

Several cultivars of plants, viz., sorghum, rice, pigeonpea, chickpea, jute and peanut were grown in complete nutrient solution and later subjected to Fe-stress conditions. The Fe-stress tolerance mechanism has been identified in a number of cultivars but there were diferences in the mode of reducing the pH of the medium by the roots* A number of cotton cultivars including some hybrids were also examined and it was found that none of them developed chlorosis; all reduced the pH to nearly 3 in a very short period. The mechanism of Fe-stress tolerance differed among plant species and the pH reducing capacity did not depend on the onset of chlorosis unlike in sorghum. Earlier studies showed that in sorghum adventitious roots alone had the capacity to reduce the pH. On the basis of this and other evidences a scheme is presented whereby potassium application could at least partially correct Fe-chlorosis in monocots.

0114 KANNAN, S., and RAMANI, S. 1982. Zinc-stress response in some sorghum hybrids and parent cultivars: significance of pH reduction and recovery from chlorosis. Journal of Plant Nutrition 5(3): 219-227. 11 ref.

Zinc deficiency was induced in two sorghum hybrids and their parent cultivars by growing them in complete nutrient medium for 30 days and then transferring to minus zinc medium at pH 6.4. The onset of Zn chlorosis and recovery as well as the change in the pH of the nutrient medium under Zn-stress conditions were recorded. It was found that chlorotic symptoms due to Zn deficiency appeared after 2 days of stress and persisted for a long period in the cultivars, 36-A and 168, while the hybrid CSH-7 (36-A X 168) recovered from chlorosis after 12 days. The hybrid CSH-8 (36-A X PD-3) was chlorotic after 2 days, but recovered after 15 days. A significant hybrid vigor was observed for Zn-stress tolerance in the hybrid CSH-7 and CSH-8.

0115 KANNANGARA, T., DURLEY, R.C., and SIMPSON, G.M. 1982. Diurnal changes of leaf water potential abscisic-acid phaseic-acid and IAA in field grown Sorghum bicolor (L.) Moench. Zeitschrift fuer Pflanzenphysiologie 106(1): 55-61,

Diurnal changes of leaf water potential, abscisic acid, phaseic acid and indole-3-acetic acid were studied in field grown sorghum. Leaf water potential fluctuated over a range of -0.84 to -1.82 MPa with two distinct low value peaks at 10.00 and 16.00 h. Abscisic acid exhibited a distinct diurnal variation and fluctuated over a range of 45-100 ng g-1 fresh weight with two distinct peaks at 08.00 and 18.00 h. Abscisic acid levels, except those from 10.00 to 17.00 h were, negatively correlated with leaf water potential and began to increase at leaf water potential values around -1.0 MPa. Phaseic acid levels were low compared to abscisic acid levels, but fluctuated in a manner similar to abscisic acid with peaks at 10.00 and 18.00 h. Fluctuations in indole-3-acetic acid levels were very small.

0116 KANNANGARA. T., DURLEY* R.C., SIMPSON. G.M.* and STOUT* D.G. 1982. Drought resistance of Sorghum bicolor. 4. Hormonal changes in relation to drought stress in field-grown plants. Canadian Journal of Plant Science 62(2): 317-330. 39 ref. (Summary:Fr).

This study was undertaken to investigate the nature of hormonal changes in relation to drought stress in two cultivars of sorghum. Two cultivars, M-35 and NK300, were grown in a field plot protected by a rain shelter. Plants in one soil compartment were stressed by withholding water while those in another (controls) were irrigated frequently. Levels of the plant hormones abscisic acid (ABA), phaseic acid (PA) and indole-3-acetic acid (IAA) measured by high-performance liquid chromatography (HPLC) were determined in the youngest leaves of control and stressed plants at intervals throughout the growth cycle. Plant height, senescence, and leaf water status were also determined. Leaf water potential and solute potential were reduced in both cultivars by drought stress; values for M-35 plants were lower than NK300. Leaf senescence was higher in M-35 plants and was promoted by stress in both cultivars.

0117 KARL* R.* and RUEDIGER* W. 1982. Natural inhibitors of germination and growth 1. Development of a quantitative biotest and application upon extracts from husks of Avena-sativa. Zeitschrift fuer Naturforsch Sect. C Biosciences 37(9): 793-801.

Extracts from oat husks inhibit germination of a variety of seeds including Avena sativa, sorghum spp., Phalleris spp., Raphanus spp., Amaranthus caudatus* Lepidium sativum. A quantitative assay for this inhibition was developed on the basis of percentage of root growth of Avena in the presence of extracted material compared with root growth of water controls. Fractionation of the extracts revealed that about half of the total inhibitory activity was found in the fraction of free organic acids. The inhibition was not due to known inhibitors. Abscisic acid was not found in this extract. Phenole carbonic acids were determined in the extract. Their concentration was too low to significantly contribute to the observed inhibitory activity.

0118 KETCHERSID, M.L.. VIETOR* D.M.* and MERKLE, M.G. 1982. CGA-43089 effects on metolachlor uptake and membrane permeability in grain sorghum (Sorghum bicolor)• Journal of Plant Growth Regulation 1(4): 285-294. 23 ref.

Phytotoxicity of metolachlor toward grain sorghum increased as soil moisture increased. This was found with both unprotected sorghum and sorghum protected with 1.25 g CGA-43089 per kg of seed. However* under all conditions, metolachlor was less phytotoxic to protected sorghum than to unprotected sorghum. Metolachlor in sorghum coleoptiles increased as soil water increased. The rate of absorption of metolachlor and the total amount accumulated by excised sorghum coleoptiles was decreased by CGA-43089. Initial uptake of leucine by excised sorghym coleoptiles was decreased by metolachlor or metolachlor plus CGA-43089 but, after 24 h, uptake of leucine was increased by these treatments. Leucine incorporation into protein by coleoptiles was increased after 24 h treatment with CGA-43089. The apparent competitive effect of CGA-43089 on the absorption of metolachlor was most evident in the roots. Leakage of photosynthate from roots was highest following treatment with both CGA-43089 and metolachlor.

0119 KHANNA CHOPRA. R., and SINHA, S.K. 1982. Photosynthetic characteristics in relation to dry matter accumulation in sorghum hybrids and their parents. Page 741 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

Heterotic sorghum hybrids CSH-2, CSH-3 and the their parents were analyzed for leaf area, photosynthesis rate and activity of photosynthetic enzymes during growth and development. RuBP carboxylase and PEP carboxylase were examined in panicle components also* during grain development. Dry matter production was greater *in* hybrids compared with their parents. Hybrid CSH-3 accumulated more dry matter before anthesis while CSH-2 accumulated more dry matter during grain development. Photosynthesis rate, RuBP and PEP carboxylase activity in the leaves was similar in inbreds and hybrids. Compared with leaves, the panicle had a lower activity of photosynthetic enzymes. Heterosis was not observed in the activity of photosynthetic enzymes in the panicle. The above results will be discussed to explain the higher dry matter production and yield in heterotic hybrids. Significance of dry matter accumulation before and after anthesis will also be considered in relation to adaptability.

0120 KHANNA-CHOPRA. R. 1982. Photosynthesis, photosynthetic enzymes and leaf area development in relation to hybrid vigour in Sorghum vulgare L. Photosynthesis Research 3(2):113-133. 26 ref.

Heterotic hybrids of sorghum produced more dry matter than their respective parents. Therefore, an analysis of leaf area development, rate of photosynthesis and activities of RuBP carboxylase and PEP carboxylase was made to determine whether the superior dry matter production in the hybrids could be attributed to any of these characteristics. Heterosis in leaf area was maintained at all stages in plant growth. Heterosis in photosynthesis was observed only during grain development in certain hybrids. At all other stages, the photosynthesis rate in hybrids were either intermediate or similar to one of the parents. No heterotic effect was observed in enzyme activity at any stage of growth. It is suggested that a multiplicative interaction between the heterotic leaf area and photosynthesis rate could possibly explain heterosis in dry matter production in heterotic hybrids.

0121 KHIDSE, S.R., BHALE, N.L., and BORIKAR, S.T. 1982. Association analysis for seedling vigor in sorghum. Sorghum Newsletter 25:129.

Thirty-two hybrids and twelve parents of grain sorghum were studied for seed size and five seedling characters under laboratory conditions. The observations were recorded on fifty seedlings the 10th day after sowing. The differences among genotypes were significant for all characters. Seedling dry weight exhibited a significant positive association with all traits except the length of radicle. The results, therefore, indicate that the selections for seedling vigor based on seedling fresh weight and seed size would give fruitful results.

0122 KHIDSE, S.R., BHALE, N.L., and BORIKAR, S.T. 1982. Chlorophyll stability index in sorghum. Sorghum newsletter 25: 130.

17 genotypes with four treatments each of 30. 60, and 90 days stress and control were sown in two replications in 136 earthen pots. A single plant was maintained in each pot. Soil moisture was maintained by regular and uniform watering. Stress was developed by curtailing water after 30, 60 and 90 days after sowing, until sings of wilting developed. The stages 30, 60 and 90 days of sowing roughly coincides with panicle initiation, panicle emergence, and grain development, respectively. The chlorophyll stability index was determined as per Kaloyerreas (1958). The mean CSI values for hybrids were lower than parents. These results indicated better drought resistance in hybrids than parents. In general, CSI values decreased after stress indicating overall drought resistance in sorghum crop. The CSI values before stress ranged from 0.10 to 0.60, 0.07 to 0.81, and 0.006 to 0.75 at 30, 60, and 90 days after sowing, respectively.

0123 KHIDSE, S.R., BHALE, N.L., and BORIKAR, S.T. 1982. Effect of water stress on proline accumulation in sorghum. Journal of Maharashtra Agricultural Universities 7(2): 195-196. 3 ref.

0124 KHIDSE, S.R., BHALE, N.L., and BORIKAR, S.T. 1982. Proline accumulation in sorghum. Sorghum Newsletter 25: 131.

17 genotypes were sown in two replications in 102 earthen pots. A single plant was maintained in each pot and moisture was maintained by regular and uniform watering. Water stress was allowed to develop by curtailing water after 30 and 60 days of sowing, until the signs of wilting developed. Proline accumulation was estimated as per Bates, et al (1973). The results indicated increased proline accumulation due to stress at both panicle initiation (30 days) and panicle emergence (60 days) stages in all the parents and hybrids. Increase in proline content due to stress at panicle initiation was from 0.81 to 1.49 and 0.92 to 1.45 in parents and hybrids, respectively. Similarly, at panicle emergence stage, it has increased from 0.29 to 0.43 in parents and 0.41 to 0.71 in hybrids. On an average basis, parents and hybrids accumulated 84 and 58% more proline due to stress, respectively, at panicle initiation than the control. However, such evaluation at the panicle emergence stage revealed higher proline accumulation in hybrids (73%) than parents (48%)•

0125 KOJIMA, M., and CONN, E.E. 1982. Tissue distributions of chlorogenic acid and of enzymes involved in its metabolism in leaves of Sorghum bicolor. Plant Physiology 70(3): 922-925. 18 ref.

When grown in light, the leaf blades of sorghum seedlings was found to have 60% of the total chlorogenic acid in the epidermal protoplasts and the rest in the mesophyll protoplasts. Chlorogenic acid oxidase was found only in the mesophyll protoplasts whereas other enzymes necessary for chlorogenic acid synthesis were isolated from the epidermal and mesophyll protoplasts and the bundle sheath strands.

0126 KOLOMEICHENKO. V.V. 1982. Gravimetric determination of leaf area in grasses. Photosynthetica 16(2): 251-252.

0127 KRIEG. D.R.. and HUTMACHER. R.B. 1982. The utility of various drought resistance mechanisms. Annual Corn and Sorghum Industry Research Conference 37: 37-51. 16 ref.

0128 KULKARNI. L.P.. HUDGE, V.S.. BORIKAR. S.T.. and SOLANKE. R.B. 1982. Imbibition, pure alive seed and seedling vigor study in parents and hybrids of sorghum. Sorghum Newsletter 25: 129.

0129 KULKARNI. L.R.. NARAYANA. R.. and KRISHNA SASTRY. K.S. 1982. Photosynthetic efficiency by using C02 14 at different stages of growth in sorghum. Sorghum Newsletter 25: 128.

The photosynthetic rate, using excised leaves, was determined for 30 genotypes on 30th, 60th. and 90th day in the crop grown in summer of 1979. The differences among the genotypes were significant. SFV-100. 1324. R-16 and SPV-86 were some of the genotypes with the highest photosynthetic rate. In these genotypes, the photosynthetic rates were nearly five to eight-fold higher than the lowest and more than two-fold higher compared to the mean. This indicated that the range and difference among genotypes were large. SB-1079. APV-105. M 35-1 and 168 were the other genotypes which showed very low rates of C02 fixation.

0130 LAL. G.S., DABHOLKAR, A.R.. and MISHRA. R.C. 1982. Stability for flowering and plant height in sorghum. Sorghum Newsletter 25: 8-9.

0131 LEE. T.C.. KAPLAN. S.L.. and DUKE, S.H. 1982. Effects of anoxia in maize and sorghum: enzymes of putative importance in resistance to anoxia. Plant Physiology 69(4 suppl.): 41. (Abstract).

Variation in the response of several maize and two sorghum genotypes to root zone anaerobiosis was examined. Seedlings were grown under aerobic conditions for 3 to 4 weeks followed by 7 days of root flooding. Plant dry weights were determined to measure sensitivity to flooding. Flooded plants weighed 10 to 35% less than controls. Changes in the activities of alcohol dehydrogenase (ADH). pyruvate decarboxylase (PDC). and NADP-malic enzyme (NADP-ME) were monitored during flooding. Generally a 5 to 10 fold increase in ADH and PDC activities occurred in all genotypes examined during flooding. Both ADH and PDC peaked in activity after 5 days of flooding. There was considerable variation among genotypes in maximal activities of ADH and PDC. There were no obvious relationships between levels of ADH and PDC activity during flooding and resistance to anoxia. Levels of NADP-ME activity remained relatively constant over the flooding period for both species. The data show no link between the activities of ADH. PDC, and NADP-ME and anoxia resistance in maize and sorghum.

0132 LEHLE. F.R.. and PUTNAM. A.R. 1982. Qualification of allelopathic potential of sorghum residues by novel indexing of Richards' function fitted to cumulative cress seed germination curves. Plant Physiology 69: 1212-1216. 25 ref.

The inhibitory activity of aqueous extracts of field-grown sorghum (cv. Bird-a-boo) herbage and roots was quantitatively indexed by three aspects of cumulative cress (cv. Curlycress) seed germination: the germination onset; weighted mean rate; and final germination percentage. Extract potency was greatest for herbage collected four weeks after planting but declined sharply thereafter as the plants matured. About 91% of the inhibitory activity obtained from four-week-old herbage was in a low molecular weight fraction. Differential effects of herbage and root extracts on cress seed germination suggest that the nature and/or proportion of biologically active substances extractable from these plant parts is dissimilar.

0133 LEMOS FILHO. J.P. 1982. Effect of aluminium on the contents of some mineral elements, on the photosynthesis and on the activity of certain oxidases in sorghum. (Pt)• Thesis. Universidade Federal de Vicosa, MG. Brazil. 46 pp. 59 ref.

0134 LIN, C.H., and TSAY. J.S. 1982. The low germination rate of seed of sorghum cultivar Taichung No. 5. (Ch). National Science Council Monthly 10(4): 327-334. 9 ref. (Summary:En)•

The low germination rate of the seed sorghum (cv. Taichung No. 5) caused serious trouble in the sorghum production in Taiwan. Efforts were made to overcome the low rate of germination (seed dormancy) by washing in running water, pre-treatment with 2.4-D, GA3, KN03, urea, CaC12, and thiourea. All failed to increased the germination rate to pass the germination test. Six different genera of fungi were found on the seed surface and in the interior pocket facing the micropyle of the ungerminated seed. In comparison with sorghum cultivar Taichung No. 3, cultivar Taichung No. 5 has a thinner testa and a lower level of astringent polyphenolic compound in the sorghum grain. Seed-borne fungi have been assumed to be the major factor of low germination rate.

0135 LINARES, E., LEON, N.,, and MEDRANO, C. 1982. Effect of a desiccant (Paraquat) on ripeness acceleration of sorghum. (Es)• Pages 24-25 In second technical meeting on weed biology and control. Maracay, Venezuela: Univ. Central de Venezuela. (Abstract).

0136 LIPINSKY, E.S., and KRESOVICH, S. 1982. Sugar crops as a solar energy converter. Experientia 38(1): 13-18.

0137 LOSAVIO, N., COLUCCI, R., MASTRORILLI, M.. and VENEZIAN SCARASCIA, M.E. 1982. The water stress and air temperature influence on growth and development of grain sorghum. (It). Annali Dell'Istituto Sperimentale Agronomico 13(2): 249-262.

In a grain sorghum crop irrigated at 120% of BTM half area (6000 m('2)) was submitted to water stress during the boot-early and milk stage periods. The leaf growth was restrained in stressed plants and the senescence was increased. Nevertheless the lower leaf area, the stress plants which were again irrigated showed a growth rate very similar to those ones which were well irrigated. The observed increase of the net assimilation rate can explain the high value of the CGR.

0138 MAEDA, J.A., and SAWAZAKI, E. 1982. Factors which affect Sorghum seed quality: cultivars and sites.(Pt). Bragantia 41: 101-107. 12 ref. (Summary:En).

0139 MAERTENS, C., and CLAUZEL, Y. 1982. First observations on the use of endoscopy in in situ studies of cultivated plants (Sorghum vulgare and Lolium multiflorum). (Fr). Agronomic 2(7): 677-680. (Summary:En).

Several methods are described for in situ observation of root systems by endoscopy. This technique allows root fronts to be situated and the intensity of colonization of the soil profile by roots to be estimated. It also seems suitable for establishing growth correlations. First results are presented on root profiles and root fronts in sorghum and also on the comparison of rye-grass root systems before and after mowing.

0140 MAJOR. D.J., HAMMAN. W.M., and ROOD. S.B. 1982* Effects of short-duration chilling temperature exposure on growth and development of sorghum. Field Crops Research 5(2): 129-136. 16 ref.

The early-maturing sorghum cultivar Pride P130 was grown in a greenhouse with day/night temperature of 23/18 deg C and transferred to a controlled environment chamber with day/night temperature of 13/8 deg for 3, 7, or 10 day periods starting at seedling emergence and continuing to maturity. Reductions in leaf number and plant height caused by chilling were only temporary. Chilling at 28 days after emergence caused tiller number to increase from 3 to up to 8 per plant. Panicle emergence and anthesis were delayed and the period between the 2 stages was shortened after chilling treatment. Chilling temperature did not affect grain growth, number of grains per panicle yield per panicle or anthesis of secondary tillers. It was concluded that, although chilling temperature of short duration might increase tiller number or reduce plant height they would not seriously affect final yield or maturity.

0141 MALAVOLTA, E., and CROCOMO, O.J. 1982. Potassium and the plant. (Pt). Pages 95-162 In Potassio na agricultura Brazileira. Piracicaba, Brazil: Instituto da Potassa e Fosfato/Instituto Internacional de Potassa.

Mean levels of N, P and K found in various parts of sorghum and their effect on yield are discussed. Physiological aspects of K including excessive or deficient absorption, translocation, photosynthesis, enzyme activity, formation of polyamines from putrescine, fertilizer use and effects on pests and diseases are reviewed.

0142 MALHOTRA, K., OELZE-KAROW, H., and MOHR, H. 1982. Action of light on accumulation of carotenoids and chlorophylls in the milo shoot (Sorghum vulgare Pers.). Planta 154(4): 361-370. 25 ref.

Carotenoid accumulation is simultaneously controlled by phytochrome (Pfr) and by the availability of chlorophyll. Throughout plastidogenesis light dependent chlorophyll and carotenoid accumulation are interdependent processes: Accumulation of chlorophyll in natural light requires the presence of carotenoids; likewise, accumulation of considerable amounts of carotenoids depends on the availability of chlorophyll. However, in both cases the efficiency of biosynthetic pathway, the potential biosynthetic rates ("capacities") are determined by phytochrome. A "push and pull" model of carotenogenesis advanced previously to explain carotenogenesis in the mustard seedling. Therefore, the model applied to carotenogenesis in higher plants in general.

0143 MANESS, N.O.. MCBEE, G.G.. and MILLER, F.R. 1982. Placental sac influence on grain sorghum caryopsis development: Anatomical view. Agronomy Abstracts: 104.

One senescing and two non-senescing cultivars of sorghum were grown under field conditions. Caryopses were harvested from panicles at 1,5,10,15,20, 25 days post anthesis (PA) and black layer, fixed in gluteraldehyde, embedded in glycol mathacrylate, sectioned and sequentially stained. Transfer cells, overlying basal parenchyma cells and vascular tissue, were evident by 5 days PA. A fully expanded sac had formed by 10 days PA, and, concurrent with 15 days and most 20 day PA sacs, was lined with transfer cells containing invaginations. They adjoined the endosperm and thin walled parenchyma cells which adjoined the vascular tissue. Later, a discolored area ("brown layer") was observed around the placental sac area of caryopses with no indention of associated tissues. This was accompanied by partial degeneration of transfer and basal parenchyma cells. Invaginations of transfer cells became coagulated, deformed and basal parenchyma cells were crushed forming a mat between the sac and vascular tissue.

0144 MANN, J,. and MILLER, F. 1982. The relationship of base metabolic temperature and altitude. Sorghum Newsletter 25: 134-135. 3 ref.

0145 MATOCHA, J.E., and PENNINGTON. D. 1982. Effects on plant iron recycling on iron chlorosis of grain sorghum grown on calcareous soils. Journal of Plant Nutrition 5(4-7): 869-882. 13 ref.

The purpose of this study was to develop a practical and economical means of improving Fe nutrition of grain sorghum. Soil applied as well as foliarly applied treatments were evaluated. Ferrous iron from folairly applied inorganic Fe sources was complexed by plant metabolites and cycled back to the soil as organic residue. Sorghum plant response and Fe uptake were compared with commercial Fe chelates and foliar Fe sprays. The degree of plant response to Fe was associated with the severity of Fe chlorosis. Amaranthus, spp, a commonly occurring weed in Fe chlorotic areas showed higher Fe complexing ability than sorghum. Subsequent applications of the various Fe-treated plant residues to soils of medium to severe Fe chlorosis problems indicated Amaranthus, spp, was a better Fe carrier than the other sources. Data indicate plant uptake of Fe by the sorghum crop from plant complexed sources equaled or exceeded that from FeEDDHA.

0146 MCBEE, G.G., and MILLER, F.R. 1982. Carbohydrates in sorghum culms as influenced by cultivars, spacing, and maturity over a diurnal period. Crop Science 22(2): 381-385. 16 ref.

'Combine Kafir-60' (CK-60) and 'Rio' were grown in rows 100 cm apart with plant spacings of both 10 and 40 cm. Plants were harvested at preboot and early anthesis over a diurnal cycle of six different times. Upper and lower culm sections were analyzed for glucose, sucrose and starch. Percentages of total nonstructural carbohydrates (TNC) were somewhat similar in both cultivars at preboot, reaching a maximum level of 18.3%. By anthesis, TNC peaked at 40.2% in Rio compared to 26% for CK-60, with the most dramatic increase occurring in the sucrose fraction. Closer spaced plants (10 cm) tended to be higher in TNC and during anthesis, upper culm sections of CK-60 and Rio contained 7.0 and 12.8% more TNC, respectively, than those spaced 40 cm apart.

0147 MCBEE, G.G., MANESS, N.O.. and MILLER, F.R. 1982. Role of placental sac for carbohydrate metabolism in grain sorghum caryopses. Agronomy Abstracts: 104.

Three sorghum cultivars, varying in degree of senescence, were grown under partially controlled field conditions and harvested at 10, 15, and 20 days post anthesis. Caryopses selected from the center of the panicle at each harvest were frozen for analysis. The pedicels, rachis and 15 cm section of the peduncle were fixed by heat and later analyzed. Stem exudates were also obtained from peduncle sections. Placental sac contents were withdrawn and carbohydrate content analysed using high performance liquid chromatography. Sucrose was present in significantly higher levels than glucose or fructose in the peduncle. rachis and the pedicels connecting to caryopses. Placental sac fluids contained very low sucrose levels in relation to glucose and fructose. Concurrently, the placental sac, located above the dominant vascular system leading into the caryopses, became lined with transfer cells, allowing for a means of transfer into the endosperm. This evidence suggests the placental sac serves as a collection point for transport sugars, hydrolysis of sucrose into glucose and fructose.

0148 MCINTYRE* B.L.* and MILLER, F.R. 1982. Water relations of selected senescent and nonsenescent sorghum grain hybrids. Agronomy Abstracts: 105.

During a drought in College Station in 1980, nonsenescent (NS) sorghums demonstrated greater drought resistance as compared to senescent (S) sorghums. A study was initiated in 1981 to investigate the nature of these reponses. Two hybrids, senescent ATx378 x RTx7000 and nonsenescent ATx623 x 74CS5388, were grown together in field lysimeters to compare leaf water, osmotic and turgor potentials, and stomatal conductance (Cs) during grain fill. Plants were maintained well-watered until anthesis. when half the lysimeters were allowed to dry and develop a water deficiency. Midday leaf water were consistently higher (0.1 to 0.2 MPa) in ATx623 x 74CS5388. Cs was lower in this hybrid, with differences more fully expressed at higher leaf water. ATx623 x 74CS5388 exhibited a higher midday accumulation of stem soluble carbohydrate (as measured by % Brix) and demonstrated greater ability to maintain turgor as leaf water declined. With a deficit occurring after anthesis NS plants demonstrated greater drought avoidance capability.

0149 MCWILLIAM, J.R. 1982. Chilling and the germination and early growth of sorghum and cotton seedlings. Page 208 In Proceedings, second Australian agronomy conference, Parkville, Australia: Australian Society of Agronomy. 3 ref.

0150 MORGAN, P.W., and QUINBY. J.R. 1982. Floral induction in field grown sorghum. Plant Physiology 69(4 suppl.): 81. (Abstract).

Sorghum, a quantitative short day plant* exhibits a hastening of floral initiation in the growth room when treated with far red light (FR) or GA3 and/or FR. Demonstrated the hastening of floral initiation by GA3 under natural photoperiods in the field at Plainview, TX during two successive years. GA3 (5X10-4M) applied beginning 10 to 12 days after emergence hastened floral initiation to a major degree* especially in the later genotypes tested, but there was little or no difference in the date of anthesis of control and treated plants. Initiation-inducing treatments significantly reduced plant height indicating the absence of leaf and thus node initiation between floral initiation of treated and control plants. Floral initiation appears to have been seperated from floral development by the treatment; floral development requires the proper photoperiod regardless of the early presence of a florally differentiated apical meristem.

0151 MORIDIS, G.J.. and MCFARLAND, M.J. 1982. Modeling soil water extraction from grain sorghum. St. Joseph, Michigan: American society of Agricultural Engineers. (Fiche No. 82-2600).

0152 MORIN, G.C.A., FINKNER, R.E.. and FUEHRING, H.D. 1982. Plant biomass production for energy in eastern New Mexico. St. Joseph, Michigan: American Society of Agricultural Engineers. (Fiche No. 82-3092).

0153 MOROOKA, M., and OSHIMA, H. 1982. Yield and nutrient uptake of grain sorghum grown on the andosols. (Ja). Kyushu Agricultural Research 44: 84.

0154 MORTVEDT. J.J. 1982. Grain sorghum response to iron sources applied alone or with fertilizers. Journal of Plant Nutrition 5(4-7): 859-868. 11 ref.

Several greenhouse pot experiments were conducted on Fe deficient soils to determine agronomic effectiveness of various Fe sources applied alone or with fertilizers. Grain sorghum response was greatest with FeEDDHA in all experiments. Effectiveness of FeS04 or FeHEDTA band applied with fluid fertilizers decreased in the order: polyphosphate suspension, orthophosphate suspension, urea-ammonium nitrate solution. Crop response was greater with FeHEDTA than with FeS04 in all fertilizers. Band application of urea-phosphate (UP), an experimental acidic phosphatefertilizercontainingurea, cogranulated with FeS04 (to contain 4% Fe) was somewhat effective for grain sorghum. Crop response to UP-Fe products decreased with level of water-soluble Fe and percentage of the total Fe remaining in the ferrous form. Results show that agronomic effectiveness of Fe sources applied with fertilizers varies widely, depending upon chemical reactions which occur during manufacture or after soil application.

0155 MUNDY, J. 1982. Isolation and characterization of two immunologically distinct forms of alpha-amylase and a beta-amylase from seeds of germinated Sorghum bicolor (L.) Moench. Carlsberg Research Communications 47(5): 263-274. 34 ref.

Two immunologically distinct forms of alpha-amylase named alpha-1 and alpha-2 and a beta-amylase were isolated from germinated sorghum by affinity-, hydroxylapatite- and hydrophobic interaction chromatography. The two alpha-amylases showed similar molecular weights of 41,500 - 42,700 as determined by electrophoresis and gel permeation chromatography. The two enzymes have similar amino acid compositions except for differences in Ser, Val, lle, and Cys. They have slightly different isoelectric points of 4.65 for alpha-1 (major form) and 5.1 for alpha-2. Alpha-1 and alpha-2 amylases contain 0.7% and 5.7% carbohydrate by weight respectively and they exhibit different kinetic properties and substrate specificities. Crossed Immunoelectrophoresis and immunodiffusion of sorghum alpha-1 amylase aginst monospecific anti-barley alpha-2 amylase showed immunological identity between barley male alpha-2 and sorghum male alpha-1 amylase. Non-identity was seen between sorghum alpha-2 and the barely malt amylase. Sorghum alpha-1 and alpha-2 amylase show partial immunological identity.

0156 MURTY, U.R., KIRTI, P.B., BHARATHI. M., SRIDHAR, P., and RAO, N.G.P. 1982. Towards achieving obligate apomixis in sorghum. Sorghum Newsletter 25: 93-94. 5 ref.

Three elements of apomixis have been identified in sorghum. These are: (1) the production of diploid female sex cells; (2) the prevention of fertilization; and (3) the development of the diploid female gametes into viable embryos. These embryos with normal endosperm develop into viable seed and give rise to offspring.

0157 MURUMKAR, C.V., KARADGE, B.A., and CHAVAN, P.D. 1982. Growth, mineral nutrition and nitrogen metabolism of potassium deficient sorghum. Biovigyanam 8(1): 37-42. 27 ref.

Growth, mineral contents and nitrogen metabolism of sorghum var. MSH-37 grown in potassium deficient medium in sand culture have been investigated. Growth and biomass production is found to be severely affected due to potassium deficiency. Sodium, calcium as well as phosphorus appears to be absorbed more by the plants in want of potassium in the medium. Synthesis of photosynthetic pigments is affected severely. However, there is significant increase in the total nitrogen and proline content in the shoot parts of potassiun deficient plants. Amino acid composition of shoot and roots is also influenced. Enzyme studies revealed that activities of peroxidase, acid phosphate and protease are stimulated due to potassium deficiency. All these metabolic changes lead to retardation of growth.

0158 MYERS, R.J.K., and ASHER, C.J. 1982. Mineral nutrition of grain sorghum: macronutrients. Pages 161-177 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 74 ref.

0159 NAGARAJA, C.V., and BOMMEGOWDA. A. 1982. Growth analysis studies in sorghum hybrids as seeded and ratoon crop. Sorghum Newsletter 25: 42-43.

0160 NAIK, L.B. 1982. Studies on the differences in dry matter accumulation and distribution pattern in sorghum genotypes. Andhra Agricultural Journal 29(2-3): 164-167. 3 ref.

The pattern of dry matter accumulation and its distribution was studied in three genotypes of sorghum (CSH 5, CS 3541 and SB 461). Dry matter accumulated successively increased throughout the growth period till the harvest, in all the genotypes investigated. However, the rate of dry matter accumulation varied during the various growth stages and among the genotypes. SB 461, the rate of dry matter accumulation was highest during its grand growth period. In CSH 5, it was highest during its grain filling period. The dry matter accumulation in the ear was highest in CSH 5. These differences were mainly due to variations in the dry matter distribution.

0161 NARASIMHAN, C. 1982. Nitrogen metabolism in normal and opaque sorghum grains during development. M.Sc. thesis, Indian Agricultural Research Institute, New Delhi, India.

Dry matter, protein accumulation, nitrate reductase activity and activity of key enzymes of nitrogen metabolism glutamate dehydrogenase, glutamate oxaloacetate transaminase, glutamate synthase and glutamine synthetase were studied during grain development in CSV-5 and high lysine opaque P-721 sorghum to get an idea about the constraints that might limit not only grain yield but also protein quality and quantity. The differences in soluble proteins and esterase isoenzymes pattern between CSV-5 and P-721 during grain development indicated gene specificity during grain development.

0162 NIRALE, A.S., KANNAN, S., and RAMANI, S. 1982. Heterosis in ion uptake patterns in some sorghum hybrids and parents - a study with Rb-86 absorption and transport. Journal of Plant Nutrition 5(1): 15-26.

The uptake patterns of Rb were

examined in four popular sorghum hybrids along with their parents, employing excised roots and intact seedlings with a view to identify heterosis in the absorption or transport processes. The cultivars consisted of two types, generally grown under irrigated or rainfed conditions. The results revealed that there was heterosis in the absorption by excised roots in the rainfed hybrid CSH-8; and in the translocation of Rb to the shoot in the irrigated hybrids, CSH-5 and CSH-6. There were significant differences in the absorption and transport of Rb among the cultivars, and between the rainfed and irrigated ones. This suggests that several ion uptake parameters have to be examined while looking for the phenomenon of heterosis in hybrid plants and it should not be restricted to one or two features.

0163 O'NEILL, M.K. 1982. The development and water use of moisture-stressed and non-stressed sorghum (Sorghum bicolor (L.) Moench). Ph.D. thesis, The University of Arizona, Arizona, USA.

0164 OELZE-KAROW, H., and MOHR, H. 1982. Phytochrome action on chlorophyll synthesis: a study of the escape from photoreversibility. Plant Physiology 70(3): 863-866. 11 ref.

A brief red light pretreatment (pulse), operating through phytochrome, stimulates the synthesis of chlorophyll a and b in sorghum shoots that are placed in continuous saturating white light. The red light effect is fully reversible by a far-red (756 nanometers) light pulse of 45 minutes. Thereafter, escape from reversibility is fast, being completed within 2 hours. It is shown here that physiologically active phytochrome (Pfr) is required continuously during these first 45 minutes if the onset of the loss of photoreversibility is to begin 45 minutes after the red light treatment. Thus, the initial action of Pfr consists of two distinct processes: the first process is to overcome the lag prior to escape from photoreversibility; the second process is the actual stimulation of chlorophyll synthesis by Pfr. The duration of the lag prior to escape from the photoreversibility depends on the level of Pfr established by the light pulse. The duration increases with increasing Pfr levels from nondetectable to 45 minutes.

0165 OGRA, R.K., and BAIJAL, B.D. 1982. Physiological studies on the effect of salinity on sorghum. I. Changes in alpha-amylase and acid protease during seedling growth. Indian Journal of Plant Physiology 25(2): 133-140. 22 ref.

Influence of salinity on alpha-amylase and acid protease and the biochemical changes induced were investigated in two varieties of sorghum, differing in their salt tolerance during germination. Increase in the salt concentration of the external medium, resulted in the decrease of alpha-amylase and acid protease in both the varieties i.e. T. 8B (tolerant) and M.P. Chari (susceptible). The decrease was comparatively more in the susceptible variety, resulting in delayed mobilization of food reserves. The salt tolerance of variety T. 8B is attributed to its better malting capacity during germination.

0166 OLOGUNDE, O.O., and SORENSEN, R.C. 1982. Influence of concentrations of K and Mg in nutrient solutions on sorghum. Agronomy Journal 74(1): 41-46. 15 ref.

A greenhouse experiment was conducted in sand culture to determine the main and interactive effects of K and Mg in the medium on growth and composition of sorghum plants. Nutrient treatments included seven concentrations each of K as

KC1, and Mg as MgC12. Seventeen of the possible 49 treatment combinations were used in a central composite factorial design with two replications. A sorghum hybrid ('RS 671'), its male ("Ex 415'), and female ('Redlan') lines were used. Aboveground parts of plants were harvested at 25, 50, and 75 days after emergence. The three sorghums showed similar effects for most treatments. Dry matter production was not affected by concentrations of K and Mg until 50 and 75 days after emergence, respectively. At final harvest, maximum top dry matter production was obtained at the optimum rates of 195 and 38 ppm of K and Mg, respectively. Effects of K were not affected by concentrations of Mg and vice versa.

0167 ORCHARD, P.W., and SO. H.B. 1982. The effects of transient waterlogging on the yield of sunflower and sorghum. Page 309 In Proceedings, second Australian agronomy conference. Parkville, Australia: Australian Society of Agronomy. 2 ref.

0168 OWONUBI, J.J., and KANEMASU, E.T. 1982. Water use efficiency of three height isolines of sorghum. Canadian Journal of Plant Science 62: 35-46. 24 ref. (Summary:Fr).

The SD canopy had a higher temperature than the other isolines. In both years SD canopy had the lowest water use while the TA canopy had the highest of the pure stands. The amount of total dry matter produced was in direct relation to their heights. Comparing the pure stands, the SD and TA canopies had the highest WUE for grain and dry matter, respectively, for both years. ALT plots had the highest WUE for dry matter, but the SD plants produced the most grain per unit amount of water. This study indicates that under some circumstances where dry matter harvest is of significant value, the alternating row canopy offers an advantage over the pure TA stands. When compared to the TA stand, the alternating arrangement had higher WUE for both grain and dry matter.

0169 PARAMESWARA, G., and KRISHNASASTRY, K.S. 1982. Variability in leaf elongation rate and reduction in green leaf length in sorghum genotypes under moisture stress and on alleviation of stress. Indian Journal of Agricultural Sciences 52(2): 102-106. 15 ref.

When there was no moisture stress 'CSH 6' sorghum had the highest leaf elongation rate followed by 'CSH 5'. The rate of elongation was higher in the hybrids than in their parents. Moisture stress caused cessation of leaf elongation within 48 hours in some and 72 hours in others. On alleviation of stress there was death ('firing') of leaves to varying degrees. This was quantified by taking the length of the green leaf before and after stress. The percentage 'firing' of leaves was the lowest in hybrid 'CSH 6', and '2077 B' (a parent of 'CSH 5') showed maximum death. In view of the importance of the net functional leaf area available after alleviation of stress for regenerative growth, the low damage in 'CSH 6' during stress and on alleviation is a desirable character. Since genotypic differences exist for this parameter, it could be used as an index for drought tolerance.

0170 PEACOCK, J.M. 1982. Response and tolerance of sorghum to temperature stress. Pages 143-159 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 107 ref.

0171 PEACOCK, J.M., MAITI, R.K., SEETHARAMA, N., and SOMAN, P. 1982. Review of ICRISAT's research in sorghum physiology. Patancheru, A.P., India: ICRISAT. 20 pp. 54 ref.

0172 PERROT-RECHENMANN. C., VIDAL. J., BRULFERT. J., BURLET. A., and GADAL, P. 1982. A comparative immunocytochemical localization study of phosphoenolpyruvate carboxylase in leaves of higher plants. Planta 155(1): 24-30. 24 ref.

The intracellular localization of phosphoenolpyruvate (PEP) carboxylase in plants belonging to the C4, Crassulacean acid metabolism (CAM) and C3 types was investigated using an immunocytochemical method with an immune serum raised against the sorghum leaf enzyme. The plants studied were sorghum, maize (C4 type). In the green leaves of C4 plants, it was shown that the carboxylase was located in the mesophyll and stomatic cells, being largely cytosolic in the mesophyll cells. Similarly, in CAM plants, the enzyme was found mainly outside the chloroplasts. In contrast, in C3 plants, the PEP carboxylase appeared to be distributed between the cytosol and the chloroplasts of foliar parenchyma. Examination of sections from etiolated leaves showed fluorescence emission from etioplasts and cytosol for the parenchyma of french bean as well as for the bundle sheath and mesophyll of sorghum leaves•

0173 PLATT, S.G., and RAND, L. 1982. Methionine sulfoximine effects on C4 plant leaf discs comparison with C3 species. Plant Cell Physiology 23(5): 917-922.

Methionine sulfoximine caused ammonia accumulation and photosynthetic rate inhibition in leaf discs from two C4 species, Zea mays and sorghum cv. NC-70X, as well as one C3 plant species, datura cv. stramonium. Similar results were obtained earlier with the C3 species Spinacia oleracea. The effect occurred in the absence of inorganic nitrogen reduction and was light dependent. Ammonia accumulation rates were similar in all four species examined. The results support a role for glutamine synthetase in leaf ammonia recycling in both C4 and C3 leaves.

0174 RAJUKKANNU, K., and BALASUBRAMANIAN, M. 1982. Translocation and persistence of certain granular insecticides in sorghum. Madras Agricultural Journal 69(10): 699-700. 8 ref.

0175 RAO, A.N., and DAS, V.S.R. 1982. Chlorophyll content and photochemical activities of three sorghum cultivars grown under three irradiances. Photosynthetica 16(1): 145-147. 15 ref.

On a fresh and dry matter basis an increase and on a unit leaf area basis a reduction in total chlorophyll (Ch1) content of sorghum cultivars was observed when grown under lower (50 and 30%) irradiances than under full day light. The activities of photosystem 1 (PS 1) and even more photosystem 2 (PS 2) activities were lowered to various degrees in plants of the three cultivars grown under light stress. The cultivar CSH-6 exerted the highest Ch1 contents and PS activities under all three growth irradiances.

0176 RAO, N.K.S., and SINGH, S.P. 1982. Defoliation and compensatory mechanism in sorghum. Indian Journal of Agricultural Sciences 52(11): 748-750. 6 ref.

The rate of photosynthesis of the intact leaves of 'Swarna' variety of grain sorghum was studied under some defoliation treatments by using labelled carbon. Defoliation increased the rate of photosynthesis of the remaining intact leaves very substantially, showing a compensatory mechanism.

0177 RAO, N.K.S.. and SINGH, S.P. 1982. Note on the contribution of different photosynthetic sites to grain yield in sorghum. Indian Journal of Agricultural Sciences 52(8): 543-544. 5 ref.

Relative contribution of photosynthetic sites to the final grain yield in sorghum was worked out. The yield reduction technique (prevention of photosynthesis by defoliation and shading) was used.

0178 RETTA, A., SULLIVAN, C.Y.. and WATTS. D.G. 1982. Evaluation of sorghum root growth and soil water depletion. Sorghum Newsletter 25: 132.

0179 REUSCHE, G.A. 1982. Germination and emergence of sorghum (Sorghum bicolor (L.) Moench) genotypes under varying levels of soil water and osmotic potential. Ph.D. thesis, Mississippi State University, Mississippi, USA. 136 pp.

Germination and seedling growth of sorghum generally decreased as the osmotic potential of the moisture source (PEG 6000 solutions) decreased from 0 to - 13 atm. Responses, however, varied with the "osmoticum" technique used. There was also considerable variability among genotypes in germinative responses in the PEG osmotic system. Although there was not good correspondence between the lines used in the soil studies and those used in the osmotic system studies, PEG 6000 at - 7.0 atm. osmotic potential using the saturated filter paper technique appeared to be effective in differentiating among genotypes for germination responses under low moisture stress.

0180 ROMHELD. V., MARSCHNER, H., and KRAMER, D. 1982. Responses to Fe deficiency in roots of "Fe-efficient" plant species. Journal of Plant Nutrition 5(4-7): 489-498. 14 ref.

Under Fe deficiency ("Fe stress") the roots of so called "Fe~efficient" plant species (mainly dicots and s otne monocots) show typical responses, such as increased formation of root hairs, development of rhizodermal transfer cells, and increased capacity to reduce Fe-III in the rhizodermis:simultaneously the uptake rate of Fe increases rapidly. Fe deficiency also enhances the uptake rates of Mn and Zn, although to lower levels than for Fe uptake. Thus, these responses to Fe deficiency also have a favourable effect on the Mn and Zn nutritional status of those plant species grown on substrates with low Fe availability. In contrast to "Fe-efficient" species, in the so-called "Fe-inefficient" species (mainly grasses) these responses for the fine regulation of Fe uptake are absent.

0181 ROSAND, P.C., and WILD, A. 1982. Phosphate adsorption and immobilization characteristics of 3 soils from southern Bahia Brazil. Pesqui Agropecu Bras 17(7): 1013-1021.

Measurements of the phosphate adsorption/desorption characteristic of three acid soils from southern Bahia, Brazil, were compared with other soil properties and with the response of sorghum to a range of phosphate additions. One soil containing smectite and with a high content of exalate-extractable Fe and Al oxides, showed high phosphate adsorption and provided the test plants with a good supply of phosphate. A contrasting soil showed lower phosphate adsorption, lower phosphate availability, and gave a high phosphate immobilization. It contained high amounts of Fe and Al extractable by dithionite; gibbsite and goethite were identified. The half-life of labile phosphate in this soil was 170, 210 and 275 days measured by phosphate uptake by sorghum plants, isotopic exchange, and anion-resin extraction, respectively. In the other two soils the half-life was over 400 days by all three methods. Anion-exchange resin extraction provided a convenient index of labile phosphate, and hence of immobilization of phosphate.

0182 SAEED, M. 1982. Genotype X environment interactions and yield stability in relation to maturity in grain sorghum (Sorghum bicolor (L.) Moench). Ph.D. thesis. The University of Nebraska - Lincoln, USA. 124 pp.

A study was conducted to characterize the nature of genotype x environment (GE) interaction for grain yield components, and to evaluate yield stability in relation to maturity of 54 grain sorghum genotypes in 48 environments across Nebraska and Kansas. Differential yield response of genotypes to different environments increased with an increase in duration of growth. To attain a desired level of precision in evaluating a genotype yield performance, the amount of testing required for a set of genotypes with a wide range of maturity is greater than that required for a set of genotypes with a narrow range of maturity. Analysis of a set of genotypes with minimal maturity differences provided a better evaluation for yield stability. High yielding genotypes of medium maturity tended to be more responsive to favourable environmental conditions. Stability for seed number component of grain yield is more important than for seed weight in contributing to yield stability of genotypes at all maturity levels.

0183 SAHRAWAT, K.L. 1982. Effects of retardation of nitrification on composition and yield of crops. Pages 570-575 In Proceedings, Ninth International Plant Nutrition Colloquium, vol. 2. 22-27 August 1982, London, UK: Commonwealth Agricultural Bureaux, Warwick University.

0184 SALTZMANN, S., ACHER, A.J., BRATES, N., HOROWITZ, M., and GEVELBERG, A. 1982. Removal of the phytotoxicity or uracil herbicides in water by photodecomposition. Pesticide Science 13(2): 211-217.

The efficiency of a photo-oxidation procedure for the detoxication of water containing herbicides of the uracil group was tested by bioassay. Treated herbicide solutions were checked for their inhibiting effect on germination and photosynthesis in sorghum. The treated solutions, the main photodegradation products of bromacil and terbacil did not inhibit significantly either germination or seedling development at concentrations of up to 200 and 10 mg liter-1, respectively. Preliminary tests with industrial waste effluents containing added uracil compounds showed that these compounds were rendered non-phytotoxic by the photo-oxidation procedure.

0185 SAMPATH, P., and KULANDAIVELU, G. 1982. Biochemical changes in phaseolus and sorghum grown under different light intensities. Plant Physiology and Biochemistry 9(2): 60-67. 16 ref.

Effect of decreasing the light intensity to 33% and 9% of full sunlight on leaf mass accumulation and biochemical constituents has been investigated in a typical C3 phaseolus and C4 sorghum species. Progressive decrease in the light intensity during growth brought about parellel change in the leaf mass accumulation as evidenced by lower fresh and dry weight per unit leaf area. Analysis of biochemical constituents revealed drastic changes in the protein content and increased starch hydrolytic activity. Contrary to most of the biochemical constituents, the pigment content increased with a decrease in the light intensity. In sorghum chlorophyll, dry weight and carbohydrate content increased for a longer period than in phaseolus but free amino acid contents decreased earlier,

0186 SEETHARAMA, N., REDDY, B.V.S., PEACOCK, J.M., and BIDINGER, F.R. 1982. Sorghum improvement for drought resistance. Pages 317-338 In Drought resistance in crops with emphasis on rice. Los Banos, Philippines: IRRI.

At ICRISAT, sorghum improvement for drought resistance involves screening germplasm and elite breeding material, using a range of techniques. The selections are then advanced to multilocational trials in drought-prone areas, mechanisms in addition to escape and to tailor the plant to suit the target environment is emphasized. Field and laboratory techniques are used to study specific adaptations such as leaf-area adjustment (drought avoidance) and heat and desiccation tolerance, and adjustment in osmotic potential (drought tolerance). The future problems and prospects in crop improvement for drought resistance are considered.

0187 SEETHARAMA, N., WADE, L.J., PEACOCK, J.M., VERMA, P.K., REGO, T.J., and SINGH, S. 1982. Effect of nitrogen and water stress on leaf area development in sorghum. Pages 595-606 In Proceedings, ninth International Plant Nutrition Colloquium, vol. 2, 22-27 August 1982, Warwick University, England, U.K. Slough, U.K.: CAB. 19 ref.

The effects of nitrogen, water, and temperature on components of leaf area in sorghum grown on a vertisol during the postrainy season at Patancheru, India are described. The combined effect of nitrogen and water stress reduced leaf area development, resulting in lesser radiation interception and lower crop yields. Nitrogen stress reduced yields more than water stress.

0188 SHACKEL, K.A., FOSTER, K.W., and HALL, A.E. 1982. Genotypic differences in leaf osmotic potential among grain sorghum cultivars grown under irrigation and drought. Crop Science 22(6): 1121-1125. 23 ref.

Osmotic potential of leaves may have relevance to turgor maintenance and adaptation of plants to water-limited environments. Studies were conducted to determine whether it is possible to detect genotypic differences in leaf osmotic potential in the field and the conditions where screening for this character would be most effective. It is proposed that differences in leaf osmotic potential may be used to select sorghum genotypes that exhibit contrasting water relations. Selection may be more effective under frequently irrigated conditions and during grain filling than under water-limited environments or during early stages of growth.

0189 SHAH, C.K.. and PHILOMENA, P.A. 1982. Morphohistochemical studies on coleoptile. Indian Botanical Reporter 1(1): 15-19. 14 ref.

Histochemical studies on developing coleoptiles of sorghum, maize, oat, wheat, barley and rice provided not only the cytological proof for their cotyledonary nature but also biochemical similarities in having abundant polysaccharides and protein particles. The vasculature of germinating embryos points to the coleoptile as being one lobe of a single lateral cotyledon. In addition, staining intensities of the cotyledonary homologues reached the same sacle values. The foliage leaves arose from the growing meristem, while the cotyledon and the crest of the coleoptile arose directly from the proembryo. Therefore the coleoptile is a part of a single lateral cotyledon.

0190 SHCHERBAKOV, V. YA. 1982. Laser irradiation of seed of grain sorghum. (Ru). Kukuruza 5: 29.

Irradiation of sorghum seed with laser rays increased the plant growth and 4 years average grain yields from 5 to 5.46 t/ha.

0191 SHCHERBAKOV. V. YA. 1982. Reaction of grain sorghum following treatment of the grain with gamma rays. (Ru). Nauchno-tekhnicheskii Byulleten 'Vsesoyuznogo Selektsionno-geneticheskogo Institute 4: 57-60. 2 ref.

When treated with 200-1600 radiation doses the hybrid Stepnoi 5 was more sensitive to radiation than the variety Efremovskoe Beloe 2. Irradiation increased yield on average over three years by 14% in the hybrid and 10% in the variety.

0192 SHROTRIA, N.. JOSHI. J.K.. MUKHIYA, Y.K., and SINGH, V.P. 1982. Extent of damage caused by root and foliar uptake of cadmium on seedling growth, chlorophyll content and stomatal opening of two crops namely sorghum and gram. National Academy Science Letters-India 5(3): 81-86.

The results indicated that root uptake of cadmium is more toxic to plant growth. Gram has been found to be more resistant to cadmium toxicity.

0193 SINGH, A.R., BHALE, N.L., and BORIKAR, S.T. 1982. Effect of seed size and weight on germination and seedling growth in bold seeded genotypes of sorghum. Research Bulletin of Marathwada Agricultural University 6: 23-25. 7 ref.

Large and medium seeds of 8 sorghum cultivars were superior to small seeds in 100-seed weight, germination percentage, root and shoot lengths and their dry weight.

0194 SINGH, S.C. 1982. Physiologic and agronomic responses of tropically and temperately adapted grain sorghum (Sorghum bicolor (L.) Moench) hybrids under irrigation and nonirrigation. Ph.D. thesis, University of Nebraska, Lincoln, USA.

0195 SINHA, S.K., KHANNA-CHOPRA, R.. AGGARWAL, P.K., CHATURVEDI. G.S., and KOUNDAL, K.R. 1982. Effect of drought on shoot growth: significance of metabolism to growth and yield. Pages 153-169 In Drought resistance in crops with emphasis on rice. Los Banos, Laguna, Philippines: IRRI. 55 ref.

0196 SMITH. R.H., BHASKARAN. S. S., and SCHERTZ, K. 1982. Variation in drought tolerance characteristics from tissue culture-derived sorghum. Pages 489-490 In Plant tissue culture. Tokyo, Japan: Japanese Association of Plant Tissue Culture.

0197 SOMAN, P. 1982. Seedling establishment and crop stands in rabi sorghum (1981-82). Patancheru, A.P., India: ICRISAT. 23 pp.

0198 SOMAN, P.. and PEACOCK, J.M. 1982. Seedling emergence in sorghum under varying soil temperature and moisture. Page 751 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

Emergence response of a few sorghum genotypes to different soil temperatures were tested in a system where wet soil could be heated from above. Temperatures of 35, 40, 45, and 50 deg C were maintained at a depth of 2 cm. Genotypic variability was detected. Hybrids CSH-1, CSH-5, and CSH-6 showed poor emergence at high temperatures compared with varieties such as SPV 354, SPV 386 and SPV 387. The cultivars were also tested for emergence under limited soil moisture. Three levels of soil moisture were maintained in pots: 3.8-0.3%, 7.5-2.1%. and 8.1-3.2%. Again, hybrids gave very low emergence at lower moisture supply when compared with varieties. Genotypic variability was detected.

0199 SORRELLS, M.E., and MYERS, 0. JR. 1982. Duration of developmental stages of 10 milo maturity genotypes. Crop Science 22(2): 310-314. 15 ref.

Duration of the vegetative, panicle development, and seed-filling stages of 10 milo sorghum maturity genotypes was studied at Santa Maria, Rio Grande do Sul, Brazil (30 deg S Lat). Carbondale, IL (37.5 deg N Lat), and Madison, WI (43 deg N Lat). Eight of the geneotypes represented the homozygous combinations of dominant and recessive alleles at maturity loci Ma1, Ma2, and Ma3. Two additional genotypes had a third allele (ma3R) from 'Ryer' milo. A factorial analysis of variance for the eight homozygous combinations indicated that the number of days to floral initiation was significantly affected by the location X maturity-loci interaction. Most of this interaction variance was accounted for by locations X Ma1 X Ma2, and a location X Ma2 X Ma3 interaction was significant only at Santa Maria.

0200 SUBBIAN, P., KRISHNAMOORTHY, V.V., and CHAMY, A. 1982. Effect of removal of boot leaf on the grain yield of sorghum Co. 24. Madras Agricultural Journal 69(12): 840.

The removal of sorghum boot leaf at the ear emergence stage or 1-3 weeks later decreased the grain yield and 1000-grain weight, decreases were greatest with its removal at ear emergence.

0201 UJIHARA, K. 1982. Studies on preharvest sprouting in grain sorghum. (Ja)• Bulletin of the Chugoku National Agricultural Experiment Station, A 30: 1-33. 44 ref. (Summary:En)•

0202 VAUGHAN, K.C., and DUKE, S.O. 1982. Tentoxin effects on sorghum: the role of polyphenol oxidase. Protoplasms 110(1): 48-53. 16 ref.

In an ultrastructural and cytochemical study of tentaxin-treated sorghum, both bundle sheath and mesophyll plastids were severely affected. Plastids from chlorotic leaf areas leaked most internal membranes yet had plastid ribosomes and large fibrillar areas of plastid DNA. In "recovered areas" (mottled yellow and green), cells were found that had plastids of near-normal ultrestructure as well as the severely affected plastid-types found in chlorotic leaf areas. Polyphenol oxidase (PPO) cytochemistry of these mottled leaf areas indicated that all "recovered" mesophyll plastids had PPO whereas all the abnormal mesophyll plastids showed no activity. Because bundle sheath plastids of sorghum have no PPO activity at any developmental stage, yet are affected by tentoxin, PPO cannot be uniquely affected by this toxin. Authors suggest that tentoxin may affect the transport of cytosolic proteins into the plastid.

0203 VIETOR, D.M., KETCHERSID, M.L., and MERKLE, M.G. 1982. CGA-43089 effects on metolachlor uptake and 14C-labeled photosynthate loss from sorghum bicolor L. roots. Agronomy Abstracts: 113.

The herbicide metolachlor and the protectant CGA-43089 were added individually at concentrations of 20 ppm and in mixtures at concentrations of 20 and 10 ppm to the rooting medium (nutrient solution) of sorghum seedlings that had been pulse-labeled via photosynthetic assimilation of 14 C02. The treatments were imposed to determine CGA-43089 effects on the herbicide action of metolachlor and to quantify photosynthate partitioning to the roots and rooting medium when root growth was chemically inhibited. Although root growth was inhibited equally by 20 ppm of either the metolachlor or CGA-43089. only the CGA-43089 significantly increased the percentage of 14C-labeled photosynthate recovered in the sterile rooting medium compared to the untreated control. The percent removal of metolachlor from the rooting medium was reduced in the presence of CGA-43089. The combination of 20 ppm of both growth inhibitors maximized the percentage of labeled photosynthate recovered in the rooting medium among the four treatments and control.

0204 WALLACE, G.A., and WALLACE, A. 1982. Micronutrient uptake by leaves from foliar sprays of EDTA chelated metals. Journal of Plant Nutrition 5(4-7): 975-978. 3 ref.

Sorghum, corn, grape and macadamia leaves were sprayed with the potassium salt, the ammonium salt and the sodium salt of EDTA, each with the following micronutrients as micro g/ml solution respectively: 469 copper, 625 iron, 625 manganese and 750 zinc. Corn and milo tests were with solution culture and grape and macadamia were with soil-grown-plants. After about two weeks, samples were carefully washed with rubbing in 1/10N HC1 and detergent followed by deionized water. Analyses by optical emission spectrometry indicated foliar iron absorption by all species, manganese absorption by corn, milo and grape but not by macadamia; substantial zinc absorption by corn and milo with less by grape and small amount by macadamia and large amounts of copper absorption by corn, milo and grape with none by macadamia. The three EDTA sources did not vary greatly in their responses. Some of the micronutrients were translocated to roots of corn and milo.

0205 WANG, H.K., LIV, B.Y., FENG, G.Z., and WANG, Q.M. 1982. A study of the permissible level of mercury due to the utilization of sludge on land. (Ch). Acta Agriculturae Universitatis Pekinensis 8(4): 69-75. 5 ref. (Summary:En).

Mercury, as a contaminant of sewage sludge, when added to soil, its accumulation was found to decrease after the crop harvest in the order rice $^1/_2$ cabbage $^1/_2$ turnip $^1/_2$ maize $^1/_2$ sorghum $^1/_2$ wheat. Permissable levels of soil mercury were calculated as 17 mg/kg on calcareous soil and 6 mg on acid soil.

0206 WARDLAW, I.E. 1982. Assimilate movement in lolium and sorghum leaves. III. Carbon dioxide concentration effects on the metabolism and translocation of photosynthate. Australian Journal of Plant Physiology 9(6): 705-713. 17 ref.

0207 WARE, G.O., OHKI. K., and MOON, L.C. 1982. The Mitscherlich plant growth model for determining critical nutrient deficiency levels. Agronomy Journal 74(1): 88-91. 13 ref.

The success of a plant tissue analysis program depends on the calibration relating growth and nutrient concentration in specified plant tissues for each essential element. The minimal nutrient concentrations in tissues associated with maximum growth have been determined from calibration curves that were drawn free-hand to best fit the respective X and Y values in graphical plotting. Statistical models to establish critical deficiency levels related to 90% maximum growth are desirable to reduce the arbitrariness of the graphical procedure. A modified Mitscherlich response equation was used to quantify critical deficiency levels by characterizing plant growth as a function of tissue nutrient concentration. Critical deficiency levels determined from the Mitscherlich model were significantly greater ($P^{1}/_{4}0.05$) than the previously reported nutrient values of the same studies utilizing the graphical procedure.

0208 WEIBEL, D.E. 1982. Comparison of bloom, bloomless, and sparse-bloom sorghums for grain yield.Sorghum Newsletter 25: 28-29. 2 ref.

0209 WEIMBERG* R., LERNER, H.R., and POLJAKOFF-MAYBER* A. 1982. A relationship between potassium and proline accumulation in salt-stressed Sorghum bicolor. Physiologia Plantarum 55(1): 5-10. 26 ref.

The amount of total monovalent cations in leaves of sorghum, RS 610. which were exposed to salinity stress, was a function of both the osmotic potential and the concentration of K+ of growth media. The plants have a Na+ exclusion mechanism that keeps the level of Na+ in leaves low. Thus, most of the osmotic adjustment in leaves was due to K+. Proline did not start to accumulate in leaves until the concentration of total monovalent cations in leaves reached a threshold of approximately 200 micro mol/g fresh weight. Above this threshold, the contents of proline and monovalent cations in leaves increased with increasing salinity of the medium. The ratio of proline to monovalent cation was 5% of that amount of monovalent cation in excess of the threshold concentration. Therefore, if the cations are located in the vacuoles and proline accumulates in the cytoplasm, then the amount of accumulated proline is sufficient to act as a balancing osmoticum across the tonoplast. Very little proline accumulated in roots because this tissue contained much less total monovalent cations.

0210 WERNICKE* W.. and BRETTELL, R.I.S. 1982. Morphogenesis from cultured leaf tissue of Sorghum bicolor - culture initiation. Protoplasma 111(1): 19-27. 30 ref.

This paper reports further studies on the generation of tissue cultures from leaves of the sorghum. It could be shown that during differentiation the leaf tissue rapidly loses the ability to respond to conventional tissue culture techniques. This was probably related to a loss of sensitivity towards 2,4-D, an otherwise most potent growth regulator in tissue culture. The immature tissue which proved to be sensitive proliferated over a wide range of concentration with a broad optimum of about 0.6-6 mg 1-1 2,4-D. This concentration range appears to be only slightly higher than that described for many dicotyledonous tissue cultures. The relevance of these findings is discussed with reference to the well known dual function of 2,4-D, namely as a selective herbicide and a potent artificial auxin. The implications of these attributes to the practical application of cereal tissue culture is stressed.

0211 WERNICKE, W., POTKYKUS, I., and THOMAS, E. 1982. Morphogenesis from cultured leaf tissue of Sorghum bicolor - the morphogenetic pathways. Protoplasma 111(1): 53-62. 26 ref.

Immature leaf explants of sorghum can be stimulated in vitro to form roots, shoots or embryos. When the cultures were maintained with the high 2,4-D level which was essential for optimal culture initiation, the organs or embryos proliferated as suppressed primordia, but they could always be identified by simple histological means. Perivascular cells of comparatively old but still immature leaf sheath regions appeared to be strongly determined to form adventitious roots or root-type "callus" cultures. We have evidence that the embryogenic tissue, and ultimately the embryos, are of multicellular origin. This ontogeny of the embryos appears to be contradictory to the often stated view that somatic embryos generally arise from single "committed" cells. The implications of these findings for basic and applied research on cereal tissue culture are discussed.

0212 WILKINSON, R.E. 1982. Alachlor influence on sorghum growth and gibberellin precursor synthesis. Pesticide Biochemistry and Physiology 17(2): 177-184. 40 ref.

Growth (14 days) of sorghum cv G522 DR from seed planted in sand into which alachlor was uniformly incorporated (0, 0.07, 0.14, 0.28, 0.56, 1.12, 2.24, or 4.48 kg/ha) was reduced by 0.14 kg/ha and severely inhibited (88%) by 0.56 kg/ha while cellular water content was not greatly influenced by 0.56 kg/ha. When added into the nutrient solution bathing the roots of 96-hours sorghum seedlings, alachlor (0, 0.0156, 0.0312, 0.0625. 0.125. 0.25, 0.5, 1, 2, 4, 8, 16, 32, 64, or 128 ppmw) was not lethal to 14-day-old sorghum at rates up to 32 ppmw (92% survival); however, shoot and root lengths were reduced 43 and 58% respectively. Alachlor inhibition of sorghum growth appears to be closely associated with inhibition of cell enlargment; the coleoptile is the most susceptible stage of sorghum growth to alachlor. This situation closely resembles growth where gibberellic acid (GA) synthesis is inhibited.

0213 WILKINSON, R.E. 1982. Mefluidide inhibition of sorghum growth and gibberellin precursor biosynthesis. Journal of Plant Growth Regulation 1(1): 85-94. 37 ref.

0214 WILLIAMS, E.P., CLARK, R.B.. YUSUF, Y., ROSS, W.M.. and MARANVILLE. J.W. 1982. Variability of sorghum genotypes to tolerate iron-deficiency. Journal of Plant Nutrition 5(4-7): 553-567.

Sorghum needs to be improved for its ability to tolerate and produce under iron (Fe) deficiency conditions. To do this, sorghum germplasm from various sources were screened and identified for performance under Fe deficiency conditions. Twenty-nine inbred lines and 41 experimental lines used by sorghum breeders at the Nebraska Agricultural Experiment Station, 31 inbred lines used in a disease and insect nursery at the Texas Agricultural Experiment Station, 10 genotypes from Nigeria, and 78 S1 progenies from the Nebraska population NP20BR were screened to determine germplasm differences under Fe deficiency conditions. Iron deficiency was induced in plants by growing them in a growth chamber in nutrient solutions with nitrate as a source of nitrogen. Observations on the rapidity with which plants became Fe deficient were recorded.

0215 WILLIAMS. R.D., and HOAGLAND, R.E. 1982. The effects of naturally occurring phenolic compounds on seed germination. Weed Science 30(2): 206-212. 43 ref.

Germination tests with 10-3 and 10-5 M solutions were conducted under controlled conditions in petri dishes at 25 C in the dark. At 10-3 M, coumarin, hydrocinnamic acid, juglone and pyrocatechol inhibited germination, but p-hydroxybenzaldehyde and p-hydroxybenzoic acid were not effective and others had intermediate effects. There was little effect by any compound at 10-5 M. Chlorogenic acid, p-hydroxybenzaldehyde, and pyrocatechol, each combined with coumarin, inhibited germination. The combination of coumarin plus p-hydroxybenzaldehyde had an additive effect on hemp sesbania and prickly sida, inhibiting germination to a greater extent than either compound alone. The lack of inhibitory action at the higher concentration of some of these chemicals suggests they may not exhibit a high allelopathic potential.

0216 WILSON. G.L., and DICZBALIS. Y. 1982. Yield consequences of varying duration of growth stage 1. Sorghum Newsletter 25: 125-126.

0217 WILSON. G.L.. and EASTIN, J.D. 1982. The plant and its environment. Pages 101-119 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum. 2-7 November 1982, Patancheru, A.P.. India. Patancheru. A.P.. India: ICRISAT. 119 ref.

0218 WILSON. G.L.. RAJU. P.S.. and PEACOCK. J.M. 1982. Effect of soil temperature on seedling emergence in sorghum. Indian Journal of Agricultural Sciences 52(12): 848-851. 3 ref.

Seedling emergence in sorghum was studied over a range of soil temperatures. Thirty lines were sown in alfisol beds. Charcoal dust (black) and kaolin (white) were used as surface covers to modify soil temperature. Soil temperatures were recorded daily and it was found that delayed and poor emergence was associated with high soil temperatures. In the charcoal treatment where temperature reached 65 deg C (at 5 mm depth) there was no emergence. There was considerable genetic variation in ability to emerge under high temperature.

0219 WU. M.X.. ZHA, J.J.. CHEN. J.Z.. and SHI. J.N. 1982. Studies on plant phosphoenolpyruvate carboxylase. VI. Stabilizing effect of glucose-6-phosphate and glycine to sorghum leaf PEP carboxylase. (Ch). Acta Phytophysiologia Sinica 8(1): 9-16. 17 ref. (Summary:En).

It was shown that PEP carboxylase of sorghum leaves was thermolabile. The activity of the enzyme was rapidly inactivated at 45 deg C. Allosteric activator (G-6P or glycine) showed a slight protective effect to heat inactivation of the enzyme, but combined addition of G-6-P and glycine showed protection of enzyme activity cooperative from heat inactivation markedly. The activity of PEP carboxylase was gradually reduced during storage at 4 deg C. Cold-inactivation of the enzyme could be prevented by addition of where G-6-P and glycine in the presence of glycerol. The physiological significance of the cooperative effect of G-6-P and glycine in protecting PEP carboxylase from heat inactivation was proposed in relation with the adaptation to thermal environment of C4 plants,

0220 WU. M.X.. ZHA. J.J., TANG. X.Y.. and SHI. J.N. 1982. Studies on plant phosphoenolpyruvate carboxylase. VIII. Light induced formation of PEP-carboxylase in C4 plants. (Ch). Acta Phytophysiologia Sinica 8(2): 101-110. 21 ref. (Summary:En).

The activity of PEP-carboxylase in the segments of etiolated leaves of corn and sorghum increased rapidly upon continuous illumination. The increase of enzyme activity was accompanied by an increased incorporation of (3H)-leucine into leaf protein and an increase in the chlorophyll content. Inhibition experiments with cycloheximide, actinomycin D and DCMJ showed that the effect of light on the activity of PEP-carboxylase had no concern with photosynthetic electron transport but was intimately related to protein synthesis in the leaf. Cycloheximide and actinomycin D strongly inhibited the enzyme activity and the incorporation of (3H)-leucine into enzyme protein, but DCMU had no influence on these parameters. Without any inhibitor, light greatly enhanced the incorporation of radiolabel into partially purified PEP-carboxylase protein. In the test of Ouchterlony double immunodiffusion and immunoabsorption of PEP-carboxylase, it was further proved that light stimulated the synthesis of PEP-carboxylase protein during greening of leaf.

0221 WU, Q.H., CHEN, Z.G., YANG, Z.T., WANG, Y.X., ZHANG, Z.M., LIU, Z.D., and ZHANG, G.L. 1982. Stem tip culture invitro in Sorghum bicolor x Saccharum officinarum progeny. Kexue Tongbao 27(9): 1025.

0222 WURTELE, E.S., THAYER, S.S., and CONN, E.E. 1982. Subcellular localization of a UDP-glucose: aldehyde cyanohydrin beta-glucosyl transferase in epidermal plastids of sorghum leaf blades. Plant Physiology 70(6): 1732-1737. 30 ref.

Epidermal and mesophyll protoplasts, prepared from leaf blades of 6-day-old light-grown sorghum seedlings were separated by differential sedimentation and assayed for a number of enzymes. The epidermal protoplasts contained higher levels of NADPH-cytochrome C reductase (EC 1.6.2.4), triose phosphate isomerase (EC 5.3.1.1), phosphoenolpyruvate carboxylase (EC 4.1.1.31), and a UDP-glucose:cyanohydrin beta-glucosyl transferase (EC 2.4.1.85), but lower levels of NADP+ triosephosphate dehydrogenase (EC 1.2.1.13) than did mesophyll protoplasts. When protoplast preparations were lysed and applied to linear sucrose density gradients, triosephosphate isomerase was found to be present in epidermal plastids. A significant fraction (41%) of the glucosyl transferase activity was also associated with the epidermal plastids.

0223 YATSUHASHI. H., HASHIMOTO, T., and SHIMIZU, S. 1982. Ultraviolet action spectrum for anthocyanin formation in broom sorghum first internodes. Plant Physiology 70(3): 735-741. 27 ref.

An action spectrum for anthocyanin formation in dark-grown seedlings was determined over the wave length range from 260 to 735 nanometers. The action peaks were at 290 650, 385, and 480 nanometers in descending order of height. The action of the 290-nanometer peak was not affected by subsequently given far red light, whereas those of the other three action peaks were nullified completely. The nullification of the 385-nanometer peak action by far red light was reversible. When an irradiation at these action peaks was followed by a phytochrome-saturating fluence of red light irradiation, the action of the 290-nanometer peak remained, whereas that of the 385-nanometer peak as well as those of the 650- and 480-nanometer peaks was masked by the action of the irradiation. These findings suggested that the 290- and 385-nanometer action peaks involved different photoreceptors, the latter being phytochrome. The blue light-absorbing photoreceptor as reported to be a prerequisite for phytochrome action in milo sorghum was not found to exist in the broom sorghums.

0224 ZANINI. J.R. 1982. Effect of physiological maturation in the production of seeds and in the industrial output of sorghum. (Pt). Thesis, Escola Superior de Agricultura Luiz de Queiroz, Piracicaba. SP, Brazil. 109 pp. 44 ref. (Summary:En).

0225 ZELITCH, I. 1982. The close relationship between net photosynthesis and crop yield. Bioscience 32(10): 796-802.

Crop yield is closely related to the net photosynthetic assimilation of CO2 throughout an entire season, but instantaneous measurements of photosynthesis may be misleading. Increasing the rates of net photosynthesis and translocation and enlarging the storage capacity by selection and breeding may bring about large increases in yield, especially in C3 species.

0226 ZHAO. T.Y., and SHI. P. 1982. A study of the transport and distribution patterns of assimilates in hybrid sorghum plants. (Ch). Shanxi Agricultural Science (Shanxi Nongye Kexue) 5: 12-14. 2 ref.

Field trials with nine sorghum hybrids and lines in 1980 in Shanxi showed that the dry weight of leaves, sheaths, stems and roots reached their maximum before the grain filling stage and dropped afterwards, while the dry weight of heads continued to increase after the grain filling stage, which indicated that a part of the stored substance in other organs moved to the heads, the dry weight of which reached its maximum at the wax-ripe stage, then decreased gradually. The dry weight of stems and roots increased again at the late wax-ripe stage, suggesting that some of the assimilates in heads was translocated back to the stems and roots together with part of the assimilates from the grains after the wax-ripe stage.

GENETICS AND BREEDING

0227 ANONYMOUS. 1982. Mississippi grain sorghum performance trials. 1980. MAFES Research Highlights 45(2): 7-8.

Data are provided on days to 50% flowering. disease rating. plant height, bird damage, grain weight and grain yield of sorghum cultivars.

0228 ANONYMOUS. 1982. Performance of rabi sorghum genotypes in transition tract of Dharwad. Research Bulletin of Marathwada Agricultural University 6: 29-31.

Among all the varieties SPV-495 matured late (132 days) followed by SPV-486 and 490 (131 days). Varieties SFV-43. 226. 268 and 272 matured early (119 days). The highest grain yield (16.04 q/ha) was recorded from SPV-489, closely followed by SPV-422. Muguti and SPV-305. They were also on par with SPV 43. 224. 226. 436. 486. 487. 491. 495 and CSH-8R. The lowest grain yield (8.68 q/ha) was obtained from SPV-216 and was significantly lower compared to above listed varieties. The rabi hybrid CSH-8R recorded a grain yield of 12.60 q/ha only. The highest fodder yield (50.36 q/ha) was obtained from SPV-434, which was on par with SPV 486, 489 and Muguti. Whereas, CSH-8R recorded a fodder yield of 28.88 q/ha. A maximum harvest index (39%) was recorded from SPV-305 followed by SPV-226, 268. 422 and 489 (34%). The lowest harvest index (19%) was recorded from SPV-439.

0229 ANONYMOUS. 1982. The new cultivars of crops in Thailand. (Thai) • Khaosan Krom Wichakan Kaset 9(4):17-22.

0230 ABDEL-TAWAB, F.M., SKLIM, A.K.A., HUSSEIN, K.R.F., and RASHED, M.A. 1982. Phylogenetic relationships in genus zea and related genera. 2. Electrophoretic patterns and molecular weight of protein. Egyptian Journal of Genetics and Cytology 11(2): 265-274.

0231 ABEBE, B., and WECH, H.B. 1982. The 1981 activities of Plant Genetic Resources Centre/Ethiopia on sorghum germplasm. Pages 31-45 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa, 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth. Ethiopia: Ethiopian Sorghum Improvement Project.

The Plant Genetic Resources Centre/Ethiopia is engaged in the maintenance and evaluation of more than 6000 accessions of sorghum germplasm which were collected throughout the country. In the 1981 crop season, 5155 accessions were planted at Nazareth and Arsi Negelie for multiplication and rejuvenation. These materials were characterized and evaluated for eight morpho-agronomic characters. In addition to these. they were stratified geographically* taxonomically and agronomically. Data for their reaction to stalk borer and bacterial leaf steak were alsocollected.

0232 AGRAWAL. B.L.. and HOUSE. L.R. 1982. Breeding for pest resistance in sorghum. Pages 435-446 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum. 2-7 November 1981. Patancheru. A.P., India. Patancheru. A.P.. India: ICRISAT. 32 ref.

0233 ALIO. A.N. 1982. Sorghum improvement in Somalia. Pages 101-102 In Report on the third FAO/SIDA seminar on field crops in Africa and the Neat East. Rome. Italy: FAO.

0234 ALIO. A.N. 1982. Sorghum improvement in Somalia. Pages 115-119 In Proceedings. Regional Workshop on Sorghum Improvement in Eastern Africa. 17-21 October 1982. Nazreth and Debra Zeit. Ethiopia. Nazreth. Ethiopia: Ethiopian Sorghum Improvement Project.

0235 ALL INDIA COORDINATED SORGHUM IMPROVEMENT PROJECT. 1982. A report of the research work done during 1981-82 on sorghum breeding. Paper presented at the Sorghum Workshop 17-19 May 1982. Pune, India. 41 pp.

0236 ALL INDIA COORDINATED SORGHUM IMPROVEMENT PROJECT. 1982. Annual report of sorghum breeding for 1981-82. Dharwad. Karnataka. India: University of Agricultural Sciences. Regional Research Station. 29 pp.

0237 ANTOHE. I . . COSMIN. 0.. BARBULESCU. A.. VLAS. I . . GRECU. E.. SCURTU. M.. V0ICU. E.. C0SEREA. V.. RIZEA. A.. ILICEVICI. S.. VLADU. P.. PRETOKIAN. D.. CONSTANTIN. P.. and MIHALACHE. M. 1982. Results obtained in grain sorghum breeding. (Ro). Analele Institutului de Cercetari pentru Cereale si Plante Tehnice. Fundulea 49: 63-74. 10 ref. (Summaries:Ru. En).

In three years' trials at eight sites, with two sowing dates, seven hybrid varieties established during the first period of Romanian sorghum breeding (1958-1971) were compared with 10 lines and hybrids developed in the second period (1972-1981). when the emphasis was on selection for earliness, for tolerance of low temperatures, aphid attack and soil salinity and alkalinity, for higher 1000-grain weight and for higher nutritional value of the grain. In general, the second-stage hybrids surpassed the older ones in yield and 1000-grain weight and for higher nutritional value of the grain. In general, the second-stage hybrids surpassed the older ones in yield and 1000-grain weight, with Fundulea 21. Fundulea 30. Fundulea 32 and HSF65/80 notable for their stability in a range of environments. HSF81/80 and HSF85/80 for resistance of Schizaphis and several others for grain protein quality, in particular for their lysine and tryptophan contents.

0238 ARIYANAYAGAM. R.P. 1982. Sorghum and millet improvement programme for Mozambique. Final technical report. Nampula. Mozambique: Instituto Nacional de Investigacao Agronomics, 38 pp. (FAO-AGO-M0Z/75/009).

0239 ATENCIO. H.E. 1982. Evaluation of mutants of Criollo Rojo Pequeno sorghum for vigor and development in stress conditions in West Venezuela. Sorghum Newsletter 25: 36-37.

0240 ATKINS. R.E. 1982. Registration of 16 sorghum parental lines (Reg nos. PL 74 to PL 89). Crop Science 22(6): 1280.

0241 ATKINS. R.E. 1982. Registration of IAP2B(M)C3 sorghum germplasm (Reg. no. GP 131). Crop Science 22(6): 1275.

0242 ATKINS. R.E. 1982. Registration of IAP3BR(M)C3 sorghum germplasm (Reg. no. GP74). Crop Science 22(1): 165-166.

0243 ATKINS. R.E. 1982. The development and characteristics of a sorghum random mating population and 16 restorer lines released by Iowa State University. Sorghum Newsletter 25: 25-26.

0244 ATKINS. R.E.. and BUENO. A. 1982. Intercharacter correlations in sorghum in relation to genotypic and environmental variations. Proceedings of the Iowa Academy of Science 89(3): 117-120.

Intercharacter associations in sorghum were evaluated in four experiments that provided a diversity of production environments and genetic materials The yield component that showed the highest correlation with grain yield in all experiments was number of seeds per head. Seed size was the component that showed next best correlation with yield. Heads per plant showed low correlation with yield in three of the four experiments. Grain yield was correlated significantly with the maturity-related characters, midbloom and black-layer formation, in all experiments. Yield also was correlated significantly with plant height among the diverse group of hybrids tested. The correlations of leaf area with grain yield did not seem sufficiently strong to suggest that indirect selection for yield by means of estimates of total-plant leaf area would be very effective.

0245 BALASIVUDU. Y., REDDY. C.S.. REDDY. M.S.S., and REDDY. B.M. 1982. Mutational studies in sorghum. 1. Effect of sodium azide in Ml generation. Andhra Agricultural Journal 29(4): 254-258. 11 ref.

Effects of sodium azide (0.001M, 0.002M and 0.003M) at 4.8 and 6.4 pH were studied on dry and pre-soaked (4 and 8 hours) seeds of two local varieties of sorghum (M 35-1 and Kodali)• Seed germination and survival of plants till maturity were more in Kodali than in M 35-1. but a higher frequency of chlorophyll mutations were recorded in M 35-1 (8.19%) than in Kodali (7.21%) in Ml generation. In general. mutagen treatments with presoaked seeds, low pH, lower concentration and longer duration were more effective for all Ml characters. Positive and significant correlations between plant survival and chlorophyll mutations suggest that M2 population to be screened for mutations can be estimated based on Ml data.

0246 BANDEPGOUDAR. M.R.. and GOTO, J.V. 1982. Linkage studies in sorghum (Sorghum bicolor (L.) Moench). SABRAO Journal 14(1): 35-40. 9 ref.

The linkage relationship of genes governing five characters was studied in the cross IS3691 x J. Set. 3 in sorghum. The involvement of one to three genes was observed in different characters. Ratios for four of five characters are reported for the first time. Analysis of joint segregation data revealed the existence of linkage. The gene Dw (plant height) was found linked with S'g (glume covering). P'r (pedicelled spikelet).

F (grain shape) and Dg1 (depression on dorsal surface of the grain). These genes were assigned to the tenth linkage group.

0247 BAPAT. D.R.. POL. P.S., PAWAR, A.D., and RAMSHE. D.G. 1982. Response of a heterozygote and a homozygote to levels of population. Sorghum Newsletter 25: 56.

0248 BASTOS, C.R. 1982. Inheritance study of aluminium tolerance in sorghum in nutrient culture. Ph.D. thesis, Mississippi State University, Mississippi, USA.

0249 BAWAZIR. A. A. A. 1982. Studies on combining ability and the nature of gene action in F2 diallel crosses in grain sorghum, Sorghum bicolor (L.) Moench. Page 104 In Report on the third FAO/SIDA seminar on field crops in Africa and the Near East, 6-24 June 1982, Nairobi, Kenya. Rome, Italy: FAO.

0250 BAWAZIR, A.A.A. 1982. The status of sorghum improvement in PDR Yemen. Pages 169-173 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa, 17-21 October 1982. Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

A selection programme was initiated in 1977 in the coastal region of the country as a step to improve the existing cultivar Beini. The high yielding varieties and hybrids released have not spread widely because of poor quality and low forage yield for the needs of the Yemeni farmers. The main emphasis in the sorghum improvement program in PDR Yemen is (a) to select short types with high grain yield for combine harvesting and (b) tall or medium types for dual purposes of grain and forage production.

0251 BETANCOURT, A., MEDINA, S., ROSAS. G.. and MILLER, F.R. 1982. Twin vs. single seed sorghum hybrid comparison. Sorghum Newsletter 25: 29-30.

0252 BHALE, N.L. 1982. Heterosis in single, three-way and double-cross hybrids of sorghum. Indian Journal of Agricultural Sciences 52(12): 822-826. 5 ref.

To determine the magnitude of heterosis in sorghum 20 single crosses, 40 three-way and 24 double crosses were assessed. Though these hybrid groups generally differed less in stem height and days to panicle emergence, they showed greater differences in grain and fodder yields. The performance of 3-way crosses with heterozygous female parents (38.84 to 65.49% heterosis) was comparable to that of single crosses (22.80 to 64.14% heterosis). Heterosis was lower in 3-way crosses with heterozygous males and double crosses.

0253 BHALE, N.L.. and B0RIKAR, S.T. 1982. Combining ability for yield and yield components in rabi sorghum. Journal of Maharashtra Agricultural Universities 7(3): 247-249. 4 ref.

A line x tester analysis of combining ability for ten characters in rabi sorghum revealed the importance of non-additive gene action for yield and yield contributing characters. The restorer 285 is desirable for earliness and bold grain size. 36A and 1202A among male-steriles and 168 and PD-3-1-11 among restorers are desirable combiners for yield and some yield contributing characters. The good combiners viz., 36A, 168, PD-3-1-11 and 285 are useful for improving rabi sorghums.

0254 BHALE, N.L., and BORIKAR. S.T. 1982. Male sterile single crosses for hybrid seed production in grain sorghum. Seed Science and Technology 10(3): 373-378. 8 ref. (Summaries:De. Fr).

Twelve male-sterile single crosses (A X B) and four B-lines of grain sorghum were evaluated for comparative seed yield potential at Parbhani during 1977-78. The experiment demonstrated the superiority of male-sterile single crosses over inbred lines for seed yield and for the yield components earhead length and secondary and tertiary earhead branches. The single-crosses, on the average. differed little from the inbred lines in plantheight, days to 50% flowering and 100 seed weight. Hale-sterile crosses 36A x 1202B and 1202A x 2219B had a significantly higher seed yield (59% and 45%, respectively) than the check CK60B. Advantages of male-sterile single crosses are discussed, and further critical studies on A x B crosses are suggested.

0255 BHALE., N.L., KHIDSE, S.R., and BORIKAR, S.T. 1982. Heterosis for proline accumulation in sorghum. Indian Journal of Genetics and Plant Breeding 42(1): 101-104. 4 ref.

Ten hybrids along with parents were evaluated for proline accumulation, before and after stress at panicle initiation and panicle emergence stages. Parents like 120A, CK 60A and 285 exhibited higher proline accumulation than check M 35-1. Proline accumulation increased due to stress. However, the range of heterosis was higher before stress treatment. Hybrids like 1202A x PD-3-1-11. 1202A x 285 and 1202A x 168 accumulated significantly higher proline than check M 35-1 and revealed high heterosis.

0256 BHARATHI.M.. MURTY, U.R., and RAO, N.G.P. 1982. Embryo and endosperm formation in cross-sterile facultatively aposporous apomicts. Page 752 In Sorghum in eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

Twenty-one cross-sterile cultures were isolated in advanced generation progenies of crosses involving the facultative apomict, R-473, and a sexual line. White Seed. Four of these cross-sterile lines were examined at various time intervals up to 4 days. A considerable number of embryo sacs remained unfertilized at various time intervals. Lack of fertilization was concluded from the presence of intact synergids, unfused polar nuclei of the central cell and the undivided egg. The frequency of such embryo sacs approached 20%. The unfertilized egg was seen to give rise to an embryo starting from the 2nd day after pollination. Endosperm also formed simultaneously, but the endosperm nuclei presented an appearance different from that of sexually formed endosperm. The antipodal nuclei were seen to have contributed to such endosperm at least in some cases. Pollen tubes were found to continue growth in nuclei that were more than 3 days old. These observations were taken to indicate that pollen tubes cannot penetrate aposporous embryo sacs.

0257 BHAT, M.G., GOWDA, B.T.S., ANAHOSUR, K.H., and GOUD, J.V. 1982. Inheritance of plant pigmentation and downy mildew resistance in sorghum. SABRAO Journal 14(1): 53-59. 17 ref.

Inheritance of plant pigmentation, downy mildew resistance and their relationship was studied by using two resistant and two susceptible varieties. Purple pigmentation was dominant over tan and it was controlled by four genes designated PlaPlb, PlcPld which acted as two sets of complementary genes. There was no linkage between downy mildew resistance and plant pigmentation. Resistance to downy mildew was dominant. Three different four-gene

F2 segregation ratios 192:64, 219:37 and 240:16 were obtained. Downy mildew resistance was found to be controlled by a set of six genes designated Pea, Peb, Pec, Ped, Peel and Pee2 of which Pea is primary for conditioning resistance, Peb, Pec and Ped are complementary and Peel and Pee2 are complementary duplicate genes.

0258 BHOLA NATH. 1982. Population breeding techniques in sorghum. Pages 421- 434 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 22 ref.

0259 BIETZ, J.A. 1982. Cereal prolamin evolution and homology revealed by sequence analysis. Biochemical Genetics 20(11-12): 1039-1054.

Prolamin mixtures were isolated from oats, rice, normal and high-lysine sorghum, two varieties of pearl millet, two strains of teosinte, and gamma grass and subjected to NH2-terminal amino acid sequence determinations. In each case primarily a single sequence was observed despite significant heterogenecity, suggesting that prolamin homology in each cereal arose through duplication and mutation of a single ancestral gene. Comparisons were then made to prolamin sequences previously determined for wheat, corn, barley, and rye. Within genera, different varieties or subspecies exhibited few difference, but more distantly related genera, subtribes, and tribes showed increasingly large differences. Within the subfamily Festucoideae, no homology was apparent between prolamins of oats and those of the subtribe Triticinae. Within the subfamily Paniocoideae, corn was shown to be closely related to teosinte but more distantly to Tripsacum. Sorghum was shown to have diverged less from corn than had millet. These comparisons demonstrate that prolamin sequence analyses can be predicted successfully.

0260 BONNEMANN. J.J. 1982. Grain sorghum performance trials for 1981. South Dakota State University, Agricultural Experiment Station C 238, 19 pp.

0261 BORIKAR, S.T., and BHALE, N.L. 1982. Genetics of grain size in sorghum. Sorghum Newsletter 25: 95-96. 1 ref.

0262 BORIKAR, S.T., and BHALE, N.L. 1982. Line x tester analysis for yield and yield components in winter sorghum. Sorghum Newsletter 25: 13.

Genetic combining ability studies with reference to winter sorghum are limited. In the present study, 20 hybrids produced by crossing four male-steriles (CK60A, 2219A, 36A, and 1202A) with five restorers (285, PD-3-1-11, 168, IS-84, and CS-3541) were evaluated in a replicated trial during the winter season. The analysis of variance revealed significant differences between hybrids and male parents. The estimates of specific combining ability (SCA) variances were pronounced for all characters indicating the preponderance of nonadditive gene action for yield and yield components. However, general combining ability (GCA) was also considerable for days to flowering and plant height. The heritability estimates were high for plant height, days to flowering, and grain size and were medium for grain yield.

0263 BOYE-GONI, S.R. 1982. Combining ability and inheritance of aluminium tolerance in grain sorghum (Sorghum bicolor (L.) Moench). Ph.D. thesis, The University of Arizona, USA.

0264 BREWBAKER. J.L. 1982.

Crop improvement in Hawaii: past, present and future. Miscellaneous Publication - College of Tropical Agriculture and Human Resources, USA. No. 180. 35 pp.

0265 CANTRELL, R.P. 1982. Development of A-lines from random mating sorghum populations. Annual Corn and Sorghum Industry Research Conference 36: 9-17.

0266 CHANTEREAU, J. 1982. Sorghum. Descriptives of cultivars proposed for extension in central-north and northern zones (Senegal). Bambey, Senegal: ISRA/CNRA. 7 pp.

Information provides on origin, use, taxonomic and morphological characteristics, agronomic characteristics, phytopathological behaviour, yield potential, strong and weak points. The following cultivars are described: sorghum 80-4, sorghum, 80-25, sorghum 80-44, sorghum 73-13, sorghum CK612A x 73-208, sorghum 75-14, sorghum 612A x 75-14.

0267 CHANTEREAU, J. 1982. The contribution of IRAT to the development of sorghum varieties and hybrids in West Africa. Page 748 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

A series of hybrids (IRAT S12 and IRAT 179) and varieties (IRAT S6, S7, S8 in Burkina Faso, IRAT S10 in Niger, IRAT S11 (CE90), S13 (CE67), S15 (CE99) and (CE111) in Senegal were developed. Crop management was found inportant if increased yields were to be realized from these new varieties and hybrids. Traits such as resistance to grain mold and food quality were also found to be important. Recent selection for varieties and hybrids involves these traits plus seedling vigor and related factors contributing to stand establishment. Promising lines are CE 145-66. CE 151-262, and CE 157-95. New seed parents for hybrids have been developed and CE 102A and B and CE 111A and B are useful in Senegal. In the north of Senegal, with irrigation, CSH-9 from India, CK 612A from USA, R 75-14 from ICRISAT and the IRAT hybrid 181 are performing well. The importance of linking new varieties and hybrids with improved management practices is emphasized.

0268 CHERALU, C, and REDDY, C.S. 1982. Comparison of mutagenic sensitivity of selected Indian, American, and African sorghums. Sorghum Newsletter 25: 92-93.

Three different varieties of Sorghum bicolor, Aispuri (IS 18425), a tall Indian variety, Shallu (R 474), an American variety, Feterita (IS 2311) and Fara-Fara (IS 7439) from Sudan and Nigeria, respectively, were treated with sodium aize (0.005M, and 0.015M) prepared in phosphate buffer at pH 6.5 and hydrazine (0.005M and 0.015M) prepared in borate buffer at pH 8.5 to compare the mutagenic sensitivity of these varieties and to study and assess the mutagenicity of these chemicals.

0269 CHINA:PLANT BREEDING INSTITUTE, SHENYANG. 1982. Preliminary report on the evaluation of newly introduced sorghum TX-ms lines. (Ch). Liaoning Nongye Kexue (Liaoning Agricultural Science) 1: 30-31, 33.

0270 CONDE, M.F.. PRING. D.R., SCHERTZ, K.F., and ROSS, W.M. 1982. Correlation of mitochondrial DNA restriction endonuclease patterns with sterility expression in six male-sterile sorghum cytoplasms. Crop Science 22(3): 536-539. 8 ref.

Six cytoplasmic male-sterile sorghum lines (KS34 through KS39), which have cytoplasms from sources other than the milo group, were tested for fertility expression in F1 hybrids produced with nine lines, and their organelle DNAs were examined by restriction endonuclease fragment analysis. Three of the KS lines had cytoplasms indistinguishable from milo male-sterile cytoplasm; the remaining three lines differed from milo both in fertility response and their mitochondrial DNA restriction patterns. Chloroplast DNA restriction patterns of all six KS lines were indistinguishable from that characteristic of milo chloroplast DNA. The results indicate a relationship between mitochondrial DNA and genetic behavior of the male-sterile cytoplasms. These cytoplasms may be useful in broadening the cytoplasmic base of hybrid sorghum production.

0271 CORDONNIER, M.J.. DAY, J.L.. and FISHER, CD. 1982. 1981 field crops performance tests. Georgia Agricultural Experiment Station Research Report 388: 1-63.

0272 CROSTON, R.P., and EL AHMADI, A.B. 1982. Collecting in Darfur, Sudan. Plant Genetic Resources Newsletter 50: 28-31. 4 ref. (Summaries:Es, Fr).

A total of 119 population samples were collected from fields and threshing floors. Observations on the cereals collected are described including morphological variation for several characteristics.

0273 DA, S.S., ROONEY, L.W., and MILLER, F.R. 1982. Laboratory methods for evaluating to quality in a sorghum breeding program. Sorghum Newsletter 25: 103-104.

0274 DABHOLKAR, A.R., and BAGHEL, S.S. 1982. Inheritance of tannin in grains of sorghum. Indian Journal of Genetics and Plant Breeding 42(2): 204-207. 8 ref.

Seven varieties of sorghum of diverse origin were crossed in a diallelfashion. Tannin in the grain was estimated using Folin-Davis method. Additive genetic variance was found to predominantly govern the inheritance of tannin in grain. IS 9327, 555 and CSV-3 were desirable combiners.

0275 DENMAN. C.E., MCNEW, R.W., PECK, R.A., REEVES, H.E., BELETE, K.. and JORDAN, J.D. 1982. Performance tests of hybrid sorghum and corn in Oklahoma, 1981. Research Report Oklahoma Agricultural Experiment Station, P-823. 41 pp.

0276 DEVDANAM, K., REDDY, C.S., and REDDY, B.M.M. 1982. Studies on sodium azide induced chlorophyll and morphological mutations in M2 and M3 generations of sorghum. Sorghum Newsletter 25: 92.

Two local varieties of Sorghum bicolor, M 35-1 and Kodali, were treated with three different concentrations (0.001M, 0.002M, and 0.003M) of sodium azide to study their effect on chlorophyll and morphological mutations in M2 and M3 generations. Based on seedling injury and plant survival in Ml, sorghum variety Kodali was found to be more sensitive than M 35-1, but based on the frequency of chlorphyll and morphological mutations in M2, M 35-1 was found to be more mutagen sensitive than Kodali. In general, a higher frequency of chlorophyll mutations (albino, chlorina, viridis, and xantha) was observed in M2 than in M3 generation, but the spectrum was different in both the varieites. In M2, a higher frequency of viridis was followed by albino, chlorina and xantha in M 35-1, whereas in Kodali, viridis was followed by xantha, albino, and chlorina.

0277 DEVDANAM, K., REDDY, C.S., and REDDY, M.M. 1982. Sodium azide induced quantitative variation in M2 and M3 generation of two local varieties, M 35-1 and Kodali of sorghum. Sorghum Newsletter 25: 91.

The induced quantitative variability in mutagen treated populations of both M2 and M3 generations of both varieties M 35-1 and Kodali, differed in magnitude for different characters. An increase in variation was observed for quantitative characters like length and girth of panicle, and yield per plant in M2 and M3 generations compared to control, but a decrease was observed in plant height, number of nodes, girth of stem, days to 50% flowering, and 100 grain weight. A comparison of induced quantitative variation between M2 and M3 generations indicated a greater increase in number of nodes and plant height in M2 than in M3, but there was a gradual increase in 100 grain weight, length of panicle and yield per plant from M2 to M3 generation.

0278 DIXON, L.K., and LEAVER, C.J. 1982. Mitochondrial gene expression and cytoplasmic male sterility in sorghum. Plant Molecular Biology 1(2): 89-102. 24 ref.

Analysis of native mitochondrial DNA by agarose gel electrophoresis revealed the presence of two 'plasmid-like' DNA species of molecular weight 5.3 and 5.7 kb in the cytoplasmic male sterile lines Kafir nucleus in cytoplasm IS1112 and Yellow Feterita nucleus in M35-1 cytoplasm. Thus there is a positive correlation between the synthesis of the 82000 molecular weight polypeptide and the presence of the additional DNA species.

0279 DOGGETT, H. 1982. The history of sorghum improvement in East Africa. Pages 8-15 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa, 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0280 DREIER. A.F., NORDQUIST, P.T., ELMORE, R.W., GRAB0USKI, P.H., and NELSON, L.A. 1982. Nebraska grain sorghum performance tests 1981. Nebraska, USA: University of Nebraska. 27 pp. (Nebraska Cooperative Extension Service-E.C. 82-106).

0281 DREMLYUK, G.K., and MALYUZHENETS, N.S. 1982. Expression of the heterosis effect for yield and other economically important characters in hybrids of grain sorghum. (Ru). Nauchno-tekhnicheskii Byulleten Vsesoyuznogo Selektsionno-geneticheskogo Instituta 3: 46-49. 4 ref.

A study of twelve varieties and their F1-F2 hybrids showed that the greatest heterosis for grain yield per plant relative to the better parent found in the F1 hybrid Khigeri Karlikovoe K1695 (Hegari Dwarf K1695) X Gvineiskoe Karlikovoe (Guinea Dwarf). Most of the F2 hybrids were inferior in grain yield to the better parent. Heterosis for height was shown by all hybrids, reaching 146.1% relative to the better parent in the Fl and 119% in the F2.

0282 DUNCAN, R.R. 1982. Field screening of genetically variable sorghum genotypes in acid soil stress environments. Pages 139-144 In Plant Nutrition Slough, UK: CAB.

0283 DUNCAN, R.R., ROSEN0W. D.T., S0T0MAY0R-RI0S, A., and FREDERIKSEN, R.A. 1982. Registration of GPT2RB anthracnose resistant sorghum germplasm population (Reg. no. GPBO). Crop Science 22(6): 1274-1275. 3 ref.

0284 EJETA, G. 1982. The status of sorghum improvement research in the Sudan. Pages 120-131 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa, 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0285 ENGELHARDT, T. 1982. Examining yield and taste of hybrid and local varieties of Sorghum vulgare (L.) in Botswana. Quarterly Journal of International Agriculture 21(Special issue): 59-72. 35 ref.

In field trials in Botswana in 1979-80, fifteen sorghum cultivars were sown on 1 November and grown with adequate NPK and weed and insect control. Grain yields of sorghum hybrids averaged 3.84 t/ha and yields of local cultivars averaged 1.98 t/ha but taste characteristics of hybrids were not significantly different from local cultivars. The hybrid cultivars NK 222 and SSK 52 were particularly recommended for their high yield potential and taste quality under Botswana conditions.

0286 ENSERINK. H.J., and NJERU, E.S. 1982. Progress report, 1981 Western Kenya: results and discussion of trials during the 1981 long-and short-rains. Kenya: Sorghum and Millet Development Project. (Field Document, 7).

0287 FINKNER, R.E., BARNES, C.E., GREGORY, E.J., ARNOLD. R.N., HOOKS, R.F., LUGG, D.G., and SMITH, F. JR. 1982. Test yields of sorghum and corn, 1981. Research report, New Mexico, Agricultural Experiment Station No. 483. 39 pp.

0288 FRANCE:INSTITUT NATIONAL RECHERCHE AGRONOMIQUE. 1982. 1982 varieties bulletin. Grain-maize, grain sorghum. Provisional descriptive cards of varieties registered in 1982 (France). (Fr). Guyancourt, France: INRA. 233 pp.

0289 FRANCIS, C.A. 1982. Developing hybrids of corn and sorghum for future cropping systems. Annual Corn and Sorghum Industry Research Conference 36: 18-30. 40 ref.

0290 GEBREKIDAN, B. (ED). 1982. Sorghum improvement in Eastern Africa. Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa, 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project. 196 pp.

0291 GEBREKIDAN, B. 1982. Breeding sorghum for stress conditions. Pages 99-100 In Report on the third FAO/SIDA seminar on field crops in Africa and the Near East. 6-24 June 1982, Nairobi, Kenya. Rome, Italy: FAO.

0292 GEBREKIDAN. B. 1982. Utilization of germplasm in sorghum improvement. Pages 335-345 In Sorghum in eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 45 ref.

0293 GIRIRAJ, K.» and GOUD, J.V. 1982. Genetics of yield and panicle components in grain sorghum. Crop Improvement 9(2): 111-114. 4 ref.

Inheritance of grain yield and panicle components was studied in F1 and F2 generations of eight-parent diallel cross in grain sorghum. The component analysis revealed that grain yield, panicle length, panicle breadth, number of whorls, number of primary branches, length of primary branch, 100-seed weight and number of grains per panicle were governed by both additive and non-additive components of genetic variation. For majority of the characters, estimate of heritability was high in Fl and low in F2 generation.

0294 GOLMIRZAIE, A.M. 1982. Interrelation of the brown and purple genes (Tptptp) with the pericarp and other testa genes in Sorghum bicolor (L.) Moench. Ph.D. thesis. University of Arkansas. USA. 123 pp.

A study was conducted from 1978 to 1980 at Fayetteville, Arkansas, to determine the pericarp and testa genotypes of two sorghum lines (AR3009 and TAM2566) and to determine the effect of the testa genes Tptp on the pericarp and other testa genes. Five lines of sorghum, AK3001R, AK3002. AK3003, TX385. and TX399 were used as testers for obtaining this information. All possible crosses were made among the two lines AR3009 and TAM2566 with the tester lines of sorghums and between themselves to study the F1, F2, and F3 segregation. The F2 and F3 generations were classified for the characters under study. Segregations were tested by the chi-square method for goodness of fit. The testa color inheritance was controlled by a single pair of genes (Tptp). The results obtained from these crosses showed no significant level of probability for the combination of testa color genes. Tptp with the pericarp and other testa genes. This indicated that the testa color genes had no effect on inheritance of pericarp and other testa genes.

0295 GOMATHINAYAGAM. P.. and RAJASEKARAN. S. 1982. Studies of chlorophyll mutants in the M2 and AM1 generations in (Sorghum bicolor (L.) Moench with gamma rays and methyl methane sulphonate. Andhra Agricultural Journal 29(1): 26-29. 8 ref.

Alternate treatments proved to be more potent in inducing chlorophyll mutations than single treatments. The multiple chlorophyll mutations of two types occurred in a higher frequency than one type, three types and four types in all the treatments. The pooled segregation ratio increased upto certain dose levels in all the treatments and there after decreased or showed an in consistant trend. The single treatment induced several types of chlorophyll mutants i.e., albina, xantha, chlorina, viridis, striata, albo-viridis, albo-xantha and tigrina. The tigrina type was observed in greater frequency in alternate treatments than in single treatment.

0296 GORBET, D.W. 1982. Ratoon evaluations of grain sorghum hybrids. Sorghum Newsletter 25: 69-70.

0297 GOURLEY. L.M., EDWARDS, N.C., SANDERS, T.G., HOVERMALE, C.H., ARNOLD. B.L., and BUEHRING, N.W. 1982. Mississippi grain sorghum performance trials, 1981. Bulletin Mississippi Agricultural and Forestry Experiment Station, 903. 5 pp. (Also published in MAFES Research Highlights 45(5): 1-3.

0298 GRANT, R.F.. and LEA, J.D. 1982. Drought resistance selection criteria for agricultural crops. Crop Production 11: 13-20.

0299 HALALLI, M.S.. GOWDA. B.T.S., KULKARNI, K.A., and GOUD, J.V. 1982. Inheritance of resistance to shootfly (Atherigona soccata Rond.) in sorghum (Sorghum bicolor (L.) Moench). SABRAO Journal 14(2): 165-170. 20 ref.

In a seven-parent diallel analysis, inheritance of resistance to shootfly, trichome density, egg count/plant and % deadhearts were found to be controlled by both additive and non-additive gene effects, whereas recovery resistance was controlled by additive gene effects. In general, performance per se of parents was a good indication of combining ability. Egg count was positively correlated with % deadhearts. Trichome density was negatively correlated with total egg count as well as with % deadhearts.

0300 HARER. P.N., and BAPAT, D.R. 1982. Heterosis studies in grain sorghum. Journal of Maharashtra Agricultural Universities 7(1): 30-32. 9 ref.

Appreciable amount of heterosis was observed for almost all the characters, excepting number of leaves. Highest heterosis (197.10%) was noticed for the trait grain yield, followed by weight of panicle (147.18%). The increase in grain yield was found to be mainly due to the increase in panicle weight and to some extent due to 1000 grain weight. It was also noticed that crosses between high yielding and bold grained parents resulted in high yielding and bold grained hybrids. The hybrids of 36A were high yielding, similarly the hybrids involving the male parent SC 120, were also high yielding and early maturing.

0301 RARER, P.N., and BAPAT, D.R. 1982. Line X tester analysis of combining ability in grain sorghum. Journal of Maharashtra Agricultural Universities 7(3): 230-232. 9 ref.

Combining ability effects were studied in a line x tester design experiment involving five male steriles and ten restorers. The combining ability variances due to males, females and hybrids were highly significant for all the characters. Additive gene action was observed for the characters viz., plant height, number of leaves, leaf length, total leaf area, days to 50% flowering, panicle length, width and 1000-grain weight. Whereas non-additive gene action was predominant far leaf width, weight of panicle and total grain yield/plant. The superior combination involved all the three possible combinations between parents for high and low general combining ability effects. The combinations 36A x 348 and 36A x SC 120 appeared quite promising for characters like grain yield and maturity. The heritability percentage in narrow sense was high for the developmental and panicle characters and was medium for grain yield/plant and 1000 grain weight.

0302 HEINRICH, G.M., FRANCIS, C.A., and EASTIN. J.D. 1982. Yield stability of grain sorghum across environments. Sorghum Newsletter 25. 26.

0303 HENZELL, R.G., FLETCHER, D.S., and GALLAGHER, E.C. 1982. Grain sorghum trial yields: South Queensland. Queensland Agricultural Journal 108(5): 230-231.

0304 HENZELL, R.G., FLETCHER, D.S., and VAN SL0BBE, L. 1982, Guide to grain sorghum characteristics: South Queensland, 1982-83. Queensland Agricultural Journal 108(5): 232.

0305 HENZELL, R.G., PERSLEY, D.M., GREBER, R.S., and TEAKLE, D.S. 1982. Resistance breeding to sugarcane mosaic virus in Australia. Page 754 In Sorghum in eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

A breeding program to incorporate the single gene "K" from Krish for resistance to sugarcane mosaic virus (SCMV) and the multigenic field resistance from Q-7539 into the grain sorghum lines KS-4. TAM-422, R-7078 and KS-19 has been conducted in Queensland. Nineteen lines with the "K" gene have been released. Two of these, QL-3 and QL-22 are also highly resistant to sorghum downy mildew, QL-19, with Q-7539's resistance has also been released. An international survey of SCMV strains on 10 sorghum differentials has indicated the wide spectrum of resistance to SCMV strains of the single gene Krish resistance.

0306 HENZELL, R.G., PERSLEY, D.M., GREBER, R.S., FLETCHER, D.S., and VAN SLOBBE, L. 1982. Development of grain sorghum lines with resistance to sugarcane mosaic and other sorghum diseases. Plant Disease 66(10): 900-901. 14 ref.

Fifteen parental lines (QL6-17 and QL20-22) homozygous for the Krish source of sugarcane mosaic virus resistance were developed over 6 years. Virus was not detected in new growth leaves following mechanical inoculation with sugarcane mosaic virus. Line QL19 contains the Q7539 source of resistance, which confers a high level of resistance to natural infection. QL19 averaged 13.5% infected plants in field experiments over 3 years compared with 79% in the recurrent parent KS4. Percentage of infection in QL19 and Q7539 decreased as inoculum dilution increased. QL22 was highly resistant to sorghum downy mildew (Peronosclerospora sorghi) and QL20 was resistant to race 1 of head smut (Sphacelotheca reiliana), whereas QL7 and 13 were more resistant to rust (Puccinia purpurea) than their recurrent parents.

0307 HITAKA, N.. and DANJO, T. 1982. Lodging resistance of grain sorghum and corn. (Ja)• Kinki Chugoku Agricultural Research 64: 56-59. 13 ref.

0308 HOOKSTRA, G.H. 1982. Simultaneous evaluation of grain sorghum A-lines and random-mating populations with topcrosses. Ph.D. thesis, Nebraska University, Lincoln, USA.

Nineteen A lines were crossed to six random-mating populations and top crosses were evaluated for general combining ability (GCA) and specific combining ability (SCA) effects. The A line N37 and population RP1R had the best GCA effects. SCA effects ranked topcross 72 LN3625 x NP7BR as superior, but N37 x RP1R had the highest mean yield.

0309 HOOKSTRA, G.H.. and ROSS, W.M. 1982. Comparison of F1's and inbreds as female parents for hybrid sorghum seed production. Crop Science 22(1): 147-150. 15 ref.

Mean values of 13 traits measured on the nine groups of eight F1's were compared with their respective A-lines. Each F1 group outyielded its common A-line component with seeds per head contributing most to that advantage. Other characters relating directly to seed parent yield showed no great differences between Fl groups and their respective A-lines. Genotypic and simple correlations of seeds per head and grain yield were high in both groups. Use of Fl female parents in hybrids can reduce production costs to the seed producer and seed costs to the farmer if acceptable, high performing hybrids are identified.

0310 HOSHINO, T., and HAGIO, T. 1982. Selection from acid soil tolerant population. Sorghum Newsletter 25: 22.

0311 ICRISAT. 1982. Sorghum germplasm. Pages 15-20 In Annual report, 1981. Patancheru, A.P., India.

0312 INDIRA, S., RANA, B.S., and RAO, N.G.P. 1982. Further studies on the incidence and genetics of rust resistance in sorghum. Indian Journal of Genetics and Plant Breeding 42(1): 106-113. 4 ref.

The incidence of rust is higher under humid condition of Dharwad consequently increasing the susceptibility of the hypersensitive parents and frequency of susceptibles in F2. There is no evidence for the existence of more than three genes even at Dharwad leading to the conclusion that the differential behaviour is due to the increased inoculum attributable to favourable environment rather than the occurrence of different physiological races of the fungus. The segregation pattern in tan X tan, tan X purple and purple X purple crosses is similar. Rust resistance is confirmed to be trigenic recessive of the rlrlr2r2r3r3 genetic

constitution. Modifying factors appear to push a hypersensitive reaction towards susceptibility under more favourable conditions for disease development. SPV-34 and CS 3541 are better sources of resistance.

0313 IUSHCHENKO. S.I. 1982. Analysis of the varietal diversity of broomcorn in the reaction to cytoplasmic sterility. (Ru). Biulleten' - Vsesoiuznyi Institut Rastenievodstva 124: 47-49.

0314 IVANIUKOVICH. L.K. 1982. Heritability of the main economically valuable characters by F1 sorghum hybrids. (Ru). Biulleten' Vsesoiuznyi Institut Rastenievodstva 124: 41-43.

0315 IVANIUKOVICH. L.K. 1982. Problems of sorghum breeding and some ways of solving them. (Ru). Biulleten' - Vsesoiuznyi Institut Rastenievodstva 124: 38-41.

0316 JAYARAMAIAH. H.. and GOUD. J.V. 1982. Inheritance and interrelationships of genes in sorghum. Indian Journal of Genetics and Plant Breeding 42(3): 329-334. 7 ref.

The inheritance and interrelationships of seven qualitative characters were studied in sorghum cross 'CS 3541 X IS 4610". The inheritance of nature of pedicelled spikelet. glume colour (ventral side), and the tip of the grain were studied for the first time. The existence of both pleiotropy between leaf sheath covering and glume colour and linkage between the genes, plant or leaf sheath colour (Ai-P), glume colour (DP), pedicelled spikelet (Pr). leaf sheath covering (Lt2), grain shape (U) and tip of the grain (Gt) were noticed. The linked genes form a part of linkage group I I .

0317 JIMENEZ, C.J.. FRANCIS. C.A.. and NELSON. L.A. 1982. Environmental effects on grain sorghum in western Nebraska. Sorghum Newsletter 25: 26.

0318 JOHNSON. J.W.. and ROSENOW. D.T. 1982. Registration of 15 sorghum parental lines (Reg. nos. PL59 to PL73). Crop Science 22(6): 1280.

0319 JOHNSON, J.W.. ROSENOW. D.T.. and TEETES G.L. 1982. Registration of four composites of greenbug - resistant sorghum germplasm (Reg. nos. GP 126 TO GP 129). Crop Science 22(6): 1273.

0320 JOHNSON. J.W.. ROSENOW. D.T.. TEETES. G.L.. and MILLER. F.R. 1982. Registration of TAM 2566 sorghum germplasm line (Reg. no. GP75). Crop Science 22(6): 1271.

0321 JOHNSON. J.W.. ROSENOW. D.T.. TEETES. G.L.. and PHILLIPS. J.M. 1982. Registration of 19 greenbug resistant sorghum germplasm lines (Reg. nos. GP 79 to GP 97). Crop Science 22(6): 1272.

0322 JOHNSON. J.W.. SCHAFFERT. R.E.. and TEETES. G.L. 1982. Registration of ISR1 sorghum germplasm line (Reg. no. GP 78). Crop Science 22(6): 1271-1272.

0323 JOHNSON. J.W.. TEETES. G.L.. and ROSENOW. D.T. 1982. Registration of TAM 2567 and TAM 2568 greenbug resistant sorghum germplasm lines (Reg. nos. GP 76 and 77). Crop Science 22(6): 1271.

0324 JOHNSON. J.W.. TEETES. G.L.. ROSENOW. D.T.. WISEMAN. B.R.. and PHILLIPS. J.M. 1982. Registration of 28 midge resistant sorghum germplasm lines (Reg. nos. GP 98 to GP 125). Crop Science 22(6): 1273.

0325 JOSHI. P.. BHATNAGAR. S.K.. SHAH. M.A.. and SHARMA. V. 1982. Status of sorghum breeding at Udaipur Centre. I. Varietal development. Sorghum Newsletter 25:

19-20.

SPV 245 (SB 1066 x CS 3541) has the distinction of maintaining consistently higher grain yield among different varieties tested during kharif 1978. 1979. and 1980. not only at the All-India level, but also in most of the states. SPV 436, a sister line of SPV 245. showed a quantum jump in productivity at the national level. Besides higher grain yield, it has additional advantages of earliness, bold shining grains, and high fodder yield than the released varieties. In addition. SPV 346 exhibited tolerance to almost all diseases (downy mildew, head mold, rust, leaf blight, and anthracnose). Variety SPV 245 and SPV 346 were also superior among the varieties and hybrids tested in Maghi season (early rabi).

0326 KABIRO. Z. 1982. Report on sorghum improvement in Burundi. Pages 79-84 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa. 17-21 October 1982. Nazreth and Debre Zeit, Ethiopia. Nazreth. Ethiopia: Ethiopian Sorghum Improvement Project.

0327 KALINGARAYAR. A.S.. and DHARMALINGAM. C. 1982. Relative difference in seed vigour in sized seeds of hybrid sorghum CSH 5 and its parents. Madras Agricultural Journal 69(9): 600-604. 17 ref.

The large seeds of sorghum hybrid CSH 5 and its parents retained by 10. 9 and 8 round perforated metal sieves were superior to small seeds in seed vigour tests such as germination energy, brick-grit test, chemical soak test, dry matter production and the vigour index.

0328 KALMBACHER, R.S., WRIGHT, D.L., and MARTIN, F.G. 1982. Evaluation of commercial grain sorghum hybrids at Ona, 1982. Research Report Agricultural Research Center, RC-1982-8. 6 pp.

0329 KAMBAL, A.E., ALI, H.. and GABBAR, H.A. 1982. The status of sorghum improvement in Yemen Arab Republic. Pages 151-168 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa, 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0330 KEASCHALL. J., CANTRELL. R.. and AXTELL. J. 1982. Variation in agronomic traits of B-lines developed from random mating sorghum populations. Agronomy Abstracts: 71.

The objective of this study was to determine if significant variation exists among the B lines for yield, days to half-bloom, plant height, and/or lodging. Selection for these traits will be worthwhile if significant variation exists between lines. A randomized complete block design was used, and the agronomic traits were evaluated by the variance components, frequency distributions, and correlations between traits. The B line families differed significantly for each trait measured. The distributions of the families when ranked lowest to highest appeared normal for all traits measured except lodging. Tall plants tended to have high yields; significant positive correlations were also seen between yield and lodging, and plant height and lodging. The significant variation observed for the traits measured indicates that development of A and B lines through population improvement can add genetic diversity not available in present A lines used for hybrid production.

0331 KEBEDE, Y.. and MILLER, F.R. 1982. Differences in performance between "old" and "new" sorghum hybrids. Sorghum Newsletter 25: 32.

0332 KERMALI, I.R. 1982. The present status of sorghum breeding in

Kenya with special emphasis on the lowelevation drylands. Pages 99-108 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa. 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia, Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0333 KHIDSE, S.R.. BHALE, N.L., and BORIKAR, S.T. 1982. Combining ability for leaf water deficit and grain yield in rabi sorghum. Indian Journal of Genetics and Plant Breeding 42(1): 82-86. 6 ref.

Present investigation involving thirty two hybrids was aimed at study of combining ability for leaf water deficit, grain yield and other related traits of rabi sorghum. Predominance of non-additive gene action was observed for all the traits studied. The parents like 1202 A (primordial differentiation stage), 282 and 168 (Panicle emergence stage). Swarna and M 35-1 (grain development stage)• recorded desirable GCA effects for leaf water deficit. The parent 285 revealed desirable GCA effect for grain size. In respect of grain yield and yield contributing characters, PD 3-1-11 was most promising. Crossing of promising lines, selecting desired recombinants and crossing them inter se will be useful in rabi sorghum breeding programme.

0334 KHIDSE, S.R., BHALE, N.L., and BORIKAR, S.T. 1982. Heterosis and combining ability for seedling vigor index in sorghum. Sorghum Newsletter 25: 12. 2 ref.

0335 KIDE. B.R., BHALE, N.L., and BORIKAR, S.T. 1982. Combining ability in single and three-way crosses of sorghum. Indian Journal of Agricultural Sciences 52(9): 554-557. 6 ref.

Sixty 3-way crosses and 20 single crosses of sorghum developed from 4 male-sterile (A and B) lines along with parents were studied for combining ability. The performance of 3-way crosses was on a par with that of single crosses. The heterozygous females (A x B) were inferior owing to ill effects of inbreeding in the 3-way crosses. Non-additive gene action was evident for plant height, days to flowering, grain size and yield. Both male-steriles and sterile single crosses were equally suitable for the study of combining ability. For agronomic characters, '36A', '1202A', '168' and '285', developed from exotic X Indian crosses, proved desirable combiners.@

0336 KIRKBY, R.A. 1982. The role of IDRC in Eastern Africa National Sorghum Improvement Programs. Pages 16-17 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0337 KIRTI, P.B., MURTY, U.R., and RAO, N.G.P. 1982. Chromosomal structural hybridity and breeding systems in Sorghum bicolor (L.) Moench. Page 753 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

The study was undertaken to find out whether sexuality, cross-sterility and apomixis have any chromosomal basis. A facultatively apomictic line (R-473), a cross-sterile line (101), four normal lines (White Seed, Kafir-B, IS-84 and Aispuri) and four Fl hybrids were examined at the mid-prophase stage of meiosis. Unpaired chromosomal regions were noticed at the pachytene stage in the apomictic and cross-sterile lines but not in the normal sexual lines. Fl hybrids between normal sexual lines (Kafir-B x Aispuri) did not exhibit any abnormalities in chromosome pairing but those between sexual and apomictic lines were structurally heterozygous. Chromosomal structural differences can» therefore, result occasionally in abnormal breeding systems including apomixis. This study indicates that crosses between divergent materials may help achieve obligate apomixis.

0338 KIRTI. P.B., MURTY, U.R., and RAO, N.G.P. 1982. Chromosomal studies of cross-sterile and cross-fertile sorghum, Sorghum bicolor (L.). Genetica 59(3): 229-232.

Chromosome pairing and meiosis were studied in cross-fertile sorghum lines and F1 hybrids between one cross-sterile and several fertile lines. The cross-fertile parents exhibited regular meiosis, but the cross-sterile ones and the hybrids had abnomalities indicative of non-homologies, deficiencies and/or duplications. The significance of the chromosomal differentiation in cross-sterile sorghums in relation to the origin or cross-sterility and apomixis was discussed.

0339 KOFOID, K.D.. MARANVILLE, J.W., and ROSS, W.M. 1982. Relationship of the tests to agronomic and nutritional traits in sorghum.Crop Science 22(2): 352-357. 30 ref.

The relationship of the testa character to agronomic and nutritional traits in S1 families from two random-mating populations, NP13R and NP14B, where each was divided into subpopulations with and without a testa layer were studied. Differences occurred between the testa and nontesta subpopulations in at least one population in at least 1 year for all of the traits studied except grain yield and height. The testa types tended to have lower means for other agronomic traits. although differences were not always significant. Among the nutritional and mineral traits, the testa types had more protein, lysine percent sample, K, and tannin; and less lysine percent protein, oil, carbohydrate, P, gross energy, enzyme activity, in vitro dry matter digestibility, and metabolizable energy than the nontesta types.

0340 KONGTLAN, Z., GENQI, L., and FANRUI, K. 1982. Transfer of the male fertile genes of restorer without gametic fusion and the expression in the progeny of sorghum. Acta Genetica Sinica 9(3): 209-213. 4 ref.

0341 KUKADIA. M.U., and SINGHANIA, D.L. 1982. Heterosis for forage yield, its components and quality characters in sorghum. Indian Journal of Agricultural Sciences 52(12): 827-831. 11 ref.

A set of 21 genotypes comprising 6 elite lines and 15 all possible crosses of forage sorghum was used to estimate heterosis for forage yield and its components. The mean magnitude of heterosis was 44.09% for green-forage yield and 52.87% for dry-forage yield. Heterosis was low for number of leaves, and was negative for days to flowering, total soluble solids and leaf: stem ratio. 'Rio' X 'Vidisha' showed the highest heterosis for the yields of green and dry forages, perhaps owing to the high expression of plant height, stem diameter, number of leaves and leaf area.

0342 KUKADIA. M.U., DESAI, K.B., DESAI, M.S., RAJA, K.R.V., and PATEL, R.H. 1982. Comparison of Mahalonobis' s D sq. statistic and metroglyph technique in study of genetic divergence in sorghum germplasm collection. Sorghum Newsletter 25: 96.

0343 KUKADIA, M.U.. DESAI, K.G., DESAI, M.S., PATEL, R.H., and

RAJA, K.R.V. 1982. Inheritance of eight agronomic characters in three sorghum crosses. Sorghum Newsletter 25: 96.

0344 KULLAISWAMY, B.Y. 1982. Linkage studies in sorghum (Sorghum bicolor (L.) Moench). Ph.D. thesis, University of Agricultural Sciences, Dharwad, Karnataka, India.

The parents chosen for hybridisation, originated from three different geographic areas (India, U.S.A., and Africa). Eight cross combinations were made and the material was carried forward until the third hybrid generation. The object of the investigation was to establish new linkage groups and to identify additional loci to the already established linkage groups. Inheritance studies indicated the involvement of one to four pairs of genes for different characters. Monogenic F2 ratios were obtained for the characters-tillering habit, plant colour, leaf angle, midrib colour, ear exertion, pulvinus colour, glume texture, awning, ear shape, panicle compactness and grain colour. A total of 80 factor pairs were identified for the first time and the linkage relationships of 26 genes were established. The total of the mapped genes was raised from 57 to 83.

0345 KULLAISWAMY, B.Y., and GOUD, J.V. 1982. Inheritance and genetic association of a few qualitative characters in IS 8744 X IS 887 sorghum. Indian Journal of Agricultural Sciences 52(12): 815-822. 11 ref.

A study was conducted on the inheritance and linkage relationship of genes conditioning 6 qualitative characters in sorghum. Monohybrid ratios were postulated for leaf-sheath colour, midrib colour and pulvinus colour. Digenic ratio of 9:7 was fitted in for basal sterility. A ratio of 45:19 was assigned for glume gaping and 39:25 for glume-tip colour. The factors Ga, P, Wmd, Px, bs and Gep were placed in the third linkage group.

0346 LITSINGER. J.A. 1982. Plant breeding priorities for developing insect resistant legume, maize, and sorghum varieties for rice-based cropping systems in Asia: insect pest management strategy. College, Laguna, Philippines: IRRI. 20 pp. 18 ref.

0347 LO, Y.W. 1982. Autotetraploid sorghum. Sorghum Newsletter 25: 87.

0348 MAHDY, E.E., HASSABALLA, E.A., EL-MORSHIDY. M.A.. and KHALIFA, M.A. 1982. Comparative studies on selection index and phenotypic single trait selection in sorghum (Egypt). Assiut Journal of Agricultural Sciences 13(4): 141-152. 26 ref.

0349 MALI: RECHERCHE CULTURES VIVRIERES OLEAGINEUSES. 1982. Results of 1982 experimentation programme, of regional millet, sorghums, cowpeas and maize breeding (Mali). (Fr). Bamako, Mali: Section de Recherche sur les Cultures Vivrieres et Oleagineuses (Sotuba). 48pp.

0350 MALYUZHENETS, N.S., DREMLYUK, G.K., and PAVLYK, O.S. 1982. Aspects of the expression and inheritance of leaf surface area in grain sorghum. (Ru). Byulleten' Vsesoyuznogo Selektsionno-geneticheskogo Instituta 1: 27-30. 10 ref.

0351 MANI, N.S. 1982. Heterosis in sorghum. Sorghum Newsletter 25: 18-19.

In the present study, three grain sorghum varieties (BD 569, IS-2695, and IS-7155) and three F1 hybrids involving these lines (BD 569 x IS-2695. IS-269S x BD 569) were studied for heterotic effects. In the crosses, BD 569 was used either as male or female due to its dwarf stature and several other characters that contribute to its distinct plant type when compared to the other two tall varieties. The panicle in the dwarf is semicompact with brick-red seeds enclosed in blackish-purple glumes with tip awns. IS-2695 had loose panicle, pulvinate panicle branch base, spikelets with tip awns, and brown colored, small-sized grains enclosed in glumes of the same color. Panicle branch whorls were distantly arranged on the main axis. IS-7155 develops semicompact panicles with reddish-brown small grains enclosed in reddish-purple glumes without awns. Heterosis was studied in the F1 and F2 generations and segregations for panicle characters such as panicle compactness, awns size, glume color and seed color.

0352 MARTI, A. 1982. Performance of grain sorghum cultivars (Sorghum). (Es). Pages 109-110 In Annual meeting of technical information for producers. Rafaela, Santa Fe Argentina: Reunion Anual de Informacion Tecnica para Productores.

0353 MATTHEWS, R.V., FRANCIS, C.A.. and SCHUTZ, W.M. 1982. Estimates of heterosis for cold tolerance in grain sorghum. Agronomy Abstracts: 75.

Inbred lines of grain sorghum and their hybrids were studied to determine the magnitude of heterosis for emergence and growth under cool conditions. Twenty-eight hybrids and their parents were grown in the field in 1982 at two locations in Nebraska. All seed had been produced in the same crossing nursery in 1981. A modified randomized complete block design with six replications was used with the 28 groups as whole plots; the parents and the cross were subplot entries. This resulted in 28 independent estimates of heterosis. Planting dates were April 21 at Sidney and April 27 at Mead. For each entry, 100 viable seeds were planted; harvest was at the 8 to 10 leaf stage. The traits observed were the number of plants and their average dry weight. Evaluation of data from Mead revealed that hybrids exceeded the parental mean by an average of 63% for number of plants and 51% for plant weight. Differences ascribed to heterosis were highly significant (P $^{1}/_{4}$ 0.01) when evaluated using linear contrasts.

0354 MCINTYRE, B.L., and MILLER, F.R. 1982. Use of tropical germplasm to enhance drought resistance in sorghum. Sorghum Newsletter 25: 33. 5 ref.

0355 MECKENSTOCK, D.H., MILLER, F.R., and R00NEY, L.W. 1982. Dye binding capacity of eight near isocytoplasmic sorghum lines. Sorghum Newsletter 25: 34-35. 4 ref.

0356 MEHRA, K.L. 1982. Collecting in Zambia. Plant Genetic Resources Newsletter 50: 45-50.

0357 MENGESHA, M.H., and RAO, K.E.P. 1982. Current situation and future of sorghum germplasm. Pages 323-333 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 15 ref.

0358 MENGESHA. M.H., and RAO, S.A. 1982. Current status of pearl millet germplasm at ICRISAT. Paper presented at the All India Coordinated Millets Improvement Project Workshop, 26-28 April 1982, Coimbatore, India. 24 pp. 11 ref.

0359 MENGESHA. M.H., RAO, K.E.P., and RAO, S.A. 1982. Sorghum and millets genetic resources at ICRISAT. Plant Genetic Resources Newsletter 51: 21-26. (Summaries:Es, Fr).

0360 MIJAVEE, A. 1982. Testing domestic and foreign broomcorn varieties in conditions of Vojvodina (Yugoslavia). (Sh). Bilten za hmelj, sirak i lekovito bilje 14(40): 5-25. 15 ref. (Summary:En).

In the period 1977 - 1981 tested the conditions of Vojvodina 65 varieties and lines of sorghum, 48 of which were of foreign origin, for the following characters: yield of brushes as the main product, yield of grain as a by-product, commercial amd mechanical quality, number of fibers, and brush length. The yields of brushes varied from 14.39 to 34.54 q/ha, the yields of grain from 33.24 to 61.47 q/ha. The percentages of first class brushes ranged from 0 to 87%, brush length from 35 to over 65, cm, and number of fibers from 45 to over 76. Regarding the commercial quality, domestic varieties and lines performed the best. Recently developed American varieties were superior in grain yield and disease resistance.

0361 MILLER, F.R. 1982. Genetic and environmental response characteristics of sorghum. Pages 393-402 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 14 ref.

0362 MILLER. F.R. 1982. The genetics of pericarp color in Sorghum bicolor (L.) Moench. Pages 177-179 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT.

0363 MISHRA, R.C., DABHOLKAR, A.R., and BARCHE, N.B. 1982. Genotype year interaction of hybrids and varieties of sorghum. Sorghum Newsletter 25: 7-8. 3 ref.

0364 MISHRA, S.P., SINHA. S.K., and RAO, N.G.P. 1982. Heterosis and combining ability of amylase activity in germinating seeds of sorghum. Zeitschrift fur Pflanzenzuchtung 89(3): 187-191. 8 ref.

Seedling heterosis for amylase activity was observed in all cross combinations. The males were generally superior to females. The nature of gene action was predominantly non-additive. Enzyme systems might furnish the criteria for capitalizing on non-additive genetic variance.

0365 MOTA, M., GUSMAO, L., BETTENCOURT, E.. and MARTINS, J.N. 1982. Report on a mission to collect plant germplasm on the northeast of Portugal, June 1982. Rome, Italy: IBPGR. 24 pp. 6 ref.

0366 MURTY, D.S., and HOUSE, L.R. 1982. Report of the Sorghum Elite Progeny Observation Nursery (SEP0N) - 1980 & 1981. Patancheru, A.P., India: ICRISAT. 36 pp.

The Sorghum Improvement Program of ICRISAT organzed the Sorghum Elite Progeny Observation Nursery (SEPON) in 1980 and 1981 with 77 and 48 entries respectively and supplied the seed to various national programs of the Semi-Arid Tropics. Several agronomically superior selections with good grain quality, less mold susceptibility, disease resistance and high yield were made by the cooperators in Asia, Africa, and Central and South America. Data on days to 50% flower, plant height, grain mold incidence, grain yield and overall performance from SEPON 1980 and SEPON 1981 have been summarized; superior and widely adapted entries were pointed out. Some of the entries selected from SEPON are being evaluated as preliminary and/or advanced varieties by various national programs.

0367 MURTY, D.S., NICODEMUS, K.D., and HOUSE, L.R. 1982. Inheritance of basmati and dimpled seed in sorghum. Crop Science 22(5):

1080-1081. 6 ref.

Studies on F1, F2, F3, and backcross generations of three crosses and their reciprocals in sorghum showed that the inheritance of basmati (scented plant) and dimpled seed characters is controlled by two independent recessive genes. The plump seed character exhibited xenia.

0368 MURTY. D.S.. PATIL. H.D.. and HOUSE. L.R. 1982. Cultivar differences for gel consistency in sorghum. Pages 289-293 In Proceedings, International Symposium on Sorghum Grain Quality. 28-31 October 1981. Patancheru, A.P.. India. Patancheru. A.P.. India: ICRISAT. 11 ref.

The potential of gel consistency tests in the evaluation of sorghum food quality was investigated. Gel spread of cooled thin porridges exhibited significant cultivar differences and was affected by season. available soil moisture, dehulling and grinding methods. Gel spread was negatively associated with corneousness of the grain and particle size index of the flour. It was also associated with the roti and ugali properties assessed by taste panelists. The flow of cold flour-KOH gels in test tubes varied among cultivars and deserves more investigations. The value of gel consistency tests in sorghum quality improvement programs is discussed.

0369 MURTY. U.R. 1982. Milo and nonmilo cytoplasms in sorghum: review of literature and notes on micro sporogenesis. Hyderabad. A.P., India: ICAR. National Fellow Project on Sorghum and Groundnut. 15 pp. 38 ref. (Technical Bulletin, 3).

The diversity of cytoplasm in sorghum was outlined by a review of literature on the various aspects. The four basic types of lines are (1) the milo. A2 and other steriles derived from the conversion programme (2) 9 E with non-dehiscent anthers (3) the KS lines with cytoplasms from the grassy non-cultivated types and sugarcane (KS 40); and (4) the tropical indigenous lines (M 35-1, M 31-2. VZM 1 & 2 and G1). The characteristic behaviour of these steriles in microsporogenesis in the light of Quinby's hypothesis emphasized the need for a genetic characterization of sorghum cytoplasms for utilization in breeding and a basic distinction between temperate and tropical sources. The data on microsporogenesis lent parallel evidence to that of the other lines of studies.

0370 MURTY. U.R.. KIRTI. P.B., BHARAHI. M., JAHNAVI, M.R., and RAO, N.G.P. 1982. The sources of apomixis, their maintenance and utilization in sorghum breeding and the literature on sorghum apomixis. Hyderabad, A.P., India: ICAR, National Fellow Project on Sorghum and Groundnut. 18 pp. 24 ref. (Technical Bulletin, 1).

Several source materials of apomixis in sorghum were listed. Of these, the original line, R-473, along with 3 more derived lines isolated from the cross, R-473 x White Seed, have been included. Another 12 facultative apomicts having a high frequency of apomixs and derived from the crosses of IS-84 and CK 60-B with R-473 have been tested. The concept of "Vybrids" which are the first and subsequent generation progenies of two facultative apomicts has been outlined and a procedure for the production of vyhrids has been given. Detailed suggestions on the maintenance of facultative apomicts was given. A comprehensive list of references was provided at the end.

0371 MURTY, U.R., RAO, N.G.P., KIRTI, P.B., and BHARATHI, M. 1982. The problems of apomixis and its prospects in the eighties. Pages

361-372 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 53 ref.

0372 MUSHI, C.S. 1982. The status of sorghum improvement in Tanzania. Pages 132-140 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa, 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0373 MUSHONGA, J.N. 1982. The status of sorghum improvement in Zimbabwe. Pages 174-184 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa, 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0374 NAGABASAIAH, K.H.M. 1982. Genetic analysis of ten quantitative characters in F2 generation of a seven parent diallel set in sorghum (Sorghum bicolor (Linn.) Moench). M.Sc. thesis. University of Agricultural Sciences, Dharwad, Karnataka, India. 174 pp.

A seven parent complete diallel analysis in sorghum in F2 generation was studied for per se performance, combining ability and gene action for 10 quantitative characters using the parents IS 3691, IS 84, CS 3541, 148, LSR 1, RCR 408 and FR 169. The material was raised in a randomised complete block design. The analysis of variance showed highly significant differences among genotypes for all characters. Additive gene action was predominant for plant height, internode length, leaf breadth and panicle length, while non-additive gene action was more important for leaf number, leaf length and grain yield, but both were equally important for days to 50% flowering. panicle breadth and 1000-grain weight.

0375 NARAYANA, D., SAHIB, K.H., RAO, B.S., and RAO, M.R. 1982. Studies on the fertility restorers and sterility maintainers in sorghum experimental material. Sorghum Newsletter 25: 94.

0376 NARAYANA, L.L., REDDY, R.N., RAO, N.G.P., and PILLAI, K.D. 1982. Developmental studies in cytoplasmic genetic male-sterile sorghum lines. Page 753 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

The development of anther, male gametophyte, ovule, and female gametophyte in the male-sterile sorghum lines, G-1A, CK-60-A, VZM-2-A and M-35-1 has been studied. Abnormalities such as intratapetal syncytia, thickening of tapetal cell walls, abnormal radical elongation of tapetal cells, early disorganization of tapetum and cytomixis are responsible for male sterility in these lines. The embryo sac develops according to the polygonum type and is thus sexual. Because of pollen sterility, fertilization fails to take place under selfing. In the absence of fertilization, sexual embryo sacs degenerate and consequently there is no seed set. However, in G1A and CK-60-A a tendency for the formation of aposporous embryo sacs and degeneration of the megaspore mother cell on the products of meiosis has been noticed. By continued selfing it may be possible to induce apomixis in these lines.

0377 NGURE, L. 1982. The need for a sorghum improvement network in Eastern Africa - for discussion. Pages 185-187 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa, 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia, Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0378 NIGERIA: INSTITUTE FOR AGRICULTURAL RESEARCH. 1982. Cereal improvement programme. Pages 1-15 In Annual report of the Institute for Agricultural Research 1980/81. Zaria, Nigeria: Ahmadu Bello University. 25 ref.

0379 NIU, T.T., HOU. H.T., and TAN, W.Q. 1982. Analysis of heterosis of some yield characters in sorghum hybrids. (Ch). Shanxi Agricultural Science 3: 2-5.

Conventional varieties, hybrids showed strong heterosis for all yield components studied but heterosis was negative for the grain: stem ratio. Heterosis was conditioned by multiple genes•

0380 OBILANA, A.T. 1982. Population improvement in sorghum in Nigeria. Page 745 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

The population improvement program in Nigeria utilizes four genetically broad-based random-mating populations as base materials, and two main recurrent selection methods: S1 progeny testing and stratified mass selection. Progress made so far is indicated and discussed comparatively in terms of increased grain yield and Striga resistance, for and among the four populations: B composite, Y composite, YZ composite and MSAR composite, using the two recurrent selection procedures. The implication of using the ms7 type of sterility system and its proportion in the original and advanced generation cycles is indicated. A proposal for the possible use of a combined recurrent selection method: S1 testing plus mass selection (female choice); for an environment with single growing season and additional irrigation, is discussed towards maximizing the genetic gain from selection for yield and multiple disease resistance.

0381 OBILANA, A.T., ADESIYUN, A.A., and MANZO, S.K. 1982. Breeding for disease and pest resistance in sorghum. Pages 125-137 In Breeding for durable disease and pest resistance. Rome, Italy: FAO.

0382 0R0ZC0 MEZA, F. DE J. 1982. Comparison of sorghum hybrids with some of their progenitors by means of agronomical and physiotechnical characteristics. (Es). Thesis, Universidad Autonoma, Chapingo, Mexico. 103 pp.

0383 PATEL. M.H., DESAI. K.B., and KUKADIA. M.U. 1982. Note on the manifestation of heterosis in sorghum. Indian Journal of Agricultural Sciences 52(12): 856-857. 7 ref.

0384 PATEL, R.H., DESAI, K.B., and DABHOLKAR, A.R. 1982. Combining ability for grain yield and its components in sorghum. Indian Journal of Agricultural Sciences 52(11): 713-717. 4 ref.

In a study on the combining ability of lines of sorghum, variance due to gca was found to be the predominant cause of variation in the expression of most of the characters, including grain yield. The most superior female for yield and other attributes was '2077A'. Among lines, 'M 13', 'M 28' and 'M 25' appeared promising combiners. The Fls of '2219A' x 'M 9', '2219 A' x 'M 33', '2219A' x 'M l' and '36A' x 'M 25' had significant positive effects of specific combining ability (sca). The per-se performance of '2077A' x 'M 28'. '2077A' x 'M 13', '2077A' x 'M 25' and '2077A' x 'M 11' was good. They had desirable sea effects for other characters also.

0385 PATIL, R.C.. and THOMBRE, M.V. 1982. General combining ability effects in sorghum. Sorghum Newsletter 25: 90-91. 1 ref.

0386 PATIL, R.C., and THOMBRE, M.V. 1982. Genotypic path coefficients in F1 and F2 of sorghum. Sorghum Newsletter 25: 89.

An experiment of 36 F1s and 36 F2s, obtained from crossing nine varieties viz.. 148/168. SB 1066. IS 3924. IS 3922(405). 370. S Girl MR 1. EC 92792. PD 2-5 and IS 6394 in all possible combinations (excluding reciprocal) was grown at College of Agriculture, Pune. during rabi 1979, with three replications. The data pertaining to components of panicle and grain yield/plant were collected from the plant selected at random and analyzed for genotypic path coefficients, separately for Fl and F2s.

0387 PATIL, R.C.. DESHAMANE. N.B., and PARATHBADI. G.S. 1982. Genetic variability in a 3 x 4 line x tester set of sorghum. Sorghum Newsletter 25: 88-89.

Twelve Fl combinations obtained from crossing four male parents (IS 3924. IS 2930-75. IS 9986 and IS 3691) with Gm2-3-l. IS 1122 and IS 6394 were grown in randomized block design with three replications, at Agricultural Research Station. Mohol (Solapur). in rabi season, a single row of 5m length of each Fl combination was planted and each row was spaced 45 cm apart. The observations were recorded from five plants selected at random from each Fl combination. Different genetic parameters were calculated and presented.

0388 PATIL. R.C.. DESHAMANE.N.B.. and BAPAT. D.R. 1982. Line X tester analysis of combining ability in sorghum. Journal of Maharashtra Agricultural Universities 7(2): 132-134. 5 ref.

A trial with 21 Fl combinations resulted from crossing seven male parents to M 36045, PD 3-1-11 and CS 3541 (R 6), was laid out in three replications to estimate heterosis and assess the combining ability for quantitative characters. Most of the combinations produced good amount of heterosis over mid and better parents. The g.c.a. variances were higher in magnitude compared to s.c.a. variances for all the characters except panicle weight and grain weight, indicating the presence of additive gene action for these characters. Epistatic gene action was observed for panicle and grain weight. Low heritability was observed for number of secondaries, panicle and grain weight. PD 3-1-11 and SPV 86 were observed to be the best general combiners for all the characters except SPV 86 for number of primaries. M 36045 x FR 129, M 36045 x Gm 1-5 (except for 100 grain weight). PD 3-1-11 x FR 167. PD 3-1-11 x SPV 102 (except for number of secondaries). CS 3541 x FR 203 and CS 3541 x Hy66 were the best combinations for all the characters studied.

0389 PETERSON. G.A. 1982. Divergent selection for grain protein in a grain sorghum (Sorghum bicolor (L.) Moench) randommating population. Ph.D. thesis, Oklahoma State University, Oklahoma, USA. 76 pp.

A divergent selection study for grain protein was initiated in a grain sorghum randommating population. Identified high protein lines were composited and allowed to random-mate to form the base population. To form the initial high and low protein populations a 30% selection intensity was applied to each end of the population distribution from base population selections. During subsequent years the 30% selection intensity was applied to high protein selections in each grid of the high population and to low protein selections in each grid of the low population. Equal amounts of seed were bulked in each year to form the new populations. Analysis of variance for the replicated trials indicated significant selection differences for grain protein, yield, yield per panicle. 100 kernel weight, days-to-50%-bloom, and height.

0390 PETERSON, G.C., and WEIBEL, D.E. 1982. Divergent grain protein selection. Sorghum Newsletter 25: 28.

0391 PETERSON, G.C., and WEIBEL, D.E. 1982. Divergent selection for grain protein in a grain sorghum random-mating population. Agronomy Abstracts: 79.

Divergent selection for grain protein was conducted in a grain sorghum random-mating population. New high and low populations were formed by selecting the 30% of the plants at the upper and lower ends of the population distribution for grain protein. Analysis of variance indicated significant selection differences for grain protein, yield, yield per panicle, 100 kernel weight, days-to-50%-bloom, and height. Grain protein was significantly increased in the high populations and exhibited an inconsistent downward response in the low populations. In the high populations yield decreased slightly while protein yield increased. Increased yield and protein yield of the low populations was attributed to significantly larger kernels. Grain protein was significantly negatively correlated with yield and displayed small, inconsistent correlations with protein yield. Yield and protein yield were significantly positively correlated. The correlations of protein yield with grain protein and yield indicated selection for protein yield could also achieve small positive gains in grain protein and yield.

0392 PETERSON, G.C., SUKSAYRETRUP, K.. and WEIBEL, D.E. 1982. Inheritance of some bloomless and sparse-bloom - mutants in sorghum. Crop Science 22(1): 63-67. 6 ref.

To determine the number of gene loci that condition the sparse-bloom and bloomless phenotypes and to determine the relationship among these mutants, four sparse-bloom and five bloomless sorghum lines were crossed in various combinations, and in combination with two normal bloom lines. Homozygous recessive alleles at two different loci conditioned the expression of bloomlessness. These genes were designated as bml and bm2. Expression of sparse-bloom was governed by homozygous recessive alleles at a minimum of three loci. These genes were designated hi, h2, and h3. The bloomless and sparse-bloom genes were not allelic and segregated independently.

0393 PETHINI, J.A., RAUPP, A.A.A., PORTO, M.P., and SILVEIRA JUNIOR, P. 1982. National trial of experimental grain sorghum, 1981/82. (Pt). Pages 12-14 In Annals of the eleventh technical yearly meeting of sorghum. Pelotas, RS Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

0394 PORRAS, E. 1982. Sorghum momentum: update on sorghum research: a champion producer, the state of Texas. World Farming 24(5): 14, 16-17, 30.

0395 PORTO, M.P., RAUPP, A. A. A., and SILVEIRA JUNIOR, P. 1982. Comparison of generations in grain sorghum. (Pt). Pages 28-33 In Annals of the eleventh technical yearly meeting of sorghum. Pelotas, RS Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

0396 PORTO. M.P.. RAUPP, A.A.A., and SILVEIRA JUNIOR, P.

1982, Preliminary trial of grain sorghum varieties. (Ft). Pages 25-27 In Annals of the eleventh technical yearly meeting of sorghum. Pelotas, RS Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

0397 PRING, D.R., CONDE, M.F., and SCHERTZ, K.F. 1982. Organelle genome diversity in sorghum: male-sterile cytoplasms. Crop Science 22(2): 414-421. 25 ref.

Seventeen sorghum cytoplasms, 16 of which were male-sterile, were compared by restriction endonuclease fragment analysis of mitochondrial (mt) and chloroplast (ct) DNA in a survey of cytoplasmic variation in sorghum species. The widely used male-sterile (milo) cytoplasm exhibited mt and ctDNAs which differed from normal, fertile (kafir) cytoplasm. Seven groups of male-sterile cytoplasms were differentiated by mtDNA restriction fragment differences, while only three were differentiated by ctDNA; thus a greater degree of variability of the mitochondrial genome is suggested. Strict maternal inheritance of mt and ctDNAs was demonstrated. Both organelle DNAs appear to share similar evolutionary relationships based on restriction fragment patterns. The potential utility of organelle DNA variation in the identification and differentiation of male sterility sources in sorghum is discussed.

0398 PRING. D.R., CONDE. M.F., SCHERTZ, K.F.. and LEVINGS, C.S. 1982. Plasmid-like DNAs associated with mitochondria of cytoplasmic male-sterile sorghum. Molecular & General Genetics 186(2): 180-184. 25 ref.

Plasmid-like, linear DNAs were detected in preparations of mitochondrial DNA from cytoplasmic male-sterile sorghum. Designated N-l and N-2. the DNAs exhibited molecular sizes of ca. 5.700 and 5,300 bp, respectively. The DNAs occurred in only the IS1112C entry among 24 entries examined. Electron microscopy of the DNAs indicated that the molecules were linear as isolated. Nick translation of N-l and N-2 followed by membrane hybridization indicated substantial homology between the two DNAs, and some homology to the S-l and S-2 maize plasmid-like DNAs. At least four additional DNA species, ranging from ca. 1,000-4,000 bp if linear, were also detected in sorghum mitochondrial DNA.

0399 QUINBY, J.R. 1982. Interaction of genes and cytoplasms in sex expression in sorghum. Pages 385-391 in Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru. A.P., India: ICRISAT. 26 ref.

0400 QUINBY, J.R. 1982. Sorghum genetics and breeding. Pages 763-767 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 20 ref.

0401 RAJKI-SHCLOSI, E. 1982. "GKI Remeny", a recently registered bird-resistant grain sorghum hybrid in Hungary. Sorghum Newsletter 25: 5-6. 3 ref.

For estimating bird damage, 12 grain sorghum hybrids with different tannin content put into trials in four replications at Szeged-Othalom in 1979 and 1980. Wile bird damage in GKI Remeny was minimal, GKI-2 was more than 95% destroyed. "GKI Remeny" is an extensive grain sorghum hybrid with early maturity and good productivity. On the basis of its tannin content, GKI Remeny is a bird-resistant hybrid.

0402 RANA, B.S., ANAHOSUR, K.H., RAO, V.J.M., PARAMESHWARAPPA. R.. and RAO. N.G.P. 1982. Inheritance of field resistance to sorghum charcoal rot and selection for multiple disease resistance. Indian Journal of Genetics and Plant Breeding 42(3): 302-310. 12 ref.

Six segregating and nonsegregating generations of three R X S and two S X S crosses were studied for charcoal rot resistance under epiphytotic conditions. CSV-5 (148/168) was comparatively the most resistant parent. The F1 showed partial dominance of resistance. The resistance appears to be a polygenic threshold character governed by duplicate epistasis with low heritability (38%). The F3 progenies transgress the parental limits. In absence of absolute resistance for charcoal rot, selection 2 S.D. below population mean (S.I. = 1%) results in selecting resistant transgressive segregates. Charcoal rot, SDM and leaf rust inherit independently. It is possible to combine these characters through simultaneous selection by choosing rust resistant plants from the segregating F3 progenies possessing $^1/_4$1% SDM and $^1/_4$10% charcoal rot susceptibility.

0403 RANA, B.S., RAO, V.J.M.. SINGH, V.U., INDIRA, S., and RAO, N.G.P. 1982. Breeding for multiple insect and disease resistance in sorghum. Page 745 In Sorghum in eighties; proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

Sorghum being predominantly a low input crop of the semi-arid tropics, the simultaneous incorporation of resistance to major pests and diseases in improved cultivars is essential to confer greater levels of stability to production. While individual sources of resistance have no doubt been documented, efforts have also been made recently to identify and develop sources exhibiting resistance to groups of pests and diseases. These will be documented. The mechanism governing resistance to most sorghum pests in nonpreference. Disease resistance in downy mildew and charcoal rot is a quantitative threshold character. The nature of inheritance is generally additive for threshold characters and for insect resistance. Stability of resistance is also under genetic control. It is possible to develop a genetic basis for multiple resistance and pyramid genes for resistance. The plant breeding implications of breeding for multiple resistance to sorghum pests and diseases will be discussed.

0404 RAO, K.E.P., and MENGESHA, M.H. 1982. Sorghum germplasm collection in Rwanda. Patancheru, A.P., India: ICRISAT. 28 pp. 4 ref. (Genetic Resources, progress report-46).

0405 RAO, K.E.P.. and MENGESHA, M.H. 1982. Zera-zera sorghums in Ethiopia. Sorghum Newsletter 25: 87-88.

0406 RAO, M.J.V., and RAO, N.G.P. 1982. A breeding procedure for combining high protein and high lysine with plump corneous seeds of sorghum. Pages 747 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

The transference of the high lysine trait to plump, corneous endosperm at normal protein levels is yet to be accomplished and distinct guidelines to breeders are not presently available. Based on a comprehensive study involving derived plump and shrivelled lines from the high lysine Ethiopian parentage and P-721, it has been possible to identify crosses which did not exhibit the general negative relationship between protein and lysine. The studies yielded data on criteria for choice of parents, the direction of the cross, character associations, nature of gene action and mating systems.

0407 RAO, M.J.V., CHIDLEY, V.L., and HOUSE, L.R. 1982. A three-stage screening methodology for Striga-resistance screening in the field. Paper presented at the All India Coordinated Sorghum Improvement Project Workshop, 17-19 May 1982, Pune, India. 14 pp.

0408 RAO, N.G.P., and RANA, B.S. 1982. Selection in temperate - tropical crosses of sorghum. Pages 403-419 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 72 ref.

0409 RAO, S.K., GUPTA, A.K.. and BAGHEL, S.S. 1982. Genetic variation and interrelationships of grain quality attributes with agronomic traits in sorghum. Agricultural Science Digest 2(3-4): 147-150.

0410 RAO, S.K.. GUPTA, A.K., BAGHEL, S.S., and SINGH. S.P. 1982. Combining ability analysis of grain quality in sorghum. Indian Journal of Agricultural Research 16(1): 1-9. 11 ref.

A Line X Tester cross trial with five male sterile lines crossed with 4 male parents resulting into 20 hybrids of sorghum was conducted during kharif season of 1975 to assess the combining ability of parents and to arrive at the best combinations. Additive gene action was predominant for 100-seed weight. Non-additive gene action was predominant in the expression of seed density, protein (moisture free), oil, reducing sugars and total polysaccharides. High heritability estimates were recorded for 100 seed weight; medium heritability for non-reducing sugars, oil, total polysaccharides, methionine and protein; whereas low heritability estimates for seed density and tryptophan. 61-9-1 was the best male parent for the balanced protein containing better levels of essential amino acids. 1036A X 61-9-1 was the best combination with regard to balanced composition of quality attributes.

0411 RAO, V.J.M., REDDY, B.B., EKLADIOUS, K.G., RANA, B.S., and RAO. N.G.P. 1982. Basis for further improvement of parental lines of sorghum hybrids. Indian Journal of Genetics and Plant Breeding 42(1): 60-63. 5 ref.

An attempt has been made to develop a basis for further improvement of male and female parents for future commercial sorghum hybrids. With respect to female improvement, compared to B X B crosses, B X R crosses offered greater scope for improving yield, grain quality and resistance to stem borer. The B X R and R X R crosses have been found to be generally superior to B X R indicating limited B variability among B lines.

0412 RAUPP, A. A. A., PETRINI, J.A., PORTO. M.P., and SILVEIRA JUNIOR, P. 1982. National trial of grain sorghum, 1981/82. (Pt). Pages 7-9 In Annals of the eleventh technical yearly meeting of sorghum. Pelotas, RS Brazil: Unidade de Execucao de Pesquisa de Ambito Estudual de Pelotas.

0413 RAUPP, A.A.A.. SILVEIRA JUNIOR, P., BRANCAO, N., PETRINI, J.A., PORTO, M.P., VIEIRA, R.E.. SOARES, G.J. DOS S., CHIELLE, Z., and ARANHA, M.T.M. 1982. Grain sorghum trial in Rio Grande do Sul, 1981/82. (Pt). Pages 15-24 In Annals of the eleventh technical yearly meeting of sorghum. Pelotas, RS

Brazil: Unidade de Execucao de Pesquiea de Ambito Estadual de Pelotas.

0414 REDDI. T.V.V.S.. and PRABHAKAR, G. 1982. Azide induced seedling injury in parents and hybrid of grain sorghum. Sorghum Newsletter 25: 96-97, 1 ref.

0415 REDDY, B.B., and RAO, N.G.P. 1982. Bridging the gap between hybrid and varietal performance in sorghum. Indian Journal of Genetics and Plant Breeding 42(1): 64-69. 5 ref.

Growth analysis of several sorghum hybrids and improved cultivars was carried out to assess the progress made in varietal improvement. Compared to CSH-1, the first commercial hybrid, the performance of improved varieties like SPV-221 and SPV-314 was superior, but much headway needs to be made before attaining performance levels of CHS-5 or CSH-9. At comparable heights and maturities, improvement in total biomass production with out detriment to harvest index leads to higher order yields. There are indications that marked yield superiority and stability of performance may be positively related but more critical studies are needed to establish this.

0416 REDDY, C.S.. and SMITH, J.D. 1982. Internode length in height mutants of sorghum varieties, TX-414 and NM-31. Indian Journal of Heredity 14(1-4): 25-31. 14 ref.

Tall mutants were isolated in sorghum varieties, TX-414 and NM-31 treated with gamma rays, hydrazine and their combinations along with cysteine used as post-treatment modifier. In the mutants there is no increase in the number of nodes compared to control but the increase in length of all internodes contributed to the tallness of the mutant plants. Based on total height of the mutants in comparison with control, mutants were calssified as 1-dwarf and 2-dwarf while the controls were of 3-dwarf types. Also based on internodal length and their contribution towards the total height of the plants mutants are classified as having unimodal and ever increasing type of internodes while both TX-414 and NM-31 are of ever-increasing types.

0417 REDDY, C.S., and SMITH, J.D. 1982. Mutational studies in sorghum. Page 746 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

In sorghum, induced mutagenesis as a tool for genetic improvement has made only a beginning. Seeds of grain sorghum (Tx-414) were treated with various doses of gamma rays, hydrazine (HZ) and ethyl methanesulphonate (EMS) singly and in combinations, with and without cysteine used as a pre and posttreatment modifier. Hydrazine was found to be a more potent mutagen compared with EMS and gamma rays based on induction of chlorophyll and morphological mutations in the M2 generation. Cysteine by itself had no toxic effect in Ml nor induced any mutations in the M2, but when used as pre- and posttreatments of gamma irradiated and hydrazine treater material, it afforded protection against seedling injury caused by gamma rays and HZ, and also increased the recovery of chlorophyll and morphological mutations compared with single treatments. Treatments of gamma rays, EMS and HZ in all possible combinations produced less than additive effects for the induction of mutations.

0418 REDDY, C.S.. BALASIVUDU,Y., REDDY. M.S.S., and REDDY, B.M. 1982. Mutagenic effects of sodium azide on various Ml characteristics in two varieties, M

35-1 and Kodali of sorghum. Sorghum Newsletter 25: 92.

Mutagenic effects of sodium azie (0.001M, 0.002M and 0.003M) prepared in 0.01M phosphate buffer, at two pH levels, 4.8 and 6.4 were studied on dry and pre-soaked (4 hours and 8 hours) seeds of two local varieties of sorghum, M 35-1 and Kodali. In Ml generation, a decrease in seed germination and plant survival was observed with increasing concentrations of the mutagen, but decreasing trend was observed with Kodali. The frequency of chlorophyll deficient mutants (Striata, Albo-viridis and Maculata) were more in M 35-1 than in Kodali. A greater reduction in seed germination and survival was observed with 4.8 pH in Kodali variety compared to 6.4 pH, but in M 35-1, a geater reduction in seed germination and plant survival was observed with 6.4 pH compared to 4.8 pH in Ml generation. In both the varieties, a greater seedling damage was observed in pre-soaked seed than with dry *seed* mutagen treatment.

0419 REDDY, M.N.. and CHETTY, C.K.R. 1982. Effect of plot shape on variability in Smith's variance law. Experimental Agriculture 18(4): 333-338. 5 ref.

Fairfield Smith's variance law is extended to study simultaneously the effect of plot size and its rectangularity (which quantifies shape) on variance. This model is fitted to two seasons' data on sorghum grain yield generated from uniformity trials under rainfed conditons. Some implications of the fitted model are discussed.

0420 REGER, .B.J., and JAMES, J. 1982. Pollen germination and pollen tube growth of sorghum when crosses to maize and pearl millet. Crop Science 22(1): 140-144. 6 ref.

Sorghum pollen germinated on and penetrated the stylar tissue in both maize and pearl millet. While the majority of pollen germination occurred on the stigma, germination was observed on all parts of the gynoecium, stigma, style, and ovary, in both genera. Pollen tubes behaved erratically in styles and usually were short. Individual pollen tubes of up to 15 mm long were observed in maize, and up to 6 mm long in pearl millet. In intact maize and pearl millet X sorghum crosses 0.1 to 0.2% of the gynoecia examined had pollen tubes in the ovary with less than half being observed at the micropyle. Such observations, evan at low frequency, indicate that delivery of the sorghum male gamete is physically possible after regular pollination in both maize and pearl millet.

0421 ROSENOW, D.T., and CLARK, L.E. 1982. Drought tolerance in sorghum. Annual Corn and Sorghum Industry Research Conference 36: 18-30. 40 ref.

0422 ROSENOW, D.T., and FREDERIKSEN. R.A. 1982. Breeding for disease resistance in sorghum. Pages 447-455 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 6 ref.

0423 ROSENOW, D.T., CLARK, L.E., and WOODFIN. C.A. 1982. Screening for drought tolerance in sorghum using field nurseries. Agronomy Abstracts: 81-82.

Breeding lines of sorghum were screened for drought tolerance in large field drought screening nurseries in West Texas the past three years. The five major nursery sites were at different locations with different soil types and temperature regimes. Soil moisture was manipulated by timing of irrigation and planting date. Two distinct drought responses were identified. One is when plants were stressed prior to flowering, while the other is when plants were stressed during grain fill. Excellent sources of tolerance to both types were identified. The different nurseries used with different stress environments, different planting dates. and different moisture regimes to insure stress during either the pre-flowering or post-flowering stage. Numerous standard checks were used throughout the nurseries along with furrow diking to reduce plot to plot variability. The distinct drought responses identified were repeatable from year to year. Significant progress has been made in developing sorghums with pre- and post-flowering drought tolerance.

0424 ROSS, W.M., GORZ, H.J., and HASKINS, F.A. 1982. The effect of the sugary gene on stalk sweetness in hybrids. Sorghum Newsletter 25: 99. 1 ref.

0425 RUTTO, J.K. 1982. The status of sorghum improvement in Kenya-general. Pages 85-98 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa. 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0426 SADAQUATH, S., PALLED, Y.B., SEIKH, M.K., and JAYANNA, M. 1982. SPH-210. 211 and 212- promising rabi hybrid sorghums for transition tract of Karnataka state. Research Bulletin of Marathwada Agricultural University 6: 27-29. 2 ref.

20 sorghum hybrids grown under rainfed conditions gave yields of 1.43-4,13 t grains and 3.21-13.02 t fodder/ha; both yields were the highest in SPH-212, followed by SPH-211 and SPH-210 with 3.97 and 3.77 t grains, respectively.

0427 SAEED, M., and FRANCIS, C.A. 1982. Yield stability in relation to maturity in grain sorghum.Agronomy Abstracts: 82.

Yield stability in relation to maturity (early, medium, late) of 54 grain sorghum genotypes was studied in Nebraska and Kansas across 48 environments. A stability analysis was done for each maturity group and for all genotypes without grouping by maturity. Simple correlation coefficients between stability parameters and number of days to flowering were computed. The largest proportion of significant genotype x environment and genotype x environment(linear) interaction was due to differences among maturity groups. Stability analysis for all genotypes ignoring maturity groups revealed significant correlation (r=0.94) between regression coefficient(b) and days to flowering which suggested that genotypic response to environments was largely a function of maturity. Separate stability analysis for a maturity group showed stable genotypes in each group, but proportionately fewer in the late group, A combined analysis without grouping failed to detect this stability of individual genotypes.

0428 SAINI, M.L.. PARODA, R.S., and CHOWDHURY, J.B. 1982. Pachytene analysis in six species of Eu-Sorghum and their hybrid. Cytologia 47(3-4): 451-456. 23 ref.

Critical analysis of chromosomes at pachytene and later stages of microsporogenesis in six different species of Eu-Sorghum namely S.vulgare, S.durra, S. caudatum, S. roxburghii, S. sudanense and S. virgatum and their 15 Fl hybrids were made. The hybrids involving one wild and one cultivated species showed relatively higher proportion of chromosomal abnormalities than those involving either both cultivated or both wild species. Pachytene pairing was found to be complete and apparently normal in two S. sudanense

X S. durra and S. caudatum X S. roxburghii hybrids. Pachytene analysis in remaining 13 hybrids revealed the presence of some minute, though cytologically detectable. structural differences such as terminal as well as interstitial non-paired regions, small duplications and terminal deletions, and differential segments between the parental species. In spite of the existence of these meiotic irregularities in some hybrids, the subsequent stages of meiosis were quite normal leading to good seed setting. Cytogenetical mechanisms underlying species differentiation in the genus are discussed.

0429 SARADA MANI, N. 1982. EMS (ethyl methanesulfonate) induced morphological mutants in grain sorghum. Sorghum Newsletter 25: 97-98. 2 ref.

0430 SATO, H. 1982. Introduction of new varieties of summer crops, (Sorghum). (Ja). Japanese Journal of Breeding 32(4): 394.

Suzuho, an F1 hybrids of MS21 Redbine selection 3048 A X Nagashina 168 Senkinhaku, is a midseason variety, with good adaptability to late sowing with intermediate height, better lodging resistance and grain yields are higher than those of grain varieties.

0431 SAXENA. S., and DABHOLKAR, A.R. 1982. Stability of yield components and their effects in sorghum. Genetica Agraria 36(3-4): 269-276. 11 ref.

A total of fourteen genotypes, including several hybrids, was evaluated at four sites Indore, Khandwa. Khargone and Powarkheda, India for grain yield and three yield components. Yield and stability were better for hybrids than for varieties.

0432 SCHERTZ, K.F.. and PRING, D.R. 1982. Cytoplasmic sterility systems in sorghum. Pages 373-383 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 30 ref.

0433 SHAHANE, T.G., and B0RIKAR, S.T. 1982. Character association and path analysis in winter sorghum. Indian Journal of Agricultural Sciences 52(7): 429-431. 3 ref.

Eighty hybrids of sorghum along with their 18 parents were studied in winter for genotypic correlations and path coefficient analysis. Grain yield showed positive correlation with most of the characters, but non-significant correlation with days to flowering and grain size. Path-coefficient analysis showed that panicle weight had the highest positive direct effect on grain yield, followed successively by number of secondaries/panicle, panicle length and grain size. Improvement in grain yield in winter sorghum would hence be possible through selection for panicle weight and number of secondaries/panicle.

0434 SHAHANE, T.G., and BORIKAR, S.T. 1982. Note on path analysis in sorghum. Indian Journal of Agricultural Sciences 52(11): 788-789. 2 ref.

0435 SHAHANE, T.G., BAPAT, D.R., and BORIKAR, S.T. 1982. Combining ability in winter sorghum. Sorghum Newsletter 25: 13-14.

0436 SHEPEL, N.A., and ARISTARKHOVA, M.L. 1982. Effect of stand density on the variability of quantitative characters in heterotic hybrids of grain sorghum. Biulleten' - Vsesoiuznyi Institut Rastenievodstva 124: 44-47.

0437 SHINDE, V.K.,

NANDANWANKAR, K.G., AMBEKAR, S.S., and PIMPRIKAR. Y.K. 1982. Annual report of research work done on sorghum breeding, 1981-82. Parbhani, Maharashtra, India: Marathwada Agricultural University. 29 pp.

0438 SHINDE, V.K.. NANDANWANKAR, K.G., AMBEKAR, S.S., and PIMPRIKAR, Y.K. 1982. Evaluation of sorghum germplasm for grain yield. Sorghum Newsletter 25: 14-15.

Four hundred cultures of 12 races were screened for grain yield, pearly endosperm, plant height, days to 50% flowering and grain size at the Sorghum Research Station, Parbhani during kharif 1979. Each culture was planted in two replications of single-row plot of 4.0 meter length. A line of CSV-4 was planted as a check after each 20 entries. Normal experimental practices were followed. Five plants in each entry were randomly selected, and plant height, cob length, grain yield, and days to 50% flowering were recorded. Maximum range of variability for grain yield was observed in the Durra group (2.50 to 45.60) followed by Dochna (4.55 to 48.80) with the least variability in Dochna nigricans (6.35 to 7.50). Durra group cultures were found to be significantly superior for grain yield over CSV-4. The cultures in Bicolor-sorgos, Dochna-roxburghi, Nervosum-caudatum, Nervosum-dochna and Dochna-kafir groups exhibited inferiority to CSV-4.

0439 SHIVANNA, H., PARAMESHWARAPPA, R., and KULKARNI, K.A. 1982. SPV-456-An earheadbug-resistant variety. Sorghum Newsletter 25: 7.

SPV-456, a selection from the cross CS-3541 x SB-1079, has been found to exhibit a remarkable degree of field resistance to earheadbug Calocoris angustutus during Kharif 1981 at the Regional Research Station, Dharwad. This variety flowered in 79 days, matured in 128 days, and grew to a height of 240 cms. The grain and fodder yield potential of the variety was 5926 and 10796 kg/ha.

0440 SIS0DIA, N.S., GUPTA, Y.K., and HENRY, A. 1982. Note on path coefficient analysis of grain yield in sorghum. Madras Agricultural Journal 69(10): 687-689. 8 ref.

0441 STANLEY, B. 1982. Time and patience: the keys to new sorghum varieties for Central America. IDRC Reports 11(3): 16-17.

0442 TARUMOTO, I. 1982. Expressed plant-parts of glossiness controlled by g1 gene. Sorghum Newsletter 25: 88.

0443 TARUMOTO, I. 1982. Pleiotropic effects of gl glossy gene in sorghum on leaf structure, leaf digestion, and disease resistance. Page 745 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

Some of the pleiotropic effects of the gl glossy gene in sorghum were examined. The outer-side cell walls of cuticles of glossy leaves in SC-112 and Rancher were observed to be thicker and harder than those of nonglossy leaves in Zairai-Token. The nonglossy isogenic plants were always somewhat higher in leaf digestibility than the glossy isogenic plants. This suggests that the thicker and harder cell walls of cuticles in the glossy leaves would be more resistant to the attack of cellulose enzymes than the highly dense epicuticular waxes on the nonglossy leaf surfaces. The relationship between glossiness and resistance to sorghum leaf blight suggests that the resistant gene to leaf blight would be independently inherited of the gl glossy gene.

0444 THOMBRE, M.V., PATIL. R.C., and JOSHI, B.P. 1982. Association of panicle components with grain yield in sorghum. Sorghum Newsletter 25: 17-18.

In order to study the association of panicle components on grain yield, the trials of nine varieties (148/168. SB1066. Swarna. IS-3922(405), 370, PD 2-5, S Girl MR 1, EC 92792. and IS-6394) with three replications were carried out at the Agricultural Research Station, Mohol. and College of Agriculture. Pune. during the winter of 1979. The observations on panicle components were collected and pooled over two locations. The data were analyzed for genotypic and phenotypic correlation coefficients and path analysis. From the present investigation, it can be concluded that panicle length, panicle girth, number of primaries and secondaries, panicle weight, and 1000-seed weight influenced, either directly or indirectly, grain yield/plant and showed the importance of these components in grain yield.

0445 TONGDEE. A.. and BENJASIL, V. 1982. Varietal testing for some upland crops like corn, sorghum and legume in Thailand. College, Laguna, Philippines: IRRI. 10 pp.

0446 TOURE, A.B., and SCHEURING, J.F. 1982. Presence of male sterility maintainer genes in local sorghum varieties in Mali. (Fr). Agronomie Tropicale 37(4): 362-365. (Summaries:En, Es).

0447 TRAORE, L., and MILLER F.R. 1982. Population study of tropically adapted sorghum. Sorghum Newsletter 25: 35.

0448 TRIPATHI, D.P., DONGRE, A.B., MEHTA, S.L., and RAO, N.G.P. 1982. Soluble protein and esterase isoenzyme pattern on isoelectric focussing from seeds and anthers of diverse cytoplasmic genic male sterile sorghums (Sorghum bicolor L. Moench). Zeitschrift fur Pflanzenzuchtung 88(1): 69-78. 15 ref.

Soluble protein and esterase isoenzyme patterns from seeds and anthers of cytoplasmic-genic male sterile sorghums have been studied by isoelectric focussing. Qualitative and quantitative differences were observed in soluble protein patterm from seeds of male steriles, maintainers, fertility restorers and an apomictic lines. Esterase iso-enzyme pattern of milo based male steriles differed from male steriles of diverse Indian origin. Soluble protein pattern from anthers of B-lines showed many bands with isoelectric point higher than 5.37 which were absent in anthers of A-lines. Acidic proteins present in male sterile anthers were also present in their counterpart B-lines though their concentration differed. Esterase isoenzyme from anthers also differed.

0449 TRIPATHI, D.P., MEHTA, S.L., and RAO, N.G.P. 1982. Biochemical basis of diverse cytoplasmic genetic male steriles in sorghum. Page 754 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

Study of soluble protein and isoenzyme in seeds and amino acids in anthers of different steriles, maintainer and restorer lines showed characteristic differences. Based on esterase pattern, male steriles with diverse cytoplasm could be organized into three groups: (a) CK-60 A and B, (b) M-35-1 A and B, and (c) G-1A and B, VZM-2A and B. Comparison of amino acids from anthers of A vs B lines showed lower contents of histidine, threonine, glutamic acid, glycine, leucine and phenyl alanine and higher contents of alanine, serine, proline and tyrosine in A lines than B lines. VZM-2 pollen shoved resemblance to G-1 pollen but differed from both CK-60 and M-35-1 pollen in shape. size and exine sculpture. The pollen from male-sterile lines were more or less devoid of protein and starch particles.

0450 TRIPATHI, D.P., MEHTA, S.L.. NAMPRAKASH, and RAO, N.G.P. 1982. Characterization of diverse sorghum male sterile pollen grains by scanning electron microscopy. Indian Journal of Genetics and Plant Breeding 42(1): 75-81. 7 ref.

Pollen grain shape and size, exine sculpture and internal structure as revealed by scanning electron microscopy of pollen from diverse sorghum cytoplasmic-genetic male sterile and their maintainer lines showed distinct differences VZM2 pollen showed resemblence to GI pollen but differed from both CK 60 and M 35-1 pollen. CK60 pollen exine sculpture showed differences from that of M35-1 pollen. The pollen from male sterile exine lines were more or less devoid of protein and starch particles. The grouping of sorghum lines based on pollen structure corresponds to the grouping based on genetic and biochemical studies.

0451 UJIHARA, K., HOSHINO, T., and ONO, S. 1982. Screening for pre-harvest germination of grain sorghum. Sorghum Newsletter 25: 131.

0452 VADHER, P.V., DESAI, K.B., and RAWAL, P.P. 1982. Gamma rays induced increased seed index in sorghum (Sorghum bicolor (L.) Moench). Sorghum Newsletter 25: 94-95.

0453 VAKHNENKO, V.V. 1982. Promising varieties and hybrids of grain sorghum for cultivation in the northern part of the aral sea area. Biulleten' - Vsesoiuznyi Institut Rastenievodstva 118: 32-34.

0454 VALDES. A., and MILLER, F.R. 1982. Correlations between sorghum grain yields and various agronomic characteristics at three locations. Sorghum Newsletter 25: 36.

0455 VIATOR. H.P., BOQUET, D.J., BROWN, L., HUTCHINSON, R.L., MARSHALL, J.G., and RABB, J.L. 1982. Performance of grain sorghum hybrids in Louisiana. Pages 45-57 In Report of Projects - Lousiana Agricultural Experiment Station, Department of Agronomy, USA.

0456 VIATOR, H.P., BROWN, L., HUTCHINSON, R.L., MARSHALL, J.G.. and RABB, J.L. 1982. Performance of grain sorghum hybrids in Louisiana, 1982. Pages 110-120 In Report of Projects - Lousiana Agricultural Experiment Station, Department of Agronomy, USA.

0457 VIEIRA, R.E. 1982. Results of the national trial of grain sorghum in Cruz Alta, Rio Grande do Sul, 1981/82. (Pt). Pages 10-11 In Annals of the eleventh technical yearly meeting of sorghum. Pelotas, RS Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

0458 WEBSTER, O.J. 1982. Sorghum genetic studies. Sorghum Newsletter 25: 98.

0459 WEIBEL, D.E.. SOTOMAYOR-RIOS, A., PAVA. H.M., and MCNEW, R.W. 1982. Relationship of black layer to sorghum kernel moisture content and maximum kernel weight in the tropics. Crop Science 22(2): 219-223. 8 ref.

Three male lines of sorghum were each crossed onto three female lines to produce nine hybrids. These hybrids and the three male lines were used to study the relationship between black layer formation and maximum dry weight and moisture content. Kernels were collected from the top, middle, and bottom portions of sorghum panicles at two stages of maturity to obtain two samples of kernels before and two samples after black layer formation. The object of this study was to determine if black layer formation could be used as an index of moisture content and of physiological maturity under tropical conditions. Black layer formation and maximum dry weight occurred at the same time or within one maturity stage in most cases. Moisture content of the kernels at black layer formation varied with hybrids and lines.

0460 WOODRUFF, B.J., CANTRELL, R.P., AXTELL, J.D., and BUTLER, L.G. 1982. Inheritance of tannin quantity in sorghum. Journal of Heredity 73(3): 214-218. 18 ref.

The vanillin assay was used to estimate the seed tannin content of 13 F2 populations of sorghum. The analysis revealed an intermediate to high broad-sense heritability for tannin quantity. Similar F2 segregation patterns in many of the crosses suggested that relatively few genes control this trait. High tannin was found to be dominant to low tannin. Classification of the F2 based on the parental and F1 ranges of catechin equivalents suggested one or two genes were segregating in most crosses, although different gene loci or alleles appeared to exist. However, comparing the expected distributions within each phenotypic class to the observed F2 distributions indicated one or two gene models were inadequate to explain the data.

0461 WOREDE. M. 1982. Brief description of the Plant Genetic Resource Centre. Ethiopia. Pages 24-30 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa, 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0462 WOREDE, M. 1982. The Plant Genetic Resources Centre of Ethiopia (PGRC/E). PGRC/E.ILCA Germplasm Newsletter 1: 2-3.

Presented the activities of, the Plant Genetic Resources Centre, which was established in 1976 in Addis Ababa. The centre houses some 21 000 accessions (mainly cereals and pulses) of which 5000 are sorghum lines.

0463 WU, T.P. 1982. Comparative karyo morphology of 2 species in the subgenus Para sorghum. Proceedings of the National Science Council, Republic of China (Part B Basic Science) 6(3): 319-325.

In morphological comparison, the awn length, sessile spikelet size, pediceled spikelet sex and rhizomatous character appear to be the outstanding morphological characters distinguishing S.nitidum from S.versicolor, both belonging to subgenus Para-sorghum. Pachytene analysis and comparison between these two species indicate that their karyotypes are essentially similar. None of the attempts to obtain an inter specific hybrid between these two species has been successful. Moreover, it is shown that they are isolated from each other geographically. Based on these morphological, cytological, breeding and geographical data, the phylogenetic relationships between them are discussed. The phenomenon of a low mean number of chiasmata in S.nitidum and a higher value for S.versicolor was noticed at diakinesis and was considered to be a reliable cytological criterion distinguishing these two species.

0464 XIE, X.S., and BI, Z.B. 1982. Genetic study on aphid resistance in sorghum. (Ch). Journal of the Agricultural Association of China 117: 6-14. 12 ref. (Summary:En).

0465 XU, B.Y., and ZHAO, S.T. 1982. Inheritance of extrashort leaf in a sorghum cultivar, Shuike 001. (Ch). Hereditas, China 4(5): 13-15. 1 ref.

The analysis of F1 and F2 of crosses of Shuike 100, with erect leaves about 30 cm long, and five varieties with long lax leaves indicated that the cahacter short, erect leaf was controlled by a single pair of recessive alleles.

0466 YORK, J.O. 1982. Arkansas grain sorghum performance tests for 1981. Mimeograph Series Arkansas Agricultural Experiment Station, 297. 16 pp.

0467 ZAKE, V.M. 1982. The status of sorghum improvement in Uganda. Pages 141-150 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa, 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0468 ZAVALA GARCIA, P. 1982. Effect of the inter-relation between the physiotechnical characters of the hybrid and its progenitors on the yield in grain and the assessment of genetical parameters of grain sorghum. (Es). Thesis, Centro de Genetics, Colegio de Postgraduados, Chpingo, Mexico. 310 pp.

0469 ZHANG. K.. and FU, H. 1982. Effect of high temperature on fertility of the male sterile lines in sorghum. (Ch). Acta Genetica Sinica 9(1): 71-77. 6 ref. (Summary:En).

Fertile yellow anther and normal seeds were produced from plants of male sterile lines in sorghum treated by high temperature. The critical temperature was 39-40 deg C and it was the pollen-mother-cell stage sensitive to this effect. Induction of fertile yellow anthers in male sterile lines by high temperature revealed that the plants itself contained the substances to form fertile yellow anther, and the male fertile gene was normal, even though they may be inhibited by some inhibitors. This was proved by isozyme electrophoresis bands patterns of yellow fertile and white sterile anthers of male sterile lines in uninucleate pollen stage that were similar to those of the normal plants of the maintainers. When samples were taken at trinucleate pollen stage, some bands of the white anthers disappeared, while those of the yellow anthers of male sterile line were still maintained as in male fertile lines i.e., the maintainer.

AGROCLIMATOLOGY

0470 ARZE. B.J. 1982. Agriculture in regions with a summer interstitial drought in E1 Salvador. (Es). Materiales de Ensenanza 13: 230-248. 10 ref.

0471 AVASARMAL, B.C.. BHARAMBE, P.R., and SHINDE. J.S. 1982. Soil moisture extraction pattern of different crops grown on vertisol under rainfed condition. Journal of Maharashtra Agricultural Universities 7(2): 125-129.

The moisture extraction pattern of groundnut, cotton, hybrid jowar and moong crops grown on vertisol and their effect on soil moisture depletion was studied under field condition. Maximum amount of water was extracted by groundnut from 0-30 cm depth and by hybrid jowar from 0-45 cm depth. In case of cotton, considerable depletion of water was also observed in 60-90 cm zone. Water depletion pattern in moong and fallow was more or less similar. The residual available water content in 0-90 cm soil profile was maximum under moong and fallow i.e., 13.90

and 14.50 cm respectively. While in other crops it was only 50% that of moong and fallow. Hybrid jowar yielded maximum (20.17 q/ha) followed hy H-4 cotton (13.03 q/ha). while moong recorded the lowest yield.

0472 AVELAR. T.M.. OLIVEIRA. I.B. DE.. and PEREIRA. L.S. 1982. Considerations in the calculation of crop water requirements in relation to production levels. (Fr). Hommes, Terre et Eaux 12(47): 75-90. 25 ref.

Factors affecting maximum and actual evapotranspiration and yields of crops and their implication in models to calculate crop water requirements are discussed with reference to research on sorghum and maize.

0473 FRANCIS. C.A.. MOOMAW. R.S., NELSON, L.A., SAEED. M., and RAJEWSKI. J.F. 1982. Testing procedures for genotype-environment interaction in grain sorghum. Agronomy Abstracts: 67.

Efficiency of testing cultivars is a primary concern to plant breeders both in the public and the private sectors. From a set of 54 grain sorghum genotypes tested in Nebraska and Kansas over 48 environments in 1978 and 1979. calculated the theoretical standard error of a genotype mean for various combinations of years, environments and replications. This was done for the entire set of genotypes, and again after grouping by maturity. Increasing years is time consuming, especially for the commercial plant breeder, and results indicate that more than two years testing increased efficiency very little. Changing replications from two to three to four likewise had a minimal effect on the standard error of a genotype mean. Increasing number of locations was the most effective way to increase precision, but more than 10 locations did not improve the results enough to justify the increased cost. Grouping genotypes by maturity reduced the number of locations needed to give the same level of precision.

0474 GARAGORRY. F.L.. PORTO. E.R.. MOITA, A.W.. SILVA. A.S.. and FILHO, H.C. 1982. A study of sorghum production potential in the semi-arid tropic of Brazil. Brazil: EMBRAPA. 13 pp. 4 ref.

The paper presents the application of a computerized agroclimatic system to the study of sorghum production potential in the semi-arid tropic of Brazil. After a brief description of the system, the results obtained for a sample of counties are discussed. In particular, the paper illustrates the use of clustering techniques in connection to agroclimatic zoning. The use of the system in relation to complementary irrigation studies is also stressed.

0475 GARRITY, D.P.. WATTS. D.G.. SULLIVAN. C.V.. and GILLEY. J.R. 1982. Moisture deficits and grain sorghum performance: evapotranspiration-yield relationships. Agronomy Journal 74(5): 815-820. 22 ref.

A field experiment was conducted using a modified line source sprinkler system to establish treatments that resulted in several different evapotranspiration levels during each growth stage. The system was installed on a Valentine very fine sand in west central Nebraska. The specific objectives of the study were: 1) to determine the crop evapotranspiration-yield relationships for grain sorghum in, this location. 2) determine how the timing and intensity of water deficits affect this relationship. 3) compare the evapotranspiration-yield response of selected genotypes, and 4) to determine whether crop water use efficiency can be increased by judicious limited irrigation. In two seasons the relationship between evapotranspiration (EX) and grain yield (Y) or dry natter was linear, Evapotranspiration reduction under all conditions tested incurred some yield reduction.

0476 GARRITY. D.P.. WATTS. D.G.. SULLIVAN. C.Y.. and GILLEY. J.R. 1982. Moisture deficits and grain sorghum performance: effect of genotype and limited irrigation strategy. Agronomy Journal 74(5): 808-814. 13 ref.

The response of three selected sorghum hybrids to a wide range of timings and intensities of drought stress were studied in field experiments on a sandy soil in west central Nebraska. A modified line source sprinkler irrigation gradient was used to create the treatments. Yield reductions (41 to 45%) resulting from the gradual intensification of stress over the entire season were large but very similar among genotypes. Greater genotypic differences occurred in treatments in which irrigation was limited during only one or two growth periods. The genotypic rankings for yield were quite consistent over the range of treatments, with the hybrid of highest yield potential (RS 626) usually continuing to demonstrate superior yields under drought stress. The hybrid (NB 505) of lowest yield potential did not show a comparatively greater drought resistance (i.e.* a lower percentage yield reduction) under severe stress.

0477 GRIBKOVA. N.G.. and NATOCHIEVA. N.N. 1982. Influence of agrometeorological conditions on the growth, development and productivity of maize and sorghum. Biulleten' - Vseoiuznyi Institut Rastenievodstva 124: 34-38.

0478 HERBERT. S.W.. FUKAI. S.. and WILSON. G.L. 1982. Plant characteristics associated with high grain yield under high and low moisture availability. Sorghum Newsletter 25: 1.

In a field experiment the plant characteristics associated with high grain yield under good moisture conditions were determined. 20 hybrids were grown under high rainfall conditions at a density of 100.000 plants/ha in two planting patterns. 1-m and 0.33-m row widths. Several plant characteristics were measured at floral initiation, anthesis. and maturity.

0479 HORROCKS. R.D.. and YANG. A.Y.T. 1982. Soil temperature affects nutrient uptake by sorghum cultivars. Agronomy Abstracts: 122.

This study was conducted to evaluate the influence of temperature on nutrient accumulation in aerial portions of sorghum plants. In a greenhouse study. cooled-root and ambient soil temperatures were approximately 20 and 25C respectively. Plants were harvested at 8- and 12-leaf stages of development. At the 8-leaf stage, sorghum plants subjected to warm temperatures were significantly higher in concentration of N. P. Mg. and Cu whereas. Ca concentration decreased. Temperature did not have a significant influence on concentration of K. Zn. Fe. and Mn. At the 12-leaf stage of development, sorghum plants grown under warm temperature treatments were lower in concentration of N. K. Ca. Mg. Zn. Mn. and Cu than plants grown under the cooled-root treatment, while P and Fe did not respond to the temperature treatments.

0480 HUDA. A.K.S.. SIVAKUMAR. M.V.K.. VIRMANI. S.M.. and SEKARAN. J.G. 1982. Report of collaborative multilocation sorghum modeling experiment 1980-81. ICRISAT Agroclimatology Progress Report. 7. 73 pp.

0481 HUDA. A.K.S.. SIVAKUMAR. M.V.K.. VIRMANI, S.M.. and SEKARAN, J.G. 1982. Report of the collaborative multilocation sorghum modeling experiment (1978-1982). Patancheru, A.P., India: ICRISAT. 35 pp. 26 ref.

0482 HUDA, A.K.S., SIVAKUMAR, M.V.K., VIRMANI. S.M.. SEETHARAMA. N., SINGH, S., and SEKARAN, J.G. 1982. Environmental factors and modeling sorghum growth and development. Presented at the ICRISAT/WMO Symposium/Planning Meeting on the Agrometeorology of Sorghum and Millet in the Semi-Arid Tropics, 15-19 November 1982, ICRISAT, Patancheru, A.P., India.

0483 HUDA, A.K.S., SIVAKUMAR, M.V.K., VIRMANI, S.M., SEKARAN, J.G.. and SINGH, S. 1982. Role of simulating models in yield predictions - ICRISAT experience in modeling sorghum growth and development. Presented at the IRAT-ICRISAT Workshop on Water Management and Crop Production, 3-6 May 1982, IRAT, Montpellier, France.

The grain sorghum simulatiion model (SORGF) reported from Texas A & M University was selected for testing and validation to determine its utility for assessing sorghum production in the SAT, A brief description of the model is given, a collaborative multilocation sorghum modeling experiment which was initiated by ICRISAT in the 1979 rainy season to develop a data base to test and improve SORGF has also been briefly discussed. Several subroutines of the model that needed modification for the overall validation of the model in the SAT include light interception, phenology, dry matter accumulation and partitioning, soil water and leaf development.

0484 ICRISAT. 1982. Preliminary report of the ICRISAT/WMO Symposium/Planning Meeting on the Agrometeorology of Sorghum and Millet in the Semi-Arid Tropics. 15-19 November 1982, ICRISAT, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 40 pp.

0485 KANEMASU, E.T., SINGH, P., and CHOUDHRY, U.N. 1982. Water use and water use efficiency of pearl millet (Pennisetum americanum (L.) and sorghum (Sorghum bicolor L. Moench).). Presented at the ICRISAT-WMO Symposium/Planning Meeting on the Agrometeorology of Sorghum and Millet in the Semi-Arid Tropics, 15-19 November 1982, ICRISAT, Patancheru, A.P., India.

0486 KEIM. K.R., MOHAMED, S.. HOPPER, N.W., and QUISENBERRY, J.E. 1982. Genotype by environment interaction of sorghum (Sorghum bicolor L. Moench) for yield and morphological traits. Agronmy Abstracts: 71.

Eight diverse inbred lines were used in a replicated field experiment conducted over two years in each of two water levels designed to provide optimal and suboptimal water conditions. Highly significant differences were observed in both years among inbred lines for all traits measured. Significant genotype by water level interaction occurred for several traits within each year. In both years, number of leaves and panicles per plant indicated no significant genotype by water level interactions. Significant differences between water levels were observed for most traits in year one, characterized by generally hot and dry environmental conditions during the entire season. Year two, being hot and dry early with cool, wet conditions later, resulted in significant differences between water levels for morphological traits, but not yield and yield components. With this wide range of environmental conditions, some inbreds were capable of maintaining rather stable yield production, and in some cases increased yield if additional water became available.

0487 LIRA, M. DE A. 1982. Influence of rainfall on grain and stover sorghum yields. Pages 741-742 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India:ICRISAT. (Abstract)•

A study was conducted aiming at the determination of the influence of rainfall on grain and stover sorghum yields. The study was carried out without any supplementary irrigation. It included nine environments and three varieties in each of two locations of semi-arid Pernambuco, Brazil. Results indicated that stover yield was highly significant and correlated with total rainfall during the crop cycle. For each mm of rainfall, stover yield increased 23.7 kg/ha. There was no clear response to rainfall for grain yield. In one of the locations, grain yield was significantly correlated with rainfall in the first 60 days after planting, as well as with rainfall from the 40th to the 70th day of the crop cycle. For the other location, the correlations were generally not significant. For each mm of rainfall from the 40th to the 70th day after seeding, grain yield increased from 10 to 52 kg/ha.

0488 LOGAN. J. 1982. The agroclimatology of grain sorghum hybrids adapted to the Great Plains USA. Proceedings, The Nebraska Academy of Sciences and Affiliated Societies 92: 79. (Abstract).

Monthly climatic data for loctions along transects through the sorghum growing regions of the United States and Ethiopia were compiled to generate daily climatic normals of average temperatures and accumulated precipitation. The growing degree day (base 10 deg C) requirements of two grain sorghum hybrids adapted to the Great Plains were used to estimate expected dates of various critical stages of sorghum development at each location. An agroclimatic procedure was developed to compare sorghum phenology and moisture availability during critical periods.

0489 M0RIDIS, G.J., and MCFARLAND, M.J. 1982. Modeling soil water extraction from grain sorghum. Paper, American Society of Agricultural Engineers 82-2600, 36 pp. 35 ref.

The effect of soil water status on the transpiration rates from a grain sorghum canopy was studied. Grain sorghum was grown in a set of 14 lysimeters under different stress treatments. An error function type relationship between relative transpiration rates and integrated soil water potential was developed and tested against obtained data.

0490 MURTHY. B.S., and RAO, K.S. 1982. Short-wave albedo of soil and jowar crop. Mausam 33(2): 217-220. 14 ref. (Summary:Hindi).

Measurements of albedo of jowar were made during the kharif season of 1970. The diurnal variation of crop, albedo under different sky conditions is discussed. The average noontime albedo of jowar was 22% compared to the soil albedo of 11%. There is a strong dependence of crop albedo on solar elevation under clear sky conditions; the dependence is relatively weak under cloudy conditions. The midday crop albedo values do not change significantly with cloudiness. The seasonal trend of midday albedo of jowar shows an increase of albedo with crop growth, till it reaches 25% when the crop was 55 days old, remains steady for 15 days, and decreases gradually thereafter to about 18% as the crop matures.

0491 NARKHEDE, P.L., GHUGARE,

R.V., and PATIL. C.B. 1982, Relative efficiency of winter sorghum in utilizing moisture under narrow and wide row planting. Sorghum Newsletter 25: 59-60.

Use efficiency of stored water of winter sorghum (CV: M 35-1 and CSH-8R) on a 30 cm deep and a 60 cm deep soil (basaltic, montmorillonitic clay) as influenced by three row spacings (45, 90 and 135 cm) assessed during the 1979-80 (normal) and 1980-81 (below normal) rainfall seasons, at Dry Farming Research Station, Solapur, India.

0492 NARKHEDE, P.L., PATIL, C.B., and GHUGARE, R.V. 1982. Moisture utilization by winter sorghum in relation to plant density. Sorghum Newsletter 25: 59.

Moisture is the most important crop growth limiting factor under drought-prone conditions. Plant density plays an important role in efficient utilization of moisture for maximum crop production. In this trial moisture extraction and its utilization by winter sorghum as affected by plant density, (5, 10 and 15 plants sq.m) was studied on 30 cm (5 cm moisture storage capacity) and 60 cm (10 cm moisture storage capacity) deep soils (basaltic, montmorillonitic clay), during 1979-80 (normal) and 1980-81 (below normal) rainfall seasons, at Dry Farming Research Station, Solapur, India.

0493 NEILD. R.E. 1982. Temperature and rainfall influences on the phenology and yield of grain sorghum and maize: a comparison. Agricultural Meteorology 27(1-2): 79-88. 12 ref.

Phenology models based on growing degree days were used to compare the phenology and yield responses of maize and sorghum to climate in souteast Nebraska. Maize and sorghum differ in rate of development during certain critical periods. Sorghum is more vulnerable than maize to excess moisture during germination and seedling establishment. Maize is more vulnerable to high temperature stress over a period that is three times longer than sorghum.

0494 REDDY, B.B., SIVAKUMAR, M.V.K., RAO, V.J.M., RAO, K.V.S., and RAO, N.G.P. 1982. Climate-yield relationships in traditional and improved sorghum cultivars in India during the past decade. Page 741 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India:ICRISAT. (Abstract).

Consequent to the climatic vulnerability of traditional Indian sorghums, new cultivars with altered plant type, duration, dry matter production and growth rhythms have been developed and cultivated commercially. Soil, rainfall and evapotranspiration, and yield data are available from several diverse locations during both kharif (monsoon) and rabi (winter) seasons over the past decade, when normal, subnormal, and above normal rainfall situations were encountered. A comprehensive analysis of the climatic factors, yield and their interrelationships during the decade of the seventies is attempted. Both sole crop and cropping system yields have been considered. The implications of the analysis of dryland sorghum improvement will be analyzed.

0495 RICHARDSON, A.J., WIEGAND, C.L., ARKIN, G.F., NIXON. P.R., and GERBERMANN, A.H. 1982. Remotely-sensed spectral indicators of sorghum development and their use in growth modeling. Agricultural Meteorology 26(1): 11-23. 17 ref.

Earth Resources Technology Satellite (LANDSAT) multispectral scanner (MSS) data for five overpass dates (3/5, 21/5, 8/6. 28/6 and 1/8) during the 1976 grain sorghum growing season (Bell County. Texas) and weather data were used to estimate the plant growth measurements (PGM), leaf area index (LAI), biomass, plant height, plant cover, and grain yield. Vegetation indices derived from LANDSAT data were correlated to crop development and growing conditions as measured with LAI and biomass samples. Largest LAI and perpendicular vegetation index (PVI) calculated from LANDSAT spectral data occurred at the half-bloom (HB) stage of development. The PVI was significantly correlated with sorghum PGM on the earliest sampling date (3/5/76) when vegetative ground cover was only 20% . Regression analysis indicated that the PVI explained 79% of the variation in estimating LAI over the first four sampling dates. On the other hand, the regression of PVI, solar-thermal units, and a soil water index accounted for 90% of the variation in LAI measurements.

0496 SCARASCIA. M.E.V., MARACCHI, G., and PALOSCIA, S. 1982. Estimation of some agricultural crop characteristics using the albedo. (It). Annali dell'Istituto Sperimentale Agronomico 13(1): 217-233. 13 ref. (Summary:En).

Albedo values for sorghum, lucerne, globe artichokes. soyabeans. hard wheat and maize were recorded in S. Italy, using a Middleton solarimeter. The value varied with the altitude of the sun. canopy structure, leaf area index (LAI) and water status of the leaf. The LAI and leaf water potential are correlated with albedo values and a method is presented for assessing them.

0497 SINGH. P.R. 1982. Agro-physiological responses of hybrid sorghum (CSH-6) to soil moisture regimes, nitrogen and phosphorus fertilization. Ph.D. thesis, Haryana Agricultural University, Hissar. India. 134 pp.

0498 SIVAKUMAR. M.V.K.. and REGO. T.J. 1982. Agroclimatic conditions of rainfed areas of India in relation to fertilizer use. Presented at the Fifth FAI Specialized Training Program on Management of Rainfed Areas. 20-23 September 1982. Fertilizer Association of India, New Delhi.

0499 SIVAKUMAR, M.V.K., and VIRMANI, S.M. 1982. Agrometeorology - An aid to crop planning in drought prone areas. Presented at the Seminar-cum-Workshop on Planting for Dryland Agriculture in DPAP Areas, 27-29 May 1982. Hyderabad. India. 16 pp. 10 ref.

0500 SIVAKUMAR, M.V.K.. and VIRMANI. S.M. 1982. The physical environment. Pages 83-100 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India:ICRISAT. 29 ref.

0501 SIVAKUMAR. M.V.K.. HUDA. A.K.S.. and VIRMANI, S.M. 1982. Physical environment of sorghum and millet growing areas in South Asia. Presented at the ICRISAT-WMO Symposium/Planning Meeting on the Agrometeorology of Sorghum and Millet in the Semi-Arid Tropics, 15-19 November 1982, ICRISAT, Patancheru. A.P.. India.

0502 STEWART. J.I.. and LENGA. F.K. 1982. Grain sorghum yield and yield component responses to evapotranspiration levels for three distinct ranges of plant population. Pages 19-36 In Soil management under intensive cultivation. Nairobi, Kenya: Soil Science Society of East Africa. 7 ref.

0503 VEGA, J.D., and CANTU. F. 1982. Analysis of the climate-water relationship of some crops to support timing and quantity of irrigation. (Es). Turrialba 32(2): 155-159. 4 ref. (Summary:En).

The determination of the scheduling and quantity of irrigation is a research activity of great importance because of the intimate relationship between water and production. This relationship varies as a function of the climate and crop in question. The purpose of this study was to determine the relationship between the evapotranspiration of different crops and the evaporation of a class A tank as an integrator of climatological characteristics. For each crop under study, an analysis was made of the dependence on the environment, differencess between consumption patterns, and the efficiency of evapotranspiration.

0504 VIRMANI. S.M. 1982. Increased and stabilized production of sorghum/millet based farming systems in the semi-arid tropics:Role of agroclimatic studies. Presented at the ICRISAT-WMO Symposium/Planning Meeting on the Agrometeorology of Sorghum and Millet in the Semi-Arid Tropics. 15-19 November 1982. ICRISAT. Patancheru. A.P.. India.

0505 VIRMANI, S.M., and SIVAKUMAR, M.V.K. 1982. Studies on rainfall climatology. evaporative demand and climatic water balance conducted at ICRISAT. Presented at the IRAT-ICRISAT Workshop on Water Management and Crop Production. 3-6 May 1982. IRAT. Montpellier. France.

0506 VIRMANI. S.M.. HUDA. A.K.S.. SIVAKUMAR. M.V.K.. and SEETHARAMA, N. 1982. Prediction of leaf area in grain sorghum. Agronomy Abstracts: 19.

Several methods for the estimation of leaf area in grain sorghum were evaluated using field measurements of leaf length, leaf width, leaf weight, and leaf area covering several genotypes grown at different locations during the rainy and postrainy seasons from 1979 to 1981. The relationship between leaf area and leaf weight varied with genotypes, environment, and stage of growth. Equations estimating leaf area from leaf weight on an individual plant basis will be reported. These equations were tested using independent data sets. Area for individual leaves was also estimated to ascertain the variability in the coefficients used for estimation of leaf area. These coefficients were significantly different for different genotypes, environments and individual leaves. Leaf area estimated for the whole plant using a single equation was found to be quite adequate when tested for variable genotypes and environments. Using estimated and measured leaf area in a grain sorghum simulation model (SORGF) dry matter and grain yields were predicted and compared with observed data.

SOIL SCIENCE

0507 ARMBRUST. D.V.. DICKERSON. J.D.. SKIDM0RE. E.L.. and RUSS. O.G. 1982. Dry soil aggregation as influenced by crop and tillage. Soil Science Society of America Journal 46(2): 390-393. 20 ref.

Soil loss by wind erosion is greater in the spring due to higher wind velocities, loss of protective crop residues by tillage and decomposition, and overwinter changes in nonerodible soil aggregates. This study was conducted to determine the effect of crop species and tillage on soil aggregation. Plots of continuous winter wheat, grain sorghum, and soybean with tillage treatments of mechanical, chemical, and combination of mechanical and chemical weed control were sampled for aggregate distribution, stability, and overwinter breakdown. Winter wheat plots contained more nonerodible aggregates (½ 0.84 mm). and the aggregates were more stable and more resistant to overwinter breakdown than were aggregates from sorghum or soybean plots. Soybean plots were lowest in all three variables measured. Tillage-treatment effects varied, with all chemical-treated plots containing the most nonerodible aggregates and the mechanical-treated plots having the most stable aggregates.

0508 BAKAR, M.Z.A.. NAFIS, A.W., CHAANG, T.C., and MOHAMAD. A.R. 1982. Distribution, characterization and utilization of problem soil in Malaysia - a country report. Tropical Agriculture Research Series 15: 41-61. 34 ref.

The problems of peat, acid sulphate and sandy beach soils in Malaysia are reviewed. Yields of sorghum, cassava, groundnuts, soyabean, sweet potato, maize, tobacco and Colocasia on peat soils in West Selangor are given.

0509 FAHAD, A.A., MIELKE, L.N., FLOWERDAY, A.D., and SWARZENDRUBER, D. 1982. Soil physical properties as affected by soybean and other cropping sequences. Soil Science Society of America Journal 46(2): 377-381. 24 ref.

Infiltration, water stability of soil aggregates, and water retention characteristics were measured on a Sharpsburg silty clay loam in a 4-year cropping sequence. The cropping systems include soybean, sorghum, corn, and fallow, in various sequential cropping combinations. The influence of cropping systems on size distribution of waterstable aggregates is indicated by the values of geometric mean diameter (GMD). The rank order of GMD for the soybean sequences was : soybean after fallow ½ soybean after sorghum ½ soybean after corn ½ continuous soybean. The low GMD of continuous soybean reflected the negative effect of soybean roots in building a stable soil structure. Cumulative infiltration after 4 hours of water application was 6, 13, 29, and 41 cm for continous soybean, sorghum after soybean, fallow after soybean, and corn after sorghum, respectively. The low infiltration was associated with low macroporosity and decreased aggregate stability. Both Kostiakov's and Philip's equations fitted the infiltration data reasonably well statistically.

0510 FONTES, M.P.F.. NOVAIS, R.F., ALVAREZ, V.H., and BORGES, A.C. 1982. Availability of sulfur in three chemical extractors in some latosols of Minas Gerais. (Pt)• Revista Brasileira de Ciencia do Solo 6(2): 125-130. 14 ref. (Summary:En).

In samples from superficial horizons of twelve latosols of the Minas Gerais State, the available S by three chemical extractors (Ca(H2P04)2 in H20, CA(H2P04)2 in HOAc and Morgan's reagent) was determined to study the plant response to application of this nutrient in the soil and to compare the efficiency of the extractors tested. A greenhouse experiment was carried out, for two subsequent times. The rates of S tested were 0, 20, 40, 80 and 160 ppm and the test plant was sorghum. Forty five days after sowing the aerial parts of the plants were harvested, oven dried and the plant S was determined. In the first crop there was no significant response to S but in the second crop, a significant response was observed in seven soils. When the efficient of the three extractors was compared by measuring parameters as absorbed S, relative yield, percentage of response and actual response it was observed that Ca(H2P04)2 in HOAc presented the best performance and was the extractor indicated for the studied soils.

0511 ICRISAT. 1982. Second

policymakers' seminar to review the program of the improved vertisols management in relation to assured rainfall regions of India - a summary. 10-11 September 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 27 pp.

0512 KANWAR, J.S. 1982. Problems and potentials of vertisols and alfisols - the two important soils of SAT-ICRISAT experience. Tropical Agriculture Research Series 15: 119-138. 18 ref.

General properties of alfisols and vertisols are described and research on sorghum, pigeon pea, chickpea and maize production on these soils at ICRISAT is reviewed.

0513 KAUSALYA, T. 1982. Effect of cultivation on mineralization of organic matter in soil. Ph.D. thesis, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttar Pradesh, India.

0514 SAHRAWAT, K.L., and BURFORD, J.R. 1982. Modification of the alkaline permanganate method for assessing the availability of soil nitrogen in upland soils. Soil Science 133: 53-57.

The alkaline permanganate digestion method has been widely used for assessing the available nitrogen pool in soils. Simple laboratory experiments have shown that the standard method does not include nitrate and nitrite, but that a simple modification, involving the use of Devarda's alloy, allows inclusion of nitrate and nitrite. This modification is desirable if the method is to be used for assessing available nitrogen in tropical upland soils that experience pronounced wet and dry seasons. Results with soil in experimental farm showed that the nitrate content of the soil contributed 10 to 40% of the available nitrogen assessed by the modified method.

0515 SONAR, K.R., KUMBHAR, D.D.. SHINDE, S.S., and PATIL, N.D. 1982. Soil test crop response correlation studies on rabi sorghum in vertisols. Page 43 In Abstracts, Forty-seventh Annual Convention, Indian Society of Soil Science, 2-4 October 1982, Nagpur, Maharashtra, India. Nagpur, Maharashtra, India:Indian Society of Soil Science, Nagpur Chapter.

A field experiment conducted on a vertisol under semi-arid tropics showed that 2.07, 0.78 and 2.41 kg N. P205 and K20, respectively were required to produce one quintal of sorghum grain (Cv. CSH 8R). In the nutrition of sorghum, the contribution from soil available N, P and K were 34, 73 and 20% respectively whereas from fertilizer nutrients it was 44, 39 and 73%. The experimental results showed a reasonable agreement between the yields targetted (40, 50 and 60 g/ha) and those actually achieved. There was saving of fertilizer under different yield targets without affecting the sorghum yields as compared to that of recommended dose. The highest benefit/cost ratio of 4.9 was observed under 40 g/ha yield target while the lowest one (3.2 was under recommended fertilizer dose).

0516 SPOSITO, G., LUND, L.J., and CHANG, A.C. 1982. Trace metal chemistry in arid-zone field soils amended with sewage sludge: 1. Fractionation of Ni, Cu, Zn, Cd, and Pb in solid phases. Soil Science Society of America Journal 46(2): 260-264. 14 ref.

The surface horizons of two arid-zone field soils that had received amendments of either liquid or dried, anerobically digested sewage sludge for 4 years were sampled to determine the forms of selected trace metals in the solid phase. The soils had been amended with sludge twice annually at rates of 0, 22.5. 45.0, or 90.0 tons/ha/year. Barley and sorghum had been grown on the soils in randomized experimental plots, The soil samples were analyzed for total Ni. Cu, Zn. Cd. and Pb and were fractionated by sequential extraction to estimate the quantities of these metals in "exchangeable." "sorbed." "organic," "carbonate." and "sulfide" forms. The total contents of the five metals in the two field soils were governed by the total content of the metals in the sludges applied and by the rate of sludge application.

0517 TURENNE. J.F. 1982. Soil structure stability and the organic system in heavy montmorillonite clays. Tropical Agriculture 59(2): 158-161.

The results of analyses from the experiment station at Sainte-Anne, Martinique. F.W.I., on vertisols, emphasize the importance of nitrogen compounds in the formation of humic substances and in the development of a stable structure under an alternate sorghum cultivation. The carbon-nitrogen interaction suggests the existence of a characteristic organization of the organic system. Such organization can be used for a better efficiency of farming systems.

0518 VIRMANI. S.M.. BURFORD. J.R.. and SAHRAWAT. K.L. 1982. Improved management systems for vertisols in India. Presented at the Fifth International Soil Classification Workshop. 1-11 November 1982. Khartoum. Sudan.

SOIL MICROBIOLOGY

0519 BAMI. A.. and SINGH. R.D. 1982. Azotobacter inoculation for better yield of M.P. Chari. Farmer and Parliament 17(2): 20. 24.

0520 GODSE. D.B.. DART. P.J.. and HEBBAR, K.P. 1982. Nitrogen-fixing bacteria associated with sorghum. Page 757 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981. Patancheru. A.P.. India. Patancheru, A.P., India: ICRISAT. (Abstract).

The total number of N2 fixers from rhizosphere soil, rhizoplane and root macerate of sorghum plants was estimated by plate counts using N-free sucrose and malate media. Using these inocula, nitrogenase activity was measured by the most probable number (MPN) method on sucrose and malate semisolid media. Nitrogenase activity was measured by the acetylene reduction technique. Value of the spermosphere model was demonstrated with plants growin in tubes of Fahraeus agar medium for selection of the most abundant and host compatible bacteria from the rhizosphere soil, rhizoplane soil and root macerate. Based on colony morphology, various isolates were picked up from plates and purified. Purified isolates were tested for nitrogenase activity of malate and sucrose semisolid media with 20% acetylene incubated for 3 hours at 33 deg C. Applicability of analytical profile index (API) tests was demonstrated for quick identification of nitrogen fixers belonging to Enterobacteriacae.

0521 GRAHAM. P.H. 1982. Research on biological nitrogen fixation in the international agricultural research centers. Pages 695-705 In Biological nitrogen fixation technology for tropical agriculture, (eds. P.H. Graham and S.C. Harris). Cali. Colombia:CIAT.

Five of the international agricultural research centers (IARCs) currently have research programs in the area of biological nitrogen (N2) fixation. This paper reviews the activities of the centers in this area and highlights common and distinctive features of the programs, as well as their links with BNF activities in national programs and developed country laborataries.

0522 HAMEED, T., and CHAUDHARY, A.H. 1982. Biological nitrogen fixation in the rhizosphere of grasses. Pakistan Journay of Botany 14: 35-36. (Abstract).

0523 LEE. K.J., and GASKINS, M.H. 1982. Increased root exudation of 14C-compounds by sorghum seedlings inoculated with nitrogen-fixing bacteria. Plant and Soil 69(3): 391-399. 19 ref.

Organic components leaked from sorghum seedlings ('root exudates') were examined by recovering 14C labelled compounds from root solutions of seedlings inoculated with Azospirillum brasilense. Azotobacter vinelandii or Klebsiella pneumoniae nif-. Upto 3.5% of the total 14C recovered from shoots, roots, and nutrient solutions was found in the root solutions. Inoculation with Azospirillum and Azotobacter increased the amounts of 14 C and decreased the amounts of carbohydrates in the root solutions. When sucrose was added as a carbon source for the bacteria, the increase of 14C in the solutions did not occur. Quantities of 14C found in the root solutions were proportional to amounts of mineral nitrogen supplied to the plants. Bacterial growth also was proportional to nitrogen levels. When sorghum plants were grown in soil and labelled with 14C02, about 15% of the total 14C recovered within 48 hours exposure was found in soil leachates.

0524 MALLIKARJUNAIAH. R.R.. and BHIDE. V.P. 1982. Nitrogen fixation in Azotobacter and its effect on germination of crop seeds. Malaysian Applied Biology 11(2): 111-115. 11 ref.

After inoculation with various cultures of Azotobacter chroococcum and Azotobacter vinelandii, seed germination increased by 10-16% and 12-18% in sorghum cultivar CSH-1 and M35-1 respectively. In maize cultivar Ganga safed No. 2 and Deccan double hybrid. 12-18% increases were obtained. In local pearl millet and in cultivar HB-1 and HB-3. the germination increases were 24. 13 and 20%. respectively. Germination of wheat cultivar Nl-146. Nl-5439 and Nl-747-19 increased by 16. 18 and 20% respectively.

0525 MIRANDA. J.C.C. DE. 1982. The influence of inoculated endomycorrhizal fungi on the yield of sorghum and soybean under field conditions, in a cerrado soil. (Pt)• Revista Brasileira de Ciencia do Solo 6(1): 19-23. (Summary:En).

A field experiment was established in an argillaceous dark red latosol fertilized with different levels of simple superphosphate and patos de Minas rock phosphate. It was successively cultivated with sorghum and soybean in presence of native endomycorrhizal fungi and the introduced species Gigaspora margarita and Glumus macrocarpus. Spore number, root infection percentage, P absorption and grain yield of sorghum and soybean were measured for all treatments. In the treatments with simple superphosphate, the yield of both crops, was significantly higher in the presence of introduced endomycorrhizal fungi. These results were probably due to the low native fungal population of the soil. The endomycorrhizal association effect was less evident for soybean because of the lower P availability in the soil in the second crop.

0526 OKON. Y. 1982. Azospirillum. Phytoparasitica 10(2): 121. (Abstract).

Extensive inoculation experiments in Israel using Azospirillum - peat inoculants demonstrated significant benefit to plants and increased in yield of corn. sorghum. wheat and setaria. Significant benefits (compared with controls) were obtained in soils initially fertilized with intermediate levels of N, the yields obtained being comparable to those in fully fertilized, non-inoculated fields.

0527 OKON, Y. 1982. Field inoculation of grasses with Azospirillum. pages 459-467 In Biological nitrogen fixation technology for tropical agriculture, (eds. P.H. Graham and S.C. Harris) Cali, Colombia:CIAT.

Inoculation with Azospirillum clearly benefited the growth and commercial yield of Zea mays, Sorghum bicolor, Setaria italica, Panicum miliaceum and Triticum species grown under different environmental and soil conditions, at different levels of combined nitrogen (N), and in irrigated and unirrigated plots of commercial size. In one trial maize plants grown on inoculated plots contained up to 77.1 kg/ha more N than plants that were not inoculated.

0528 RAUT, R.S., and KIDE, D.S. 1982. Studies on Rhizobium inoculation in intercropping of mung, urd and arhar with sorghum. Pages 36-37 In Abstracts, Forty-seventh Annual Convention, Indian Society of Soil Science, 2-4 October 1982, Nagpur, Maharashtra, India. Nagpur, Maharashtra, India:Indian Society of Soil Science, Nagpur Chapter.

A field experiment was conducted to study the role of Rhizobium inoculation in intercropping of mung, urd and arhar with sorghum. The soil was clayey having medium status of carbon and low status of nitrogen with pH 8.1. Rhizobium inoculation was effective in increasing the nodulation, dry matter production, nitrogen uptake and yield of intercrops mung, urd and arhar. Intercropping system reduces the dry matter and grain yield of sole crop and also supressed nodulation, dry matter, nitrogen uptake und yield of intercrops. Intercropping with urd and arhar is economical than growing sole crop of sorghum, urd or arhar. Among these three intercrops, performance of arhar was better in all respects.

0529 REDDY, G.V.S. 1982. Effect of seed inoculation with Azotobacter and water soaking on growth and yield of hybrid sorghum (CSH-5). M.Sc. thesis, Punjabrao Krishi Vidyapeeth, Akola, India.

The present agronomic investigation was conducted on clay soil at Agronomy Farm, College of Agriculture, PKV, Akola during kharif 1981. A factorial randomised block design was adopted with eight treatment combinations of three factors each at two levels and four replications. The treatment combinations consisted of seed inoculation with and without Azotobacter, seed soaking in water and no soaking and two levels of nitrogen i.e., recommended dose (75 kg N/ha) and 2/3 of recommended dose (50 kg N/ha). Seed inoculation with Azotobacter significantly increased the plant height, number of functional leaves, leaf area index and dry matter production/plant. Seed inoculation gave an equivalent response to that obtained by .20 kg N/ha. However, seed soaking did not affect significantly the growth and yield of sorghum.

0530 SANORIA, C.L., SINGH, K.L., RAMAMURTHY, K., and MAURYA, B.R. 1982. Field trials with Azospirillum brasilense in an Indo Gangetic India alluvium. Journal of the Indian Society of Soil Science 30(2): 208-209.

0531 SCHANK, S.C, SMITH, R.L., and MILAM, J.R. 1982. Acetylene reduction activity of several sorghum and N2-fixing bacterial associations. Page 752 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India:ICRISAT. (Abstract).

Fifty-one sorghum lines were tested in replicated field plots for acetylene reduction (AR). Range of AR activity was from 0 to 1934 nanomoles per gram of dry root per hour. In order to further study these highly variable field responses, an in vitro screening technique has been developed to evaluate plant responses, root bacteria associations, and acetylene reduction of specific grass bacteria combinations. Axenic systems using diverse sorghum germplasm were established by inoculating sorghum plants with Azospirillum or other N2~fixing bacteria. The seedlings were grown in test tubes for 10 days on a Fahraeus, nitrogen and carbon free medium. In addition, bacterial populations of Azospirillum were studied at the end of the growth period using fluorescent antibody labeling. Roots were scored for root-bacteria associations.

0532 SCHENCK, N.C., SMITH, G.S., MITCHELL, D.J., and GALLAHER, R.N. 1982. Minimum tillage effects on the incidence of beneficial mycorrhizal fungi on agronomic crops. Florida Scientist 45(suppl.l): 8. (Abstract).

For two years the incidence of mycorrhizal fungi in soil and roots of several agronomic crops receiving different tillage practices were monitored. Spores of mycorrhizal fungi were wet-sieved from soil samples and roots were cleared and stained to determine intra-root colonization by these fungi. In most cases, minimum tillage practices increased the incidence of mycorrhizal fungi (309 spores/kg soil; 24% root colonization) above that in crops receiving conventional tillage (249 spores/kg soil; 10% root colonization). A greater diversity of species of mycorrhizal fungi, usually more of the plant growth promoting types, occurred with minimum tillage than with conventional tillage. There were generally more spores associated with sorghum and soybean than corn and more spores associated with oats than vetch. Subsoiling had little effect on the incidence of mycorrhizal fungi.

0533 SHENDE, S.T., and APTE, R. 1982. Azotobacter inoculation: a highly remunerative input for agriculture. Pages 532-543 In Biological nitrogen fixation: proceedings of the National Symposium, 25-27 February 1982, New Delhi, India. Bombay, India:BARC. 9 ref.

0534 TILAK, K.V.B.R., SINGH, C.S., ROY, N.K., and RAO, N.S.S. 1982. Azospirillum brasilense and Azotobacter chroococcum inoculum: effect on yield of maize (Zea mays) and sorghum (Sorghum bicolor). Soil Biology and Biochemistry 14(4): 417-418. 9 ref.

0535 WANI, S.P., DART, P.J., and RAO, R.V.S. 1982. Factors affecting the nitrogenase activity of sorghum and millet estimated by soil-root core assay method. Page 506 In Biological nitrogen fixation: proceedings of the National Symposium, 25-27 February 1982, New Delhi, India. Bombay, India:BARC. (Abstract).

Factors affecting the nitrogenase activity of sorghum and millet estimated by a soil-root core assay method have been studied. The activity is affected by field variability, extends some distance from the crown of the plant. The time of sampling during the day, and the time interval between taking the core and injecting C_2H_2 also affected activity. "Mechanical" disturbance during transportation of cores from field to the lab reduced the activity. Activity varied not only with the growth stage of the crop when assayed, but also with the temperature at which the cores were incubated during assay, and the amount of nitrogen fertiliser added. Activity is well correlated with the soil moisture

0536 WANI. S.P.. BART. P.J.. and UPADHYAYA. M.N. 1982. Report on improving the soil-core assay technique for estimating nitrogenase (C2H2 reduction) activity of field grown sorghum and millet plants. Patancheru. A.P., India: ICRISAT. 26 pp. (P.M. Microbiology, Progress report-1).

0537 WANI. S.P.. DART. P.J.. CHANDRAPALAIAH, S.C.. and UPADHYAYA. M.N. 1982. Nitrogen fixation associated with sorghum. Page 756 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum. 2-7 November 1981. Patancheru. A.P.. India. Patancheru. A.P.. India:ICRISAT. (Abstract).

Using a soil-core assay method in the acetylene reduction technique. 334 lines have been screened; 55% of the lines tested stimulated N2-ase activity in rhizosphere and 14% stimulated high activity (100 micro g N/core/day). The activity is affected by field variability, time of sampling during the day. and the time interval between taking the core and injecting C2H2. Activity varied not only with the growth stage of the crop when assayed, but also with the temperature at which the cores were incubated during assay and the amount of nitrogen fertilizer added. Activity is well correlated with the soil moisture. A test tube culture technique has been developed to test the effect of host genotype and bacterial culture on nitrogenase activity. A method for assaying intact plants for nitrogenase activity has been developed. By using this method the same plant can be assayed several times during its growth cycle and seed can also be obtained.

WATER MANAGEMENT

0538 ALVINO. A.. and ZERBI. G. 1982. Effect of water table level on the yield of grain sorghum as rainfed and irrigated crop. Irrigazione 29(2): 27-34. 6 ref.

An experimental device which permitted the setting of an inclined water table in a field up to the depth of 1.5 m is described. On this field an experiment was carried out on a grain sorghum crop to test the response of the crop. grown in rainfed and in irrigated conditions, to different water table levels. Results pointed out an increasing grain yield related to decreasing water table levels, both in rainfed and irrigated crop; the maximum yield was noted when the water table was 1.20 m deep (respectively 6.3 and 8.1 t/ha). When the water table was deeper, yield decreased decidedly. The crop gave good yield also with very shallow water table with considerable reaction to irrigation also in this case.

0539 CHAROY. J.. IMBERNON. J.. and FRETEAUD, J.P. 1982. Irrigation management using a neutron moisture meter. SARIR hydro-agricultural project (Libya). Nogent-sur Marne. Paris:IRAT. 14 pp. 5 ref.

The work carried out by IRAT, during the first two year's working of the "SARIR" hydro-agricultural project has made it possible to control efficiently the irrigation of the 8,000 ha of crops set up by SATEC. In an unknown. hostile environment, the irrigation calendar for the wheat and sorghum crops has been drwan up very quickly by collecting, with a neutron moisture meter, data on the hydrodynamic characteristics of the soils and the water requirements of the plants. These data, transmitted to the head of the farm in the form of an irrigation warning bulletin, have enabled the water resources of this zone to be managed correctly. The results obtained have shown, if any proof was necessary, that, in an environment that is homogeneous from the climate and soil standpoints, using a moisture meter makes it possible to establish a satisfactory moisture balance under crops at the farm level.

0540 ELSENHAUER, D.E. 1982. Predicting the last irrigation for corn and grain sorghum. Lincoln, Nebraska, USA:University of Nebraska. 4 pp.

0541 HATFIELD, J.L. 1982. The utilization of thermal infrared radiation measurements from grain sorghum crops as a method of assessing their irrigation requirements. Irrigation Science 3(4): 259-268. 14 ref.

0542 ICRISAT. 1982. Consultancy report: Water management research in the Farming Systems Research Program at ICRISAT. 19-23 November 1982. Patancheru, A.P., India. Patancheru, A.P., India:ICRISAT. 21 pp.

0543 ICRISAT. 1982. Report work: Land & water management agricultural hydrology. Patancheru, A.P., India:ICRISAT. 60 pp. (Farming Systems Research Program).

0544 IRAT-ICRISAT. 1982. IRAT-ICRISAT Workshop on Water Management and Crop Production:A review of research at ICRISAT. 3-6 May 1982, IRAT, Montpellier, France. Montpellier, France:IRAT-ICRISAT. 152 pp.

0545 NARKHEDE, P.L., KALE, S.P., and SHENDE, S.A. 1982. Effect of critical irrigation on the moisture utilization by sorghum in Vertisol. Sorghum Newsletter 25: 58-59.

A trial was conducted to assess the effect of irrigation (4 cm and 6 cm) at the most critical (boot) stage on the production of winter sorghum (M 35-1) during 1977-80 period encompassing two normal and two below normal rainfall seasons, at the Dry Farming Research Station, Solapur, India. In this trial, observations on utilization of stored and applied water by sorghum were recovered.

0546 NATH, J., RAJ, M., SINGH, A., DEV, S., and SINGH, R. 1982. Performance of sorghum, sunflower and wheat as affected by salinity of irrigation water. Transactions of Indian Society of Desert Technology and University Centre of Desert Studies 7(2): 59-61. 2 ref.

Effects of irrigation with saline water on the performance of sorghum, sunflower and wheat were determined. Fodder yield of sorghum and dry matter yield of sunflower decreased with increasing salt content of irrigation water. A significant decrease in wheat grain yield was observed with salinity at more than 8 mmho/cm.

0547 SINGH, P., GUNASEKARA, G., and SINGH, S. 1982. Profile water dynamics in alfisols and vertisols in relation to root distribution. Pages 27-64 In IRAT-ICRISAT Workshop on Water Management and Crop Production, 3-6 May 1982, IRAT, Montpellier, France. 7 ref.

Since water is one of the most limiting factors in agricultural production in the semi-arid tropical (SAT) regions, it is very important to quantify the productive and unproductive losses of water for the evaluation of a water management system and for meaningful interpretation of experimental results. This report presents some work done at ICRISAT Center during the period from 1973 to 1979 on the quantification of water balance and soil profile water dynamics of Alfisols and Vertisols in selected crops or cropping systems. It is emphasized that for more agronomically meaningful description of a soil profile as reservoir for water, we must quantify the availability of water in relation to root distribution and crop growth stage.

0548 SIVAKUMAR, M.V.K.. SACHAN, R.C., HUDA, A.K.S.. SINGH. S., SEETHARAMA, N.» and VIRMANI, S.M. 1982. Crop response to available water and water requirements. Pages 65-95 In IRAT-ICRISAT Workshop on Water Management and Crop Production, 3-6 May 1982, IRAT, Montpellier, France. 24 ref.

Several experiments have been conducted at ICRISAT during the postrainy-season to examine crop response to available water and water requirements. A holistic approach involving measurements of water transfer in the soil-plant-atmosphere continuum was adopted in these studies. Changes in the canopy physical environment and in plant parameters of water stress such as leaf water potential, stomatal conductance, leaf temperature, and transpiration due to water deficits were discussed. The relationship between water use and plant growth was described in terms of leaf area, dry matter, yield and yield components. The need to consider carefully the crop phenology in assessing the water deficit effects was emphasized. Water use and water efficiency data collected for several crops/cropping systems grown at ICRISAT Center were presented with special reference to their implications in improved farming systems.

05 49 SRIVASTAVA. K.L., MIRANDA, S.M., GUNASEKERA, .B.C.G., and VIRMANI, S.M. 1982. Land and water management in rainfed farming systems. Pages 97-121 In IRAT-ICRISAT Workshop on Water Management and Crop Production, 3-6 May 1982, IRAT, Montpellier, France. 22 ref.

Land and water are the key elements of the resource-base of rainfed farming systems and strategies for effective management of these resources are intimately linked. This paper reviews ICRISAT's research approach for developing improved land and water management practices and their integration with other aspects of farming system. The small watershed-based farming systems approach which holds a good promise for management of Vertisols is discussed. The present status of research on Alfisol management, tank irrigation and runoff modeling at ICRISAT has been reviewed.

0550 STEWART, B.A., and MUSICK, J.T. 1982. Conjunctive use of rainfall and irrigation in semiarid regions. Advances in Irrigation 1: 1-24. 24 ref.

Rainfall distribution and use of limited irrigation is discussed with regard to semiarid regions, and the efficiency of water use and soil water storage, especially for growing crops such as grain sorghum, are discussed.

0551 STONE, J.F.. REEVES, H.E., and GARTON, J.E. 1982. Irrigation water conservation by using wide-spaced furrows. Agricultural Water Management 5(4): 309-317. 7 ref.

Studies of wide-spaced furrow irrigation were conducted at Goodwell, OK, USA. Wide-spaced furrow irrigation applied water to the root zone while maintaining a relatively dry soil surface. This condition reduced evapotranspiration losses and can reduce water requirements by 20 to 50%. Probability of a yield reduction with this water conservation method is lessened by either:(a)abandoning the wide-spaced furrow irrigation method on 1 August of a high water-stress season; or (b) alternating the dry furrows in an alternate-furrow scheme. A high stress season is defined as one in which the August wind velocity averages greater than 1.8 m/s and less than 7.5 cm of rain fall between 15 Juny and 1 September (in the temperate northern hemisphere). The test for high stress conditions consists of measuring rain and wind velocity beginning on 15 July. The averages are examined on 1 August. If rainfall average is less than 1.6 mm/day and wind average is more than 1.8 m/s then normal irrigation is practiced on subsequent irrigations. Studies were conducted in 60 m plots.

0552 SWINDALE, L.D. 1982. Transfer of watershed technology to the farms farming systems experience. Pages 147-152 In IRAT-ICRISAT Workshop on Water Management and Crop Production, 3-6 May 1982. IRAT, Montpellier, France.

In this paper the progress being made in applying the technology developed for better management of the deep black soils of India, and the new concepts and methodologies are developing for farming systems work in the future are highlighted.

0553 TSAKIRIS, G.P. 1982. A method for applying crop sensitivity factors in irrigation scheduling. Agricultural Water Management 5(4): 335-343. 22 ref.

Quantitative information concerning crop yield response to water deficiency (magnitude and time of occurrence) is of outstanding importance for the economic evaluation and optimization of irrigation systems. In this paper attention is focused on the parameter representing crop sensitivity in a production function proposed by Jensen (1968). A method is presented for the modification of this parameter, derived from experiments, in order to make it suitable for application in irrigation practice. The procedure is illustrated using data for grain sorghum. Finally, an attempt is made to optimize the intraseasonal distribution of irrigation water for the same crop when the volume of available irrigation water for the entire season is limited.

0554 VIRMANI. S.M., and SIVAKUMAR, M.V.K. 1982. Studies on rainfall climatology, evaporative demand and climatic water balance conducted at ICRISAT. Pages 1-26 In IRAT-ICRISAT Workshop on Water Management and Crop Production, 3-6 May 1982, IRAT, Montpellier, France. 12 ref.

Analyses based on the average monthly, seasonal and annual rainfall to assess the moisture availability to crops is often inadequate because of the relatively high evapotranspirational demand during most of the growing season. Methodologies for assessing moisture availability to crops have been discussed. Use of probabilities of rainfall in relation to potential evapotranspiration and of the length of the dependable rainfall period enables comparison of diverse locations. Water balance techniques to examine soil-moisture availability and methodologies for choice of suitable crops/cultivars at selected locations have been discussed. The relevance of such agroclimatic analysis in transfer of farming systems technology is discussed.

0555 VITHAYA WANAPICHIT. 1982. Responses of grain sorghum varieties to irrigation frequencies. (Thai). M.Sc. thesis, Kasetsart University, Bangkok, Thailand. 163 pp. 103 ref. (Summary:En).

Responses of grain sorghum varieties to irrigation frequencies were studied at the National Corn and Sorghum Research Center. The results showed beneficial effects on some agronomic characteristics, leaf water content, soil moisture content, yield components and grain yield with increasing irrigation frequency. Lodging and shoot fly damage were reduced by increasing irrigation frequency. The irrigation with 7 days intervals tend to give the best yeild. Varietal differences were observed in agronomic characteristics, shoot fly damage, lodging, yield components and grain yield. Based on grain yield and agronomic data, the result suggest a tendency for Pioneer 8199 and Goldfinger to be superior to other cultivars under the drought condition.

0556 WRIGHT. D.L., and RHOADS, F.M. 1982. Optimizing grain yields with irrigation and scheduling nutrient applications when double cropping corn with grain sorghum. Florida Scientist 45(suppl.l): 4. (Abstract).

Intensive management of corn followed by grain sorghum has resulted in grain yields of 25207 kg/ha per season. Corn yields under dryland conditions in Florida averages about 2822 kg/ha or 1/10 of what can result with two crops and irrigation. Planting dates and high yielding hybrids of both corn and grain sorghum are a necessity. Certain corn hybrids have produced 6000 kg/ha more grain than other hybrids similar management. Scheduling macro and micronutrient applications on corn has resulted in grain increases of 1500 kg/ha. Large fertilizer applications on corn makes it an ideal crop to doublecrop behind when corn is harvested by July 15 to 25. Grain sorghum yields of 7945 kg/ha after corn need only 112 kg/ha of nitrogen resulting in more fully utilizing residual fertilizer, the land, irrigation system, other machinery, and the long growing season of Florida.

0557 WRIGHT, G.C. 1982. Comparison of furrow and sprinkler irrigation systems for grain production in the Ord Irrigation Area. Page 313 In Proceedings, Second Australian agronomy conference. Parkville, Victoria, Australia:Australian Society of Agronomy. 1 ref.

AGRONOMY AND CULTIVATION

General

0558 ANONYMOUS. 1982. Crop recommendations 1982/83. N.T. Rural News 7(4): 9-15.

Recommendations are given for seed supplies, fertilizer rates, planting dates and rates, varieties, weed and insect control for sorghum, maize, mung bean and soyabean in the Northern Territory, Australia, in 1982-83.

0559 ANONYMOUS. 1982. National Committee for Agronomic Research (Mali). 22nd session, 20-23 April, 1982. Bamako, Mali:Ministere de l'Agriculture/Institut d'Economie Rurale.

Reports are presented on the technical groups specialized in rural production systems, food and oilcrop production and ICRISAT Cooperative programme in Mali.

0560 ABD-EL-RAHIM, H.M., ABDALLA, M.M., EL-MORSHIDY, M.A., and HASSABALLA, E.A. 1982. Effect of B9, CCC and 2,4-D on agronomic characters and yielding ability of grain sorghum. Assiut Journal of Agricultural Sciences 13(4): 125-132.

10 ref.

0561 BA, M.. ZERBO. D., and DIARRA, T. 1982. The mechanization of millet and sorghum production in southern Mali. Pages 507-517 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India:ICRISAT. 8 ref.

0562 BALASUBRAMANIAN, A., THEETHARAPPAN, T.S., PRASAD, M.N., and THANGAVELU, 0. 1982. Studies on nursery management of transplanted sorghum. Sorghum Newsletter 25: 46.

0563 BOQUET, D.J., and WALKER, D.M. 1982. Cultural responses of grain sorghum. Louisiana Agriculture 26(2): 16-17.

0564 CHATHA, M.Q. 1982. Current agro-technology for sorghum production. Islamabad, Pakistan:Pakistan Agricultural Research Council, Islamabad, Pakistan. 11 pp.

0565 CHRISTENSEN, N.B., and VANDERLIP, R.L. 1982. Yield stability comparisons of pearl millet (Pennisetum americanum (L.) Leeke) with grain sorghum (Sorghum bicolor (L.) Moench). Agronomy Abstracts: 118.

The yield of sorghum was compared to that of pearl millet, using Eberhart and Russell's yield stability model. Replicated yield trials were conducted during 2 years at 6 locations in Kansas. In 1980 3 sorghum hybrids and 27 pearl millet hybrids were used; in 1981 6 sorghum hybrids and 24 pearl millet hybrids were used. All sorghum and pearl millet hybrids used have similar maturity dates. In 1980 pearl millet (2161 kg/ga) significantly outyielded sorghum (1967 kg/ha). During 1981 sorghum yield (6314 kg/ha) was significantly greater than pearl millet (3200 kg/ha). In 1980 the average regression coefficient for the two crops was significantly different, millet 0.964 and sorghum 0.841. In 1981 they again were significantly different with sorghum 1.43 and millet .904. For the two years pearl milet seems more stable with the regression coefficient consistently near 1.0.

0566 CLEGG, M.D. 1982. Crop management. Pages 491-497 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru. A.P.. India. Patancheru, A.P., India:ICRISAT. 47 ref.

0567 ENSERINK, H.J. 1982. Sorghum agronomy investigations in western Kenya: assignment report. Busia, Kenya:Sorghum and Millet Development Project. 35 pp.

0568 FAYED, M.F.S. 1982. Improved grain sorghum production technology in Egypt, pages 100-101 In Report on the third FAO/SIDA seminar on field crops in Africa and the Near East, 6-24 June 1982, Nairobi, Kenya. Rome, Italy:FAO.

0569 GARCIA, A.G. 1982. Sorghum for grain. (Es). Hojas Divulgadoras, Spain:Ministerio de Agriculture. 20pp. (No.7/82 HD).

Cultural practices for sorghum including soil preparation, fertilizer applications for different water regimes, growth cycles, spacing, irrigation and harvesting techniques, nutritive value, weed, pest and disease control are described.

0570 GOMEZ RIVAS, E. 1982. Handbook of agricultural practices for cereals and legumes. (Es). Maracay, Venezuela:Universidad Central de Venezuela. 58 pp.

0571 HARAKI, T., and HORINO, T. 1982. Effect of removing leaves and glumous flowers on grain sorghum yield. (Ja). Kinki Chugcku

Agricultural Research 63: 44-47. 7 ref.

0572 HERBERT. S.W., FUKAI. S., and WILSON, G.L. 1982. Plant characteristics associated with high grain yield of sorghum. Page 210 In Proceedings. second Australian agronomy conference. Parkville, Victoria, Australia:Australian Society of Agronomy.

0573 HESLEHURST, M.R. 1982. Modelling seasonal grain sorghum yields in subtropical Australia. Agricultural Systems 9(4): 281-300. 56 ref.

0574 JAYAPRAGASAM, M., PARVATHI, K., and SELVARAJ. K.V. 1982. Effect of some pre-harvest treatments on grain yield and protein content of sorghum. Madras Agricultural Journal 69(1): 6-10. 9 ref.

Spraying of 15% or 20% solution of sodium chloride, 48 hours before harvest, reduced the moisture content of sorghum grain by about 3 per cent whereas dusting carbaryl of chalk powder at the above stage reduced the moisture by 1 to 2% only. The yield of grain and the protein content were not affected by the chemical desiccants tried. Harvesting Co 18 and Co 21 sorghum on 90th, 95th or 100th day after sowing did not bring about a significant change in grain yields or its protein content.

0575 LIU, G.H. 1982. Reasons for establishing a sorghum-growing area in the Xindin Basin. (Ch). Shanxi Agricultural Science 5: 2-3.

0576 MAJOR, D.J., and WILSON, D.B. 1982. Sorghum production in dryland, short-season conditions.Annual Corn and Sorghum Industry Research Conference 37: 11-25. 22 ref.

0577 PORRAS, E. 1982. Grain-bearing sorghum - progress in the study being conducted in the north-American state of Texas. (Es). Agricultura de las Americas 31(10): 30.

0578 SANMUGAM. T., and SENANAYAKE, S.M.P. 1982. Prospects for expansion in the production of coarse grains and grain legumes. Colombo. Sri Lanka:Agrarian Research and Training Institute. 295 pp.

0579 VANCE, P.N. 1982. Agronomic studies on grain sorghum in Papua New Guinea. Research Bulletin, Department of Primary Industry No. 30. 122 pp. 70 ref.

Land Preparation and Cultivation

0580 ANONYMOUS. 1982. Sorghum: advice for sowing in the year 1982. (Es). Cereales de Buenos Aires 2975: 24-29.

Recommendations are given for grain sorghum cultivar sowing dates, control of Contarinia sorghicola and cultural methods for the six ecological subregions of the sorghum growing area of Argentina.

0581 ANONYMOUS. 1982. Sorghum: to prove is to believe. Agricoltura Nuova 24(6): 16-18.

0582 ADEOYE, K.B. 1982. Effect of tillage depth on physical properties of a tropical soil and on yield of maize, sorghum and cotton. Soil and Tillage Research 2(3): 225-231. 13 ref.

Field experiments were carried out to study the effect of three tillage depths (5, 15 and 30 cm) on soil physical properties and on yield of maize, sorghum and cotton on a ferruginous tropical soil. The increase in porosity due to deep tillage was only temporary and differences in water storage and movement were only noticeable during the early part of the rainy season. Deep tillage increased the yield of maize and cotton by about 10% but sorghum yield was not affected.

0583 ALESSANDRIA. E.E. 1982. Factors affecting grain sorghum planting: seeding depth and caryopsis dimension. (Es)• Revista de Ciencias Agropecuarias 3: 71-89. 34 ref. (Summary:En),

0584 ASSIS. F.N. DE., MENDEZ, M.E.G.. and SCHUCH, L.O.B. 1982. Response from two commercial grain sorghum hybrids to different sowing periods in Pelotas, Rio Grande do Sul. (Pt). Pages 63-65 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil:Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

0585 BORDOVSKY, D.G. 1982. Effect of tillage practice on sorghum for grain. Agronomy Abstracts: 244.

The effects of conventional and reduced tillage production practices on sorghum for grain were evaluated during the 1979 through 1982 growing seasons at Munday, TX, on a Miles fine sandy loam soil. No significant differences in yield were observed under irrigated or dryland conditions during any of the 3 years. Only small differences in stored soil moisture due to tillage practices were observed in the irrigated or dryland portion of the study. Grain yields from irrigated conventional tillage plots and irrigated reduced tillage plots averaged 4805 kg/ha and 4930 kg/ha grain, respectively. Grain yields from dryland conventional tillage plots and dryland reduced tillage plots averaged 2472 kg/ha and 2426 kg/ha, respectively. No difference in soil organic matter content was observed due to tilage practice after 3 years of continuous sorghum for grain. Herbicides effectively controlled weeds in early spring prior to planting of reduced tillage plots. Conventional tillage plots were tilled an annual average of nine and one half times for weed control and seed bed preparation.

0586 BRAGACHINI, M. 1982. Adjustment of the large sorghum grain planting equipment. (Es). Publicacion Miscelanea, Estacion Experimental Regional Agropecuaria, Rafaela, Argentina 12: 31-37.

0587 BRAZIL:CENTRO NACIONAL PESQUISA MILHO SORGO. 1982. Recommendations for sorghum cultivation, 2nd edition. (Pt). Sete Lagoas, MG, Brazil: Centro Nacional de pesquisa de Milho e Sorgo. 62 pp. (Circular Tecnica No. 1).

Cultural methods including soil conservation and land preparation, fertilizer application, liming, chemical and physical characteristics of local rock phosphates, sowing dates, plant populations and pest, disease and weed control are discussed by various authors.

0588 BRAZIL:CENTRO NACIONAL PESQUISA MILHO SORGO. 1982. Technical recommendations for the cultivation of grain sorghum. (Pt). Sete Lagoas, MG, Brazil: Centro Nacional de Pesquisa de Milho e Sorgo. 39 pp. (Circular Tecnica No. 5).

Cultural methods for grain sorghum including soil preparation and conservation, sowing depth, density and spacing, mechanical and chemical weed control, correction of soil acidity, fertilizer rates according to soil P and K content, N applied at sowing and as a topdressing, pest and disease control, irrigation requirements, hand and mechanical harvesting, measures to reduce grain loss and storage are discussed.

0589 BUENO, A. 1982. Influence of spacing, density and plant height on the performance of grain sorghum. (Pt). Pesquisa Agropecuaria Brasileira 17(2): 261-267. 18 ref.

Two split plot experiments were used to test the effects of three row spacings, two plant densities and two hybrids that differed only in the allelic structure of height locus 2 (Dw2 Dw2 or Dw2 dw2). on the agronomic performance of grain sorghum. Variations in planting regimes generally were not effective in changing maturity related traits. Hybrids, however, had significant influence on days to midbloom and physiological maturation, with the tall hybrid (Dw2 Dw2) showing lateness. The treatments were influential in changing plant height. Taller plants were associated with wider row spcaings. the high plant density, and homozygosity at height locus 2 (Dw2 Dw2). Plants grown in rows 0.51 m apart produced the highest grain yields and the largest numbers of seeds per head and heads per plant. Conversely, the heaviest seeds were obtained at the 1,02 m row spacing. Plant density showed a consistent effect on numbers of seeds per head and heads per plant, with larger numbers observed at the low density. The allelic structure of height locus 2 affected hybrid performance for grain yield.

0590 CHAROY. J. 1982. Technical article on sorghum farming in the SARIR (Libya).Nogent-sur-Marne, Paris: IRAT. 15 pp.

0591 CLEGG. M.D. 1982. The yield response of different sorghum plant types grow in 38. 76. and 114 cm row spacing. Agronomy Abstracts: 118.

Two years of replicated field experiments were conducted at the Mead Experiment Station. A split plot design was used. with row spacing as main plots and genotypes as sub-plots. Normal statured. small statured, stiff mid-rib (erect) and tall plant types were grown in 38, 76, and 114 cm row spacings. Yields of the normal and short statured sorghum hybrids increased as much as 30% as the row spacing was decreased. Yields of the erect and tall types varied with genotype in their response to row spacing. Some genotype yields increased as row spacing was decreased, but usually not more than 10%. Other genotype yields changes little or decreased as row spacing was decreased. The yield increase with decreasing row spacing could be related to increased light interception with smaller plant types. However, a larger size, an erect structure and height tended to decrease the dependency of adjusting row spacings for increased light interception. Other factors probably became more important in influencing yield. Combined data sowed a very good correlation of yield and seed number per unit area.

0592 F0ALE, M.A. 1982. Contrasting effects of population density on yield of irrigated grain sorghum in the Ord River Irrigation Area. Page 221 In Proceedings of the second Australian agronomy conference. Parkville, Victoria, Australia:Australian Society of Agronomy.

0593 FOALE. M.A. 1982. Performance of uniculm grain sorghum. Sorghum Newsletter 25: 127.

0594 FOALE. M.A., WILSON, G.L.. COATES, D.B., and HAYDOCK. K.P. 1982. The response of irrigated grain sorghum productivity to population density and seasonal solar elevation. Pages 122-124 In CSIRO. Division of Tropical Crops and Pastures, Annual Report 1981-82. Brisbane, Australia:CSIRO.

0595 GERIK, T.J., and MORRISON. J.E. JR. 1982. Effects of conservation tillage on plant growth and rooting of grain sorghum.

Agronomy Abstracts: 120.

Conservation tillage is an attractive concept because of reduced energy and labor costs. It is not a widely accepted production practice because the heavy soils remain wet and cold during the early planting season and farmers fear a reduction in yields could result. Studies were undertaken to compare the effects of controlled-traffic conservation tillage and conventional tillage on soil strength, plant establishment, plant growth, root development, and yield of grain sorghum. Experiments were conducted on an "Austin" silty clay (Typic Haplustolls) during 1981 and 1982. Leaf area, grain yield, and yield components did not differ between the two tillage treatments, but plant populations were reduced 8% by conservation tillage. Soil penetration resistance was lower under conservation tillage, although treatment differences were not significant. Also, higher root densities were found before anthesis on plants grown under conservation tillage. It concludes that conservation tillage enhances soil structure and is equally productive compared to conventional tillage systems.

0596 HOLLAND, J.F., FELTON, W.L., and DOYLE, A.D. 1982. No-tillage crop production research in northern N.S.W. Page 193 In Proceedings of the second Australian agronomy conference. Parkville, Victoria, Australia:Australian Society of Agronomy.

0597 JAUBERTIE, J.P., and CATELAND, B. 1982. Investigations on row spacing and sowing density under irrigated conditions in sorghum. Sorghum Newsletter 25: 39-40.

0598 JONES, M.J., REES. D., SINCLAIR, J., and MAKIN, I. 1982. Soil factors and sorghum population optima in Botswana. Page 744 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India:ICRISAT. (Abstract).

In sorghum row-spacing/population trials in Botswana, soil factors strongly influenced crop response to the rainfall pattern. Higher populations had higher rates of water use than low populations on a loamy sand but not on a sandy loam, in which rooting appeared to be restricted by a naturally high bulk density. On this compact soil high populations showed severe drought stress with consequent loss of yield potential, and yields peaked at about 63000 plants/ha. It is postulated that crop performance in a semi-arid environment depends heavily on the ability of the soil to act as a buffer against drought, and this is a function not only of soil depth and water-holding capacity but also ease of rainfall infiltration and root proliferation. Such factors are highly relevant in extension advice to farmers and in land capability evaluation.

0599 LANZI, T. 1982. Sorghum in late planting. (It). Giornale di Agricoltura 92(21): 47.

0600 MANE, V.S., and SHINGTE, A.K. 1982. Use of mulch for conserving moisture and increasing the yield of sorghum in dryland. Indian Journal of Agricultural Sciences 52(7): 458-462. 9 ref.

Experiments conducted from 1969-70 onwards showed that 100% increase in the yield of winter sorghum could be achieved with the use of organic mulches. The types and quantities of mulches, however, did not show significant difference in the yields. The dry grass mulch gave consistent increase in yield. Moisture was better utilized in the mulched plots. Application of surface mulch up to 15 days after emergence of seedlings gave the highest returns. The yields, however, decreased with delay in application of mulch. Mulching with sannhemp increased the yields of winter sorghum significantly.

0601 MAO. M.A. 1982. Studies on row spacing and planting pattern of dryland sorghum under different fertility levels. Page 103 In Report on the third FAO/SIDA seminar on field crops in Africa and the Near East, 6-24 June 1982. Nairobi, Kenya. Rome, Italy:FA0.

0602 MARIANI, G. 1982. Problems and perspectives of grain sorghum cultivation in Italy. Page 755 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India:ICRISAT.

Peninsular Italy, as other Mediterranean environments, makes sorghum cultivation possible in range of situations, and as an alternative to maize, at least in marginal area, under rainfed conditions or with irrigation, as the main crop or second crop after wheat. Cultivation is based on hybrids, double dwarf types from the USA. The yield of performances are economically interesting. The main difficulty is obtaining uniform and suitable stands if sowing is not followed by irrigation. While diseases do not represent a serious constraint, sorghum shoot fly and sorghum midge adversely affect cultivation in some areas. Birds may cause severe crop losses in isolated small fields. The main objective of sorghum improvement is to produce hybrids (adapted to drought conditions and suitable for early or deep sowing), whose seed should be produced in our conditions; they also need some resistance to birds, but with a reasonable tannin content in the grain*

0603 MARTI, A. 1982. Planting. Selection of cultivars. (Es). Publicacion Miscelanea - Estacion Experimental Regional Agropecuaria. Rafaela, Argentina 12: 17-22.

0604 MUCHOW, R.C., COATES, D.B., WILSON. G.L., and FOALE, M.A. 1982. Growth and productivity of irrigated Sorghum bicolor (L. Moench) in northern Australia. I. Plant density and arrangement effects on light interception and distribution, and grain yield, in the hybrid Texas 610SR in low and medium latitudes. Australian Journal of Agricultural Research 33: 773-784. 17 ref.

The influence of plant arrangement and density on yield of the grain sorghum hybrid Texas 610SR grown as an irrigated dry season crop in the Ord Irrigation Area (lat. 16 deg S.) was determined. Neither the rate of dry matter production nor the pattern of partioning of dry matter during grain-filling varied between treatments, and grain yield was unresponsive to row spacings below 75 cm and densities above 267000 plants/ha. The results were analysed by considering the effect of radiation interception and distribution in the canopy on dry matter production. The opportunity was then taken to compare this trial, and two others conducted at the same low latitude where grain yield was unresponsive to density, with four trials conducted at higher latitudes (27 deg S) where Texas 610SR was very responsive to density.

0605 MUSICK. J.T.. and DUSEK, D.A. 1982. Skip-row planting and irrigation of graded furrows. Transactions of the ASAE 25(1): 82-87, 92. 19 ref.

Skip-row irrigation field tests were conducted in 1976-77 on corn, and in 1979 on grain sorghum on a site having differential profile permeability associated with prior deep tillage. Tests consisted of planting two 0.75 m rows and leaving out one or two rows between planted strips in 1976, and one row between planted strips in 1977 and 1979. One furrow was irrigated between each pair of crop rows. Skip-row irrigation reduced average water intake from 130 to 60 mm, or to 46% of every-row irrigation. Where the residual deep tillage effect almost doubled water intake, skip-row irrigation averaged 34% of every-row irrigation. These data suggest that reduction of water intake is greater on more permeable soils. Water intake data indicate that skip-row irrigation is effective in reducing size of graded-furrow irrigation and limiting the potential losses to profile drainage.

0606 PERIYATHAMBI, C, and PALANIAPPAN, S. 1982. Note on the effect of pre-monsoon sowing on the crop stand and yield of rainfed sorghum. Indian Journal of Agricultural Sciences 52(5): 345. 3 ref.

0607 RAGHAVULU, P., and SINGH, S.P. 1982. Effect of mulches and transpiration suppressants on yield, water use efficiency and uptake of nitrogen and phosphorus by sorghum under dryland conditions of north-western India. Journal of Agricultural science 98(1): 103-108. 11 ref.

Field experiments consisting of three mulch treatments (no mulch, straw mulch and dust mulch) and six transpiration suppressants (no suppressant, kaolin, phenyl mercuric acetate, atrazine, mobileaf or alachlor and 2-chloro ethyl trimethyl ammonium chloride) were conducted under dryland conditions during the summer rainy seasons (July-November) of 1976, 1977 and 1978. Compared with no mulch, straw mulch increased yield in all 3 years, water use efficiency in 1977 and 1978, and uptake of N and of P in 1977 and 1978. Dust mulch had only a marginal advantage. Amongst transpiration suppressants, only kaolin and atrazine had a marked effect. Both these chemicals increased grain yield, water use efficiency and uptake of N and P, compared with no suppressant.

0608 SINGH, A.R., and KULKARNI, L.P. 1982. Effects of different dates of sowing on quality of CSH-5 sorghum seed. Sorghum Newsletter 25: 52.

0609 SINGH, M. 1982. Effect of plant geometry and nitrogen levels on growth, yield and quality of hybrid sorghum (CSH-6). M.Sc. thesis, Haryana Agricultural University, Hisar, India. 82 pp.

A field experiment was conducted at the Agronomy Research Farm. The treatments comprised five spacings viz., 30X20 cm, 30X30 cm, 45X15 cm, 60X10 cm and 60X15 cm as main treatments and five levels of nitrogen viz., 0, 50, 100, 150, and 200 kg N per hectare as sub treatments. Application of nitrogen at higher rate (150 kg N/ha) significantly increased ear head weight, grain yield per plant and grain yield per hectare under wider spacing (60X15 cm). However, 1000-grain weight was not influenced significantly by any of the treatments. The economic optimum doses were worked out to be 132.56, 119.52, 102.84. 94.15 and 117.87 kg nitrogen per hectare under 30X20 cm, 30X30 cm, 45X15 cm, 60X10 cm and 60X15 cm spacings, respectively. Among various nitrogen levels application of 150 kg N/ha gave maximum net return.

0610 SUBOWO., DAWAM, M., and NOTODIMEDJO, S. 1982. Effect of plant spacing on the growth and yield of three sorghum (Sorghum bicolor (L.) Moench) cultivare. Agrivita 5(1): 10-13. 5 ref.

A research was undertaken to investigate effect of plant spacing on three sorghum cultivars at Food Crops Research Station, Mojosari, Mojokerto, East Java, from July to December 1978. A split plot design was used with three replications, Cultivars were placed on the main plot while spacing on the sub plot. No interaction was found between cultivars and plant spacing. Among the three sorghum cultivars. No. 6C produced the highest yield (67.2 qt/ha). Plant density affected grain yield. The highest grain yield (74.7 qt/ha) was obtained from 50 x 5 cm spacing (or 400.000 plants per ha) and the lowest yield (50.3 qt/ha) was obtained from 100 x 20 cm (or 50,000 plants per ha). Average yield from 50 cm row width was the highest (63.4 qt/ha). while wider row width (75 cm and 100 cm) produced lower yield (60.6 qt/ha and 57.8 qt/ha, respectively).

0611 UMRANI. N.K., KALE, S.P.. and NARKHEDE, P.L. 1982. Root proliferation pattern of sorghum as influenced by plant density and row spacing. Sorghum Newsletter 25: 61-62.

0612 UNGER. P.W. 1982. Effects of tillage method after winter wheat on soil water storage and sorghum yield. Agronomy Abstracts: 258.

Five tillage treatments were evaluated for managing crop residues and controlling weeds and volunteer wheat during the 11 months of fallow from harvest of irrigated winter wheat in 1978, 1979. and 1980 until dryland sorghum planting the following years. The treatments were: moldboard plowing initially, then disk tillage; rotary tillage initially, then sweep tillage; disk tillage; sweep tillage; and no-tillage with herbicides for weed control. Plant available soil water contents to a 1.8-m depth at sorghum planting averaged 14.5, 14.3, 15.9, 17.9, and 20.7 cm for the respective treatments. Sorghum grain yields averaged 2.560; 2,190; 2,370; 2,770; and 3,350 kg/ha with the respective treatments. The higher yields with no-tillage were attributed to higher soil water contents resulting from increased precipitation storage, which reduced plant water stress during rainless periods. Improved conservation of precipitation is beneficial for improving crop yields in the Southern Great Plains where precipitation is limited and the supply of water for irrigation is limited and being depleted.

0613 VERMA, J.K., and PANDAY, B.B. 1982. Row spacing, planting pattern, and seedbed shaping effects on production of grain sorghum. Sorghum Newsletter 25: 64-65.

0614 WADE, L.J., and LADEWIG, J.H. 1982. The relationship between sample number, sample size, and sample configuration in the estimation of the density of sorghum crops grown in large field experiments. Sorghum Newsletter 25: 38-39.

0615 WILLCOCKS, T.J. 1982. An investigation into cultivation methods for dryland farming in semi-arid regions with summer rainfall. Thesis, Newcastle upon Tyne University, UK. 342 pp.

0616 WILSON, G.L.. DICZBALIS, Y., and ASPINALL, J.D.E. 1982. Inter-plant uniformity and yield. Sorghum Newsletter 25: 126-127.

The hybrid RS610 was hand planted (two seeds per position, later thinned to one) at 100,000–300,000 and 500,000 plants per hectare, at a constant 20 cm row width, plant distance within the row thus varying. At each density, seeds were spaced to give coefficients of variation (CV) in distance between plants of 0, 15 and 25 percent. Total above ground dry weights and grain yields were recorded on an individual plant basis. Yield responses were assessed against the CVs of final plant weights, as the most appropriate measure of plant uniformity.

0617 WYLIE, P.B., HENZELL, R.G.. and HARBISON J. 1982. South Queensland grain sorghum planting guide: 1982-83 season. Queensland AgriculturalJournal108(5):233-235.

Fertilizers and Plant Nutrients

0618 ANONYMOUS. 1982. Conclusions and recommendations of FAO expert consultation in India on fertilizer use under multiple cropping systems. Fertiliser News 28(6): 59-62.

0619 ADRIAANS, J.H.. and HERDEN. R.A. 1982. The effect of nitrogen and phosphorus application on yield of raingrown summer crops in central Queensland, 1. Sorghum in Dawson and Callide Valleys. Page 283 In Proceedings, second Australian agronomy conference. Parkville, Victoria, Australia:Australian Society of Agronomy. 1 ref.

0620 ALI, A.H., BASHIR, M.I., and EL-ATTAR, F.I. 1982. Effect of nitrogen fertilizer and plant density on the grain yield of three sorghum varieties. Annals of Agricultural Science 18: 351. (Abstract).

Two yield trials were carried out at two locations, namely El-Salaa and El-Baliana at Sohag Governorate, in 1977 season to investigate the effect of four nitrogen levels, i.e. zero, 30, 45 and 60 Kg.N./Feddan, and three plant densities, i.e. 15, 20 and 25 cm. between hills on the yield of three sorghum varieties, i.e. Giza 114, Giza 15 and Giza 3. The newly released variety Giza 15, outyielded Giza 114 and Giza 3 by 30.8% and 19.9% respectively. There was a progressive and consistent increase in grain yield with Feddan. Plant density did not affect the grain yield significantly, planting at 15, 20 and 25 cm. between hills gave 13.71, 14.10 and 14.01 ardab/Feddan respectively. The interaction between varieties and nitrogen fertilizer and between nigrogen fertilizer and plant density was highly significant.

0621 BADHE, N.N., and MUNDWAIK, S.P. 1982. Effect of phosphorus concentration on iron zinc copper and manganese utilization by sorghum and wheat. Journal of Maharashtra Agricultural Universities 7(2): 148-150.

Field studies using varying amounts of phosphorus through single super phosphate were conducted on medium black soil and the Fe, Zn, Cu and Mn utilization by kharif sorghum (CSH-5) and rabi wheat (Sonalika) was determined. The results suggest that yield reduction caused by microelement deficiencies are unlikely on phosphated soils. However, reduction in microelement concentration and uptake by sorghum and wheat may occur, on heavily phosphated soils or with the addition of phosphorus to the soil over a long period of time. Higher concentration of microelements in root and their reduction in the above ground parts of the crops lead to the conclusion that mobility of elements particularly iron and zinc is restricted as a result of their antagonistic relationship with phosphorus or due to the physiological inhibition caused by the high concentration of phosphorus in the above ground portion of the crops.

0622 BAHIA FILHO, A.F.C., VASCONCELLOS, C.A., and SANTOS. H.L. 1982. Inorganic and "available" forms of phosphorus in a dark red latosol after application of different phosphates. (Pt). Revista Brasileira de Ciencia do Solo 6(2): 99-104. 20 ref. (Summary:En).

Inorganic forms of phosphorus in field plots after different phosphorus fertilizers were applied at different levels to a sorghum crop were determined by four extractants i.e. Bray 1 and 2, Mehlich 1 and Olsen. All extractants removed P-NH4F in plots where triple superphosphate had been applied. Fertilization with rock phosphate caused changes in P-H2S04 only. The Olsen method gave a low corelation with the inorganic phosphorus forms extracted. Bray 1 clearly showed the changes in availability resulting from the use of different phosphorus sources.®

0623 BALASUBRAMANIAN, A., THEETHARAPPAN, T.S., PRASAD. M.N., and THANGAVELU. 0. 1982. Studies on bio-fertilization in sorghum. Sorghum Newsletter 25: 45-46.

An experiment was conducted at Tamil Nadu Agricultural University, Coimbatore, during kharif 1981 to find out whether the fertilizer N can be reduced by seed and soil inoculation of Azospirillum brasilense with graded levels of N, viz. 0. 20, 40. 60 and 80 kg/ha under irrigated conditions. The soil was clay loam with a medium fertility status. Sorghum used for this study was CSH-5. The design adopted was RBD with 3 replications. A uniform dose of P and K each at 40 kg/ha was applied as basal. Nitrogen in the form of urea was applied in two splits i.e., basal and 25 days after sowing. The yield data revealed that Azospirillum inoculation significantly influenced the grain yield of sorghum and it increased the grain yield by 11.9%.

0624 BANARAS, M., ZAFARULLAH., BAJWA, M.S., and AHMAD, S. 1982. Effect of different nitrogen levels and harvest stages on the yield and quality of sorghum. Pakistan Journal of Agricultural Research 3(2): 107-111. 14 ref.

The research was undertaken at University of Agriculture, Faisalabad to determine the optimum dose of nitrogen and most suitable harvesting stage in sorghum fodder crop to obtain maximum yield with best nutritional quality of the produce. It was observed that the height of the plant and number of leaves per plant increased significantly with increase in the rate of nitrogen. Fodder yield increased as the nitrogen rate was increased from 60 to 120 kg/ha. The yield also increased with the delay in harvesting upto 75 days after planting. Relative increase in protein and fat contents with the increase in nitrogen rate was observed but these contents considerably decreased when the crop was harvested 75 days after planting. It was found that optimum rate of nitrogen was 120 kg/ha and most suitable time of harvesting was 60 days after planting.

0625 BANGAR, A.R., DESHPANDE. R.P., SHINGTE, A.K., and MORE, D.A. 1982. Quantification of gypsum requirement for amelioration of saline sodic soil. Journal of Maharashtra Agricultural Universities 7(1):85-86.

0626 BASAVARAJU, C.V., and BOMMEGOWDA, A. 1982. Effect of nitrogen levels, methods of N application and spacings on the hybrid seed yield and quality of sorghum (CSH-6). Indian Journal of Agronomy 27(4): 468-471. 2 ref.

0627 BERNARDO, L.M., CLARK, R.B., and MARANVILLE, J.W. 1982. Effect of nitrate/ammonium ratios on nutrient solution pH, nitrogen uptake, and dry-matter yields of sorghum. Agronomy Abstracts: 92.

Sorghum seedlings were grown in nutrient solutions to investigate the effects of different N03-/NH4+ ratios on nutrient solution pH, N uptake, and dry matter yields. Nutrient solution pH depended on the source of N; pH values rose to near 8 with N03- as the sole source of N and decreased to near 4 with NH4+ + N03- in solution. Upon depletion of NH4+ from solution, pH values rose abruptly to and remained near 8. Nitrogen uptake rates were highest in plants grown with the highest proportion of NH4+ (160/40 N03-/NH4+). Concentrations of N in plants grown with the various N03-/NH4+ ratios remained unchanged in the leaves with plant age. Concentrations of N increased in the roots with age at the N03/NH4+ ratios of 200/0 and 195/5. Highest N concentrations were in roots of plants grown with the 160/40 N03-/NH4+. Dry-matter yields were generaly higher for plants grown with 160/40 N03-/NH4+ compared to N03- alone as the source of N or with low proportions of NH4+.

0628 BLIGH, D.P., SEDBERRY, J.E. JR., MARSHALL, J.G.. and BABCOCK, D.K. 1982. The effects of different rates of N, P, K fertilizers on the yields and concentrations of various elements in the soil and tissue of four crops grown on Norwood silt loam. Report of Projects - Louisiana Agricultural Experiment Station, Department of Agronomy, p. 300-304.

0629 B00N-AMP0L, P., MEESAWAT. R., CHAIWANAKUPT, S., ARAYANGKUL, T., and B00N-AMP0L, Y. 1982. Response of sorghum to nitrogen and phosphorus fertilizers. Sorghum Newsletter 25: 65-66.

Two sorghum varieties, KU 301 (yellow endosperm with white coated seed) and DA 80 (yellow endosperm) were studied with nitrogen and phosphorus fertilizers (0, 62.5, 125 and 187.5 kg/ha of N - P205 - K20). The randomized complete block with 3 replications was statistically designed to each individual variety at the same location. The experiment was conducted in order to evaluate the response of these two varieties to the rates of nitrogen and phosphorus fertilizers where the crop was grown on Brown Forest soil group. The soil fertility status was medium. The plant population was 166,666 plants/ha (60 x 10 cm). Fertilizers were applied at planting. The results indicated that the yield production of KU 301 had no response of N and P fertilizer rates. However, Da 80 variety had more respone of grain yield to nitrogen and phosphorus fertilizer rates. Increasing of both N and P tended to increase grain yield. The grain yield of KU 301 and DA 80 varieties without fertilizer treatments were 2272 and 1856 kg/ha respectively.

0630 BOON-AMPOL, P., MEESAWAT, R., CHAIWANAKUPT, S., SAVATHANON, M., and KOMANASUPASAWAT, C. 1982. The effect of fertilizer x plant population on two sorghum varieties. Sorghum Newsletter 25: 66.

The experiment was conducted to study the influences on two sorghum varieties (KU 301 and Early Hegari) of different fertilizer rates (62.5-62.5-0, 125-125-0 and 250-250-0 kg/ha of N - P205-K20). These were conducted on alluvial complex soil (sandy clay loam) at Ban Mai Sam Rong Experiment Station during the rainy season. Plant spacing was assigned as 60 x 10, 50 x 10 and 30 x 10 cm. (166,666; 200,000; and 333,333 plt/ha, respectively). The grain yield of KU 301 was lower than Early Hegari under the same conditions. Grain yield of KU 301 was reduced under high plant density while Early Hegari indicated no effect. High rates of fertilizer (250-250-0) tended to reduce grain yield of KU 301 but increasing fertilizer rates had no effect on grain yield of Early Hegari. An interaction between spacing and fertilizer was not observed in Early Hegari variety. The fertility status of the soil was high in nature, especially in phosphorus and potassium. Therefore, fertilizer application showed no influence on grain yield.

0631 CABALA ROSAND. P.. and WILD, A. 1982. Direct use of low grade phosphate rock from Brazil as fertilizer. 1. Effect of reaction time in soil. Plant and Soil 65(3): 351-362. 14 ref.

A low-soluble phosphate rock from Patos (Brazil) was compared with monocalcium phosphate, and Gafsa and Morocco phosphate rocks as a source of phosphate for sorghum growing in three acid soil from Southern Bahia (Brazil). Before the test period with sorghum the four phosphates were allowed to react with the soils for 0. 90. 180 and 270 days. The effectiveness of each source was assessed as the monocalcium phosphate (MCP) equivalent at zero reaction time. The MCP equivalent of the low-soluble phosphate rock was poor in all three soils; it increased with reaction time in an ultisol with comparatively high buffer capacities for calcium and phosphate, but did not change with reaction time in the other two soils. With increased reaction time in an oxisol there was a rapid decrease in availability of the monocalcium phosphate, and a less rapid decrease in availability of Gafsa and Morocco phosphate rocks. The results support the hypothesis that the rate of phosphate rock is high in soils of low pH and with high buffer capacities for calcium and phosphate.

0632 CEDENO. B. M.A.. and CANTOG. J.A. 1982. Effect of cachaza used alone and combined with other substances on sorghum growth and on chemical properties of three acid soils of La Victoria Sugar Mill area (Panama). (Es). Thesis. Universidad de Panama. Panama. 96 pp. 52 ref.

0633 CLARK. R.B.. BERNARDO. L.M.. and MARANVILLE. J.W. 1982. Effects of nitrate/ammonium ratios on mineral element uptake by sorghum. Agronomy Abstracts: 94.

Experiments were conducted using different NO3-/NH4+ ratios in nutrient solutions to determine the effects of these sources N on mineral element uptake by sorghum plants. The N03-/NH4+ ratios in nutrient solution were 200/0, 195/5. 190/10. and 160/40 (mg N/L). Nutrient solutions were sampled and plants harvested regularly during the 12-day treatment period. Moderately severe Fe deficiencies were observed in plants grown with N03- as the sole source of N, but not in plants grown with at lease 89 micro M NH4+ (195/5 N03-/NH4+ ratio). Manganese in the roots of plants grown with N03- as the sole source of N was ten fold higher than in roots of plants grown in the 160/40 N03-/NH4+ solution. Increases in P uptake were noted when the proportion of NH4+ increased whereas K. Ca, Mg. and Mn decreased as the proportion of NH4+ in solution increased. Rises in nutrient solution pH occurred because of the depletion of NH4+ and not any other element.

0634 CLEGG. M.D. 1982. Effect of soybean on yield and nitrogen response of subsequent sorghum crops in eastern Nebraska. Field Crops Research 5(3): 233-239. 10 ref.

The cropping systems included continuous sorghum. continuous soybeans and sorghum and soybeans in rotation. Four nitrogen levels (0. 57. 114 and 170 kg/ha N) were applied to sorghum in each system. A randomized complete block design with four replication was used. Average grain yield of sorghum grown continuously with 0 N applied was 4616 kg/ha as compared to 6551 kg/ha when grown after soybeans in rotation. The estimated available N for sorghum after soybeans was 75 + or- 19 kg/ha. Regression analysis showed maximum grain yields of continuously grown sorghum would be expected to occur with application of 150 kg/ha N and with application of 95 kg/ha when grown in rotation. On this soil a large portion of sorghum nitrogen requirement can be met by growing it in rotation with soybeans. Perhaps in subsistance agriculture a legume-cereal system could supply nitrogen which otherwise would not be available.

0635 CORDEIRO, D.S., KICHEL. A.N.. PORTO, V.H. DA F., and SILVEIRA JUNIOR. P. 1982. Effect of the interaction between lime and phosphorus in the production of grain sorghum in a planosol. Pages 77-81 In Annals of the eleventh Technical yearly Meeting of sorghum. Pelotas, RS, Brazil:Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

0636 COUTINHO, E.L.M., SOUZA, E.A. DE., and BAUMGARTNER, J.G. 1982. Effects of lime and potassium fertilization on sorghum bicolor (L.) Moench. (Pt). Cientifica 10(2): 253-258.

0637 DAFTARDAR, S.Y., NARKHEDE, P.L., and SURVE, S.P. 1982. Response of rainfed winter sorghum to nitrogen under conventional and improved technology in semi-arid tropics. Sorghum Newsletter 25: 60.

The efficiency of applied N (50 kg N/ha) under improved technology was almost double that of the conventional method. Under improved technology the response of sorghum to N was 11.48 as against 5.42 (kg grain/kg N) under the conventional method. It was observed that the percentage increase in grain and stover yields of sorghum due to application of N over no nitrogen was more or less similar under both methods. However, the production levels of grain and stover under improved technology were higher by about 70 to 82% and 150 to 167% respectively over those by the conventional method. The study shows the importance of improved variety and crop management for obtaining higher response of rainfed winter sorghum to applied nitrogen.

0638 DANTAS, J. P. 1982. Comparative mineral nutrition and fertilization of grain sorghum. (Pt). Thesis, Escola Superior de Agriculture Luiz de Queiroz, Piracicaba, SP, Brazil. 126 pp. 133 ref.(Summary:En).

0639 DATIN, C.L., and WESTERMAN, R.L. 1982. Effect of phosphorus and iron on grain sorghum. Journal of Plant Nutrition 5(4-7) 703-714. 16 ref.

The objectives of this study were to determine the effect of P and Fe applied singly and in combination with other micronutrients on (a) yield and micronutrient concentration of grain sorghum and (b) DTPA extractable Fe. Two soils (Quinlan clay loam - Typic Ustocrept and Spur silt loam - Fluventic Haplustoll) that were deficient in P and Fe were collected from Western Oklahoma for a greenhouse experiment. Effect of P plus micronutrients applied singly and in combinations varied markedly with soil type. Phosphorus plus Fe and micronutrient combinations containing Fe were most effective and exhibited a synergistic effect on yield of dry matter and DTPA extractable Fe. Soil DTPA extractable Fe was significantly correlated with dry matter yield (r sq. = 0.81). Phosphorus stimulated root growth and under these experimental conditions enhanced the effect of soil applied Fe.

0640 DEHUA, H.. ZUOZHONG, C, and HUNGFANG, Z. 1982. Comparative study on the biocycling of nitrogen and mineral elements of various crops grown on the calcareous cinnamon soil in Beijing region. (Ch). Acta Phytoecologica et Geobotanica Sinica 6(2): 120-130. 11 ref. (Summary:En).

0641 DICKSON, T., and HAYDON, G.F. 1982. Diammonium phosphate as a source of N and P for sorghum in the

South Burnett, Page 275 In Proceedings. second Australian agronomy conference. Parkville, Victoria, Australia:Australian Society of Agronomy. 2 ref.

0642 EBIHARA, T.. YAMADA, K.» and MATSUMURA, S. 1982. Studies on application of sludge to agricultural land, 2: Influence of accumulative application of sludge on the soil and crops. (Ja). Bulletin of the Gunma Agricultural Experiment Station 22: 49-58. 12 ref.

0643 FONTES. M.P.F., NOVAIS, R.F., ALVAREZ, V.H., and BORGES, A.C. 1982. Critical levels of sulfur in latosol and recuperation of the applied sulfate by different chemical extractors in green-house experiments. (Pt). Revista Brasileira de Ciencia do Solo 6(3): 226-230. 11 ref. (Summary:En).

Sample of twelve Latosols, from Minas Gerais State, Brazil, received five levels of sulphur (0, 20, 40, 80 and 160 ppm) in three replications and were cultivated in green-house, for two subsequent crops, with sorghum as test plant* In the second crop, a significant response to S was observed in seven soils. The existent S in the soil, in each treatment, was determined after each crop, by Ca(H2P04)2 Ca(H2P04)2 in HOAc and reagent of Morgan. For each one of those seven soils, the critical level was determined by each extractor. Only the S concentration obtained by the Ca(H2P04)2 in HOAc correlated significantly (negatively) with the values of humidity equivalent and the soils clay content. The recovered S by those extractors, for each level of S tested, correlated significantly (negatively) with the equivalent of humidity and the soils maximum adsorption of S.

0644 FURLANI, A.M., CLARK, R.B., MARANVILLE, J.W., and ROSS, W.M. 1982. Sorghum genotype differences to organic and inorganic sources of phosphorus. Pages 751-752 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India:ICRISAT. (Abstract).

Selected sorghum genotypes, chosen because of their response to low P in earlier studies, were grown in nutrient solutions and in a low P soil with various organic and inorganic sources of P to determine their differences for dry matter yields, P concentrations and contents, dry matter produced per unit P, and P distribution among plant parts. Plants grown with organic sources of P, whether in nutrient solutions or in soils produced more dry matter and had higher P concentrations and contents than genotypes grown with inorganic sources of P. Plants grown with calcium phosphate compounds produced as much or more dry matter as plants grown with KH2P04 in nutrient solutions, but less when grown in soils. Plants grown with ferric, ferrous, and aluminum phosphates produced the least dry matter in both nutrient solutions and in soils. Widest differences among genotypes for dry matter yields were noted for plants grown witn ethylammonium phosphate, calcium tribasic phosphate, glycerylphosphate, and KH2P04.

0645 GHUGARE, R.V., DAFTARDAR, S.Y., and NARKHEDE, P.L. 1982. Effect of phosphate application on the moisture-utilization by winter sorghum on P-deficient vertisol. Sorghum Newsletter 25: 58.

A trial to study the response of winter sorghum (M 35-1) to Phosphate on a Vertisol deficient in P was conducted during 1980-81, on a farmer's field adjacent to the Dry Farming Research Station, Solapur, India. P was applied in the form of superphosphate at four different rates. A basal dose of N (50 kg/ha) was uniformly applied to all the treatments. Moisture utilization by sorghum as influenced by applied phosphate was studied. It is evident from the data that application of P considerably increased moisture depletion (8 to 20 mm) by sorghum as compared to control (no P). Highest moisture depletion (197 mm) was observed at the level of 165 kg P205/ha. The use efficiency of moisture for grain was increased by 23.6 to 46.6% due to applied P. A more or less similar trend was also noticed in respect of stover production. Favourable influence of applied P on the moisture depletion and its efficient utilization is of significance considering the low and ill-distributed rainfall in 1980-81.

06A6 HERDEN, R.A., and ADRIAANS. J.H. 1982. The effect of nitrogen and phosphorus application on yield of raingrown summer crops in central Queensland* 2. Sorghum and sunflower - Central Highlands. Page 284 In Proceedings, second Australian agronomy conference. Parkville, Victoria, AustraliaAustralian Society of Agronomy. 1 ref.

0647 HOOKER, M.L., HEREON, G.M., and PENAS, P. 1982. Effects of residue burning, removal, and incorporation on irrigated cereal crop yields and soil chemical properties. Soil Science Society of America Journal 46(1): 122-126. 13 ref.

Long-term experiments were established in 1969 to determine the effects of various methods of managing irrigated winter wheat and grain sorghum residues on yield and several soil chemical properties. Methods of residue management included (i) incorporation, (ii) physical removal, (iii) incorporation of 2X quantities of residue, and (iv) burning. Each residue plot was split, and different N rates were applied to each half. In the fall of 1979, soil samples were taken to a depth of 180 cm to determine wheat chemical changes had occurred. No significant differences were observed in the quantities of Bray #1-P, DTPA-Zn, Na, Ca, or Mg in the surface 15 cm or total N03- in the 180-cm profile. The burning and physical removal treatments resulted in significantly lower organic matter (OM), higher pH, and lower potassium (K) than the other treatments. These two removal treatments also resulted in significantly greater N03- leaching. During the early years of the experiments, there were no significant differences in yield due to the residue treatments.

0648 HOUSE, G.J. 1982. Nitrogen cycling in conventional and no-tillage agroecosystems: analysis of pathways and processes. Ph.D. thesis, University of Georgia, USA. 196 pp.

Nitrogen dynamics in sorghum (1978-1979) and soybean (1980-1981) conventional and no-tillage agroecosystems are compared. Major ecological processes including crop and weed production, litter decomposition, insect consumption, soil and solution chemistry were quantified and provided integrative information on nitrogen cycling in conventional and no-tillage systems. Annual nitrogen budget models of soybean and sorghum systems summarize input, output and internal agroecosystem nitrogen fluxes. Data represent four complete annual farming cycles (two sorghum/rye and two soybean/rye).

0649 IRUTHAYARAJ, M.R., and KUNASEKARAN, V. 1982. Fertilisation in cotton based crop rotation. Agricultural Science Digest 2(1): 17-20. 4 ref.

In a sorghum, finger millet, cotton crop sequence, application of nitrogen at 67.5 kg/ha to sorghum, 90 kg/ha to finger millet and 30 kg/ha to cotton gave the highest yields.

0650 JAGTAP, B.K., and PHARANDE. K.S. 1982. Effects of levels of nitrogen, organic matter and moisture regimes on the panicle characters, grain yield and protein content of sorghum (Sorghum bicolor (L.) Moench). Journal of Maharashtra Agricultural Universities 7(1): 51-53. 13 ref.

Investigations to find out the effect of different levels of N, organic matter and moisture regimes on the panicle characters, grain yield and the protein content of grain sorghum (CSH-5) were carried out in pot culture conditions at the Agricultural College, Pune, India on black calcareous loamy soils. There was a significant increase in the panicle characters, grain yield and the protein content at each of their higher doses of nitrogen and organic matter. The application of higher moisture regimes above the field capacity, however, had an adverse effect on the panicle characters, grain yield and the protein content of grain sorghum.

0651 KICHEL. A.N., CORDEIRO, D.S.. BRAUNER, J.L., PORTO, V.H. DA F., and SILVEIRA JUNIOR, P. 1982. Response from three commercial grain sorghum hybrids to different nitrogen fertilization levels. (Pt). Pages 69-76 In Annals of the eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil:Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

0652 KRISHNAMURTHY. B., and RAO, P.V. 1982. Response of sorghum genotypes to nitrogen. Andhra Agricultural Journal 29(2-3): 205-206. 3 ref.

0653 LA1K0VICS. GY. 1982. Study on the utilization of N fertilizers by labelling with 15N in a microplot experiment. (Hu). Agrokemia es Talajtan 31(3-4): 289-300. 7 ref. (Summaries:De, En, Ru).

0654 LOBATO, E. 1982. Phosphorus fertilization in soils of the Mid-Western region. (Pt). Pages 201-239 In Phosphorus fertilization in Brazil. Brasilia, DF, Brazil:Empresa Brasileira de Pesquisa Agropecuaria. 18 ref.

0655 LOMTE, M.H., DABHADE, R.S., and MUNDHE, S.S. 1982. Use of bio-fertilizers in sorghum. Sorghum Newsletter 25: 52.

An experiment to quantify the amount of nitrogen made available to sorghum by Azospirilium was carried out in kharif 1981 at the Sorghum Research Station, Parbhani, India in a randomized block design. The trial was laid out in a plot having poor fertility. Significant differences in grain yield were observed by the different treatments. All the treatments except T2 and T6 were significantly superior to control. Azospirillum culture had little effect on the grain yield. It is evident from the different treatments that Azospirillum culture had beneficial effect on the grain yield of sorghum equivalent to about 20 kg N/ha. The combined effect of Azospirillum + 20 kg N/ha was found most effective as compared to other treatments under poor fertility level.

0656 LOPES. A.S., VASCONCELLOS, C.A., and NOVAIS, R.F. DE. 1982. Phosphorus fertilization in some crops in the states of Minas Gerais, Espirito Santo and Rio de Janeiro. (Pt). Pages 137-200 In Phosphorus fertilization in Brazil. Brasilia, DF, Brazil:Empresa Brasileira de Pesquisa Agropecuaria. 81 ref.

0657 LUTRICK, M.C., ROBERTSON, W.K., and CORNELL, J.A. 1982. Heavy applications of liquid digested sludge on 3 ultisols 2. Effects on mineral uptake and crop yield. Journal of Environmental Quality 11(2): 283-287.

A study was made of the nutrient uptake of corn, grain sorghum, and soybeans grown on land to which liquid-digested sludge (sludge) containing 2.6% solids had been applied as a source of plant nutrients. The sludge was applied over a 6-year period to give a total of 0. 87, 174, 241, 288, and 335 metric tons/ha dry matter. Corn did not contain Pb in the leaves or grain but the leaves contained up to 2.0 ppm Cd and 0.23 ppm Hg when high levels of sludge were applied. Cadmium and Hg were not detected in the corn grain. No measurable amount of Cd and Pb were found in the leaves or grain of grain sorghum, however Hg accumulated in the leaves up to 0.06 ppm. The yield and plant data analyses indicated that annual applications of sludge from Pensacola, Fla., equivalent to 28 metric tons dry matter/ha would be an acceptable rate of disposal by land-spreading for corn, grain sorghum, and soybeans grown on three Peleudults: Orangeburg, Troup, and Lucy soils.

0658 MARTIN, G.W., and TOUCHTON, J.T. 1982. Nitrogen requirements for till and no-till grain sorghum double cropped with various winter legumes. Sorghum Newsletter 25: 67-68.

The purpose of this study was to determine the N requirements of till and no-till grain sorghum double cropped with various winter legumes on Toccoa, Do than and Wickham soil series. Winter species were selected on the basis of earlier performance tests and included: arrowleaf clover, crimson clover, common vetch, Austrian winter pea; as well as a rye and winter fallow check plots. Summer crop treatments included conventional tillage and no tillage, and four sidedress N rates (0, 34, 67, and 100 kg/ha) for sorghum. Grain sorghum (Funks 522 DR) was planted in 91 cm rows in late spring. Data collected included: available and total soil N, nematode populations, yield and N content of the above ground portion of the winter crops, grain sorghum leaf N content, time of head emergence, and grain yield.

0659 MEEK, B.. LUCY, G., and TERRY, D. 1982. Long-term effects of manure on soil nitrogen, phosphorus, potassium, sodium, organic matter and water infiltration rate. Soil Science Society of America Journal 46(5): 1014-1019.

High rates of manure were added to field plots of a Holtville silty clay (Typic Torrifluvents) soil in an irrigated desert region, and their effects on the soils' chemical and physical properties were measured for 9 years. Manure applications resulted in large losses of nitrogen (N), increased potassium (K) levels, increased phosphorus (P) availability, increased water intake rates during the growing season, and an N mineralization rate of about 5% after the first year. At high rates of manure application only 42% of the N applied could be accounted for. One application of 180 t/ha of manure in 1971 doubled the $NaHCO_3$ extractable P levels in the soil in 1979 compared with that of plots that did not receive manure. The aplication of manure had only a small or no effect on the water intake rate when it was measured between cropping periods on plots that had been recently tilled, but differences were large when water intake rates were measured while the crop was growing. The increased water infiltration rates during the growing season would be important because of increased crop yields.

0660 MIHAILA, V., and HERA, C. 1982. Response of some maize and sorghum hybrids to fertilizers on the chernozems of southern Romania. (Ro). Analele Institutului de Cercetari pentru Cereale si Plante Tehnice. Fundulea 50: 243-253. 7 ref. (Summary:En).

0661 MORAGHAN. J.T.. REGO* T.J.. and SINGH, S. 1982. Aspects of nitrogen fertilization of sorghum. Page 743 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981. Patancheru, A.P., India. Patancheru, A.P.. India:ICRISAT. (Abstract).

Nitrogen deficiency is a constraint to high sorghum yields in India. Soil nitrogen dynamics in the region are complex. Four separate situations are considered: (a) kharif production on Vertisols; (b) kharif production on Alfisols; (c) rabi production on Vertisols after a kharif fallow; and (d) rabi production on Vertisols after a kharif crop. Denitrification and nitrate leaching losses are likely problems in (a) and (b) respectively. Split applications of banded nitrogen fertilizer under high rainfall conditions have increased fertilizer efficiency in (a) and (b). Positional availability of fertilizer, due to dry soil zones. is a possible constraint in (c) and (d). Deep placement of fertlizer is needed in such situations. Pertinent research involving the isotope N15 and soil nitrogen mineralization will be discussed.

0662 MYERS. R.J.K. 1982. A simple model of nitrogen fetilizer response for grain sorghum. Sorghum Newsletter 25: 38.

The requirement of fertilizer nitrogen for maximum yield of an annual cereal crop such as grain sorghum depends on the potential yield of that crop as influenced largely by available water supply, on the ability of the soil to supply nitrogen* and on the efficiency of utilization of soil and fertilizer nitrogen. Quantitative relationships between these factors have been obtained from data in the literature and a simple model to estimate nitrogen fertilizer requirement for grain sorghum has been developed. The model is programmed for computer and hand-held calculator. Inputs required to run the model are available soil water at planting, rainfall plus irrigation during growth. total nitrogen in the plough layer and profile nitrate-nitrogen at planting.

0663 NAGRE. K.T. 1982. Response of rainfed sorghum to split application of phosphorus and potassium. Journal of Maharashtra Agricultural Universities 7(3): 233-234.

Results of the experiment conducted at Punjabrao Krishi Vidyapeeth, Akola for three years indicated that sorghum hybrid CSH-1 responded to phosphate and potash application. Application of 60 kg P205/ha recorded significant increase in grain yield over no phosphate with a mean response of 752 kg/ha. Increasing the dose to more than 60 kg P205/ha was found beneficial in one year. Application of potash at 60 and 120 kg/ha were at par and both recorded significantly more yield than no potash with a response of 392 kg/ha. In general jowar responded more to phosphorus than to potassium. In low rainfall year there was less response to P and K than in high rainfall year. Response of sorghum to per kg of phosphorus applied was 12.5 kg whereas it was 6.5 kg/kg of potassium. Under rainfed conditions single application of phosphate and potash at sowing was found better than split application.

0664 NAGRE. K.T. 1982. Soil and foliar application of nitrogen to rainfed jowar and bajra. Journal of Maharashtra Agricultural Universities 7(3): 235-236.

Hybrid jowar responded significantly to nitrogen application. Nitrogen at 30 kg/ha applied half through soil and half through foliar spray was found significantly superior to full dose through soil the responses were 787 kg/ha (67.2%) and 1251 kg/ha (106.8%) over control. Application of 60 kg N/ha either whole through soil or half through soil plus half through foliar spray increased the yield over 30 kg N/ha whole through soil but was at par with half through soil and half through foliar spray. Nitrogen use efficiency also increased with the application of 30 kg N/ha half through soil and half through spray (41.7 kg/N). Grain yield of bajra increased significantly with the application of 30 and 60 kg N/ha either applied whole through soil or half through soil and half through foliage. Both these methods were equally better and effective.

0665 NARKHEDE, P.L.. SURVE. S.P., and GHUGARE, R.V. 1982. Influence of P aplication on the maturity of winter sorghum in Vertisol. Sorghum Newsletter 25: 57-58.

A trial on the response of winter sorghum (var. M 35-1) to applied P on a vertisol (depth: 60cm) was conducted during 1981-82, at Dry Farming Research Station, Solapur, India. In this trial, the influence of different levels of P on the flowering and maturity of sorghum was studied. The application of P hastened flowering and subsequently the physiological maturity of sorghum by 5 to 8 and 4 to 9 days respectively, as compared to sorghum without P. The influence of P on days to flowering and maturity of sorghum at 50, 110 and 220 kg P205/ha levels was more or less same.

0666 NARKHEDE, P.L., UMRANI, N.K.. and GHUGARE, R.V. 1982. Response of winter sorghum to advance application of P in Vertisol. Sorghum Newsletter 25: 62.

An experiment to determine the causes of lack of response of winter sorghum (M 35-1) to applied P on a vertisol have been conducted since 1979-80, at the Dry Farming Research Station, Solapur, India. During 1981-82, in this experiment P (plus 50 kg N/ha a basal dose) was placed in the soil (in row at 10 cm depth) in one replication on 18th September, 1981 and was delayed in other replications due to heavy rains by about a week. The difference in dry matter accumulation and the yield of sorghum as a result of advance application of P were observed. It is evident that advance applications of P nearly doubled the dry matter accumulation at the 35th and 50th days from seeding and also the stover yield of sorghum as compared to usual method of P application at seeding. Advance application of P increased grain yield of sorghum at all of the different levels of P tried over the application of P at seedling. However, the percentage increase of grain yield of sorghum was very low.

0667 PAL, U.R., UPADHYAY, U.C.. SINGH, S.P., and UMRANI, N.K. 1982. Mineral nutrition and fertilizer response of grain sorghum in India. A review over the last 25 years. Fertilizer Research 3(2): 141-159. 112 ref.

0668 PATIL B.P., and ZENDE, C.K. 1982. Yield response of sorghum (Sorghum bicolor (L.) Moench) to graded doses of nitrogen in different soil series varying in their contents of organic carbon. Page 42 In Abstracts, Forty-seventh Annual Convention, Indian Society of Soil Science, 2-4 October 1982, Nagpur, Maharashtra, India. Nagpur, Maharashtra, India: Indian Society of Soil Science, Nagpur Chapter.

Soil series alone contributed to the tune of 33.54 to 72.23% towards grain yield response in low organic carbon content soils, while in high organic carbon status soils only 23.40 to 57,02% yield response was recorded. Otur soil series rank first amongst all ten soil series in respect of higher response to application of N from 60 to 180 kg/ha. Nitrogen even up to 180 kg/ha showed a progressive increase in yield in all soil series.

0669 PATIL, J.D., and PATIL, N.D. 1982. Iron and manganese availability to sorghum as influenced by soil moisture, calcium carbonate and organic matter. Journal of Maharashtra Agricultural Universities 7(2): 179.

0670 PATIL. J.D., and SHINGTE, A.K. 1982. Micro nutrient status of soils from the drought prone area of the Pune region (Maharashtra). Journal of Maharashtra Agricultural Universities 7(3): 216-218.

One hundred and six surface soil samples (0-15 cm depth) from the sorghum growing drought prone areas covering about hundred villages from Sirur tehsil of Pune district were analysed for their contents of available micronutrients alongwith the other soil phsico-chemical parameters. Most of the soil samples were adequate in respect of available copper, boron, molybdenum and manganese. Rest of the micronutrients were in the marginal or deficiency range. Available iron, manganese and zinc showed significant negative correlation with the free calcium carbonate content of the soils whereas available iron, manganese, boron, zinc and molybdenum showed significant positive correlation with organic carbon. No significant correlation was observed between available micronutrients and soil pH except molybdenum.

0671 PENSO, J.S.A., BRAGA, J.M., and THIEBAUT, J.T.L. 1982. Evaluation of patos rock phosphate solubility. III. Mixture with filter cake and vinasse. (Pt). Revista Ceres 29(165): 516-525.

Filter cake and vinasse, two by-products of the sugar and alcohol agroindustries, respectively, were mixed at six proportions with Patos de Minas rock phosphate and incubated over five different periods of time. At the end of each period, the materials were analyzed for total and soluble phosphorus, then mixed with potting soil of Dark Red Latosol. Plants of sorghum were grown in these mixtures. After 45 days, the dry matter in the aerial parts of the plants was determined; and, phosphorus in the aerial parts and in the soil was analyzed using an Olsen extractor. The results showed that both the dry matter production and the phosphorus content increased in the aerial parts with the application of mixtures of filter cake and vinasse with Patos de Minas roch phosphate. The soluble phosphorus by Olsen extraction decreased when the proportions of vinasse to rock phosphate exceeded 2:1. On the other hand, no solubilization effects were observed as caused by either of the materials.

0672 RAMACHANDRAN, S., ROBINSON, J.G.. and TRUTHAYARAJ. M.R. 1982. Studies on the response of sorghum varieties to nitrophosphate.Sorghum Newsletter 25: 43.

An experiment was conducted at the Agricultural Research Station, Bhavanisagar, Tamil Nadu, India on sorghum UCH.V.3 during summer 1977 and on CO.21 during Kharif 1977 season to ascertain the performance of levels and sources of phosphorus on sorghum varieties. The experiment consisted of three levels of P_2O_5/ha viz., 20, 40 and 60 kg and four levels of sources of phosphorus viz., triple superphosphate, nitrophosphate 30%, 50%, and 80% WSP. The sorghum was sown in lines with a spacing of 45x15 cm with a dose of 120 N, 60 P205 and 60 K20 kg/ha. Half the dose of N and full dose of P205 and K20 were applied as basal and the rest of N applied as top dressing on 45th day after sowing. The summer crop of UCH.V.3 was sown on 24-4-1977 and harvested on 13-7-1977. The kharif crop of CO.21 was sown on 19-8-1977 and harvested on 14-12-1977. The grain yields were recorded and presented.

0673 RANDHAWA. N.S.. and TANDON, H.L.S. 1982. Advances in soil fertility and fertiliser use research in India.Fertiliser News 27(2): 11-26.

The advances have been discussed under the following headings: stages of development, contribution of fertilisers to agricultural production, the research input, soil fertility evaluation, additions and removals of nutrients, crop responses to fertilisers, comparative studies on different fertilisers, balanced fertiliser use, fertiliser efficiency, cropping systems research, dryland farming systems, management of problem soils and finally, future research needs.

0674 REDDY, M.S., REGO, T.J.. BURFORD, J.R., and WILLEY, R.W. 1982. Fertilizer management in multiple cropping systems with particular reference to ICRISAT's experience.Paper presented at the FAO-Expert Consultation on Fertilizer use under Multiple Cropping Systems, 1-6 February 1982, New Delhi, India. 27 pp. 6 ref.

For the promising sorghum/pigeonpea intercrop on Vertisols, the intercrop sorghum is only slightly less responsive to fertilizer-N than sole sorghum; LER's decrease with increasing N, but responses are still worthwhile at 120kg N/ha in good rainfall years. Pigeonpea responds little if at all to phosphorous at ICRISAT. with the conclusion that P fertilizer should perhaps be applied to its companion crops. Residual effects of legumes have so far been small, perhaps reflecting the fact that for most of our crops, a substantial proportion of nitrogen in the plant is removed in grain.

0675 SANTOS, J.Q. DOS. 1982. The need for revising the concept of ion antagonism.(Pt). Pedon 3: 3-17. 20 ref. (Summary:En).

The traditional concept of ion antagonism is considered critically, and results of fertilizer experiments with sorghum, wheat, rye and berseem are presented showing the effect of root cation exchange capacity on the antagonism between monovalent (K^+) and divalent (Ca^{2+}, Mg^{2+}) cations.

0676 SHINGTE, A.K., and JADHAV, H.D. 1982. Use of anhydrous ammonia as an efficient source of nitrogen to rabi sorghum under drylands.Journal of Maharashtra Agricultural Universities 7(1): 36-38. 2 ref.

Field trials were conducted during rabi 1975-76 to 1977-78 at the Dry Farming Research Station, Solapur, representing the scarcity zone of the Maharashtra State. The efficacy of anhydrous ammonia was studied in comparison with urea for increasing the yield of rabi sorghum (Var. M.35-1) under dry land conditions. The nitrogen was applied at 25 and 50 kg N/ha through anhydrous ammonia and urea, with and without phosphate. It was observed that the nitrogen and phosphorus uptake by plants from both the sources was increased due to the nitrogen application over control. The uptake was higher in the treatments where nitrogen was applied through anhydrous ammonia rather than from urea. In general, the grain and fodder yields were significantly increased due to nitrogen application from both the sources. The application of 25 kg N/ha through urea and anhydrous ammonia increased the grain yield by 12.41 and 19.28% respectively.

0677 SINGH, L.. and BALASUBRAMANIAN, V. 1982. Effect of continuous use of fertilizers lime and micro nutrients on soil properties at Mokwa Nigeria. Journal of Indian Society of Soil Science 30(3): 306-311.

In a long-term fertility study at Mokwa, Nigeria, it was observed that use of fertilizers alone maintained optimum levels of soil pH, total nitrogen, organic carbon, C/N ratio, cation exchange capacity and exchangeable cation. Lime application increased the exchangeable calcium content significantly in the soil whereas Mg content remained almost unchanged. Exchangeable K content was significantly higher under continuous use of potassic fertilizer. Maize, cotton and sorghum responded significantly to nitrogen application. Potassium response was significant with maize and cotton only. Cotton responded very well to boron application.

0678 SINGH, R.R. 1982. Study on relative value of FYM and inorganic fertilizers alone and in combination on growth, nutrient uptake and yield of sorghum-wheat-sorghum fixed crop sequence. Ph.D. thesis, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, India. 144 pp.

Field studies were conducted on the medium black soil at JNKW Research Farm, College of Agriculture, Indore, to investigate the relative value of FYM and inorganic fertilizers alone and in combination on the growth, nutrient uptake and yield of sorghum and wheat crop sequence (sorghum-wheat-sorghum) during 1976-1978. The results indicated that if the soil was medium in P and high in K contents, addition of P and K was not beneficial and the soil fertility could be managed properly by the addition of fertilizer alone. The application of 60 kg N/ha for sorghum cultivar CS 3541 was optimum dose under the existing conditions. The application of FYM and phosphatic fertilizer showed the residual effect; even the fertilizer N added to the soil resulted in increasing its N status. The P205 and K20 status of the soil also appeared to have been built by crop residues.

0679 SQLORZANO, P.P.R. 1982. Effects of nitrogen levels and plant populations on the yield of grain sorghum (Sorghum bicolor L. Moench) and on the accumulation and distribution of nitrogen in the plant.(Es). Revista de la Facultad de Agroncmia, Universidad Central de Venezuela 12(3-4):301-326. 16 ref. (Summary:En).

There was a positive relationship between nitrogen and grain yield with the first 44 kg nitrogen giving the largest yield increase. Leaf area index more than 5.95 did not increase yield. The effect of plant population and nitrogen on the pattern of dry matter accumulation and distribution is discussed with reference to fertilizer programmes.

0680 SONAR, K.R., KUMBHAR. D.D.. PATIL, B.P., SHINDE, S.S., ZENDE, G.K., and WANDRE, S.S. 1982. Fertiliser requirements for yield targetting of sorghum (Sorghum bicolor (L.) Moench) based on soil test values. Journal of Maharashtra Agricultural Universities 7(1): 4-6. 9 ref.

A field experiment conducted on a Vertic Ustropepts soil at Mahatma Phule Agricultural University, Rahuri, India during the kharif 1976 showed that 3.34, 0.73 and 3.99 kg.N, P205 and K20 respectively were required for production of one quintal of sorghum grain (CSH-5). In the nutrition of sorghum the contribution from soil available N, P and K were 10.26. 97.26 and 14.85% respectively. The contribution of fertilizer nutrients was found to be of the order of 82.71, 16.92 and 104.44% for N, P205 and K20 respectively. Based on these results, the fertilizer adjustment equations were calculated and tested under field conditions at 4 locations during the kharif season of 1979. Under 40 q/ha target, highest benefit/cost ratio (6.02) was obtained while highest monetary returns (Rs. 8173/ha) were observed under 60 q/ha target.

0681 TAWONMAS, D., and CHANTRAPANIK. S. 1982. A study on the effects of chicken manure on sorghum yield.Sorghum Newsletter 25: 67,

Long term effects of chicken manure were investigated during 1977-1980 at Phra Bhuttabat Field Crop Experimental Station in Lopburi-a part of the Central Highlands corn belt area of Thailand. A design of 4 randomized complete blocks was utilized with treatments comparing chicken manure application with chemical fertilizer application and no fertilizer. The chicken manure had an average nutrient content of 2% N, 1.5% K. Brown seeded IS 8719 E 173 sorghum cultivar was used during the first two years of the trials. Results showed that significant differences in grain yield existed among treatments tested. In terms of the average grain yield, each method of split application (CM 1-1-1-1, 2-1-1-0 and CM 3-1-0-0) actually produced a greater grain yield than the other treatments. The maximum grain yield of 3,400 kg/ha was obtained from the treatment CM 2-1-1-0 followed by the treatment 1-1-1-1 which produced 3,330 kg/ha. It could be concluded that split applications of chicken manure at 6.25 tons/ha/year effectively enables farmers to improve the soil.

0682 TAYLOR, R.W., DUSEJA, D.R.. and THANGUDU, P.R. 1982. Sewage sludge effects on soil: heavy metal accumulation and movement.Journal of Environmental Science and Health 17(3): 427-441. 18 ref.

Treated municipal sewage sludge at 0, 11.2, 33.6, and 67.2 metric tons/ha was applied each year for two consecutive years and incorporated into a Byler loam soil having an initial pH of 5.6. Sorghum was grown in replicated plots (6.1m x 4.6m). Soil samples were taken at 0 to 20 cm and 20 to 40 cm depth at the end of each year and analyzed for DTPA-extractable Cu, Zn, Cd, and Ni. Surface soil exhibited significant increases in heavy metal concentrations in the first year at the 67.2 metric tons/ha rates. Heavy metal concentrations increased with continued sludge application. After two years, downward movement and significant increases in Cu, Zn, and Ni levels were noted at the 20 to 40 cm depth at the higher rates. Heavy metal levels in the surface soil did not appear to be phytotoxic as judged from sorghum grain and dry matter yields and comparisons with other similar studies.

0683 THIERSTEIN, G.E.. and REGO, T.J. 1982. The need for suitable implements for fertilizer application in multiple cropping systems with special reference to small farmers.Paper presented at the FAO Conference on Fertilizer use under Multiple Cropping Systems, 3-6 February 1982, New Delhi, India. 13 pp. 31 ref.

Multiple cropping can be practiced in various forms such as intercropping, mixed cropping, relay cropping, and sequential cropping. These present some unique problems in fertilizer application as compared to sole cropping. Climatic conditions in the semi-arid tropics also present some unique problems in fertilizer application since postrainy season crops are usually planted in a receeding moisture condition. Thus the machinery commonly available for applying fertilizer to sole crops is not necessarily well suited to the multiple cropping situation. Since the small dryland farmer uses very little fertilizer it is essential that he optimizes the benefits of this input.

0684 TOUCHTON, J.T. 1982. Residual nitrogen utilization by grain sorghum.Sorghum Newsletter 25: 68-69.

To determine the effects of previous crops on soil N levels and N fertilizer for subsequent grain sorghum, field studies were established in the spring of 1980 on a Hartsells fsl soil and a Decatur sil soil. The first summer crops consisted of soybeans and grain sorghum with recommended production practices. In the spring of 1981, grain sorghum (DeKalb, "DK 64") was planted on the experimental area (230,000 seed/ha) and the first summer crop plots were divided into N rate subplots (0, 34, 88, and 136 kg/ha N). The N was applied three weeks after sorghum emergence. The first summer crop soybeans and grain sorghum yielded 1,550 and 2,630 kg/ha, respectively, on the Hartsells soil and 3,900 and 5,950 kg/ha, respectively, on the Decatur soil. The grain yield differences at the highest N rate (400 to 600 kg/ha) do suggest that advantages other than a N supply do exist when sorghum follow soybeans rather than sorghum.

0685 TOUCHTON, J.T., and HARGROVE, W.L. 1982. Starter fertilizer applications for no-tillage grain sorghum.Agronomy Abstracts: 279.

Whether or not crops will respond to starter fertilizer depends on factors such as soil fertility levels and conversion rates of unavailable soil nutrients to plant available forms. In the Southeast, recent trends have been toward early planting and no tillage systems, both of which result in relatively cool soils and slow nutrient conversion rates. To determine the response of grain sorghum to a N-P starter fertilizer, sorghum was no tillage planted in early spring at 3 locations on soils high in P. Starter treatments were 0 and 90 kg/ha of 18-46-0 or 112 kg/ha of 10-34-0. Sidedress N was applied at rates of 0, 45, 90, and 120kg/ha. Six weeks after emergence, tissue N, P, and weight, respectively, averaged 28, 107, and 49% higher with than without the starter fertilizer. At heading, leaf N increased with increasing rates of sidedress N; starter fertilizer increased leaf N at only 1 of the three locations, at maturity, maximum grain yield was obtained with 90 kg/ha N, but even at the high N rate, the starter fertilizer increased grain yield up to 1000 kg/ha.

0686 TOUCHTON, J.T., GARDNER, W.A., HARGROVE, W.L., and DUNCAN, R.R. 1982. Reseeding crimson clover as a N source for no-tillage grain sorghum production.Agronomy Journal 74(2): 283-287. 17 ref.

The purpose of this field study, conducted on a Cecil sandy loam soil was to determine N fertilizer requirements for no-tillage grain sorghum double cropped with reseeding crimson clover and effects of N treatments on nutrient uptake and on insect populations. Nitrogen produced by the clover was sufficient for maximum sorghum grain yield (5.760, 7,098, and 2,924 kg/ha in 1978, 1979, 1980, respectively) without supplemental applications of inorganic N. Removing the clover had no effect on sorghum grain yield in 1978 or 1979, but in 1980 this treatment reduced grain yield 601kg/ha. Even though removing the clover which contained 62 kg/ha N in 1980 reduced sorghum yield, there was no response to applied N which suggest that the yield reduction was not due to a shortage of N.

0687 UMRANI, N.K., and NARKHEDE, P.L. 1982. Influence of N fertilization on moisture utilization by winter sorghum.Sorghum Newsletter 25: 61.

An experiment to study the effect of N application at rates of 0, 25, 50 and 75 kg N/ha, on the performance of winter sorghum on two soils (30 cm and 60 cm deep, montmorillonitic clay), was conducted during a normal rainfall season, 1978-79, at the Dry Farming Research Station, Solapur, India. In this experiment, moisture extraction and its utilization by sorghum in reaction to N were studied.

0688 USA:THE SULPHUR INSTITUTE. 1982. Sulphur - the fourth major nutrient.Washington, D.C., USA:The Sulphur Institute. 32 pp.

Deficiency symptoms in plants including sorghum; and tests to recognize them are described. Crop response to added Sulphur is evaluated for several crops in various countries.

0689 VECCHIETTINI, M. 1982. Experiences in the Chaco.(It). Rivista di Agricoltura Subtropicale e Tropicale 76(1-2): 77-86. (Summary:En).

Data are presented on trials in the Chaco area of Paraguay in 1977-78 on sorghum, maize, cotton and groundnut cultivars of different maturity groups grown at different plant densities with different NPK rates.

0690 VERMA, J.K., and PANDAY, B.B. 1982. Biofertilizers in grain sorghum.Sorghum Newsletter 25: 62-63.

A field experiment was conducted in 1980 and 1981 at Udaipur, India (24.5 deg N L was 23 deg E long, 575 m s1) to ascertain the contribution to Azospirillum applied as a seed treatment to sorghum variety (CSH-5) grown rainfed. The treatment evaluation consisted of observations on grain and stover yield and plant characteristics contributing to yield, such as days to 50% flowering, grain weight/plant, and 1000 grain weight.

0691 VERMA, J.K., and PANDEY, B.B. 1982. Plant population density and fertility level effects on sorghum productivity.Sorghum Newsletter 25: 63-64.

A replicated field experiment was conducted at Udaipur, India from 1978 to 1980 in kharif season to determine an optimum plant population density and fertility level for grain sorghum CSH-5. The plant population densities and fertility levels compared were 1.0, 1.5 and 2.0 lakh plants/ha and 20+10, 40 + 20, and 80 + 40 kg N and P205 respectively, against the standard farmer's practice of applying 5 tons of F.Y.M./ha. Half of the fertilizer N and P205 was drilled in lines 45 cm apart at the time of sowing 5 cm below the seed. The crop was grown rainfed with recommended agronomic practices. Urea and single superphosphate were used to supply N and P205 respectively. Data with respect to grain fodder as affected by differential treatment are recorded. The data shows that differential plant population and fertility levels caused significant variation in sorghum production.

0692 ZWEIFEL, T.R. 1982. An evaluation of grain sorghum (Sorghum bicolor (L.) Moench) hybrids for efficiency of nitrogen use.Ph.D. thesis, The University of Nebraska, Lincoln, USA.

Planting Seasons and Dates

0693 BANSAL. R.K., and

THIERSTEIN, G.E. 1982. Design and development of a planter-cum-fertilizer drill for dryland crops.Paper presented at the XIX Annual Convention of Indian Society of Agricultural Engineers. 15-17 February 1982. Udaipur, India. 21 pp. 17 ref.

This paper describes the design of a 4-row animal drwan planter-cum-fertilizer drill attachment to an animal drawn wheeled tool carrier developed at the ICRISAT, Hyderabad, India. The Planter is based on an inclined plate metering mechanism and is designed for sowing a large range of sizes, plant population, and row to row spacings. The fertilizer drill design uses an oscillatory positive metering mechanism. The planter metering mechanism has been extensively tested on a test bench and has been given limited field testing in sowing maize, pearl millet, pigeonpea, sorghum, chickpea, mung, castor and groundnut. Extensive operational sacle evaluation will be done during the 1982 planting season. The fertilizer drill has been successfully used for two years for applying di-ammonium phosphate, ammonium phosphate, and urea. The planter-cum-fertilizer drill is equipped with double shoe type narrow furrow openers for proper placement of seed and fertilizer followed by covering devices and press wheels for good covering and compaction of the soil.

0694 OGUNLELA, V.B. 1982. Sowing date effect on growth and development of photosensitive and photo-insensitive sorghums in a tropical environment.Zeitschrift fur Ackerund Pflanzenbau 151(3): 176-184. 13 ref.

A field experiment was conducted during 1980 wet season at Samaru in northern Nigeria to compare the effect of sowing date of sorghum cultivars on growth and development of photo-sensitive (L.187) and photo-insensitive (HP3) sorghums. Five sowing dates at 10-day intervals were tested. Both cultivars responded differentially to sowing date. While the relations between sowing date and developmental phases were quadratic in HP3, these were significantly linear in L.187. Heading, 50% bloom and physiological maturity were markedly delayed by delayed sowing in HP3 but were hastened in L.187. However, the length of grain filling phase was shortened in both cultivars. Total dry weight and plant height decreased in both cultivars when sowing was delayed from June 3 to July 24, with dry weights ranging between 818 g and 248 g/sq m and 854 g and 263 g/sq m in HP3 and L.187, respectively, at 95 days after sowing. Total number of leaves per plant declined more in HP3 (30%) than in L.187 (16%).

0695 OHNO,Y.. MOICHI, S., SASAKI, T.. and ONODERA, H. 1982. Varieties and cultural methods of sorghums, 3: Relation between cropping season and growth in grain sorghum.(Ja). Tohdku Agricultural Research 31: 59-60.

0696 PERIYATHAMBI. C., and PALANIAPPAN, S.P. 1982. Effect of pre-monsoon sowing on the crop stand and yield of rainfed sorghum.Indian Journal of Agricultural Sciences 52(5): 345.

Sowing of sorghum 10-20 days in anticipation of monsoon rains, placing the seed at 5.0 cm depth and treating the seed with KH_2PO_4 facilitated better crop stand and higher grain yield.

0697 SHAHANE, T.G., BORIKAR, S.T., and BAPAT, D.R. 1982. Effect of season on character association in sorghum.Sorghum Newsletter 25: 130.

In this study, eighty hybrids were developed by crossing eight male sterile lines (2219A, CK60A, 1036A, 2077A. 36A. 1202A. 1258A and 3660A) with 10 restorers (IS-84. 3924, Cs-3541. PD-3-1-11. 168. 285. 1235. 1324. 370 and 358). These hybrids, along with parents, were evaluated in replicated trials both in the monsoon and winter seasons at Parbhani. Maharashtra. India. Observations were recorded on nine characters viz.. plant height (cm), days to flowering. panicle length (cm). panicle weight (g), number of whorls/panicle, number of primary and secondary branches, 100 grain weight (g) and grain yield plant. Genotypic correlations were calculated for both the seasons and for all character pairs.

0698 SINGH. A.R. 1982. Effect of different dates of sowing on seed quality of CSH5 sorghum (Sorghum bicolor (L.) Moench).Research Bulletin of Marathwada Agricultural University 6: 12-15.

In trials in the monsoon season sorghum cultivar CSH5 sown on 27th June escaped rain damage during the flowering and maturation period and produced seeds of best quality in terms of 100-grain weight, germination percentage and seedling vigour, compared with crops sown on 13th June.

Farming Systems

0699 BALASUBRAMANIAN, A., SELVARAJ. K.V., PRASAD, M.N., and THANGAVELU, 0. 1982. Intercropping studies in dry land sorghum.Sorghum Newsletter 25: 45.

Two intercrops viz. cowpea (CO.3) and soybean (C0.1) were studied under three moisture conservation practices viz. 1) flat bed; 2) ridges and furrows; and 3)bed-furrow with uniform row (60 x 10 cm) and paired row (30/90 cm) planting. There were no significant differences in grain and straw yields of sorghum between uniform row (60 x 10 cm) and paired row (30/90 cm) plantings of sorghum. Sorghum raised in ridges and furrows and bed-furrow recorded higher yields of 1931 and 1874 kg/ha and increased the grain yield by 7.7% and 5.2% respectively over the flat bed system.

07 00 BALASUBRAMANIAN, A.. SELVARAJ. K.V., PRASAD. M.N., and THANGAVELU, O. 1982. Studies on the intercropping of forage legumes in sorghum.Sorghum Newsletter 25: 44.

An experiment was conducted during kharif 1981 at Tamil Nadu Agricultural University, Coimbatore, India, to select suitable forage legumes for intercropping with sorghum CSH-5 under irrigated conditions with the following treatments. Tl-pure sorghum, T2-sorghum in paired row (30/90 cm) + 2 rows of forage cowpea (SRG-1). T3-sorghum in paired row (30/90 cm) + 2 rows of forage soybean (CO 1), T4-sorghum in paired row (30/90 cm) + 2 rows of forage cluster bean, T5-sorghum in paired row (30/90 cm) + 2 rows of forage velvet bean. A uniform dose of NPK at 80/40/40 kg/ha was applied to all treatments. The design adopted was RBD with 4 replications. The soil was a clay loam with medium fertility status. The results revealed that there were no significant differences between the treatments with regard to sorghum grain and straw yield. However, pure sorghum recorded a higher grain yield when compared to intercropped sorghum.

0701 BALASUBRAMANIAN, A.. THEETHARAPPAN. T.S.. PRASAD. M.N.. and THANGAVELU. 0. 1982. Current and residual effects of legumes in sorghum based intercropping systems.Sorghum Newsletter 25: 44-45.

0702 BALASUBRAMANIAN. A.. THEETHARAPPAN, T.S., PRASAD, M.N., and THANGAVELU. O. 1982. Intercropping of redgram genotypes in sorghum.Sorghum Newsletter 25: 44.

With a view to identify improved redgram genotypes and to study the response of redgram genotypes to plant population in intercropping with sorghum, an experiment was conducted during rabi 1980-81 at Tamil Nadu Agricultural University, Coimbatore, India under rainfed conditions. Three redgram genotypes, viz. BDN-1, C.11 and CO.3 were compared as intercrops under two population levels, i.e., 40,000 and 80,000 plants/ha. The base crop was sorghum, USV.20, and was raised under uniform rows (60x10cm) and paired rows (30/90 cm) for intercropping with redgram genotypes. Redgram genotypes were also raised as a pure crop at 40,000 plants/ha. The soil was loamy with a medium available N status. The results indicated that there were no significant differences in grain and straw yield of sorghum between the uniform row and paired row (30/90 cm) planting of sorghum. Sorghum intercropped with redgram under a paired row planting recroded an increased return of 77% over a pure crop of sorghum.

0703 BANTA. G.R. 1982. Asian cropping systems research: microeconomic evaluation procedures.Ottawa, Canada:IDRC. 56 pp. 30 ref. (Summaries:Es, Fr).

0704 BOTSWANA: MINISTRY OF AGRICULTURE. 1982. Evaluation of Farming Systems & Agricultural Implements Project (EFSAIP) Botswana 1981-82.Gaborone, Botswana: Ministry of Agriculture. 188 pp. 8 ref. (Report No. 6).

0705 CLARA, R., CASAMALTHUAPA, N.V., CORDOVA, R.H., AMAYA, E.C., and GUIRAGOSSIAN, V. 1982. Sorghum improvement in association with maize.Page 744 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

The sorghum improvement program in El Salvador has most extensively used introductions from Texas A & M University, ICRISAT Center, ICRISAT-CIMMYT, and Puerto Rico directly and in combination with locals to derive earlier, shorter varieties with better grain quality. Selection and evaluation is undertaken in intercrop. Sorghum is sown in maize and they are in competition for about 68 days when the maize stalk is broken below the ear-at this time the maize is 90 days old. It has been found that the sorghum-maize intercrop (distance between maize-sorghum rows is 45 cm) is more profitable than either as a monocrop. Improved shorter varieties yield 50% more in sole crop and 35% more in the intercrop than local varieties. Best yields are obtained with the maize matures in about 90 days.

0706 DESHPANDE, S.S.. and UMRANI, N.K. 1982. Intercropping in rabi sorghum (CSH-8R).Indian Journal of Agronomy 27(4): 457-460. 6 ref.

0707 DIAZ DONAIRE, R.E. 1982. Characterization and relationship environment-handling in bean and sorghum systems in association with maize in Honduras.(Es). Thesis. Programa Conjunto Univ. de Costa Rica/Centro Agronomico Tropical de Investigacion y Ensenanza, Turrialba, Costa Rica. 118 pp. (Summary:En).

0708 ELMORE, R.W. 1982. Effects of morphological traits and cultural practices of intercropped soyabeans and cereals.Thesis, Illinois University, Urbana, Illinois, USA.

0709 FERNANDO, L.H. 1982. Continuous cropping in cereal legume-root crop rotations.Alafua Agricultural Bulletin 7(3): 96-98. 2 ref.

Three rotations are described with

the aim of developing farming systems that would maintain taro as the main traditional food crop in Western Samoa, and supply cereal grains for livestock feed and grain legumes as cheap sources of vegetable protein in food or feed. Experiments are in progress to evaluate these cropping systems and to improve them.

0710 GARRITY. D.P.. CARANGAL, V.R.. and HAWS. L.D. 1982. The role of sorghum in rice-based cropping systems.Page 746 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India:ICRISAT. (Abstract).

The development of rice-dryland crop patterns is a response to the need to intensify land use in the densely populated Asian rice-growing areas. It was possible by the adoption of earlier maturing rices and time-efficient management practices. Sorghum has demonstrated good performance and exceptional yield stability in sequence with rice. This appears to have been due, in particular, to three characteristics; (1) adaptability to heavy paddy soils; (2) superior waterlogging resistance; and (3) drought resistance. Rice-sorghum is a relatively new cropping pattern. Its present area is small, but the potential area may include millions of hectares. Greater efforts are needed to improve sorghum technology for the unique requirements of the postrice environment, the most critical areas of attention being crop establishment practices and varietal adaptation. Overshadowing these needs at present, however, are the difficulties of developing market channels to sustain production of this relatively new crop in many countries of the region.

0711 GUMASING, S.R. 1982. Plant population density and fertilizer effects on sugarcane and intercropped with mungo and sorghum.M.S. Thesis, University of the Philippines at Los Banos, College, Laguna, Philippines. 99 pp.

0712 HIPP, B.W., and SIMPSON, B. 1982. Influence of cropping system of fertilizer response by grain sorghum and on chemical and physical properties of a vertisol.Agronomy Abstracts: 209.

Studies were conducted over an 11 year period to determine the influence of cropping system and fertilizer application on grain sorghum yield, protein production, soil properties and fertilizer response. Yields of unfertilized sorghum grown in rotation with cotton and wheat were 60% higher than yields of unfertilized continuous sorghum. The yield advantage from rotation decreased with increasing fertilizer rates and was only 10% when 448 kg of 40-17-0/ha was applied. Percent protein and protein yield were greater in rotated than continuous sorghum at all fertilizer levels. Cropping system or fertility treatment did not significantly influence soil salinity, pH or exchangeable K. N mineralization rate increased with increasing N application to continuous and rotated sorghum. Bulk density and hydraulic conductivity were not influenced by fertilizer application but were influenced by cropping system.

0713 ICRISAT. 1982. Farming Systems Research Program: projects and experimental plans 1982-83.Patancheru, A.P., India: ICRISAT. 32 pp.

0714 ICRISAT. 1982. Farming systems.Pages 217-284 In Annual report, 1981. Patancheru, A.P., India: ICRISAT.

0715 IGNAO, L.M. 1982. The growth and yield of sweet potato, sorghum intercrop as influenced by time overlap and levels of nitrogen fertilization.M.S.Thesis,University of Philippines at Los Banos, College, Laguna, Philippines. 90 pp.

0716 KAWAMOTO, Y., MASUDA, Y., and GOTO, I. 1982. Studies on suitable legume species for forage in mixed culture with sorghum.Journal of Japanese Society of Grassland Science 28(3):284-291. 12 ref.

In a field trial the dry matter yield and nutritive value of a sorghum/legume mixed culture was compared to that of the pure culture. Dry matter in mixed sorghum soyabean was significantly higher than in pure sorghum at the dough-ripe stage, but lower at the booting stage.

0717 KEERIO, H.K. 1982. Effects of intercropping sorghum with fodder legumes.Pages 102-103 In Report on the third FAO/SIDA seminar on field crops in Africa and the Near East. 6-24 June 1982, Nairobi, Kenya. Rome, Italy:FAO.

0718 LOMTE, M.H., and DABHADE, R.S. 1982. Response of redgram genotypes to population in intercropping.Sorghum Newsletter 25:50-51.

0719 MAKENA, M.M., and DOTO, A.L. 1982. Soybean-cereal intercropping and its implications in soybean breeding.Pages 84-96 In Intercropping: proceedings of the Second Symposium on Intercropping in Semi-Arid Areas, 4-7 August 1980, Morogoro, Tanzania (eds. C.L. Keswani and B.J. Ndunguru). Ottawa, Canada:IDRC. 7 ref.

0720 MAY, K.W., and MISANGU, R, 1982. Genotype evaluations and implications for adapting plant material for intercropping.Pages 79-83 In Intercropping: proceedings of the Second Symposium on Intercropping in Semi-Arid Areas, 4-7 August 1980, Morogoro, Tanzania (eds. C.L. Keswani and B.J. Ndunguru). Ottawa, Canada:IDRC.

0721 MCCLURE, R.M. 1982. Nonirrigated cropping sequence involving corn, grain sorghum, soybeans and fallow in eastern Nebraska.Ph.D. thesis. The University of Nebraska, Lincoln, USA. 157 pp.

A field experiment was conducted at the University of Nebraska Field Laboratory at Mead, Nebraska, from 1972 to 1980. The objectives of the experiment included: To determine the most productive sequence of row crops (corn, sorghum and soybeans) in a nonirrigated continuous cropping system in southeast Nebraska. To ascertain the value of clean fallow in a row crop sequence. To evaluate the feasibility of continuous cropping of corn, grain sorghum and soybeans. The row crops of grain sorghum, corn and soybeans were grown following each of these row crops and fallow. A variety of agronomic factors were evaluated. Grain from continuous sorghum had less protein than grain from rotated fields.

0722 NADAR. H.M., and RODEWALD, G.E. 1982. Interaction between agronomic research and agricultural economic analysis to develop successful dryland cropping systems in Kenya.Pages 146-154 In Intercropping: proceedings of the Second Symposium on Intercropping in Semi-Arid Areas, 4-7 August 1980, Morogoro, Tanzania (eds. C.L. Keswani and B.J. Ndunguru). Ottawa, Canada:IDRC. 4 ref.

0723 NATARAJAN, M.. and WILLEY, R.N. 1982. Effects of moisture availability or intercropping and yield advanages.Pages 71-72 In Intercropping: proceedings of the Second Symposium on Intercropping in Semi-Arid Areas, 4-7 August 1980, Morogoro, Tanzania (eds. C.L. Keswani, and B.J. Ndunguru). Ottawa, Canada:IDRC. (Summary).

0724 NESBITT, H., COGGER. R., WELLS. G., KIRWAN, A,, and OLE. T. 1982. Multiple cropping project: annual report 1981-82,Pagadian, Philippines:Ministry of Agriculture. 129 pp. 16 ref.

0725 NIGERIA: INSTITUTE FOR AGRICULTURAL RESEARCH. 1982. Cropping systems programme.Pages 49-53 In Annual report of the Institute for Agricultural Research 1980/81. Zaria. Nigeria:Ahmadu Bello University. 8 ref.

0726 NYAMBO, D.B.. MATIMATI. T.. KOMBA. A.L.. and JANA. R.K. 1982. Influence of plant combinations and planting configurations on three cereals (maize. sorghum, millet) intercropped with two legumes (soybean, green-gram).Pages 56-62 In Intercropping: proceedings of the Second Symposium on Intercropping in Semi-Arid Areas, 4-7 August 1980, Morogoro, Tanzania (eds. C.L. Keswani, and B.J. Ndunguru). Ottawa, Canada:IDRC. 7 ref.

0727 PAWAR, H.K. 1982. Studies on the intensity of intercropping of groundnut in sorghum.Journal of Maharashtra Agricultural Universities 7(2):183-184.

0728 PAWAR, H.K., GAUNKAR, V.Y., and UMRANI, N.K. 1982. Intercropping of cowpea in sorghum under irrigated conditions.Journal of Maharashtra Agricultural Universities 7(2):151-153.

An experiment to study the effect of planting patterns of sorghum CSH-5 and intercrop of cowpea C-152 for grain and fodder on yield and gross money value under irrigated conditions was carried out in kharif 1979-80 and 1980-81 at Mahatma Phule Agricultural University, Rahuri, India on alkaline clayey soil having moderate total N and available phosphate and rich in potash. The highest grain and fodder yield of sorghum and gross money value was recorded from paired (30-60 cm) planting of sorghum. Intercrop of cowpea for fodder realised maximum gross money value. The combination of paired planting + cowpea for fodder was found to be the best for yield of sorghum as well as for gross money value.

0729 POL, P.S.. RAMSHE, D.G., PAWAR, A.D., and BAPAT, D.R. 1982. Effect of preceding legumes on the yield of rabi sorghum.Sorghum Newsletter 25: 56-57.

0730 RAMSHE, D.G., BAPAT, D.R., POL, P.S., and MANE, S.S. 1982. Ratooning performance of hybrid sorghum, CSH-5.Journal of Maharashtra Agricultural Universities 7(2): 130-131.

The ratooning potential of hybrid sorghum (CSH-5) was studied by harvesting the main crop at different times and irrigating the ratoon at different critical stages, keeping different number of tillers for ratoon. The results indicated that the harvesting main crop at physiological maturity stage (15 days before normal date), irrigation at all critical stages of plant growth and free tillering of ratoon yielded maximum grain and fodder yield.

0731 RANA, B.S., TARHALKAR, P.P., and RAO, N.G.P. 1982. Inter- and intraspecific competition and the design of productive cropping systems.Page 756 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

Competition between species results in their characterization as complementary, aggressive or relatively neutral species. Alteration of plant type within a species renders them more-or-less competitive. Data on inter- and intraspecies competition with sorghum as a component crop will be presented. Keeping in view the recent changes that have occurred in sorghum cultivars, the complementary or compatibility of sorghum-based cropping systems both in space and time will be examined. The design and development of stable, productive and transgressive cropping systems will be analyzed.

0732 RAO, M.R. 1982. Improved cropping systems for increased and stable yields on vertisols and alfisols of semi-arid tropical India.Paper presented at the Ninth Annual Marketing Conference of Indian Farmers Fertilizer Cooperative Limited. 10-12 February 1982. Trivandrum, Kerala. 26 pp. 8 ref.

0733 RAO, M.R., REDDY. M.S.. and WILLEY, R.W. 1982. Improved rainfed cropping systems for vertisols and alfisols of semi-arid tropical India.Paper presented at the National Seminar on 'A Decade of Dryland Agricultural Research in India and Thrust in the Eighties', 18-21 January 1982, Hyderabad, India. 22 pp. 11 ref.

0734 REDDY, M.S., and WILLEY, R.W. 1982. Improved cropping systems for the deep vertisols of the Indian semi-arid tropics.Experimental Agriculture 18: 277-287. 12 ref.

A series of experiments was designed to evaluate a wide range of possible cropping systems for deep vertisols of the Indian semi-arid tropics. The introduction of a rainy season maize crop, compared with traditional fallowing, had little effect on the yields of post-rainy season crops of sorghum, chickpea and pigeonpea. Introducing a rainy season sorghum crop caused severe yield reductions of post-rainy season crops in one year but only slight reductions in two subsequent years. Intercrop systems of maize/pigeonpea or sorghum/pigeonpea, and a three-crop system of maize/pigeonpea/chickpea, appeared very promising. Gross returns were usually much higher for the improved systems that utilized both the rainy and post-rainy eeaons, though differences in net returns were not quite so great because of the extra costs of growing the additional rainy season crops.

0735 SARROCA, J., CORONA, L., PARETAS, J.J., and HERRERA. J. 1982. Sowing methods in sorghum intercropped with Bermuda grass cv. coast cross-1.(Es). Ciencia y Tecnica en la Agricultura. Serie Pastos y Forrajes 5(1): 77-86. 7 ref. (Summary:En).

0736 SHINDE, S.H., UMRANI. N.K., and PATIL. B.B. 1982. Production potential of sorghum wheat crop rotation under resource constraints.Journal of Maharashtra Agricultural Universities 7(3): 249-253.

An experiment was conducted to find out the optimum level of production of sorghum-wheat cropping sequence under critical level of inputs, at Agronomic Research Centre, Rahuri (India) during the years 1975-76 and 1976-77. It was observed that in the normal season the farmer can reduce the expenditure on plant protection measures during post emergence period when sorghum seed was treated with carbofuran. For kharif sorghum, it was not advisable to reduce the recommended fertilizer dose. For wheat, irrigations at CRJ, LJ and milk stage decreased the wheat yield by about 21 per cent than the six irrigations at CRI, LT, LJ, flowering, milk and dough stages. This investigation indicated, when fertilizer is a limiting factor, the possibility of reducing the fertilizer to the extent of 25 to 50 per cent of recommended dose to sorghum-wheat sequence without appreciable reduction in the grain production.

0737 SINGH. R. 1982. Farming systems components and on-farm research. Patancheru, A.P., India: ICRISAT. 19 pp. 4 ref.

0738 SINGH, S.P.. and JHA, D. 1982. Stability of sorghum-based intercropping system under rainfed conditions. Page 746 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

Most of the earlier studies on the relative stability of intercrop vs sole crop systems under rainfed conditions are based on cross sectional data. It has been suggested that this approach is not conceptually appropriate and one should really look for variability over time. An attempt has been made in this paper to analyze stability of sorghum-based intercropping systems using a more logical model. The data have been taken from experiments conducted by the All India Coordinated Sorghum Improvement Project over the past decade.

0739 SINGH, V., and CHAWAHAN. P.S. 1982. Double cropping in dryland. Madras Agricultural Journal 69(8): 551-552.

In trials under dryland conditions in Rajasthan, India maize, sorghum and pearl millet grown in the kharif season gave fresh fodder yields of 28.23, 21.83 and 20.36 tonnes/ha, respectively. Barley, gram and mustard grown as 2nd crops in the rabi season gave grain/seed yields of 1.63, 1.27 and 0.77 tonnes/ha. respectively.

0740 STOOP, W.A., and VAN STAVEREN, J.P. 1982. Effect of cowpeas in cereal rotations on subsequent crop yields under semi-arid conditions in Upper Volta. Pages 653-657 In Biological nitrogen fixation technology for tropical agriculture (eds. P.H. Graham and S.C. Harris). Cali, Colombia: CIAT.

In Burkina Faso millet is grown on the relatively dry plateau and upper slope soils, whereas sorghum and maize are planted on the wetter lower slopes. Cowpeas are rotated and intercropped with each cereal. When sorghum without fertilization followed cowpea, yields were 225, 410, and 330 kg/ha more on upper, middle, and lower slopes, respectively, than when sorghum followed millet. Yields of millet were affected by both the cultivar of cowpea used in the rotation and its planting density. Time of plowing also affected the benefits from prior cropping with cowpea.

0741 STOOP. W.A., PATTANAYAK, CM., MATLON, P.J.. and ROOT, W.R. 1982. A strategy to raise the productivity of subsistence farming systems in the West African semi-arid tropics. Pages 519-526 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 27 ref.

Reviews sorghum improvement efforts in the Sahel and proposes the farming system approach as a better strategy to study and identify constraints in sorghum production.

0742 TCMITA, M., TAKAHASHI, T., YOSHIDA, N., and IDE, K. 1982. Experiments on mixed cultivation of corn and sorghum. (Ja). Bulletin of the Saitama Prefectural Livestock Experiment Station 20: 112-116.

0743 UMAT, D.S., and DESHPANDE, S.L. 1982. Studies in intercropping of sorghum with redgram. Sorghum Newsletter 25: 50.

0744 WAGHMARE, A.B.. and SINGH, S.P. 1982. Total productivity and net returns of different sorghum-legume intercropping systems and varying N levels. Indian Journal of Agronomy 27(4): 423-428. 9 ref.

The field experiments consisting of different sorghum-legume intercropping systems and N levels were conducted under irrigated conditions at Indian Agricultural Research Institute, New Delhi in 1978 and 1979. The data pertaining to total productivity (sorghum equivalent) and net returns are discussed in this paper. All intercropping systems had higher total productivity and net returns than sole sorghum, however, maximum advantage was obtained from sorghum+fodder cowpea system followed by sorghum+grain cowpea and sorghum+groundnut systems. Nitrogen application at 120 kg/ha led to higher total productivity and net returns compared to lower levels.

0745 WAGHMARE, A.B., KRISHNAN, T.K., and SINGH, S.P. 1982. Crop compatibility and spatial arrangement in sorghum based intercropping syterns. Journal of Agricultural Science 99(3): 621-629. 11 ref.

Field experiments on the crop compatability and spatial arrangements in sorghum were conducted at the Indian Agricultural Research Institute, New Delhi in irrigated conditions in 1976 and 1978. Grain yield of sorghum increased when grown in association with the legumes greengram, groundnut, grain and fodder cow peas and soyabean, compared with sole sorghum. Planting of sorghum in paired rows (30:90 cm) with two rows of intercrop in the 90 cm space produced maximum yields of sorghum and intercrops.

0746 WILLEY, R.W., NATARAJAN, M., REDDY, M.S., RAO. M.R., NAMBIAR, P.T.C., KANNAIYAN, J., and BHATNAGAR, V.S. 1982. Intercropping studies with annual crops. Presented at the Ciba Foundation Symposium No, 97 on Better Crops for Food, 14-16 September 1982, London, UK.

0747 WILLEY, R.W., RAO, M.R., REDDY, M.S., and NATARAJAN, M. 1982. Cropping systems with sorghum. Pages 477-490 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 79 ref.

0748 WILLEY. R.W.. REDDY, M.S., NATARAJAN, M., and RAO, M.R. 1982. Improved intercropping systems for the SAT. Presented at the IRAT/ICRISAT Meeting on Soil Fertility and Nitrogen Management, 13-15 April 1982, ICRISAT. Patancheru, A.P., India.

Weeds and Weed Control

0749 ANWAR-UL-HAO. AKHTAR, P.. and SHAUKAT. S.S. 1982. Fate and activity of two cotton herbicides in six soils. Pakistan Journal of Botany 14(1): 89-97. 26 ref.

Residual toxicity of prometryne and fluometuron was studied in six soils after three months of herbicide treatment. Fluometuron was more persistent than prometryne and both were more persistant in sandy than in clay soils. Residual toxicity to sorghum was inversely related to the amount of colloidal material in the soil.

0750 BANKS, P.A. 1982. Weed control systems in ratooned grain sorghum. Proceedings, Southern weed Science Society 35: 54. (Abstract).

Pre-emergence application of 2.2 kg propazine/ha or 2.2 kg metolachlor or both successfully controlled weeds in ratoon grain sorghum, but the control of established Digitaria sanguinalis and Cassia obtusifolia in the second crop required the use of paraquat or glyphosate.

0751 BARRIENTOS, V., and GUZMAN. L. 1982. Weed control (Rottboellia exaltata L.F.) in grain sorghum.Sorghum Newsletter 25: 71.

0752 BENSON. J.M. 1982. Weeds in tropical crops review of abstracts on constraints in production caused by weeds in maize, rice, sorghum-millet, groundnuts and cassava, 1952-1980.Rome, Italy:FA0. 63 pp. (ISBN: 9251012067.)

0753 BILJON. J.J. VAN, and JOOSTE, J.V.D.W. 1982. Metolachlor for weed control in grain sorghum.Pages 105-117 In Proceedings, Fourth National Weeds Conference of South Africa (eds. H.A. Van de Venter and M. Mason). Capetown, Balkema, South Africa.

Metolachlor, a herbicide with excellent grasskilling activity, can now be used successfully in grain sorghum provided the sorghum seed has been treated with CGA 43089. Results have shown that when metolachlor is used at double the recommended dosage rate some transient injury may occur under conditions associated with high rainfall, low cation exchange capacity of the soil and deep planting. This injury, is, however, completely outgrown and has no effect on yield. No differences have been observed in the important cultivars.

0754 BRINKER, R., SCHAFER. D., RADKE, R., BOEKEN, G., and FRAZIER, H. 1982. The effectiveness of MON-4606 as seed safener against alachlor and acetochlor in grain sorghum.Proceedings, British Crop Protection Conference - Weeds 2: 469-473. 4 ref.

Seed treatment of various sorghum hybrids with 1.25 g MON-4606 reduced injury from 2 kg alachlor/ha to acceptable levels when there was adequate irrigation and/or precipitation within 4-7 days of sowing. MON-4606 also effectively protected sorghum against acetochlor injury.

0755 CHANG, T.S.. and MERKLE, M.G. 1982. Oximes as seed safeners for grain sorghum (Sorghum bicolor) to herbicides.Weed Science 30(1): 70-73. 11 ref.

Studies in growth chambers indicated that CGA-43089 applied at a rate of 1.25 g/kg of seed reduced the phytotoxicity of metolachlor, bensulide, EPTC, UBI-S734 and MBR-18337 to grain sorghum during seed germination and seedling emergence. The protected sorghum tolerated metolachlor over a wider range of rates than it tolerated the other herbicides. CGA-43089 did not protect sorghum from the phytotoxicity of trifluralin. Of seven other oximes tested as seed treatments, dimethylglyoxime, benzophenone oxime, pyridine-2-aldoxime, benzoxn-alpha-oxime, and methyl thioacetohydroxamate showed promise for increasing the tolerance of grain sorghum to metolachlor. In general, higher rates of these oximes than the rate of CGA-43089 were required for equivalent protection of sorghum.

0756 CHANNAPPAGOUDAR, B.B. 1982. Physiology of crop weed competition in irrigated rabi sorghum and wheat.M.Sc. thesis. University of Agricultural Sciences, Dharwad, Karnataka, India. 207 pp.

The field experiments were conducted on deep black soil at Water Management Research Station, Navalgund, Karnataka, India, during rabi, 1979-80 to study the physiology of crop weed competition in irrigated rabi sorghum and wheat with special reference to Parthenium hysterophorus. Observations on weeds, crop growth components, yield and its components, uptake of major nutrients (nitrogen, phosphorus and potassium) by crops and weeds at different stages of crop growth were studied in both the crops. Results indicated that in sorghum, the growth was severely hindered due to weed competition especially at earlier stages. Growth parameters in wheat were less affected compared to sorghum. Parthenium suppressed the crop growth more than any other weeds. Uptake of major nutrients was more in weeds than the crop plants, but with Parthenium it was more pronounced at all the growth stages.

0757 CHENAULT, E.W., and WIESE. A.F. 1982. Effect of rope wick applications of dicamba on pigweed and grain sorghum.Proceedings, Southern Weed Science Society 35: 410. (Abstract).

0758 CRUZ. L.S.P. 1982. Weed management in yearly crops.(Pt). Pages 91-114 In Integrated weed control, Sao Paulo, SP, Brazil: Conselho Regional de Engenharia, Arquitetura e Agronomia. 15 ref.

0759 DEVLIN. D.L.. MOSHIER. L.J.. and RUSS. O.G. 1982. Effect of CGA-43089, CGA-92914, and MON-4606 on germination, emergence, and growth of a yellow endosperm cultivar of grain sorghum (Sorghum bicolor).Pages 44-45 In Proceedings, North Central Weed Control Conference. Indianapolis, USA: North Central Weed Control Conference Inc. (Abstract).

Germination of grain sorghum cultivar DeKalb DK-42Y was severely reduced when CGA-43089 was applied as a seed dressing at 1.25 g/kg seed. CGA-92194 and MON-4606, at the same rate, had no effect. At 2.5 g/kg seed. CGA-92194 reduced germination less than CGA-43089 at the same rate. At all rates in the laboratory, MON-4606 reduced germination less than CGA-43089. Growth reduction occurred when grain sorghum seed was dressed with CGA-43089 or MON-4606 mixtures with metolachlor, or any of the chemicals alone. In the field. CGA-43089, MON-4606 or CGA-92194 reduced plant populations of the same cultivar over a 2 years period, but reductions in head numbers and yield were inconsistent between years.

0760 DEVLIN, D.L., MOSHIER, L.J., and RUSS, O.G. 1982. Effect of MON-4606 or CGA-43089 rate and combination with acetanilide herbicides on grain sorghum growth in Kansas in 1981.Sorghum Newsletter 25: 70.

Rate effects of MON-4606 and CGA-43089 on grain sorghum growth and the performance of these compounds as antidotes in grain sorghum treated with three different acetanilide herbicides was evaluated in the field in 1981. Plant stand reduction due to CGA-43089 was greater than that due to MON-4606 when both were applied to sorghum seed (var "DeKalb DK-42Y") at twice normal use rates. Equivalent plant stand reduction occurred for either antidote at normal use rates. Either antidote at the higher rate did not reduce head number of yield.

0761 DEVLIN, D.L., MOSHIER, L.J., RUSS, O.G., and STAHLMAN, P. 1982. Effect of CGA-43089, CGA-92194 and MON-4606 in combination with acetanilide herbicides on growth of grain sorghum (Sorghum bicolor).Page 32 In Proceedings, North Central Weed Control Conference. Indianapolis, USA: North Central Weed Control Conference Inc. (Abstract).

Seed treatment of grain sorghum with CGA-43089 or MON-4606 prevented yield loss following treatments with alachlor, acetochlor or metolachlor. CGA-92194 prevented yield loss following acetochlor and, usually, alachlor treatments.

0762 EINHELLIG, F.A., and SCH0N, M.K. 1982. Noncompetitive effects of Kochia scoparia on grain sorghum and soybeans.Canadian Journal of Botany 60(12): 2923-2930. 36 ref.

The allelopathic potential of Kochia scoparia, a common weed in cultivated fields, was demonstrated on grain sorghum and soybeans. Growth of sorghum seedlings was reduced when the nutrient medium contained an extra equivalent of 1 g fresh weight of Kochia in 60 mL of nutrient solution, or higher quantities. Soybean seedling growth was depressed by as little as 1 g of Kochia in 240 mL of nutrient solution. Treatments with Kochia extracts that reduced growth also caused seedling to have either an increase in leaf diffusive resistance, a decrease in water potential, or both. The addition of dried Kochia to soil pots in which seedlings were germinated and grown showed that 0.5 g of debris per 80 g of soil resulted in a significant reduction in sorghum growth, and seedlings grown with 2.0-g additions also had an increase in leaf resistance and decrease in water potential. Effects on water metabolism are indicated as one mechanism of action of allelochemicals from Kochia.

0763 FORNEY, D.R., FOY, C.L., and WOLF, D.D. 1982. Weed suppression by sorghum (Sorghum bicolor) sudangrass hybrids.Proceedings, Southern Weed Science Society 35: 317. (Abstract).

0764 FOY, C.L., and WITT, H.L. 1982. Selective chemical weed control in grain sorghum.Proceedings, Southern Weed Science Society 35: 53. (Abstract).

0765 FRANS, R., GULLEY, T., and TERHUNE, E. 1982. Herbicide field trials on field crops, 1981.Mimeograph Series Arkansas Agricultural Experiment Station, no. 296. 63 pp.

0766 GRABOUSKI, P., and WICKS, G. 1982. weed control in continuous notill sorghum.Pages 61-62 In Proceedings, North Central Weed Control Conference. Indianapolis, USA: North Central Weed Control Conference Inc. (Abstract).

Pre-sowing treatments with acetochlor, terbutryne, metolachlor, cyanazine or alachlor mixtures with atrazine or metolachlor + cyanazine, all gave good weed control in no-till sorghum in 1981-82. Yields from all treatments were higher than from the glyphosate-treated control.

0767 GREEN, J.J., CHENAULT, E.W., LAVAKE, D.E., and WIESE, A.F. 1982. Weed control with a controlled droplet applicator.Progress report, Texas Agricultural Experiment Station no. 4025. 8 pp.

0768 GURUMURTHY, A.N., and KONDAP, S.M. 1982. Studies on the effects of planting patterns and weeding intervals in sorghum based intercropping system on weed infestation and grain yield.Page 17 In Abstracts of papers, annual conference of Indian Society of Weed Science. (Abstract).

A trial was conducted during the kharif season of 1980-81 to study the weed suppressing ability of 4 intercrops in relation to 2 sowing patterns and 3 weeding intervals in a sorghum crop. The sorghum + cowpea cropping system was best in reducing the weed density and weed dry matter, followed by the sorghum + green gram cropping system. With sorghum in pure stands or intercropped with groundnut or green gram, 2 hand weedings were needed, whereas with cowpea 1 weeding on the 15th day was sufficient.

0769 HARDCASTLE, W.S. 1982. Grain sorghum (Sorghum bicolor) weed control with SD-58525 and SD-91779.Proceedings, Southern Weed Science Society 35: 54. (Abstract).

0770 HATZIOS, K.K. 1982. Herbicide antidotes past present future.Varginia Journal of science 33(3): 77. (Abstract).

The concept of using herbicide antidotes offers a potential alternative for increasing the selectivity of currently available herbicides. A desirable herbicide antidote is a chemical that selectively protects crops from herbicide injury without protecting weeds. This selectivity is the result of either a very specific crop/herbicide/antidote interaction or a selective treatment such as the dressing of crop seeds with the antidote. Chemical currently used as herbicide antidotes include: NA, R-25758, CGA-43089, CGA-92194, and MON-4606. All these chemicals can antidote to some extent the effects of chloroacetanilide and carbamate herbicides on grass crops such as corn and grain sorghum. Rather than merely preventing the entry of herbicides into the plant, herbicide antidotes work inside the plant to counteract the action of herbicides by either competing with them for a common site of action or by stimulating their metabolic detoxication in the protected crops.

0771 HOLLAND. J.F., and MCNAMARA, D.W. 1982. Weed control and row-spacing in dry-land sorghum in northern New South Wales.Australian Journal of Experimental Agriculture and Animal Husbandry 22(117): 310-316. 11 ref.

Six experiments were done in northern New South Wales over three seasons to study the effects of weeds on the yield of dry-land grain sorghum and methods of weed control. The relation between crop row spacing and weed control by inter-row cultivation or atrazine, or both was studied. Where the site yield was high because of favourable growing conditions, an increase in the crop row spacing reduced yield. At low yielding sites, an increase in the row spacing increased yields. At most sites, weed growth was greater with wider row spacings, which resulted in a larger reduction in crop yield where weeds were not removed. Inter-row cultivation reduced weed growth to less than half that of the unweeded controls. Pre-emergent atrazine gave good weed suppression, generally reducing weed growth to less than 10% of the unweeded control when applied at 2.5 kg/ha active ingredient. Post-emergent atrazine was much less effective. Inter-row cultivation combined with a band of pre-emergent atrazine over the crop row was as effective in weed control as an overall spray of pre-emergent atrazine.

0772 JACKSON, L.A., YOPP, J.H., and KAPUSTA, G. 1982. Effects of flurazole (MON-4606) safener and acetochlor (MON-097) herbicide on grain sorghum.Pages 53-54 In Proceedings, North Central Weed Control Conference. Indianapolis, USA: North Central Weed Control Conference Inc. (Abstract).

0773 KALMBACHER. R., and MISLEVY, P. 1982. Effect of digit grass Digitaria pentzii growth suppression on yield of sod seeded corn zea-mays and sorghum (Sorghum bicolor).Florida Science 45(suppl.l): 1-2.

0774 KEELING, J.W., and ABERNATHY, J.R. 1982. Crop and weed response to rope and sponge herbicide applicat ion.Proceedings, Southern Weed Science Society 35: 97. (Abstract).

0775 KETCHERSID, M.L., and MERKLE. M.G. 1982. CGA-43089 concep and MON-4606 screen as protectants in sorghum (Sorghum bicolor).Proceedings, Southern Weed Science Society 35: 368. (Abstract).

0776 LEEK, G.L. 1982. Efficacy of CGA-43089 [alpha(cyanomethoximino)~benzacetonitrile] as a herbicide antidote for sorghum (Sorghum vulgare Pers.).Ph.D. thesis, Michigan State University. East Lansing, Michigan, USA.

0777 MAHALLE, S.S.. KHARKAR. M.T., and BATHKAL, B.G. 1982. Chemical weed control in rainfed sorghum.Journal of Maharashtra Agricultural Universities 7(3): 266-267.

Sorghum being largely grown under rainfed conditions in kharif season is amenable to extensive weed losses. Weeds germinate in thick stand along with crop and grow vigourously due to favourable weather conditions. However, hybrid sorghums are comparatively slow growing in early period. It is necessary, to keep sorghum field weed free in the early stage of growth. Due to the slow growth rate, cultural operations such as hoeing and weeding are practically difficult. Under these circumstances, it would be desirable to study pre-emergence treatment of herbicides which would minimise weed-crop competition during the early stage of crop growth. For the control of weeds in sorghum, 2,4-D and other few growth regulators have been tried so far. Among the triazine compounds tried in sorghum, simazine and atrazine are in general use.,

0778 MARSHALL, R.J.. and NEL, P.C. 1982. Effect of post-emergence applied 2,4-D and MCPA on growth and yield of grain-sorghum.Pages 99-104 In Proceedings, Fourth National Weeds Conference of South Africa. Rotterdam, Netherlands:A Balkema Rotterdam.

The tolerance of six grain sorghum cultivars to post-emergence applications of 2,4-D was tested in the field. A high degree of crop safety was experienced with MCPA amine. However, applications of any of the other three formulations resulted in large differences in cultivar reaction.

0779 MARSHALL, R.J., NEL, P.C, and SMIT, N.S.H. 1982. Atrazine phytotoxicity to sorghum as affected by soil factors and temperature.Crop Production 11: 147-149.

Two pot experiments were conducted in growth chambers, where the reaction of grain sorghum cultivar NK 283 to atrazine was studied on various soils. There was a strong reaction to temperature increase on kaolinitic soils containing amorphous material. This reaction is ascribed to wetting and drying cycles causing cementation of amorphous material on the caly suface, so neutralizing adsorption sites for atrazine. A soil low in amorphous material showed little reaction to temperature change. An increase in pH caused increased atrazine injury, particularly on a soil with a low P status. Utilization of these findings in selecting atrazine rates may assist in promoting more effective weed control and greater crop safety.

0780 MOSHIER, L.J., and RUSS, O.G. 1982. Honeyvine milkweed control in continuous wheat and grain sorghum.Page 18 In Proceedings, North Central Weed Control Conference. Indianapolis, USA: North Central Weed Control Conference Inc. (Abstract).

0781 MUGABE, N.R., SINJE, M.E., and SIBUGA, K.P. 1982. A study of crop/weed competition in intercropping.Pages 96-101 In Intercropping: Proceedngs of the Second Symposium on Intercropping in Semi-Arid Areas, 4-7 August 1980, Morogoro, Tanzania (eds. C.L. Keswani and B.J. Ndunguru). Ottawa, Canada: IDRC.

0782 NDON, B.A., HARVEY, R.G., and SCHOLL, J.M. 1982. Weed control in double cropped corn, grain sorghum, or soybeans minimum till planted following canning peas.Agronomy Journal 74(2): 266-269. 21 ref.

Grain sorghum, corn, and soybeans were minimum-till planted following canning peas grown with or without preplant-incorporated trifluralin. Effects of two herbicide combinations and an untreated control were compared in each of the summer crops* Average weed growth in corn, grain sorghum, and soybeans following peas treated with trifluralin was reduced 52, 52, and 62%, and average grain yields of corn and soybeans were increased 10 and 28%, respectively, compared with the same crops following untreated peas. Trifluralin residues reduced grain sorghum stands (44%) and yields (17%).

0783 NEWCOMER, D.T., and MERKLE, M.G. 1982. Control of Johnson grass (Sorghum halepense) in grain sorghum (Sorghum bicolor) by SD-58525.Proceedings, Southern Weed Science Society 35: 52. (Abstract).

0784 NORWOOD, C.A. 1982. Use of chlorsulfuron in the wheat fallow and wheat sorghum fallow systems.Pages 22-23 In Proceedings, North Central Weed Control Conference. Indianapolis, USA: North Central Weed Control Conference Inc. (Abstract).

0785 OBRIGAWITCH, T., ROETH, F.W., MARTIN, A.R., and WILSON, R.G. JR. 1982. Addition of R-33865 to EPTC for extended herbicide activity (Sorghum bicolor).Weed Science 30(4): 417-422. 20 ref.

0786 PALMER, G.K., and JEFFERY, L.S. 1982. CGA-43089 concep and M0N-4606 as grain sorghum (Sorghum bicolor) seed protectants.Proceedings, Southern Weed Science Society 35: 55.

The seed protectants MON 4606 and cyometrinil were equally effective in preventing sorghum vigour and yield reductions in plots of loamy soil.

0787 PANWAR. R.S.. MALIK, R,K., and BHAN, V.M. 1982. Studies on the competitive value of kharif crops.Page 20 In Abstracts of papers. Annual Conference of Indian Society of Weed Science.

In the field experiment during 1980-81 and 1981-82, three weed control treatments viz. weedy check, weeding at 30 days after sowing and weed free were included and their effects on the competing ability of moong, cowpea, pearl millet and sorghum were determined. The studies revealed that weeds left throughout the growing cycle of moong, cowpea, pearl millet and sorghum reduced the potential by 51.0, 52.3, 62.7 and 61.4% during 1980 and 45.5, 54.5, 58.0 and 55.1% during 1981, respectively. Comparison of yield from plots weeded at 30 days after sowing with weedy check showed that the yield obtained were 26.5 to 31.8, 25.1 to 37.9. 41.5 to 49.4 and 37.7 to 42.3% higher than weedy check in moong, cowpea, pearl millet and sorghum, respectively. The dry weight of weeds in weedy check at different stages was not significant in any of the crops tried.

0788 PEEK, J.W.. DILL, T.R., and TURNER, W.E. 1982. Use of safeners to protect sorghum from herbicide injury.Annual Corn and Sorghum Industry Research Conference 36: 31-47. 44 ref.

0789 PIGG0T, G.J. 1982. Weed control for sorghum with minimum tillage.Pages 219-221 In Proceedings, Thirty-fifth New Zealand weed and pest control conference (ed. M.J. Hartley). Palmerston North, New Zealand: New Zealand Weed and Pest Control Society Inc.

In Northland, sorghum showed an absolute requirement for herbicides to assist establishment when direct drilled, or sown into cultivated land after a 2-3 week fallow. In comparisons of triazine and acetanilide combinations for controlling weeds during crop establishment atrazine proved superior to cyanazine while alachlor was marginally superior to propachlor in terms of weed control and crop biomass yield. Phytotoxicity of alachlor was not clearly demonstrated.

0790 PINTO. J.J.O., XAVIER. F.E., and BRAUNER. G.L. 1982. Behaviour of herbicides in grain sorghum (Sorghum bicolor).(Pt). Pages 59-62 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

0791 REINHARDT, C.F., and NEL, P.C. 1982. The influence of soil characteristics, air temperature and planting depth on the activity of alachlor.(Af). Crop Production 11: 154-158. (Summary:En).

Grain sorghum bio-assays were conducted in pots under controlled conditions to determine the effect of soil type, pH, air temperature and planting depth on alachlor activity. An increase in clay percentage caused a linear decrease in alachlor activity. This correlation was only valid up to approximately 25% clay and a C.E.C. (cation exchange capacity) value of 3,75 me %. Adjustments of soil pH values 5,1;5,5;5,7 and 5,9 to pH 7,0 failed to affect activity of alachlor. The herbicide was far more active at night/day temperature regimes of 10/20 deg C and 20/30 deg C than at 15/25 deg C. When seedlings emerged from 60 mm planting depths, growth was severely inhibited in the presence of 0,5 and 1,0 mg/kg incorporated alachlor, compared to growth inhibition at the 15 mm and 30 mm planting depths. The above results suggest that factors which increase the availability of alachlor for plant absorption, may lead to increased alachlor activity. Air temperature and clay content appear to be the most important factors affecting activity of alachlor.

0792 RUFENER, J., NYFFELER, A., and PEEK, J.W. 1982. CGA-92194, a new safeners to protect sorghum from injurious effects of metolachlor.Proceedings, Brish Crop Protection Conference - Weeds 2: 461-467. 4 ref.

Dressing sorghum seed with 1-2 g CGA 92194 protected the crop from metolachlor. The safeners was equally effective on standard grain cultivar as well as on yellow endosperm cultivar, and sweet sorghum and sudan grass cultivar. Tolerance was maintained over a wide range of temperature and soil moisture conditions and there was no significant loss in activity after long-term storage of the treated seed.

0793 SAUNDERS, E. 1982. Dowco 356, a new herbicide for control of annual weeds in corn and grain sorghum.Weeds Today 13(2): 22-33.

0794 SCHNEIDER, G.L., HOEHLER, C.B., SCHEPERS, J.S., and BURNSIDE, O.C. 1982. Roller applicator for shattercane (Sorghum bicolor) control in row crops.Weed Science 30(3): 301-306. 10 ref.

Greenhouse and field experiments were conducted with a roller applicator at Lincoln, Nebraska (USA), during 1979 and 1980. Glyphosate concentrations of 5, 10, and 20% and carpet saturations of 50 and 75% controlled shattercane when applied to the top 30 cm of the plant in greenhouse research. In the field, glyphosate concentrations of 5 to 20% with a carpet saturation of 50% controlled shattercane acceptably in soybeans, but a concentration of 2.5% with 25% carpet saturation did not. Weed control was comparable whether speed of application was 3.2, 6.4, or 9.6 km/h. Shattercane control in grain sorghum was excellent at glyphosate concentrations of 5. 10. and 20% and at carpet saturations of 50 and 75%, and sorghum injury was minimal at 25 and 50% carpet saturations.

0795 SCHON. M.K.. and EINHELLIG. F.A. 1982, Allelopathic effects of cultivated sunflower on grain sorghum.Botanical Gazette 143(A): 505-510. 31 ref.

Greenhouse studies demonstrated the allelopathic effects of sunflower cultivar 'Interstate 894' on the growth and water status of grain sorghum. Significant growth reductions in sorghum seedlings were found from additions of sunflower aqueous-leaf extracts at concentrations as low as 1 g fresh weight in 120 ml nutrient solution. Reductions in sorghum growth were accompanied by decreased in leaf water potential and/or increased in diffusive resistance. Incorporation of dried sunflower leaf material into soil in which sorghum seedlings were germinated and grown caused significant depression in growth over the 2-week test period with additions of 2 g residue to 80 g soil. Allelo-chemicals released from sunflower plants and residue are suggested as a possible explanation for yield reductions in crops which follow sunflower plantings. One mechanism of toxic action on seedlings involves an inteference with water balance.

0796 SEVERINA, E.. and MATELLOTTO. E. 1982. Field experiment in the control of Anoda cristate (L.) Schlecht in grain sorghum.(Es). Malezas - Asociacion Argentina Para el Control de Malezas 10(2): 3-7.

0797 SHEBAYAN. J.A.Y., TUNDE OBILANA, A.. MOOLANI, M.K.. and EGHAREVBA, P.N. 1982. Sorghum genotype x herbicide interaction.Sorgnum Newsletter 25: 23-24. 3 ref.

Two experiments were set up in 1980 at IAR, Samaru. and Agricultural Research Station. Mokwa to determine the response of seven recommended elite grain sorghum varieties (four at Samaru and three at Mokwa) to three levels each of three tested and recommended herbicides (Terbutrym/Terbuthylazine, Atrazine, and Pendimethalin) at two savanna ecologic zones, the Northern and Southern Guinea Savanna. There were no significant differences in grain yield among the two groups of varieties. The herbicides, however, were differentially tolerated by these varieties. Significant herbicide effects on grain yield were observed only at Samaru. although at each location increased rates of herbicides reduced grain yield.

0798 SHETTY. S.V.R. 1982. Weed control in intercropping systems.Presented at the FAO Workshop on Weed Management Strategies for the Eighties. 6-10 September 1982. FAO, Rome. Italy.

0799 SHETTY, S.V.R., SIVAKUMAR, M.V.K.. and RAM. S.A. 1982. Studies on the effect of shading on the growth of some common weeds of the semi-arid tropics.Agronomy Journal 74: 1023-1028.

0800 SIMKINS. G.S.. and MOSHIER, L.J. 1982. Response of greenbug susceptible and resistant hybrids of grain sorghum to atrazine and propachlor.Transactions of the Kansas Academy of Science 85(2): 68-71. 6 ref.

There is concern that grain sorghum hybrids that resist greenbugs are more susceptible to herbicide injury than are nonresistant hybrids. Tolerance to propachlor or atrazine was evaluated in the greenhouse in eight hybrid pairs of resistant and nonresistant hybrids that were otherwise genetically similar. Propachlor or atrazine was applied at 6.7 kg/ha or 2.2 kg/ha, respectively, and incorporated before planting. Propachlor significantly reduced emergence of one greenbug-resistant hybrid but not of its nonresistant counterpart. Propachlor reduced dry weight of two greenbug-resistant hybrids but not their counterparts. When the hybrid pairs were treated with atrazine, emergence or dry weight was not significantly less in any greenbug-resistant hybrid than in its counterpart.

0801 SWANN. C.W. 1982. Chemical weed control in corn and grain sorghum.Builetin - Cooperative Extension Service, University of Georgia, College of Agriculture, no. 824. 16 pp.

0802 TURNER, W.E., CLARK, D.R., HELSETH, N., DILL, T.R., KING, J., and SEIFRIED, E.B. 1982. CGA-92194: A new safener to protect sorghum from metolachlor injury.Proceedings, Southern Weed Science Society 35: 388. (Abstract).

0803 WALTER, H. 1982. Nature and importance of weeds in sorghum in the Yemen Arab Republic.Tropical Pest Management 28(2): 156-164. 14 ref.

Grain sorghum is the dominant crop in North Yemen agriculture, covering about 70-80% of the arable land. Weed control is still carried out mainly by hand. Many of the weeds are used as fodder for animals. A total of 137 weeds was collected in sorghum. Most frequent were Cynodon dactylon and Cyperus rotundus, their importance decreased, however, under a well established sorghum crop providing good shape cover and under conditions of increased crop fertilization with mineral nitrogen. Under these conditions, for example, Commelina species and Flaveria trinerva became commoner. Thus increased use of nitrogen altered the nature and hierarchy of the weed flora. Relationships between the indicator figures of the weeds and the habitat, as defined by Ellenberg, were confirmed. Traditional methods of weed control have so far worked well, as witness an average cover of 60% sorghum and 20% weeds. In future, however, rising costs and labour shortages will increase the demand for less time-consuming weed control strategies.

0804 WARFA, A.M., and VECCHIO, V. 1982. Infestations of canals and crops in the Afgoi area (Somalia).(It). Rivista di Agricoltura Subtropicale e Tropicale 76(3-4): 287-294. 11 ref. (Summary:En).

0805 WICKS, G.A. 1982. Comparison of herbicides applied prior to planting ecofallow sorghum.Page 46 In Proceedings, North Central Weed Control Conference. Indianapolis, USA: North Central Weed Control Conference Inc. (Abstract).

0806 YAMAMOTO, H., and IWATA, I. 1982. Weed control in grain sorghum.(Ja). Kyushu Agricultural Research 44: 58.

0807 YAMAMOTO, H.. and IWATA, I. 1982. Weed interference in grain sorghum.(Ja). Kyushu Agricultural Research 44: 57.

0808 ZIMDAHL. R.L., and CLARK, S.K. 1982. Degradation of three acetanilide herbicides in soil.Weed Science 30(5): 545-548. 15 ref.

The persistence of alachlor, metolachlor, and propachlor in soil was examined under laboratory and field conditions using sorghum ('NB280S') or annual ryegrass as bioassay species. In laboratory studies, degradation rate of alachlor and propachlor was greater at 50 and 80% than at 20% field capacity at 20 C. Degradation of metolachlor was greater at 80 than at 20% field capacity. Degradation rate of alachlor and metolachlor at 50% field capacity was greater at higher temperatures. Propalachlor degradation rate varied with temperature. Under irrigated, cropped field conditions, the order of persistence was metolachlor 1/2 alachlor1/21/2propachlor.

Harvesting and Equipment

0809 BROWN, R.F. 1982. Sorghum black layer: a valuable visual aid in harvesting decisions.Queensland Agricultural Journal 108(1): 5-6.

0810 GRAVES, C.R., and MCCUTCHEN, T. 1982. Grain sorghum desiccation study.Tennessee Farm and Home Science 123: 2-3.

Leafex-3, paraquat + surfactant and liquid N were evaluated at several rates as harvest aids (desiccants) for grain sorghum. Results from this study indicated that these desiccants were not effective in preventing a moisture increase during grain sorghum harvest when the grain was harvested within 15 days of desiccant application.

0811 NATH, S., JOHNSON. W.H.. and MILLIKEN, G.A. 1982. Combine loss model and optimization of the machine system.Transactions of the ASAE 25(2): 308-312. 5 ref.

Mathematical models for losses occurring during grain sorghum harvest were characterized in terms of grain moisture and machine adjustments. Multiple regression techniques were used to develop the mathematical models. Analyses of variance were used to determine the significant interactions among independent variables. Based on the interactions, new variables were generated and multiple regression models, including different combinations of variables, were fitted to machine loss measurements. The machine loss model was evaluated using data available from South Dakota University. An optimization technique, the sequential unconstrained minimization technique, was used to identify the sets of adjustment combinations that yielded optimum (minimum) machine losses for a given moisture range.

0812 ONO, M., IRIE, M., and KANZAKI, T. 1982. Studies on grain sorghum harvesting with walking type head-feeding combine.(Ja). Bulletin of the Chugoku National Agricultural Experiment Station. Series A. Crop Division 30: 35-53. 24 ref.

0813 SHCHERBAKOV, V. YA. 1982. Preharvesting desiccation of grain sorghum.Khimiya v Sel'skom Khozyaistve 20(6): 40-42. 3 ref.

Application of 5-10 kg magnesium chlorate, 2-3 kg Reglone (diquat), 100 kg urea, 60 kg ammonium nitrate or 5 kg NaCl in 300 litres water/ha to sorghum with grain moisture content 33.8-40% gave effective desiccation of plants, accelerated maturation, had no adverse effect on grain yield and facilitated combine harvesting.

0814 SHCHERBAKOV, V. YA. 1982. Use of desiccants, vitamin-meal aggregates, and grain hermetization when harvesting sorghum grain.Soviet Agricultural Sciences 5: 30-32.

On the basis of a three-year (1978-80) experiment it has been established that when harvesting sorghum grain for monofodder during the period grom waxy to full maturity, the feed-unit yield per ha was 28.4% higher than when harvesting for grain, and it was 39% higher than when harvesting for monofodder during the phase of milk-waxy maturity. By carrying out a preharvesting desiccation with urea (100 kg/ha), the moisture content of grain decreased after 16 days by 9.1%. that of leaves by 35.7%, and that of stems by 0.7%. thereby increasing the harvest by 1.7 centners/ha and the grain-protein content by 3.23%. It was also shown that hermetization of moist grain in concrete trenches prolongs its storage-time without significantly affecting its quality.

0815 SINGH. A.R. 1982. Effect of dates of harvesting and seed moisture at harvest on processing recovery in sorghum.Research Bulletin of Marathwada Agricultural University 6: 10-12. 5 ref.

Four sorghum cultivars harvested at 5-day intervals between 20 and 40 days after flowering showed over 90% processing recovery (estimated by sieving grains throughly holes of 3 mm diam.) when harvested 30-35 days after flowering grain moisture content was 23.34-39.51% depending on cultivar.

0816 SINGH. A.R.. and KULKARNI. L.P. 1982. Effect of dates of harvesting and moisture on processing recovery of sorghum seed.Sorghum Newsletter 25: 53.

Four sorghum varieties were studied with the objective to identify the appropriate date of harvesting and the optimum moisture percentage to obtain maximum processing recovery. The genotypes CK 60A and CS-3541 gave maximum processing recovery ranging from 90 to 98% when harvested between 30 and 40 days after pollination and at 36 to 17.00% moisture.

0817 SINGH. A.R.. and KULKARNI. L.P. 1982. Effects of different dates of harvesting and drying on seed quality in sorghum.Sorghum Newsletter 25: 53-54.

Four sorghum varieties were tested for germination with the objective to identify the appropriate harvesting time for good quality seed production and to study the effects of natural and mechanical drying on seed quality.

PATHOLOGY

Fungal Diseases (General)

0818 BARBULESCU. A. 1982. Achievements in the protection of cereals and industrial crops against the principal diseases and pests.(Ro). Analele Institutului de Cercetari pentru Cereale si Plante Tehnice Fundulea 50: 349-362. 72 ref. (Summaries:Ru. En).

The main achievements in plant protection research for 25 years since the foundation of the Fundulea Research Institute in Romania are reviewed, with reference to diseases and pests of economic interest, their distribution range. biology and ecology and the development of integrated control programmes.

0819 BRANCAO. N.. CASELA. C.R.. RAUPP. A.A.A.. PORTO. M.P.. AZAMBUJA. N.H.B.. and MARTINS, R.M. 1982. Etiology and control of the fungal diseases of sorghum crop.(Ft). Pages 34-45 In Annals of the Eleventh Technical yearly Meeting of sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

0820 CRESPO. L. 1982. Diseases.(Es). Publicacion Miscelanea - Estacion Experimental Regional Agropecuaria Rafaela. Argentina 12: 49-51. 4 ref.

0821 DALMACIO. S.C.. DAYAN. M.P.. and PASCUAL. C.B. 1982. Identification of sources of resistance to some major diseases of sorghum in the Philippines.Philippine Phytopathology 17(1-2): 38-46. 11 ref.

Artificial and natural inoculation methods were used to screen for resistance to five major diseases of sorghum, namely: gray, tar and target leaf spots, leaf rust, and Rhizoctonia sheath blight. The proportions of resistant lines to the number of lines tested are as follows: 201 resistant out of 555 lines tested for rust, 27 out of 2525 for gray leaf spot, 51 out of 2268 for tar spot, 198 out of 2484 for target leaf spot and none out of 88 for Rhizoctonia sheath blight. Resistance to target leaf spot was expressed as hypersensitive reaction while resistance to tar spot was expressed as few number of stromata. Hypersensitive reaction and/or few lesion/pustule number were observed in sorghum germplasm resistant to rust and grey leaf spot. Field screening was complicated by interference among foliar diseases, plant height and maturity. Possible implications of these results in breeding for disease resistance are discussed.

0822 FORBES, G., and CRESPO. L.B. 1982. Sorghum weathering caused by Acremonium strictum Gams.Manfredi, Argentina: Instituto Nacional de Tecnologia Agropecuaria. 3 pp. 12 ref. (Technical Information No. 89).

0823 FREDERIKSEN, R.A. 1982. Disease problems in sorghum.Pages 263-271 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India:ICRISAT. 34 ref.

0824 GOVINDU, H.C. 1982. Green revolution: its impact on plant diseases with special reference to cereals and millets.Indian Phytopathology 35(3): 363-375. 40 ref.

0825 HULLUKA, M. 1982. Sorghum diseases in Ethiopia.Pages 46-53 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0826 JALALUDDIN, M. 1982. Occurrence of parasitic fungi on some host plants of Uganda.Pakistan Journal of Botany 14(special issue): 30-31. (Abstract).

0827 KAMAL. M.. AHMED, K.M., and EL MAKALEH, S. 1982. Additions to plant diseases recorded in the Yemen-Arab-Republic.Tropical Pest Management 28(4): 434-435.

0828 KIREMATH. P.C., BDARI, V.B., and PATIL-KULKARNI. B.G. 1982. Sorghum an additional host for Ephelis oryzae.Indian Phytopathology 35(3): 547-548. 5 ref.

The conidial state of Balansia oryzae was identified on sorghum cultivar CSH-5 with Udbatta disease in experimental plots at Hebbal, Bangalore, India this being the first authentic record of the pathogen on this host.

0829 KOJIMA, M. 1982. Biochemical studies on high and low molecular weight substances which are involved in defence reactions of host plant.(Ja). Journal of the Agricultural Chemical Society of Japan 56(8): 675-683. 40 ref.

0830 LINDO ZARATE, P. 1982. Toxins in plants and fungi.(Es). Tropicultura 2(1): 60-68. 9 ref.

0831 MUGHOGHO, L.K. 1982. Strategies for sorghum disease control.Pages 273-282 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India:ICRISAT. 38 ref.

0832 NATURAL, M.P.,

FREDERIKSEN, R.A., and ROSENOW, D.T. 1982. Acremonium wilt of sorghum.Plant Disease 66(9): 863-865. 2 ref.

Acremonium wilt, a new disease of sorghum in the United States, is different from other diseases in sorghum. It is distinguished hy the development of large patches of dead tissue along one axis of a leaf on either side of the midvein. As the disease progresses, whole leaves die and disease symptoms appear as the pathogen spreads into the younger leaves. The disease often results in discoloration of vascular tissue in leaves and stalks. Acremonium strictum was isolated consistently from stalks, leaf sheaths, and leaves of diseased plants. Several sorghum entries were resistant to the pathogen folowing natural infection or foliar clipping in the field. However, drenching around injured roots with inoculum and injecting a conidial suspension at the base of the plant increased their susceptibility. Grain production was reduced by 50% in affected plants.

0833 REED. J.E., PARTRIDGE, J.E., and NORDQUIST, P.T. 1982. Fungal species isolated from roots and stalks of symptomless sorghum plants during the growing-season.Phytopathology 72(7): 974. (Abstract).

Stalks and roots of field-grown grain sorghum were examined for fungal colonization throughout the 1980 and 1981 growing seasons. Fungi were found to colonize apparently healthy tissue as early as 3 weeks after planting. They became increasingly abundant after anthesis, during the period of grain development. Of the several species recovered from stalks and roots, Fusarium species were found to occur most frequently. Fusarium moniliforme appeared to predominate in stalk tissue, whereas in roots, no single species was observed to predominate. Evidence from this study indicates that fungal colonization of sorghum stalk and root tissue occurs routinely, in the absence of any symptoms of stalk rot. Therefore, the critical factors in the development of this disease appear to be related to the interaction between fungal activity and the physiological condition of the plant, rather than simply to the presence of fungi within plant tissue.

0834 SHARMA, M., UMAT, D.S., and DABHOLKAR, A.R. 1982. Screening of sorghum varieties/hybrids for various diseases.Sorghum Newsletter 25: 112. 1 ref.

0835 VUONG. H.H. 1982. Millet and sorghum phytopathology.Bamako, Mali: Institut Economie Rurale. 96 pp.

Thioral (25% haptachlor + 25% thiram) and Granox (10% benlate + 10% captafol + 20% carbofuran) gave good emergence and satisfactory yield of grain sorghum. None of these products was effective, as a pelleting of seed, against Ramulispora sorghi, Gloeooercospora sorghi and Xanthomonas holcicola.

0836 VUONG, H.H., TIGANA, L., and TRAORE, M. 1982. Some diseases in millet and sorghum during the 81-82 season.Bamako, Mali: Institut Economie Rurale.

Smuts

0837 AHMED, S., IQTEDAR, B., ASLAM, N., and ZEHRA, S.B. 1982. Biochemical changes in sorghum-vulgare infected by Sphacelotheca sorghi.Pakistan Journal of Botany 14(special issue): 41. (Abstract).

0838 KADAM, V.P., and SHINDE, P.A. 1982. Varietal reaction of some sorghum hybrids and varieties to grain smut disease.Indian Phytopathology 35(1): 166-167. 1 ref.

0839 KAUR, M. 1982. Effect of relative humidity on spore germination of Sphacelotheca reiliana (Kuhn) Clint.Science and Environment 4(1-2): 17-20.

0840 MIRZA, M.S., HAMID, S.J., and HASSAN, S.F. 1982. Resistance of sorghum varieties to covered kernel smut.Pakistan Journal of Agricultural Research 3(1):'31-33. 13 ref.

Twenty five sorghum varieties of diverse sources were screened against covered kernel smut by seed inoculation with chlamydospores of Sphacelotheca sorghi. Varieties tested varied greatly in their resistance against the disease. None appeared to be immune, however 5 were resistant, 7 were intermediate and the remaining ones were susceptible. Three lines, viz., Lyallpur Hybrid, S.S.1 and 1616 x RRS-17 exhibited a high level of resistance.

0841 QURESHI. M.A.H., and PATHAN, I.H. 1982. Effect of seed treatment fungicides on emergence, number of tillers and covered smut, 1980.Fungicide and nematicide tests; results - American Phytopathological Society 37: 171.

0842 RAO, G.K., and SARWAR, H.A.K. 1982. High temperature and depleted soil moisture favors sorghum long smut (Tolyposporium ehrenbergii).Sorghum Newsletter 25: 111.

0843 TULEEN, D.M.. and FREDERIKSEN, R.A. 1982. Evaluating a crop loss model for head smut of sorghum.Phytopathology 72(10): 1278-1280. 8 ref.

A model simulating grain sorghum yields relative to the incidence of head smut was evaluated. Grain sorghum hybrids were inoculated in the seedling stage with Sphacelotheca reiliana by the hypodermic injection technique in four field trials at three locations in Texas, USA. Percentages of infection were determined at anthesis; grain crop yields were calculted in grams per panicle and kilograms per hectare. The percentage of grain yield loss relative to uninoculated plots wad directly proportional to the percentage of plants with smutted or phylloid panicles with regression coefficients from 0.84 to 1.09 and R sq from 0.39 to 0.80.

0844 WANG, Z.Q. 1982. Brief report on the identification of resistnce to Sphacelotheca reiliana in Chinese sorghum varieties.(Ch). Liaoning Nongye Kexue (Liaoning Agricultural Science) 1: 26-30.

0845 WU, X., PAN, Z., TIAN, L., and HU, J. 1982. Physiological specialization of Sphacelotheca reiliana (Kuhn) Clint, to sorghum.(Ch). Acta Phytopathologics Sinica 12(1): 13-18. 9 ref. (Summary:En).

Rust

0846 ANAHOSUR, K.H.. PATIL, S.H., and NAIK, S.T. 1982. Effect of date of sowing on the incidence of sorghum rust.Indian Phytopathology 35(2): 247-250. 6 ref.

To see the effect of sowing date on the natural rust incidence, a highly rust susceptible cultivar, 36B was sown at 10 day interval starting from 1 June to 17 November for 3 years during 1977-79 at the Regional Research Station, Dhatwad. In all the 3 years rust incidence was significantly lower on the crops sown on 1 June and 10 June (rust indices 32.3-36.0%) as compared to later dates (rust indices 38-85%). Rust gradually increased on the crops sown later than 10 June and maximum rust appeared from 30 June to 8 October. Crops sown from 18 October to 17 November showed decreasing trend in the rust incidence. The observations on the meteorological conditions in relation to rust development revealed that rainfall (41.2-508 mm), minimum temperature (15 deg-20.2 deg C) maximum temperature (26.6 deg - 29.9 deg C) and relative humidity (58-84%) supported maximum rust development. The best sowing time of sorghum to get maximum yield was between 1 June and 20 June.

Downy Mildews

0847 ANAHOSUR, K.H., PATIL, S.H., and NAIK. S.T. 1982. A new sorghum genotype as source of stable resistance to downy mildew.Sorghum Newsletter 25: 106-107. 2 ref.

0848 BONDE, M.R. 1982. Epidemiology of downy mildew diseases of maize, sorghum and pearl millet.Tropical Pest Management 28(1): 49-60. 94 ref. (Summaries:En, Es, Fr).

The downy mildews of maize, sorghum and pearl millet are among the most destructive diseases in the tropics and subtropics. The pathogens causing the diseases are Peronosclerospora sorghi, P. heteropogoni, P.philippinensis, P. sacchari, P. maydis and Sclerospora graminicola. In spite of an increase in research on graminaceious downy mildews during the last decade, broad gaps in information still exist which prevent their adequate control. Information on seed transmission, collateral hosts as sources of inoculum and effects of environment on the conidial and oospore phases of these diseases is reviewed, and some of the important information gaps are discussed.

0849 CRAIG, J. 1982. Identification of sorghum downy mildew resistance in corn by leaf reaction to conidial inoculum.Phytopathology 72(3): 351-352.

Ten corn inbred lines were compared for symptoms on leaves inoculated with conidia of Peronosclerospora sorghi in the greenhouse and for susceptibility to sorghum downy mildew in the field. A classification system for leaf symptoms was devised. The correlation between leaf symptom types in the greenhouse and levels of downy mildew susceptibility in the field was calculated to determine the feasibility of using leaf reactions to predict levels of downy mildew susceptibility. Degree of severity of leaf symptoms was positively and significantly (P = 0.01) correlated with degree of downy mildewsusceptibility.

0850 HERNANDEZ MARTINEZ, M., NARRO SANCHEZ, J., and VALLEJO. A.B. 1982. Chemical control of downy mildew (Peronosclerospora sorghi) C.CG. Shaw at "E1 Bajio" of Michoacan Mexico.Sorghum Newsletter 25: 119-120. 3 ref.

0851 MEENAKSHI. M.S., and RAMALINGAM, A. 1982. Epidemiology of sorghum downy mildew. VII. Predisposition of mildewed leaves to zonate leaf spot infection.Life Sciences Advances 1(2): 147-150.

Downy mildew infected leaves of sorghum were found to be infected by Gloeocercospora sorghi after heavy showers. The disease was reproduced by artificial inoculations of infected leaves. The fungus spores were found to be splash dispersed from soil to sorghum leaves by rain drops and the intensity of the infection was observed to decrease with increasing height from the ground. G. sorghi spots which developed within 3-4 days of inoculation inhibited the sporulation of downy mildew fungus and resulted in the fast drying of the infected leaf areas, The predisposition is stated to be due to altered physiology of the infected leaves.

0852 NARRO SANCHEZ, J.. HERNANDEZ MARTINEZ. M.. and VALLEJO. A.B. 1982. Stability of resistance to downy mildew using RTx430 as a common pollinator of male-sterile from El Bajio Mexico.Sorghum Newsletter 25: 121-122. 3 ref.

0853 RANA. B.S.. ANAHOSUR, K.H.. RAO. M.J.V.. RAO. V.J.M.. PARAMESHWARAPPA. R.. and RAO. N.G.P. 1982. Inheritance of field resistance to sorghum downy mildew.Indian Journal of Genetics and Plant Breeding 42(1): 70-74. 4 ref.

Inheritance of SDM resistance was studied in a set of resistant x susceptible crosses using both qualitative and quantitative genetic analysis techniques. Segregation ratios in the (R X S) crosses clearly indicated the presence of three gene pairs which exhibited both complementary and duplicatory types of gene interaction among them. Quantitative genetic analysis of this character indicated similar results. SDM resistance was observed to be quantitative threshold character.

0854 SALUMUSHABANI. and FRED ERIKSEN. R.A. 1982. Symptoms of sorghum downy mildew on maize following inoculations with conidia and oospores.Plant Disease 66(11): 1006-1008. 13 ref.

The response of four selected maize inbred lines inoculated in the greenhouse using conidia and oospores of Peronosclerospora sorghi was evaluated. Reaction of specific cultivars to infection with different spore forms of Peronosclerospora sorghi is important in screening for host resistance. The inbred Tx601 was resistant to both types of inoculum, whereas Tx441 was more susceptible to conidia than oospores. Irrespective of reaction class, systemically infected plants had different colonization symptoms.

0855 SANCHEZ. J.N.. MARTINEZ. M.H.. and VALLEJO. A.B. 1982. Pathotypes of downy mildew Peronosclerospora sorghi Weston & Uppal C.G. Shaw at El Bajio de Michoacan.Sorghum Newsletter 25: 120-121. 3 ref.

0856 SINGBURAUDOM. N.. and RENFRO. B.L. 1982. Heritability of resistance in maize to sorghum downy mildew (Peronosclerospora sorghi (Weston + Uppal) C.G. Shaw).Crop Protection 1(3): 323-332. 23 ref.

0857 TAKEDA. A.S.. NAKAMURA. K.. GIMENES-FERNANDES. N.. KRONKA. S. DON.. GOMES. G.. and INOUE. L.T. 1982. Effect of chemical seed treatment on control of sorghum mildew on maize and sorghum.(Pt). Cientifica 10(1): 129-133. 10 ref. (Summary:En).

Metalaxyl (Apron 35 PM). applied as seed treatment in broomcorn or maize, at the rates of 100. 200 and 400 g/100 kg of seeds, was the most efficient fungicide in the control of sorghum downy mildew. SN 75196 (Schering AG 20%), at the rate of 100 g/100 kg of maize seeds, presented some control and may be considered as an eventual substitute for metalaxyl. Efosite AL and propamocarb presented lower effect on the control of SDM. Control of SDM was directly related with grain yield in maize crop. In another experiment it was shown that metalaxyl at high dosage, as 400g/100 kg. may be toxic to maize, and so. lower dosages must be recommended.

0858 WILLIAMS. R.J.. DANGE. S.R.S.. MUGHOGHO. L.K.. and RAO. K.N. 1982. Identification of QL-3 sorghum: a source of resistance to

Peronosclerospora sorghi. Plant Disease 66(9): 807-809. 15 ref.

In 3 years of testing in India, Botswana, Venezuela, and the USA, a selection of the Australian sorghum line QL-3 has remained free from symptoms of sorghum downy mildew when exposed to oospores and conidia of Peronosclerospora sorghi in field trials. In addition, the QL-3 resistance has remained effective when inoculated with conidia of the fungus by four techniques that resulted in the breakdown of resistance of other field-resistant cultivars. QL-3 was developed first in Australia for resistance to the sugarcane mosaic virus, but this resistance to the virus has also been effective in Asia, Europe, and the Americas. Thus the QL-3 selection represents a valuable source of combined resistance to two important pathogens of sorghum.

Leaf Spot/Blight

0859 ANZALONE, L. JR. 1982. Efect of seed treatment on sorghum seedling emergence in Louisiana, 1981. Fungicide and nematicide tests; results - American Phytopathological Society 37: 170.

0860 CLAFLIN, L.E. 1982. Control of seed decay, seedling blights, and covered kernel smut of sorghum with seed treatments, 1981. Fungicide and nemticide tests; results - American Phytopathological Society 37: 170-171.

0861 FERREIRA. A.S., and WARREN, H.L. 1982. Resistance of sorghum to Colletotrichum graminicola. Plant Disease 66(9): 773-775. 12 ref.

Twenty-three sorghum cultivars were evaluated in the greenhouse and at the Purdue Agronomy Farm for resistance to Colletotrichum graminicola. Seedling blight reaction in the greenhouse were significantly correlated with leaf blight reactions of adult plants in the field (r=0.87**, P1/40.01), although leaf anthracnose severity was usually higher in the field than in the greenhouse. None of the sorghum seedlings inoculated with C. graminicola 15 days after planting produced anthracnose symptoms: however, seedlings inoculated 25 or 35 days after planting in the greenhouse produced typical anthracnose lesions. Susceptibility or resistance to C. graminicola could be determined 25-35 days after planting at the four- to seven-leaf stages. The fungus sporulated in lesions on cultivars susceptible and resistant to C. graminicola but not in lesions on cultivars that were hypersensitive-resistant.

0862 FREDERIKSEN, R.A. 1982. The occurrence of sooty stripe in south Texas in 1981. Sorghum Newsletter 25: 124. 2 ref.

0863 HUGUENIN, B., LOURD, M., and GEIGER, J.P. 1982. Comparative morphological, physiological and pathogenic studies of isolates of Colletotrichum falcatum and Colletotrichum graminicola. (In). Phytopathologische Zeitscrift 105(3-4): 293-304. (Summaries: En, Fr, De).

The two species, Colletotrichum falcatum and Colletotrichum graminicola are not easily separated by morphological and cultural studies. Investigations on proteic polymorphism and pathogenicity of strains from sugar cane, maize and sorghum allowed us to segregate easily C. falcatum from C. graminicola and to distinguish, in the second species, by analysis of leucyl amino peptidase, acid phosphatase and alpha-esterase spectra, two distinct units. These units correspond respectively to the maize and sorghum isolates.

0864 MATHUR. K., and NAIK, S.M.P. 1982. Field evaluation of advanced sorghum varieties against leafspot diseases.Sorghum Newsletter 25: 118-119. 2 ref.

0865 MISHRA. A., and SIRADHANA, B.S. 1982. Reaction of sorghum germplasm to Colletotrichum graminicolum.Indian Journal of Mycology and Plant Pathology 12(3): 314. 2 ref.

Anthracnose of sorghum caused by Colletotrichum graminicolum occurs in mild to severe form in various sorghum growing areas. Since the disease is widespread and various other hosts are known to harbour the pathogen, the chances of increase in severity are great. In the present investigation evaluation of sorghum hybrids, inbreds and some cultivars was done to find sources of resistance to Colletotrichum graminicolum.

0866 NAKAMURA. K.. and GIMENES-FERMNDES, N. 1982. Evaluation of the severity of anthracnose on some commercial sorghum genotypes.(Pt). Cientifica 10(1): 135-139. 8 ref. (Summary:En).

The severity of anthracnose on 59 grain and forage sorghum commercial genotypes was evaluated, under field conditions of cropping, at the Faculdade de Ciencias Agrarias e Veterinarias, Campus de Jaboticabal, SP, Brazil - UNESP, in the crop year of 1980/81. The disease severity was rates by the application of a rating system varying from 1.0 to 5.0 where 1.0 means unnoticiable disease incidence in the experimental plot, constituted by a single 6m row, and 5.0, the maximum incidence and severity with the death of affected leaves. Among the 59 genotypes, three may be considered as highly resistant; 11, as resistant and the others 45, as susceptible, based on disease severity rating at two different planting times (09/12/80 and 23/01/81). The disease severity was rated at the 93rd and 103rd days after sowing, respectively for the first and second planting times.

0867 O'NEILL. N.R., and RUSH, M.C. 1982. Etiology of sorghum sheath blight and pathogen virulence on rice.Plant Disease 66(12): 1115-1118. 17 ref.

A leaf and sheath blight of sorghum occurring in 1975, 1976, and 1977 in Louisiana, USA was caused by Rhizoctonia solani. This pathogen, which belongs to anastomsis group 1, is identical to the fungus that causes aerial blight of soybean and sheath blight of rice. The perfect state of the pathogen, Thanatephorus cucumeris, was found on the foliage of sorghum in several fields. Homokaryotic, single-basidiospore isolates from sorghum varied in cultural characteristics and in virulence to rice cultivars. Virulence of these isolates on sorghum and rice was generally low when compared with heterokaryotic isolates found in the field. Rice cultivars were ranked similarly in disease reaction when inoculated with single-basidiospore isolates or heterokaryotic isolates from sorghum.

0868 PANDEY, S.C., and SHUKLA, T.N. 1982. Comparative physiological studies on growth and final pH of six species of Helminthosporium from Sorghum vulgare L.Journal of Indian Botanical Society 61: 156-160. 20 ref.

Six Helminthosporium species inciting leaf spots of Jowar grew best on Richard's medium and very poor on Brown's starch medium. It was also noted that all the pathogens had moderately good growth on Czapek's (Dex); Sabouraud's potato-dextrose and oat-meal media. All the species exhibited best growth at pH 6.0 and poor on pH 9.0, the optimum being pH 5.0 to 6.9. The best growth was obtained at 30 deg C, followed by 28 deg C by all the species except Helminthosporium hawaiiense and H. turcicum which showed opposite effect and the optimum range being 25 deg to 30 deg C. At 10 deg and 40 deg C the growth of all the species was not satisfactory but there was no growth of H. turcicum at 40 deg C. All the species except H. hawaiiense and H. tetramera failed to grow at 5 deg C. In general, the final pH of culture filtrate of the different media was towards neutrality or alkalinity.

0869 SINGH. D.S., and PAVGI, M.S. 1982. Perpetuation of two foliicolous fungi parasitic on sorghum in India.Phytopathologia Mediterranea 21(1): 41-42.

Mycelium of Ascochyta sorghi and Gloeocercospora sorghi survived for 3 and 2 months. respectively, in sterile soil and for 2 and 1 months in unsterile soil. The stromate of both fungi and sclerotia of G. sorghi in leaf debris, however, remained viable in the soil from season to season. The fungus also survived between seasons on collateral hosts such as Johnson grass and Sudan grass.

0870 SINGH. H.P., and CHAND, J.N. 1982. Biochemical changes in sorghum leaves due to infection by Helminthosporium rostratum Drechsler.Haryana Agricultural University Journal of Research 12(4): 655-657. 5 ref.

The quantitative and qualitative estimation of total phenols and O-dihydroxy phenols determined in diseased and healthy leaves of different sorghum lines/varieties, resistant, moderately resistant and highly susceptible to Helminthosporium rostratum indicated higher concentration of total phenols and 0-dihydroxy phenols in healthy resistant line/variety than that of moderately resistant and highly susceptible line/variety. In diseased, the concentration of total phenols and O-dihydroxy phenols increased only in resistant line/variety while in moderately resistant line/variety, the concentration of total phenols and O-dihydroxy phenols decreased. However, in diseased leaves of highly susceptible line/variety, the contentration of total phenols decreased, while O-dihydroxy phenols increased. The same amount of hydrocyanic acid was estimated in diseased and healthy leaves of sorghum resistant and highly susceptible line/variety. Only the amount of hydrocyanic acid decreased with the advancement in the age of the plants.

0871 WALL, G.C., FREDERIKSEN, R.A., and ODVCDY, G.N. 1982. Comparison of two different, lesion types in grey leaf spot disease found in Tampico, Mexico.Sorghum Newsletter 25:125. 2ref.

Rots

0872 ANAHOSUR, K.H.. and PATIL, S.H. 1982. Some promising sources of resistance to charcoal rot of sorghum.Sorghum Newsletter 25: 109.

Since 1976, efforts have continued to evaluate several genotypes for reaction to Macrophomina phaseolina by the "tooth pick" method and under natural conditions. Testing has indicated that E-36-1, SPV-249, SPV-428, SPV-488, and BRC 5-5-2 are the most promising. During the post-rainy season of 1981-82, the high level of resistance in E 36-1 and SPV-249 was confirmed in planting trials made at 10-day intervals from 1-9-1981 to 10-11-1981. Days to 50% flowering for E 36-1 and CSH-6 are almost the same. In all the planting dates, CSH-6 had 100% lodging with shrivelled grains, whereas E 36-1 and

SPV-249 remained free from charcoal rot. E 36-1 from November plantings had 5% lodging caused by infection with Fusarium moniliforme, but SPV-249 was completely free from lodging. Fusarium stalk rot was noticed in few plants. SPV-428, SFV-488 and BRC-5-5-2 are lines may be used in future breeding programs.

0873 JENSEN. S.G., MAYBERRY, W.R.. and OBRIGAWITEH, J.A. 1982. Erwinia chrysanthemi as a pathogen of grain sorghum.Phytopathology 72(7): 990.

A bacterial pathogen of grain sorghum caused a soft rot of the stalk of plants in the preboot stage. The organism is an effective pathogen only at high temperatures (1/230 deg C) but it can attack several commercial genotypes. Three methods were used to compare this bacteria with other authentic cultures: 1) Standard morphologic-metabolic criteria, 2) Analysis of soluble proteins by polyacrylamide gel electrophoresis, and 3) Gas chromatography of cellular fatty acids. The three methods gave good agreement and identified the pathogen as being similar to a strain of Erwinia chrysanthemi. A discussion of the diagnostic methods and the significance of the pathogen will be given.

0874 MANSOUR, S.M., EL-SHAFEY, H.A., AHMED, K.G.M., and EL-ASSIUTY, E.M. 1982. Changes in physical and chemical characters of kernel due to infection of grain sorghum with stalk rots.Ain Shams University Faculty of Agriculture Research Bulletin 2044: 1-12. 14 ref. (Summary:Ar).

0875 OBRIGAWITCH, J.A.. JENSEN, S.G., and MAYBERRY, W.R. 1982. Identification of Erwinia chrysanthemi as a pathogen on sorghum.Sorghum Newsletter 25: 123.

0876 PATIL, R.C., DESHAMANE, N.B.. and CHAVAN, A.P. 1982. Effect of different levels in nitrogenous fertilizer on charcoal rot incidence in four cultivars of sorghum.Sorghum Newsletter 25: 109-110.

0877 PATIL, R.C., DESHAMANE, N.B., and PANDHARE, T.M. 1982. Effect of plant density and row spacing on charcoal rot incidence in four cultivars of sorghum.Sorghum Newsletter 25: 110.

0878 RAO, G.K., KUMARA SWAMY, V.C., and RAO, K.N. 1982. Screening of sorghum varieties to charcoal rot.Sorghum Newsletter 25: 113.

0879 RAO, T.G.N., and BALASUBRAMANIAN, K.A. 1982. Note on irrigation schedule and development of charcoal rot incited by Macrophomina phaseoli (Maub1.) Ashby in sorghum.Indian Journal of Agricultural Sciences 52(9): 621-622. 2 ref.

0880 SOLIMAN, N.E.K. 1982. Studies on stalk-rot of grain sorghum in Egypt.Ph.D. thesis. Faculty of Agriculture, Cairo University, Egypt. 176 pp.

0881 TRIMBOLI, D.S., and BURGESS, L.W. 1982. The fungi associated with stalk and root rot of grain sorghum in New South Wales.Sorghum Newsletter 25: 105-106.

0882 VOIGT, R.L. 1982. Variation in disease response for Yuma root rot between paired plots of different seed lots of the same hybrids.Sorghum Newsletter 25: 122-123. 2 ref.

A serious root rot of sorghum roots (Yuma Root Rot) occurs in the lower Colorado River valley on grain sorghum planted in July as a double crop after winter wheat, barley, or cantalope. Every three or four years, some 150 to 200 commercial grain sorghum hybrids currently on the market are evaluated for resistance to this root rot. Only two or three percent of those tested usually prove to be totally resistant. The hybrids as a group range in disease response from every plant being resistant to every plant being susceptible with individual hybrids expressing quite constant percentages of plants that are either susceptible with individual hybrids expressing quite constant percentages of plant that are either resistant or susceptible. Hybrids with around 80% or higher of resistant plants have been recommended for farmer use since the final yield would probably be affected very little by the loss of a few plants.

Ergot

0883 ANAHOSUR, K.H., and PATIL, S.H. 1982. Effect of date of sowing on the incidence of ergot of sorghum.Indian Phytopathology 35(3): 507-509. 6 ref.

Early sowing significantly reduces the incidence of ergot and the best yields were achieved with sowing during the first second week of June. The best time for screening sorghum genotypes against the disease was in crops sown in July.

Fungi on Grain Seeds (Molds)

0884 ANAHOSUR. K.H., and PATIL, S.H. 1982. Some promising sources of resistance to grain mold of sorghum.Sorghum Newsletter 25: 109.

14 genotypes received from the sorghum breeding project at Hyderabad, including susceptible checks of different maturity, were screened by inoculation with cultures of Fusarium + Curvularia, a water spray. Based on the field score, percent germination of seeds, percent seeds showing Fusarium and Curvularia and 100 grain weight, IS-3443, IS-2328, and IS-14332 were the promosing genotypes compared with CSH-1, CSH-5 and CS-3541. In addition to possessing high level of resistance to grain mold, it was found that they were resistant to rust, downy mildew and charcoal rot in kharif 1981. Especially IS-3443 was found to be resistant to foliar disease, downy mildew, and charcoal rot and its utilization as a source of multiple resistance is taken up.

0885 BHADRAIAH. B., and RAMARAO, P. 1982. Isolates of Aspergillus flavus from sorghum seeds and aflatoxin production.Current Science 51(23): 1116-1117. 12 ref.

0886 BHALE, M.S., and KHARE, M.N. 1982. Seed-borne fungi of sorghum in Madhya Pradesh and their significance.Indian Phytopathology 35: 676-678.

26 fungi associated with sorghum seeds in Madhya Pradesh, India included the important pathogens Curvularia lunata and Fusarium moniliforme. The role of seed-borne infection by these fungi in causing pre- and post-emergence death was best demonstrated by the test tube water agar seedling symptom test.

0887 BHALE, M.S., SINGH, S.N., and KHARE, M.N. 1982. Influence of culture filtrate of seed-borne Curvularia lunata and Trichoconiella padwickii on seed germination.Indian Phytopathology 35(3): 496-497.

0888 CANEZ. V.M. JR., and KING, S.B. 1982. A comparison of three methods for grain mold asessment in sorghum.Pages 743-744 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

Eleven grain sorghum believed to represent a range in susceptibility to grain mold were field grown in Mississippi with and without aerial misting during seed development. At physiological maturity and harvest maturity, threshed grain was assessed for grain mold by (1) visualy rating grain for external discoloration, (2) planting surface-sterilized grain to determine fungal infection, and (3) analyzing grain for ergosterol content to dtermine total fungal biomass. Fusarium moniliforme, F. semitecturn, Curvularia spp and Alternaria spp were the predominant fungi isolated. The greatest number of fungal colonies and highest ergosterol content were associated with misted seed at harvest maturity. Greater differences in fungal invasion among varieties were found with ergosterol analysis than with the plating technique. visual assessment of grain mold was more closely correlated with ergosterol levels than with total fungal colonies or percent infection.

0889 CASTOR, L.L. 1982. Sorghum grain fungi.Pages 223-225 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT. 2 ref.

0890 CASTOR, L.L., and FREDERIKSEN, R.A. 1982. Grain deterioration in sorghum.Pages 163-169 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 23 ref.

Fungi affect sorghum seed quality in many ways. Based on behavior, there are two types: field and storage fungi. Field fungi may be further divided into pathogens causing grain mold, and saprophytes responsible for postmaturity deterioration or weathering. These are all capable of causing substantial losses in food quality and quantity of grain and they represent one of the most significant production hazards when attempting to introduce higher-yielding sorghum in the tropics (Williams and Rao 1981). Some of these fungi produce toxic metabolites known as mycotoxins. Considerable progress has been made in the development of sorghums resistant to grain mold and weathering. There is also evidence suggesting that some sorghums are more resistant to storage fungi.

0891 DAYAN, M.P., and DALMACIO, S.C. 1982. Sorghum grain molds: identification, incidence and pathogenicity.Philippine Phytopathology 18(1-2): 68-77.

Twenty fungal genera were found associated with sorghum grains at harvest. These include: Alternaria, Arthobotrys, Aspergillus, Botryodiplodia, Cephalosporium, Cladosporium, Curvularia, Colletotrichum, Fusarium. Gleocercospora, Helminthosporium, Nigrospora, Phaetrichoconis, Penicillium, Pestalotia, Phoma, Phomopsis, Rhizopus, Rhizoctonia and Trichoconis. The fungal genera consistently observed in all tests in decreasing order were: Fusarium, Curvularia, Phoma, Penicillium and Helminthosporium. Fusarium moniliforme and Curvularia lunata were the most predominant species observed. F. moniliforme and Curvularia lunata showed higher infection during the wet season. The two fungi invaded both the embryo and endosperm, thereby, reducing seed viability. F. moniliforme appeared more aggressive than Curvularia lunata.

0892 EL-KADY, I.A., ABDEL-HAFEZ. S.I.I., and EL-MARAGHY, S.S. 1982. Contribution to the fungal flora of cereal grains in Egypt.Mycopathologia 77(2): 103-109. 16 ref.

30 genera and 77 species, in

addition to 4 varieties were isolated from 25 samples of each of barley, wheat, maize and sorghum grains collected from different places in Egypt. The broadest spectrum of genera and species was recorded in wheat (25 genera and 59 species + 4 varieties) followed by barley (21 genera and 52 species + 2 varieties), sorghum (14 genera and 33 species + 2 varieties) and maize grains (11 genera and 29 species + 2 varieties). Aspergillus, Fusarium, Penicillium and Rhizopus were the most common genera in the four grains, except maize where Penicillium emerged in low frequency. Aspergillus was the main component of the fungal flora of the four grains and contributed 79-94.4% of the gross total count of fungi. From the preceding genera A. niger, A. flavus, A. fumigatus. F. oxysporum, P. chrysogenum, P. corylophilum, P. notatum and R. stolonifer were the most frequent.

0893 ELEGBEDE. J.. ABIODUN. WEST. C.E.. and AUDA. A.A. 1982. Fungal and mycotoxin contamination of sorghum during storage in Northern Nigeria.Microbios Letters 19(74): 77-84.

The effect of rainfall on moisture content. and the relationships between moisture content. the mycoflora and mycotoxin contamination of stored sorghum, were investigated. The moisture content of stored sorghum changed with the rainfall distribution. Field and storage fungi were identified from surface-sterilized sorghum grains. Storage fungi appeared to replace the field flora as moisture content increased during storage. Although aflatoxins were not detected in the samples, ochratoxins. zearalenone and sterigmatocystin were detected in low concentrations. The infrequent occurrence and the low proportion of mycotoxin-contaminated samples in stored sorghum led to the assumption that fungal activity was likely to have been minimal during storage.

0894 FELICIANO. C. HEPPERLY. P.. and SOTCMAYORRIOS. A. 1982. Characterization of sorghum seedborne mycoflora and its effect on 30 sorghum lines under humid tropical conditions in Puerto Rico.Phytopathology 72(1): 169. (Abstract).

Fungi from 23 genera were isolated from seeds of 30 grain sorghum lines growing in humid environments in Puerto Rico. The most common in order of decreasing incidence were Curvularia. Fusarium, Phoma, Colletotrichum, and Nigrospora. Genera with 2 or more species seedborne were Curvularia (C. lunata and C. brachyspora). Fusarium (F. moniliforme. F. semitectum. and F. acuminatum), and Colletotrichum (C. graminicola and C. gloeosporioides). High incidence of Curvularia species and Fusarium species were associated with decreased seed appearence. weight and viability. Resistance to seed deterioration varied among cultivars. Two lines showed above 90% germination and 1 showed 30% germination at physiological maturity, the other lines varied within these extremes. After 1. 2, and 3 weeks delayed harvest numbers of seed with fungal signs increased and germination decreased.

0895 FOUDIN. A.S.. and CALVERT. O.H. 1982. Schizophyllum commune as a possible mycotoxin producer in association with sorghum grain.Mycologia 74(6): 1041-1043. 6 ref.

A sample of sorghum grain infected with S. commune was tested for known mycotoxins. Negative results were obtained for aflatoxins B1 and G1, citrinin, ochratoxin. rubratoxin, T-2 toxin, diacetoxyscirpenol. vomitaxin. zearalenone. zeralenol and coumestrol.

0896 FREDERIKSEN. R.A.. CASTOR. L.L.. and ROSENOW, D.T. 1982. Grain mold, small seed and head blight: the Fusarium connection. Annual Corn and Sorghum Industry Research Conference 37: 26-36. 11 ref.

0897 HEPPERLY, P.R.. FELICIANO, C, and SOTOMAYOR, A. 1982. Chemical control of seedborne fungi of sorghum and their association with seed quality and germination in Puerto Rico. Plant Disease 66(10): 902-904. 12 ref.

Fusarium, Curvularia and Alternaria species were the most commonly isolated fungi from Capitan sorghum seeds produced under humid tropical conditions in Mayaguez, PR. Seedborne incidences of F. moniliforme and C. lunata were negatively correlated (P=0.01) with seed germination (r = -0.97 and -0.63 respectively) and positively correlated (P=0.01) with visible seed damage (r=0.92 and 0.84 respectively). Seedborne incidence of Alternaria species was not associated with germination or seed damage (r=0.26 and -0.28, respectively). Weekly applications of benomyl plus captan (0.5 + 0.5 kg/ha) from boot stage to physiologic maturity completely controlled F. moniliforme and significantly <P=0.01) reduced C. lunata. Besides reducing fungal infections, fungicide applications increased seed yield, 100-seed weight, and germination.

0898 HEPPERLY, P.R., FELICIANO, C, and SOTCMAYOR-RIOS, A. 1982. Partial control of Fusarium moniliforme seed infections in sorghum with application of methiocarb insecticide. Phytopathology 72(1): 170. (Abstract).

Studies were conducted to determine why plants sprayed with methiocarb, a broadspectrum insecticide produced seed of increased germination compared to nonsprayed plants. Sorghum, head molds are usual causes of germination losses. However, methiocarb showed no fungicidal activity in vitro. Field plants sprayed weekly with methiocarb (1 kg/ha) produced seed with 46% fewer Fusarium moniliforme infections and 30% greater germination than controls. Plants sprayed weekly with benomylcaptan (0.5 + 0.5 kg/ha) or the same plus methiocarb completely controlled F. moniliforme and produced seed with 25% greater germination compared to methiocarb alone. Partial control of F. moniliforme and increased seed quality with methiocarb was associated with control of sorghum web worm and other insects. Insect activity may increase F. moniliforme dispersal and development in sorghum.

0899 KHETARPAL, R.K., and NATO, R. 1982. Fungi recorded on seeds of sorghum germplasm imported from Nigeria. Seed Research 10(2): 172-174.

0900 KUKADIA, M.U., DESAI, K.B., DESAI, M.S., PATEL, R.H., and RAJA, K.R.V. 1982. Natural screening of advanced sorghum varieties to sugary disease. Sorghum Newsletter 25: 117.

Uneven distribution of rainfall, accompanied by heavy precipitation at flowering during the last few years, resulted in an unprecedented incidence of sugary disease (Sphacelia sorghi) in the southern and middle parts of the Gujarat state. India. The entries were scored for sugary disease resistance based on the percentage of plants showing sclerotia development. Sorghum lines SPV 59B, 220, 224, 260, 35. 300, 138, 233, 289, 295, and 296 were not damaged. Entries SPV 290 (20%), 291 (10%), 293 (15%) and 297 (15%) were affected. Entries SPV 96, 99, and 221 had very high damage. The disease is not common, but once it appears in a field, its spread is very rapid. Hence, the varieties escaping the epidemic, or characterized by some degree of tolerance, may have value in breeding for disease resistance. Entries identified as resistant to sugary disease will be utilized in a crossing program to transfer the resistance and thereby select resistant segregants in further generations.

0901 MIGUEL. J.A., and DE ANDRES. V. 1982. Aflatoxins production by two strains of Aspergillus flavus on 16 sorghum varieties.(Es). Anales del Instituto Nacional de Investigaciones Agrarias. Serie Ganadera 17: 61-67. 21 ref (Summaries: En, Es).

Sixteen sorghum seed varieties have been inoculated with two Aspergillus flavus strains (IMI 91019 and NRRL 3251), aflatoxins producers. In laboratory conditions the aflatoxins yield depended on the toxigenic potential of the mold strain and on the sorghum variety. Five of these varieties were favourable substracts for toxine formation, while seven of them (G-516 BR. MK 121. MK 180. Hazera 226, Linda, Anita and Rita) result to be more resistant to this formation. On the other hand, aflatoxins production on all sorghum types was much less than on cereals wheat and rice.

0902 MUNGHATE. A.G.. and RAUT, J.G. 1982. Effect of culture filtrates of three important seed-borne fungi of sorghum on seed germination.P.K.V. Research Journal 6(1): 62-64.

Culture filtrates of Curvularia lunata and Fusarium moniliforme, both individually, were highly toxic to seed and reduced its germination by 46-47 and 41-44% respectively when tested against two cultivars of sorghum. Leachate of Drechslera halodes caused only 16-17% reduction. Among combination of these fungi, culture filtrate of Curvularia lunata, D. halodes and F. moniliforme exhibited highest loss in seed germination which was 33-36% followed by that of C. lunata and F. moniliforme.

0903 MUNGHATE, A.G., and RAUT. J.G. 1982. Efficacy of nine different fungicides against fungi frequently associated with sorghum seed.Pesticides 16(8): 16-18.

Out of nine different fungicides. Thiram was found most effective followed by Captan and Ceresan wet in the elimination of fungi frequently associated with sorghum seed. Dithane M-45 and Dithane Z-78 ranked next to these fungicides. Copper oxychloride, Benlate. sulphur dust and wettable sulphur gave poor results. Among the different methods of fungicidal application, dry seed dressing followed by slurry method was most effective for nonsystemics and steep treatment for systemic fungicide.

0904 NARAYANA, D., and PRASAD, M.N. 1982. Complications in identification of resistance sources to grain molds in sorghum,Sorghum Newsletter 25: 108-109.

Twenty-four sorghum lines obtained from ICRISAT, All India Coordinated Sorghum Improvement Project, Rajendranagar, Andhra Pradesh Agricultural University and Tamilnadu Agricultural University were grown during August-December 1979 at Tamilnadu Agricultural University, Coimbatore, India. These lines were evaluated for their reaction grain mold fungi following inoculation under field conditions. All entries were inoculated with equal proportions of Fusarium moniliforme and Curvularia lunata spore suspensions at anthesis and heads were covered with Kraft paper bags to avoid contamination by other fungi. The environmental conditions were highly favourable for grain mold with continuous rains maintaining a high humidity. All the entries except CSV-1 and CSV-3 were previously identified as moderately to less susceptible grain molds in various screening programs.

0905 NARAYANA, D., and PRASAD, M.N. 1982. Grain mold measurement parameters in sorghum.Sorghum Newsletter 25: 108.

In the present investigations, the grain mold fungus Fusarium moniliforme was artificially inoculated to the parents and Fls. Two parameters, actual severity and percent grain infected due to Fusarium, were utlized as a measure of host and pathogen reaction. The acutal severity was worked out as suggested by Rao and Williams (1978). Individual grains were rated on a 1-5 severity scale (1 = no molds; 5 = severe molds) and the average 400 grains in each panicle was calculated as actual severity. The percent grain infected was calculated using total grain percent in an individual panicle. The correlation between these two parameters was found to be positive and statistically significant. The high value of correlation coefficient (r = 0.9225) revealed that there was a direct association between actual severity and percent grain infected.

0906 NARAYANA, D., and PRASAD, M.N. 1982. Studies on the inoculation of grain mold fungi on sorghum.Sorghum Newsletter 25: 107-108.

An attempt was made to fix the stage at which the artificial inoculation would be effective for two grain mold pathogens: Fusarium moniliforme and Curvularia lunata. These studies were made at Tamilnadu Agricultural University, Coimbatore, India during 1979 late kharif when environmental conditions were highly conducive for infection. The two pathogens, moniliforme and lunata were used separately and in a mixture in equal proportion as inoculum on five plants of CSV-1 at the following stages: (1) Preflowering, i.e.. after full emergence of panicle; (2) first day of flowering; (3) second day of flowering; (4) third day of flowering; (5) fourth day of flowering; (6) fifth day of flowering; (7) sixth day of flowering; (8) grain set, i.e., at soft milk stage. The effectiveness of each pathogen treatment was determined based on the percentage of seeds infected in each treatment.

0907 NARAYANA, D., RAO, M.R., and RAO, B.S. 1982. Screening for grain mold resistance in sorghum.Sorghum Newsletter 25: 111.

A thorough survey was undertaken in few parts of Medak district to examine the incidence of disease in cultivators'fields. From among the early sown crops, CSH-1 had 100% damage while CSH-5 had moderate infestation in this district. An ICRISAT test variety, SPV 351 had very little damage (less than 10%) and the seed was clean. The late sown crops including CSH-1 escaped most of the damage. The experimental materials sown toward the end of June at Rajendranagar center was also heavily damaged by grain molds. Visual observations indicated that the incidence of Fusarium was low but that the incidence of Curvularia predominated in most of the entries. An Aspergillus was noticed in yellow grain types.

0908 OSCMAN, H.Y.A. 1982. Studies on fungi associated with sorghum grains during storage (Egypt).Ph.D. thesis, Faculty of Agriculture, Cairo University, Egypt. 197 pp. (Summaries:Ar, En).

0909 PIGLIONICA, V. 1982. Finalized projects of CNR and plant pathological aspects of seeds.(It). Fitopatologico 32(2): 39-40. 22 ref. (Summary:En).

The main results obtained from 1976 to 1979 by several Italian Institutions within the Special 1/41/4ad hoc1/21/2 Program 1/41/4Fitofarmaci e

Fitoregolatori1/21/2 of the National Research Council on the specific subject dealing with the phytopathological aspects of some cereal seeds (i.e.. Wheat. Maize. Sorghum, and Barley), are briefly reported.

0910 RAO. G.K.. and RAO. K.N. 1982. Screening of sorghum varieties against grain molds.Sorghum Newsletter 25: 112.

Sorghum grain mold trial was conducted at Rajendranagar, Andhra Pradesh. India during 1980 with 28 entries supplied by ICRISAT. The trial was sown in two row plots of 3 meters in two replications. The mold rating was recorded following the 1 to 5 rating. Among the 28 entries tested, the variety IS 14332 is completely free from grain molds. The entries IS 2328. E35-1. M 38776-1. M-60900, M-90324, M 61743. M 62467. M-62522 and M-64083 were resistant to grain mold. In these entries, the mold infection reached 10%. Control entries SPV 104 and CSH-1 had the highest infection to grain mold. All the remaining test entries were moderately resistant to grain molds.

0911 RATHORE. B.S., MATHUR. K.. and NAIK. S.M.P. 1982. Occurrence and development of phoma (black dots) on sorghum grain in Rajasthan.Sorghum Newsletter 25: 118.

The disease manifested itself in the form of small. pinhead dark eruptions on mature grains and flumes without any geometric pattern. Sometimes the whole head showed infected grains, but in most of the cases, only one side of the head facing the sunlight was found to show black dots on grain. Isolations were made from infected seeds by the blotter method, and causal organism was identified as Phoma sorghina (sacc.) Boerema. Dorenbosch and Vankestern. The same fungus was also isolated from small, ovoid, scattered lesions of 1.5-2 x 1.0-1.5 cm on leaves. These lesions had distinct yellow margins. Older lesions exhibited numerous small black pycnidia on either surface of the leaf.

0912 RAUT. J.G., and WANGIKAR, P.D. 1982. Efficacy of elemental sulphur fungicides in the control of seed-borne fungi of sorghum other than smuts.Pesticides 16(5): 23-24. 7 ref.

300 mesh sulphur and wettable sulphur formulations, used as a dry seed dressers or in the form of slurry, were found most ineffective as compared to Thiram, in reducing the fungi commonly associated with sorghum seeds other than smuts. The ineffectiveness of these fungicides was more evident against Curvularia lunata and Fusarium moniliforme, a major seed rotting pathogens of sorghum.

0913 SOLANKE, R.B.. and KULKARNI. L.P. 1982. Effects of different seed microflora on germination of sorghum hybrid CSH-1 in Marathwada.Sorghum Newsletter 25: 113-114.

0914 ZUMMO, N. 1982. A rapid technique for evaluating sorghum varieties for seed mold resistance.Page 754 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981. Patancheru, A.P.. India. Patancheru, A.P., India: ICRISAT. (Abstract).

Because the nature of resistance of sorghum lines to grain molds is variable and not clearly defined, a method of selecting lines that could produce good quality grain under humidity without losing quality would be desirable. Threshed grains of test lines are compared with a known set of molded grains using a large 10 x illuminated lens and rated on a scale of 1-10 with 1 being completely free of molds of 10 being completely covered. A set of white and red differentials is needed when comparing red and white seeded sorghum lines. In West Africa, those lines planted earlier and exposed to the rains had a higher seed mold rating than the same lines planted 2-3 weeks later. However, those lines that were superior in grain mold resistance remained relatively superior whether planted early or late.

Virus Diseases

0915 BORODINA, E.E., SUKHAREVA. S.I.. SHTEIN-MARGOLINA, V.A., EVGRAFOVA, L.P., and KRYLOV, A.V. 1982. Biological properties of the pathogen of spotting, a new virus-like disease of cereals.(Ru). Mikrobiologicheskii Zhurnal 44(3): 38-41. 15 ref. (Summary:En).

0916 DEAN, J.L. 1982. Failure of sugarcane mosaic virus to survive in cultured sugarcane tissue.Plant Disease 66: 1060-1061.

Explants taken from immature spindle tissues above the apical meristerm of sugarcane plants systemically infested with sugarcane mosaic virus were callused on Murashige-Skoog culture medium. Of 57 plants regenerated from this callus, 55 were virus-free as indicated by lack of symptoms after 6 mo of growth in soil in the greenhouse and by bioassay on sorghum test plants. Bioassays of spindle tissues similar to those of the explants showed a steep infectivity gradient ranging from very low just above the growing point to very high about 4.5 cm above the growing point. The spindle tissues exhibited a reverse gradient with respect to callus formation, so that most of the callus came from tissues with the greatest infectivity. It was concluded that sugarcane mosaic virus was present in many, if not all, of the explants from which virus-free plants were regenerated.

0917 HAINZELIN, E. 1982. Sugarcane mosaic virus (SCMV).(Fr). Agronomie Tropicale 37(4): 393-404. 143 ref.

Sugarcane mosaic virus is fould on many plants, especially sugar cane, maize and sorghum. Described for the first time in 1919, it is present in almost all the regions of the world where susceptible varieties of sugar cane are grown.

0918 HALL, D.H., and PAULUS, A.O. 1982. Maize dwarf mosaic of corn and sorghum.Leaflet - University of California, Cooperative Extension Service No. 2859. 2 pp.

0919 JARJEES, M.M. 1982. Bio and Sero detection and identification of maize dwarf mosaic (MDMV) and sugarcane mosaic virus strains. Effect of MDMV on symptomology and grain yields of sorghum.Ph.D. thesis, Kansas State University, USA. 67 pp.

Two near isogenic sorghum inbreds. Combine Kafir 60 (CK60) and Kansas line 56 (KS56), were inoculated with maize dwarf mosaic virus strain A at three plant growth stages. These inbreds differed in their reponse to viral infections, i.e., CK60 with symptoms of mosaic then red leaf and KS56 with mosaic only. Test results showed statistically significant yield losses (p. 0.05) occurred with all virus treatments compared to their respective controls. At the earliest growth stage, inoculated CK60 and KS56 showed highest yield reductions of 61 and 26%, respectively.

0920 MARTIN, T.J., and HACKEROTT, H.L. 1982. Greenhouse seedling technique to determine the reaction of sorghum to maize dwarf mosaic virus strain A.Crop Science

22(6): 1255-1256. 13 ref.

A greenhouse seedling test to determine the reaction of sorghum to maize dwarf virus strain A was compared with results of field tests of mechanically inoculated and naturally infected plants. Greenhouse tests were as accurate as field tests in identifying resistant and susceptible lines. Greenhouse seedling tests were more effective in identifying the type of susceptible reactions-temperature dependent red-leaf necrosis or temperature independent red-stripe.

0921 PERSLEY, D.M.. and GREBER, R.S. 1982. The reaction of sorghum genotypes to natural infection by sugarcane mosaic virus: Johnson grass strain in Australia.Sorghum Newsletter 25: 105.

The reactions of the 14 lines are given. QLII did not develop symptoms and virus was not detected following inoculation of samples to SCMV susceptible test plants. Q7539 was highly resistant and QL19 and SC 0097-14E moderately resistant to natural field infection. The lower incidence of the necrotic red stripe symptom in 0KY8 and SA8735 is in accord with the data of Teakle and Moore (1972) who found that red stripe reacting genotypes have significantly lower levels of natural infection than lines developing mosaic symptoms. The symptoms on the 12 lines being used as differentials for SCMV strains were characteristic of Australian SCMV-Jg isolates and enable this strain to be distinguished from Johnson grass infecting strains occurring in several other countries.

0922 PHILLIPS, N.J., UYEMOTO. J.K., and WILSON. D.L. 1982. Maize chlorotic mottle virus and crop rotation: effect of sorghum on virus incidence.Plant Disease 66(5): 376-379. 22 ref.

Subplots planted to a corn-corn sequence (1979 and 1980) contained 1.6% infection of maize chlorotic mottle virus in the surveys of 28 June-2 July 1980. The virus was not detected in the sorghum-corn sequence subplots in this period. Second and third surveys on 8 and 21 July revealed maize chlorotic mottle virus incidence of 4.7% in corn-corn and 0.2% in sorghum-corn subplots. On 18 August, virus incidence was 12.2% in corn-corn and 0.6% in sorghum-corn plots. Corn yields on sorghum-corn subplots were significantly higher (P=0.05), but the increased yields could not be ascribed wholly to reduced incidence of the virus. In 1979, soil fumigation trials did not reduce maize chlorotic mottle virus infections, and yields of two corn hybrids were similar.

0923 SHUKLA, K., and JOSHI, R.D. 1982. Inhibition by some homeopathic drugs of sugarcane mosaic virus in sorghum.Sugarcane Pathologists' Newsletter 29: 48-50. 3 ref.

The drugs were mixed with sugarcane mosaic virus inoculum before being used to infect young sorghum plants of the cultivar Basant. The different treatments resulted in 0-80% inhibition but none gave 100%.

0924 STOKES, I.E., MOCK, R.G., GILLASPIE, A.G. JR.. and KOCH, E.J. 1982. The sugarcane mosaic virus as a mutagenic agent in sweet sorghum (Sorghum bicolor (L.) Moench.).Sugarcane Pathologists' Newsletter 28: 35-41. 18 ref.

0925 TOLER, R.W., and BERGER, P.H. 1982. Antiserum available for identification of sorghum viruses.Sorghum Newsletter 25: 123-124.

0926 TOLER, R.W., ROSENOW, D.T., RICCELLI, M., and MENA, H.A. 1982. Variability of Venezuelan isolate of maize dwarf mosaic virus in sorghum. Plant Disease 66(9): 849-850. 14 ref.

A virus isolated from sorghum in Venezuela in August 1980 was identified as maize dwarf mosaic virus. The virus caused a severe reaction in seven sorghum cultivars resistant to maize dwarf mosaic virus, particularly Tx2536 and REK430, but did not infect the immune QL3 and QL11. The virus infected Johnson grass and was serologically related to maize dwarf mosaic virus but not to sugarcane mosaic virus A or H. It is proposed that the Venezuelan virus is a variant of maize dwarf mosaic virus strain A.

Nematode Diseases

0927 BIRCHFIELD, W.. and ANZALONE, L. 1982. Grain sorghum root-knot and reniform nematode host reactions. Phytopathology 72(3): 355. (Abstract).

Grain sorghum, variety Drummondii acreage is increasing in rotation with soybeans, cotton and corn in the southeastern and gulf states of the USA. It is grown in areas where root-knot and reniform nematodes are often a problem. Sorghum varieties Funk G421, Funk G499, Funk G516, Funk G522A, Funk G522BR, Funk G611, Funk G623, and Dekalb 55 were greenhouse rested for root-knot and reniform host reactions. All varieties tested were highly susceptible to root-knot nematode, Meloidogyne incognita Wartellei. Numerous galls and egg masses occurred on the roots 49 days after exposure to 2nd stage larvae. Root galls were small on distorted, reddish discolored roots. All varieties were highly resistant or immune to reniform nematode, Rotylenchulus reniformis. Few females and egg masses on the roots were observed. These varieties may be potential host reservoirs for M. incognita Wartellei, but could be used to reduce reniform nematode for subsequent crops.

0928 HAFEZ, S.L., and CLAFLIN, L.E. 1982. Control of plant parasitic nematodes on grain sorghum and yield response, 1981. Fungicide and nematicide tests; results American Phytopathological Society 37: 198.

0929 JAIN, K.K.. SETHI, C.L.. SWARUP, G., and SRIVASTAVA, A.N. 1982. Heterodera sorghi sp.n, a new cyst-forming nematode parasitizing sorghum. Revue de Nematologie 5(2): 201-204. 3 ref.

A new cyst-forming nematode species on sorghum Heterodera sorghi n.sp. is identified and described from India. The new species differs from Heterodera gambiensis, another cyst forming nematode species from sorghum, in the presence of an egg sac, shorter spicules, shorter vulval slit length and greater depth of underbridge.

0930 PATIL. K.J., and KHAN, E. 1982. Taxonomic studies on nematodes of Vidarbha region of Maharashtra India. VII. Four new species of tylenchid nematodes. Indian Journal of Neonatology 12(2): 330-338. 4 ref.

Four new tylenchid nematodes collected from Vidarbha region of Maharashtra are being described and illustrated. Helicotylenchus gratus sp.n. is distinctive by having L=075-0.90 mm, lip smooth conoid truncate, m=46.52. spear=25.27 micro m and short hemisperical tail with 14-18 annules; H. ventroprojectus sp.n. by having smooth conoid truncate lip region, spear knobs anteriorly indented, tail with 12 annules, notched vent rally with a projection; Macroposthonia crassiorbus sp.n. by having L=0.40-0.50 mm, body annules with serrated margins, first annule not broken into platelets and first two annules anteriorly and outwardly directed; Basiria elegans sp.n. is characterized by L=0.50-0.70 mm, orifice or dorsal oesophageal gland about 3-5 micro m from spearbase, post-uterine sac about one vulval-body-width long. spicula measuring 13 micro m long and phasmids 3 anal body widths posterior to anal latitude.

0931 VILSONI. F.. and HEINLEIN, M. 1982. Host range and reproductive capacity of the reniform nematode Rotylenchulus reniformis on some crop cultivars in Fiji.Fiji Agricultural Journal 44(2): 61-66.

A total of 69 crop cultivars in 20 plant families were tested in the greenhouse to determine their host status to the reniform nematode (Rotylenchulus reniformis Linford and Oliveira, 1940). Of the crops tested, 15 were found to be non-hosts; these included broomcorn, chilli, maize, peanut, pineapple, rice, sorghum, sugarcane, sweet pepper, and Xanthosoma. The number of eggs produced per eggmass varied greatly among the susceptible crops examined.

0932 VOVLAS, N., and INSERRA, R.N. 1982. Biological relationship of Rotylenchulus borealis on several plant cultivars.Journal of Nematology 14(3): 373-377.

The embryogenic development of Rotylenchulus borealis, at 24-26 deg C, was completed on corn, in 12-15 days, and the life-cycle of the nematode from egg to egg required 35-40 days at 20-25 deg C. Juveniles remained in the soil as preinfective stages for 17-19 days before becoming adults. Only immature vermiform and swollen egg-laying females were found attached to corn roots. Eggs were laid in a gelatinous matrix on the root surface; the number of eggs per eggmass was 45+ or - 28 on corn roots. Bean, green pea, potato, sorghum and sweet potato were also found to be hosts of R. borealis. The nematode established a permanent feeding site on corn root in an endodermal cell that became hypertrophied. Pericyclic cells close to the feeding site showed granular cytoplasm and nuclei with hypertrophied nucleoli. A cell wall ingrowth was also noted around the area of stylet penetration into the endodermal cell.

Parasitic Plants - Striga

0933 ANONYMOUS. 1982. ODA fund project to study resistance to striga.World Crops 34(5): 161.

0934 BABIKER. A.G.T.. and HAMDOUN, A.M. 1982. Factors affecting the activity of GR7 in stimulating germination of Striga hermonthica (Del.) Benth.Weed Research 22(2): 111-115. 6 ref. (Summaries:De, Fr).

Experiments with the alkaline heavy clays of the Sudan Gezira showed that when the strigol analogue GR7 was applied to moist soil prior to subjecting Striga hermonthica seeds to moist conditions for 7-14 days, there was no significant increase in germination. Conditioning of seeds in soils treated with GR7 had an adverse effect on the responsiveness of seeds when GR7 was added again after conditioning. Under ideal conditions, when GR7 was applied to conditioned seeds in moist soil, up to 75% germination could be induced by 2.0 kg/ha incorporated to 2-3 cm depth. Residual activity of GR7 persisted in air-dry soil, but at 50% moisture there was complete loss within 1 day. However, when conditioned seeds were put into the soil immediately after GR7 application its activity increased with increasing soil moisture.

0935 BAPAT, D.R. 1982. Future research goals for combating Striga on sorghum. Pages 212-218 in Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September - 1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 27 ref.

0936 BHARATHALAKSHMI., and JAYACHANDRA. 1982. Mechanism of induced Striga resistance in sorghum. Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 22 ref.

The presowing hardening of sorghum with ferulic, caffeic and vanillic acids reduced the induction of seed germination in Striga by the host root exudate, lowered the number of the parasite seedlings penetrating the host root and also reduced the incidence of the parasite.

0937 BHARATHALAKSHMI., and JAYACHANDRA. 1982. Physiological basis of 'host-preference' in Striga asiatica (L.) Kuntze. Pages 160-186 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru. A.P., India. Patancheru, A.P., India: ICRISAT. 23 ref.

A survey of the cultivated fields at Kikkeri (Mandya district, Kamataka, India) on the incidence of Striga asiatica (L.) Kuntze, a root parasite on different crops, indicated intraspecific 'host-preference' (host specificity). Laboratory and pot trials on germination, penetration and emergence of the SK and PK samples of the area, with sorghum and Paspalum confirmed "this behaviour. The host-specificity of the PK sample was expressed strongly at the germination stage and that of the SK sample more at the penetration stage.

0938 HOSMANI, M.M. 1982. Agronomic and cultural methods used for control of Striga. Pages 40-48 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 23 ref.

Cultural operations and agronomic practices viz., crop rotation, fertilizer management, effect of moisture, tillage and other practices on viability of striga seeds and minimising Striga incidence are discussed.

0939 HOSMANI, M.M. 1982. Control of Striga by chemicals. Pages 50-52 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 18 ref.

A number of chemicals have been used for control of this parasitic weed as pre-plant soil incorporation, pre-emergence spray and post-emergence spray. Recently stimulants and systemic herbicides have been successfully used. A brief review about the use of chemicals is described.

0940 HOUSE, L.R., and RAO, M.J.V. 1982, Striga problems and prospects. Pages 10-18 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 13 ref.

In this paper, an attempt is made to analyse the Striga problem and highlight the shortcomings of the present research capabilities to effectively counter this menance.

0941 ICRISAT. 1982. Proceedings, ICRISAT-AICSIP Working Group Meeting on Striga control.30

September-1 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 249 pp.

0942 KHADE, S.T. 1982. Control of Striga - results from Punjabrao Krishi Vidyapeeth, Akola, Maharashtra, India.Pages 88-93 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

Since 1976-77 to 1981-82 research on control of Striga was conducted at Akola, India with the financial aid of PL-480 on (a) Evaluation of Striga resistant/tolerant sorghum strains, (b) Use of herbicides and (C) Management practices.

0943 KORWAR, G.R. 1982. Studies on herbicidal control of Striga.Pages 74-77 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

0944 HAITI, R.K., and HOUSE, L.R. 1982. Mechanisms of Striga resistance in sorghum.Pages 142-150 In Proceedings. ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 24 ref.

0945 MANI, V.S. 1982. Control of Striga in sorghum.Pages 232-237 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

0946 NANDANWANKAR, K.G., SHINDE, V.K., and AMBEKAR. S.S. 1982. Evaluation of some selections for striga tolerance.Sorghum Newsletter 25: 114-115.

With objectives of evolving striga tolerant (Striga asiatica) and high yielding varieties, a trial consisting of 5 high-yielding All India Project entries, 3 germplasm selections, 9 derivatives of CSV-5 x IS-84 and 3 promising cultures along with the tolerant check CSV-5 was established in a striga-sick plot at the Sorghum Research Station, Parbhani, during kharif 1981. Plot design was 4 rows of 5.0 meter length with three replications. Five plants were randomly selected for recording the morphological observations. Striga counts of the two middle rows were taken 90 days after sowing. Significant differences were observed among the genotypes for striga count. All genotypes showed differential responses with the striga population. Minimum striga incidence was found in the germplasm selection IS-8915 (25) followed by PBM 12-1 (34) and CSV-5 (42). CSV-5 is well known as a tolerant variety. In addition, IS-8915 and PBM-12-1 have shown tolerance with good agronomic base.

0947 NARAYANA, D. 1982. Gravity of Striga problem on sorghum in Andhra Pradesh.Pages 230-231 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

0948 NATH, V.R. 1982. Prospects of biological control of Striga by mycoparasites.Pages 54-61 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control. 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 14 ref.

A couple of fungi which are pathogenic to Striga i.e., Sclerotium rolfsii, Rhizoctonia solani, Macrophomina phaseoli are also pathogenic to sorghum and have no real chance of being considered for Striga control. Further they are abundantly available in India and are omnivorous. Some fungi while being harmless at present to sorghum are lethal to Striga but only under conditions of high EH of 90% or more for a considrable length of time in sorghum field which is rather too much to expect in sorghum fields. The work carried out so far does not indicate that we are ready for biological control using mycoparasites.

0949 OGUNLELA, V.B. 1982. Striga, fertilizer application and hybrid sorghum performance in the Nigerian Savanna.Zeit schrift fur Acker und Pflanzenbau 152(3): 208-218. 20 ref.

A field experiment was conducted at Samaru, Nigeria to study the effect of fertilizer application and cultivar on Striga hermonthica and the performance of three sorghum hybrids (SSH2, SSH4, SSH5) and their common male parent (var. SK-5912). It was also to evaluate the striga reactions of these cultivars under low and high soil fertility. Levels of striga infestation and host cultivar tolerance strongly determined the relative performance of the different cultivars. Hybrids SSH2 and SSH5, which had similar grain yields, outyielded SK-5912 and SSH4 by 20% and 55% respectively. The high susceptibility of SH4 to striga. to a large extent, contributed to its considerably poor yield performance in the Nigerian savanna. Both sorghum grain yield and stover yield were significantly negatively correlated with striga infestation.

0950 PARVATIKAR, S.R. 1982. Physiology of sorghum - Striga interactions.Pages 152-158 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

0951 PATTERSON, D.T., MUSSER. R.L., FLINT, E.P., and EPLEE, R.E. 1982. Temperature response and potential for spread of witchweed (Striga lutea) in the United States.Weed Science 30(1): 87-93. 30 ref.

In the witchweed parasitized corn and/or sorghum 'DeKalb E-59+' root systems in a sandy loam under 26/17, 26/20, 29/20, 32/23, and 32/26 deg C day/night regimes. Witchweed emerged from the soil with 26/20, 29/20, 32/23, and 32/26 deg C and flowered with 26/20, 32/23, and 32/26 deg C day/night regimes. Underground development and subsequent emergence of the parasites were substantially reduced with day/night temperatures below 29/20 deg C. Winter soil temperatures and growing season soil and air temperatures are unlikely to limit the spread of witchweed into important corn- and sorghum-producing areas of the United States.

0952 PESCH, C, and PIETERSE, A.H. 1982. Inhibition of germination in Striga hermonthica by means of urea.Experientia 38(5): 559-560.

In vitro seed germination percentages and radicle lengths of Striga hermonthica markedly decreased in the presence of urea at concentrations which could be expected in the field after standard application rates. Relatively high concentrations of ammonium sulphate brought about a similar effect while sodium nitrate was ineffective.

0953 RAMALAH. K.V., and PARKER, C. 1982. Striga and other weeds in sorghum.Pages 291-302 In Sorghum in the eighties: proceedings of the Internal Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 15 ref.

This paper considers the problem of the parasitic Striga species (witchweeds) with particular reference to sorghum. Relatively little work has been carried out on this parasite and several gaps exist in this problem. An attempt is made to critically examine the available information and to focus on the possible future course of Striga research. It also considers more briefly the status of control measures for other nonparasitic weeds.

0954 RANA, B.S., RAO. C.H., RAO, M.J.V.. and REDDY, B.B. 1982. Strategies for breeding sorghum varieties resistant to Striga.Pages 220-22A In Proceedings. ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control. 30 September-1 October 1982, Patancheru. A.P.. India. Patancheru, A.P.. India: ICRISAT. 3 ref.

0955 RANGANADHACHARYULU. N. 1982. Striga studies at the Regional Agricultural Research Station, Nandyal.Pages 94-101 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control. 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

Agronomical methods like trap cropping, catch cropping, rotation cropping, cultural methods, deep ploughing and effect of top dressing of nitrogen were all found to be ineffective. Cotton as a rotation crop reduced Striga incidence in the succeeding sorghum crop. Chemicals like Fernoxone, Agroxone, Lime, Fenac, Maleic hydrazide, MC 1488, Atrazine, Synthetic analogues GR 7 and GR 28 were tried. Some of them reduced the Striga incidence, but failed to increase the yields of jowar. Hand weeding was found to be equally effective as chemical methods, besides being less costly and safe.

0956 RAO, C.H., and RANA, B.S. 1982. Selection for Striga tolerance in sorghum.Pages 118-126 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

Striga asiatica is a root parasite of sorghum and reduces the grain and fodder yields drastically under endemic situation. Though its incidence is reported long back, its appearance has recently become more prominent after the introduction of new hybrids and varieties. Therefore, a program was initiated in 1978 to select tolerant lines from recently developed AICSIP high yielding varieties.

0957 RAO, M.J.V, CHIDLEY, V.L., and HOUSE. L.R. 1982. Genetic control of Striga asiatica in sorghum.Pages 22-39 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 14 ref.

Among the several options like genetic, agronmic and biological methods being researched for Striga control in sorghum, breeding resistant varieties appears to be economically important as part of a Striga management strategy. Progress on breeding work, in the past as well as the work at ICRISAT indicate the availability of strong source lines and some converted source lines for use as breeding stocks. Low stimulant production screening has been a useful indicator of field resistance. Preliminary observations and studies have indicated that Striga is a very versatile species capable of adapting to other hosts. Hence, a careful monitoring of other plant hosts is required and breeding of varieties with stable resistance is stressed.

0958 RAO, M.J.V., RAGHAVENDER, B., CHIDLEY, V.L., and HOUSE, L.R. 1982. Methodology for Striga research.Pages 102-116 In Proceedings. ICRISAT-AICSIP (ICAR)

Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P.. India: ICRISAT. 6 ref.

Describes the research methodology used currently for Striga resistance breeding and discuss some newly proposed systems.

0959 RAO, P.N.. and REDDY, B.V.N. 1982. Striga management in sorghum.Page 44 In Abstracts of papers, annual conference of Indian Society of Weed Science.

Application of 2,4-D Na at 2 kg/ha 4 weeks after sorghum (pre-emergence to Striga) showed good promise in reducing Striga angustifolia emergence and increasing grain yield. Post-emergence application of 2,4-D helped in killing the emerged Striga plants but contributed less to yield increases. The other treatments (post-emergence to Striga) such as urea, ammonium sulphate and NaC1 spray helped in reducing Striga population to some extent but regrowth of Striga plants was observed. Pre-sowing application of Ethephon, application of atrazine 4 weeks after sowing and hand-pulling of Striga did not show any promise either in reducing Striga population or increasing yield.

0960 SANGHI. N.K., and MURTHY. T.V. 1982. Striga - an experience in the farmer's fields.Pages 68-72 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

0961 SHETTY. S.V.R., and SHARMA, M.M. 1982. Striga experience from farming systems research at ICRISAT.Pages 78-86 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

A brief account of ICRISAT's experience with Striga in two of 'on-farm' research sites is presented. The objectives of ICRISAT's 'on-farm' research initiated during 1980 were: (1) To test the performance of new technologies on farmers' fields (2) To evaluate the economic implications of these technologies, and (3) To involve farmers in the technology development.

0962 SHINDE, V.K., and KULKARNI, N. 1982. Genetics of Striga resistance in sorghum.Pages 128-133 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 20 ref.

0963 SHINDE. V.K., and KULKARNI, N. 1982. Genetics of resistance to Striga asiatica in sorghum.Pages 134-140 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

Preliminary work on Striga has identified tolerant/resistant sources. Seven parental lines comprising four known resistant sources, viz., N 13, CSV 8R, S 1841, CSV 5 and three susceptible lines, viz.. CK 60B, 2077B and 2219B were crossed in all possible combinations and 42 crosses including reciprocals were produced and evaluated to know the genetics of Striga resistance.

0964 SHINDE, V.K.. NANDANWANKAR. K.G., and AMBEKAR, S.S. 1982. Studies on Striga tolerance in sorghum.Sorghum Newsletter 25: 117.

Heterosis studies with a tolerant line (CSV-5), a moderately tolerant line CSV-8R and susceptible lines

CK-60B and 1202B was undertaken in the striga sick plot at the Sorghum Research Station, Parbhani during kharif 1981. A trial consisting of 6 hybrids and 4 parents was sown in a single row plot of 3.0 meter length in three replications in a randomized block design. Observations were recorded on plant height, days to 50% flowering, head length, striga population and grain yield. Heterosis study for grain yield over mid parent was calculated.

0965 SUBBARAYUDU, V.C., REDDY, B.M.M., and JAGDISH, C.A. 1982. Note on a successful method of striga infection in sorghum crosses involving resistant/tolerant and susceptible parents.Sorghum Newsletter 25: 47-49.

Six cultures of sorghum (viz. IS-555, IS-7093. Dobbs, N-13, AS-4003. IS-5762) resistant/tolerant to striga were utilized as female parents and were crossed with another set of six cultures (viz., NJ-1031, M-35-1, 2077B, IS-84, CK-60B and Swarna) susceptible to striga used as pollen parents in a line x tester method during rabi 1980, at the Department of Genetics and Plant Breeding, College of Agriculture, Rajendranagar, Hyderabad, India. Two sets of pots (12" x ll" size) having 48 numbers in each set were filled with "Chalka" (sandy loam) soil without any manure. Each pot was inoculated with an equal quantity of one-year-old Striga asiatica L. seeds. The pots were watered and left for one week for incubation of striga seeds. Ten seeds of sorghum were sown in each pot. After germination, they were thinned to five plants per pot. The emergence of striga shoots were noticed when the sorghum crop was at the heading stage (45 - 55 days after sowing). The infection and emergence of striga shoots was found to be irregular.

0966 TARHALKAR, P.P. 1982. Some considerations for Striga management in sorghunu.Pages 226-229 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

0967 TEFEREDEGN, T., and FESSEHAIE, R. 1982. Striga in Ethiopia.Pages 65-70 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa, 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0968 THAKRE, S.K. 1982. Chemical composition of some striga tolerant sorghum strains as compared to CSH-1 check.P.K.V. Research Journal 6(1); 65-68.

0969 THOBBI, V.V., and SINGH, B.U. 1982. Biological control methods of Striga spp.Pages 62-64 In Proceedings, ICRISAT-AICSIP (ICAR) Working Group Meeting on Striga Control, 30 September-1 October 1982, Patancheru, A.P., India. Patancheru, A.P.. India: ICRISAT.

ENTOMOLOGY

0970 APPERT, J., and DEUSE, J. 1982. Pests of food crops in tropical areas.(Fr). Paris, France: Agence de Cooperation Culturelle et Technique. 420 pp.

0971 BERTELS MENSCHOY, and ANDREJ. 1982. Insect pests of sorghum and their control.(Pt). Circular Tecnica, Unidade Execucao de Pesquisa de Ambito Estadual de Pelotas, EMBRAPA. Pelotas, Rio Grande do Sol, Brazil: EMBRAPA. 43 pp.

0972 BERTELS, M.A. 1982. Entomological research works with sorghum crop in the agricultural year

81/82.(Pt). Pages 50-58 In Annals of the eleventh Techincal yearly Meeting of sorghum, Pelotas, RS. Brazil. Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

0973 BONZI, S.M. 1982. Note on sorghum insect pests in Upper Volta.Page 747 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981. Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

Sorghum is the main food in Burkina Faso. The most common insect pests are sorghum midge, stem borer (Busseola fusca) and shoot fly. The drought that occurred in the seventies in the Sahel Region of West Africa favored some less polyphagous pests, Poophilus costails and aphids being among them.

0974 BRADER, L. 1982. Recent trends of insect control in the tropics.Entomologia Experimentalis et Applicata 31: 111-120.

Efforts to increase agricultural production in the tropics must be oriented in the first place towards the small farmers' food crops. However, by tradition virtually all research efforts have been oriented to the so-called cash crops, and consequently current knowledge on pest control in food crops in the tropics is very limited. Moreover entomologists are trained on the basis of intensive agricultural production systems. From a selected number of examples it is evident that insects can cause significant losses in major food crops such as rice, maize, cassava, sorghum, millet, pulses and vegetables. However the history of insect control in cotton growing, for example, shows that in tropical ecosystems insect populations can be maintained at comparatively low levels when properly managed. Insect control in the tropics will lead to the further development and application of integrated pest control, and this will be the surest way to achieve real improvement in the plant health situation.

0975 BROOKS, L., and GATES, D.E. 1982. Sorghum insect control.Pages 19-23 In Kansas field crop insect control recommendations. Manhattan, Kansas, USA: Kansas State University, Cooperative Extension Service.

0976 DAVIES. J.C. 1982. Pest losses and control of damage on sorghum in developing countries: the realities and the myths.Pages 215-223 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 36 ref.

0977 FAO. 1982. Report of the eleventh session of the FAO/UNEP Panel of experts on integrated pest control, held in Kuala Lumpur. Malaysia 5-10 March, 1982.Rome, Italy: FAO. 34 pp. (Meeting report AGP/M/1982/1).

A cooperative global programme for the development and application of integrated pest control in cotton, rice and sorghum and millet are summarised. The recommendations included in the report are also given.

0978 FLATTERY, K.E. 1982. An assessment of pest damage on grain sorghum in Botswana.Experimental Agriculture 18(3): 319-328. 9 ref.

In trials conducted over five years, data on pest (insect, disease, bird) attack and yield of sorghum cultivar 65D were accumulated. A modified analytical method of damage assessment is described, which includes consideration of all pest occurrences and different levels and timing of pest a tack. There was a positive correlation between crop yield and rainfall. The selective infestation of stronger plants, or the ability of those plants to support pest populations, is shown; thus, in most cases, yield reductions are masked. The importance of the tillering habit of 65D on yield, and its ability to compensate for pest damage by further tillering, are shown. A cultivar which does not normally tiller was tested in the final year. Effects on the yield of all the pests encountered in the five years are discussed.

0979 ICRISAT. 1982. Cropping entomology: report of work 1981-82.Patancheru, A.P., India: ICRISAT. 19 pp. (Progress report - 9).

0980 JARRATT. J.H. 1982. Grain sorghum leaf and stem feeding insects.Information sheet - Mississippi State University, Cooperative Extension Service, Mississippi, USA. 2 pp. (No. 1160).

0981 JOHNSON, D.W. 1982. Insecticide recommendations for small grains and grain sorghum - 1983.Ent - University of Kentucky, Cooperative Extension Service, Kentucky, USA. 3 pp. (No. 24).

0982 JOHNSON, J.W. 1982. Evaluating sorghum for insect resistance.Annual Corn and Sorghum Industry Research Conference 36: 1-8.

0983 JOTWANI. M.G., and AGARWAL, R.A. 1982. Insect resistance in crops with special reference to sorghum, sugarcane and cotton.Pages 1-17 In Agricultural entomology, Vol. 1. New Delhi, India: All India Scientific Writers' Society. 61 ref.

0984 KATO. B., KAREL, A.K.. and NDUNGURU, B.J. 1982. Effect of insecticide spray on insect pests and yield of sorghum and simsim in pure stand in intercropping.Pages 117-118 In Intercropping: proceedings of the Second Symposium on Intercropping in Semi-Arid Areas, 4-7 August 1980, Morogoro, Tanzania. (eds. C.L. Keswani, and B.J. Ndunguru). Ottawa, Canada: IDRC. (Summaty).

0985 KULKARNI, K.A., and BHUTI, S.G. 1982. Sorghum leaf roller (Marasmia suspicallis Walter) a potential pest of sorghum.Sorghum Newsletter 25: 71.

During kharif 1981, sorghum was infested by the larvae of Marasmia suspicallis. The larvae constructed the leaf roll by joining the two longitudinal edges of the leaf with silken thread. The chlorophyll content of the leaf was destroyed by the larvae in the leaf roll. In severe cases, an entire leaf dried out. By random sampling, 11.2% of the plants were infested. The biology of the pest was studied in the laboratory. The egg stage lasted 5 days, larval development was 17 days, pupal stage lasted 7 days and the total life cycle was 29 days during November 1981. In the field, larvae were found to be heavily parasitised by a braconid parasite. The percentage of natural parasitization was about 32.6%. It appeared that parasites kept the pest in check in nature.

0986 KULSHRESTHA, S.P., and AGRAWAL, A.K. 1982. Predators and parasites: enemies of crop pests and farmers friends.Pesticides 16(1): 3-6. 3 ref.

0987 LEUSCHNER, K. 1982. Cereal Entomology: achievements and projections for the future.Patancheru, A.P., India: ICRISAT. 32 pp. 22 ref. (Draft).

0988 MEGENASA, T. 1982. Insect pests of sorghum in Ethiopia.Pages 54-64 In Proceedings, Regional Workshop on Sorghum Improvement in Eastern Africa, 17-21 October 1982, Nazreth and Debre Zeit, Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

0989 MOTE, U.N., BAPAT, D.R., SHIROLE, S.M., and MURTI, T.K. 1982. Estimation of losses caused by major pests in main and ratoon crops of sorghum. Indian Journal of Plant Protection 9(1): 50-55. 10 ref.

Field trials were conducted in 1976-77, 78-79 and 79-80 to estimate losses caused by major pests on main (kharif) and ratoon (rabi) sorghum, by adopting recommended control measures. The shootfly incidence caused substantial loss of grain and fodder in unprotected plots. The ratoon crop suffered more by the pests as compared to the main crop. The average loss of grain and fodder in main and ratoon crop was to extent of 24.71 and 28.97 q/ha respectively. A net profit of Rs. 3405 and Rs. 3169/ha was obtained in main and ratoon crop respectively by using insecticides.

0990 NDAHI, W.B. 1982. Evaluation of glyphosate and paraquat as substitutes for seedbed preparation by tillage in a hoe farming system. Tropical Pest Management 28(1): 10-13. 4 ref. (Summaries: Es, Fr).

Seedbed preparation is difficult for hoe farmers because hoes make inefficient tillage instruments. Tests were made in sorghum and millet fields in northern Nigeria to evaluate glyphosate and paraquat as substitutes for seedbed preparation by tillage. These chemicals were applied at rates of 0.5, 1.0 and 2.0 kg a.i./ha, in the period between weed and crop emergence. All treatments except 0.5 kg a.i./ha of paraquat gave acceptable yields. Glyphosate applied at a rate of 0.5 kg a.i./ha and paraquat at 1.0 or 2.0 kg a.i./ha, gave rise to similar crop yields. Sorghum grain yield after treatment with 1.0 kg a.i./ha of glyphosate was not significantly different from that obtained in hoe-tilled fields. The addition of 0.5 kg a.i./ha of atrazine to some treatments did not result in improved crop yield or weed control.

0991 NWANZE, K.F. 1982. Insect pests of sorghum in West Africa. Page 743 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru. A.P., India: ICRISAT. (Abstract).

Three species of insect pests are considered important in West Africa: the shoot fly, mainly Atherigona soccata; sorghum midge, Contarinia sorghicola; and stem borers, mainly Busseola fusca. Over 20 species of shoot fly have been recorded in Burkina Faso. Infestations are usually low to insignificant except on very late sown crops. Midge attack varies between seasons; it is usually low in the dry Sahelian zone but severe south of latitude 13 deg N. It is generally insignificant in Nigeria and Mali while "hot spots'' have been identified in central and southern Burkina Faso. Stem borer infestation is caused primarily by B. fusca; however, Eldana saccharina and Sesamia calamistis are also found. Severe infestations occur in Nigeria as far north at 12 deg 6' latitude, being most severe at Samaru and Funtua. In Burkina Faso, B. fusca infestations occur below latitude 11 deg 30' N where annual rainfall exceeds 900 mm. The late crop is most severely infested. Damage by head bugs and head worms is increasing particularly on introduced sorghums with compact panicles.

0992 REDDY, K.V.S. 1982. Pest management in sorghum - II. Pages 237-246 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 66 ref.

0993 REMES LENICOV, A.M.M. DE.

1982. Contribution to knowledge of Argentine Agallinae (Homoptera - Cicadellidae).(Es). Neotropica 28(80): 125-138. 10 ref. (Summary:En).

0994 RENSBURG. D.J. VAN., and MALAN, E.M. 1982. Control of sorghum pests and phytotoxic effect of carbofuran on five hybrids of grain sorghum.Phytophylactica 14(4): 159-163. 17 ref. (Summary:Af).

Significant reduction in infestation of sorghum by Rhopalosiphum maidis, Melanaphis sacchari, Anatrichus erinaceus and Busseola fusca was observed with the application of granules containing 10% carbofuran. It however, caused phytotoxicity in some plots. Phytotoxicity was more severe in soil with low clay content, and drought stress seemed to increase the phytotoxicity of carbofuran.

0995 ROSELLE, R.E., KEITH, D.L., PETERS, L.L.. WITKOWSKI, J.R.. and MILLER, T.P. 1982. Insect control guide for corn and sorghum - Nebraska.Lincoln, Nebraska, USA: University of Nebraska. 13 pp.

0996 SACHAN, G.C., and SINGH, C.P. 1982. Relative susceptibility of some sorghum lines to sorghum insect pests.Sorghum Newsletter 25: 76-77.

0997 SHARMA. M.. BHARAJ, G.S., and SHINDE, C.B. 1982. Evaluation of different insecticides for the control of jowar shoot bug Peregrinus maidis (Ashmead) at Indore, M.P.Pestology 6(4): 13-14.

0998 SINGH, O.P.. BUDHRAJA, K.. MISRA, U.S., and DHAMDHERE. S.V. 1982. Note on the efficiency of some new insecticides against the rice grasshopper, Hieroglyphus banian Fabricins, infesting sorghum.Indian Journal of Agricultural Sciences 52(12): 882-883. 2 ref.

0999 TEETES, G.L. 1982. Sorghum insect pest management - I.Pages 225-235 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 13 ref.

1000 TEMERAK, A.S. 1982. Laboratory studies on host habitat location of Bracon brevicornis Wesm. (Hym., Braconidae), parasitoid of the larvae of Sesamia cretica Led. (Lep., Noctuidae) in sorghum stalks.Anz. Schadlingskde., Pflanzenschutz Umweltschutz 55: 152-154.

Females of the parasitoid Bracon brevicornis were most strongly attracted to "live" larvae of Sesamia cretica (themselves) than any other acessible materials (e.g. "stalk", "frass", "paralyzed larva" or control). They were also attracted to paralyzed larvae but only when live larvae were absent. On the other hand, males were more strongly attracted to "stalk" than to "live" larvae or any other available material. Apparently "stalk" exhibited an important cue that directed the parasitoid males.

1001 WOODHEAD, S. 1982. Leaf surface chemicals of seedling sorghtim and resistance to Locusta migratoria.Pages 375-376 In Proceedings, Fifth International Symposium on Insect-Plant Relationships. (eds. Visser, J.H., and Minks, A.K.). Wageningen, Netherlands: Pudoc. 4 ref.

1002 WOODHEAD, S. 1982. P-Hydroxybenzaldehyde in the surface wax of sorghtim: its importance in seedling resistance to acridids.Entomologia Experimentalis et Applicata 31(3): 296-302. 22 ref. (Summary:Fr).

The deterrent effects of a lipid extract from seedling Sorghum on Locusta migratoria migratoroides reside in several of the surface wax components of extracts, p-Hydroxybenzaldehyde has been identified as an antifeedant present in the surface wax of all cultivars examined. Its concentration in the wax varies considerably with cultivar and in some (e.g. 65D and CSH 1) it is present at concentrations which are highly deterrent to Locusta. In all cultivars its concentration decreased with increasing plant age and palatability, and it is only present in deterrent amounts in the early stages of growth. Sorghum seedlings appear to posses particularly thick or resistant cuticular waxes as compared to other Gramineae, and the chemical composition of the waxes of all the cultivars examined appeared to be qualitatively similar.

1003 YOUNG. G.R. 1982. Recent work on biological control in Papua New Guinea and some suggestions for the future. Tropical Pest Management 28(2): 107-114. 25 ref. (Summaries: Es, Fr).

The biological control of some insect crop pests in Papua New Guinea from the late 1950s to 1979 is reviewed. The pests are considered according to the crops affected, which include coconut, citrus, cocoa, coffee, legumes, rice, sugarcane, grain sorghum, cruciferous vegetables and forest trees. The distribution in Papua New Guinea of each pest and the damage it causes are briefly described. Potential biological control agents are discussed with reference to the effects of any past introductions and some comments on possible future use. The biological control of some weed species, in particular lantana and salvinia, the giant snail, and cattle dung is also considered.

1004 YOUNG, J.R. 1982. Corn and sorghum - insect control with insecticides applied through irrigation systems. Pages 35-40 In Proceedings, Second National Symposium on Chemigation. Tifton, Georgia, USA: Chemigation RDC.

Soil Pests

1005 AGARWAL, R.K.. VERMA, R.S., BHARAJ, G.S., and JOTWANI, M.G. 1982. Adult of white grub damaging sorghum earheads. Sorghum Newsletter 25: 74.

Adults of the white grub, Rhinyptia indica Burm were found feeding on sorghum anthers and flowers during the rainy season of 1974, 1975, and 1976 at the College of Agriculture Farm, Indore, India. Damage to sorghum by this pest has not been recorded previously. Adult beetles were active at sunset. Beetles settled on the flowering heads and started feeding voraciously on sorghum anthers and flowers and this resulted in a failure of the grain to form. Spikelets appeared as if they were sterile. Beetles also produced large quantities of excreta (yellow colored pellets) which was deposited on the upper surface of the top leaves. The pest is suspected to be responsible for spread of sugary disease.

1006 ALLSOPP, P.G. 1982. Development, longevity and fecundity of the false wireworms Pterohelaeus darlingensis and P. alternatus (Coleoptera: Tenebrionidae). II. Effect of food type. Australian Journal of Zoology 30(2): 233-242. 16 ref.

Pterohelaeus darlingensis and P. alternatus were reared under constant temperatures on 10 different foods. In P. darlingensis wheat, barley and sorghum resulted in the shortest larval developmental periods, longest pupal periods and least pre-imaginal mortality. Egg-laying rates were highest on wheat, barley and maize and lowest on oats and soybean. No females were produced after feeding on wheat straw and no eggs were laid after feeding on linseed and turnip weed. Only wheat, barley, maize and sorghum (in descending order) allowed an increase in population. In P. alternatus wheat, sorghum and barley resulted in the shortest pre-imaginal development with the least mortality. Egg-laying rates were highest on wheat, maize and sorghum and lowest on barley and oats. No eggs were laid by females fed on linseed. Wheat, sorghum, maize, sunflower, barley and soybean allowed a positive population growth. Comments are made on the implication of these findings regarding control of the insects through crop rotation.

Aphids

1007 ARCHER. T.L., and BYNUM, E.D. JR. 1982. Greenbug control on sorghum with low rates of carbofuran and chlorpyrifos.Sorghum Newsletter 25: 83-84.

Low dosage rates of the insecticides carbofuran (0.56 - 0.11 kg Al/ha) and chlorpyrifos (0.28 - 0.06 kg Al/ha) were evaluated for greenbug control on sorghum in the Texas High Plains in 1978 through 1981. Applications were made with a C02 pressured hand carried boom designed to apply 7.6 1/ha total liquid in plots 15 m x 2 rows on 1 m centers. Pretreatment counts of greenbugs and beneficial insects on five plants per treatment were made 5(24 hours peior to spraying. Posttreatment counts were made 3, 7, and 14 days following insecticide application.

1008 ARCHER, T.L., ONKEN, A.B.. MATHESON. R.L., and BYNUM, E.D. JR. 1982. Nitrogen fertilizer influence on greenbug (Homoptera: Aphididae) dynamics and damage to sorghum.Journal of Economic Entomology 75(4): 695-698. 9 ref.

Greenbug, Schizaphis graminum, densities decreased in direct relationship to nitrogen (N) fertilizer rate (0, 45, 90, 135, 180, and 225 kg N/ha) and to increase in plant dry matter. Damage ratings related to greenbug density indicated that N fertilizer did not alter natural sorghum tolerance to greenbugs. Greenbug dynamics responded in a positive manner to NH4 +- N content in leaves. These data indicate that increasing N fertilizer enhanced sorghum fitness as a greenbug host. However, the rate of aphid increase diminished at the higher N concentrations.

1009 BALETKA, A.D., and CASTELLANO, S.R. 1982. Evaluation of commercial cultivar of grain sorghum for "cereal green bug" Schizaphis graminum Rond.(Es). Manfredi, Argentina: Instituto Nacional de Tecnologia Agropecuaria. 8 pp. 33 ref. (Technical Information No. 8).

1010 CAMPBELL, .B.C., MCLEAN, D.L., KINSEY, M.G.. JONES. K.C., and DREYER, D.L. 1982. Probing behavior of the greenbug (Schizaphis graminum, biotype C) on resistant and susceptible varieties on sorghum.Entomologia Experimentalis et Applicata 31: 140-146. 29 ref. (Summary:De).

The probing behavior of biotype C of the greenbug, Schizaphis graminum on susceptible and resistant lines of sorghum was elctronically monitored. Waveforms corresponding to salivation, phloem ingestion and non-phloem ingestion are described. The results of a parrallel study revealed that the rate of population growth of S. graminum was significantly greater on susceptible lines of sorghum than on resistant lines. Aphids probing the resistant lines of sorghum showed a significantly reduced imbibition of phloem sap compared with those aphids which fed on susceptible varieties. Also, increased numbers of separate probes and increased duration of non-probing were associated with greenbugs feeding on resistant lines. Greenbugs monitored on the nonhost plant, rice, exhibited non-phloem ingestion, but not phloem ingestion. Resistance in sorghum to greenbugs is associated with the phloem. There appear to be no physical differences between the sorghum varieties in the location of or extent of lignification around the vascular bundles.

1011 CHANG. C.P., FANG, M.N.. and TSENG, H.Y. 1982. Studies on the life history and varietal resistance in grain sorghum aphid, Melanaphis sacchari Zehnter in Central Taiwan.Builetin of Taichung District Agricultural Improvement Station 6: 81. (Summary).

1012 CHEDESTER, L.D. 1982. Greenbug and mite control in grain sorghum, 1981.Progress Report Texas Agricultural Experiment Station, 4019. 5pp.

Spray formulations of different pesticides were evaluated for control of biotype E greenbug, Schizaphis graminum and Banks grass mite, Oligonychus pratensis in grain sorghum. FCR 1272 at 0.1 pound per acre (lb/A), and dimethoate at 0.5 1b/A active ingredient (a.i.) reduced greenbug density by over 80%. Mite control was unsatisfactory with sprays of dimethoate at 0.25 and 0.5 lb/A; however, grain yields were increased with 0.5 lb/A of dimethoate. The application of FCR 1272 at 0.5 lb/A also resulted in yields greater than the untreated check. Granular foliar treatments of phorate and terbufos applied at 1.0 lb/A a.i. resulted in fair greenbug control, but poor mite reduction.

1013 DEPEW, L.J. 1982. Evaluation of insecticides to control greenbug in grain sorghum, 1980.Insecticide and Acaricide Tests 7: 174.

1014 HAMILTON, G.C.. KIRKLAND, R.L., and PERIES, I.D.R. 1982. Population ecology of Schizaphis graminum (Rondani) (Homoptera: Aphididae) on grain sorghum in Central Missouri.Environmental Entomology 11(3): 618-628. 26 ref.

The population ecology of Schizaphis graminum was investigated during the summers of 1979 and 1980. Population numbers of greenbug were sampled and correlated with various biotic and abiotic factors, namely, number of predators and parasites, days postplant, daily ambient air temperature means and extremes, microhabitat air temperature means and extremes, daily percent relative humidity (RH), and weekly rainfall. Stepwise regression and life table analysis methods were used. In 1979, the days postplant and coccinellid predators were of greatest significance in influencing greenbug numbers, whereas during 1980, coccinellid and Chrysopa larvae correlated significantly with changes in greenbug densities.

1015 HARVEY, T.L., HACKEROTT, H.L.. and MARTIN, T.J. 1982. Dispersal of alate biotype C greenbugs in Kansas.Journal of Economic Entomology 75(1): 36-39. 17 ref.

Alate greenbugs were trapped at Hays, Kansas from 1974 to 1979, inclusive. There were two distinct flight periods each year. The first flight peaked during the first week of June, and the second during the last week of July (1974 to 1977) or the third week of August (1978 and 1979). Flight patterns indicated that early planting of both wheat and sorghum should be avoided. More greenbugs were trapped from SE than NW during the spring but not during the summer. More greenbugs were collected from heights of 3 to 6 m than from 1,5 m, but that might be attributed to type of ground cover. As the green vegetation increased, the numbers of greenbugs collected decreased; however, strips of green wheat did not provide practical protection to adjacent bordering areas.

1016 HSIEH, J.S., and PI, C.P. 1982. Genetic study on aphid resistance in sorghum. Journal of the Agricultural Association of China 117: 6-14.

For studying the inheritance of resistance to sorghum aphid (Melanaphis sacchari) four sorghum cultivars 2R(PI257595). 129-3A, Shallu and Tx403 were used as parents. The plants of the 2R were highly resistant and plants of 129-3A had a range of highly resistant to resistant. The plants of Shallu and Tx403 were highly susceptible. The parents, F1 and F2 progenies in six crosses among four cultivars were tested for the reaction to the aphid in the field and greenhouse. The damage ratings were recorded at mature stage under field condition and 3-4 weeks after infestation with aperous viviparous adult at 6-leaf stage seedlings in the greenhouse. The results indicated that the resistance of 2R and 129-3A to the aphid was conditioned by a single dominant gene. Both 2R and 129-3A had the same gene which was allelic to the susceptible gene of Shallu and TX 403. Three replications of F2 progeny seedling test from crosses with 129-3A did not fit well with 3:1 ratio, suggesting that the cultivar 129-3A has modifiers to interact with the dominant major gene.

1017 KIMMINS, F. 1982, The probing behaviour of Rhopalosiphum maidis. Pages 411-412 In Proceedings, Fifth International Symposium on Insect-Plant Relationships (eds. Visser, J.H., and Minks, A.K.). Wageningen, Netherlands: Pudoc. 2 ref.

A report is given of the studies carried out in the United Kingdom on the probing behaviour of Rhopalosiphum maidis on different growth stages of sorghum varieties CSH 1, IS 2663 and IS 2501C and on factors that influence the orientation of the stylets in leaf tissue.

1018 NARAYANA, D., SAHIB, K.H., RAO, B.S., and RAO, M.R. 1982. Studies on the incidence of an aphid (Aphis sacchari) in sorghum. Sorghum Newsletter 25: 72.

During rabi 1981-82, sorghum was planted in late November. This delayed planting of sorghum was heavily infested with aphids (Aphis sacchari). The minimum (19.50 deg C) and maximum (34.70 deg C) temperatures at the time may have played a role in the rapid multiplication of the aphid. Aphids were initially observed at grain setting stage, during the first week of March. Aphid multiplication was very rapid and within 8 to 10 days, plants within the entire four-hectare-field were infested. The infestation started on the lower green leaves and gradualy spread to upper leaves. Since the crop had already reached maturity, there was likely little loss in grain yields, but the feeding value of the fodder deteriorated badly.

1019 PI, C.P., and HSIEH, J.S. 1982. Preliminary studies on aphid Melanaphis sacchari resistance in sorghum (Sorghum virgatum).(Ja). National Science Council Monthly 10(2): 153-160.

1020 PI, C.P., and HSIEH, J.S. 1982. Studies on grain quality and aphid resistance in sorghum. Pages 113-120 In Proceedings, Symposium on plant breeding. (eds. Hsieh, S.C., and Liu, D.J.). Taiwan: Agricultural Association of China and Regional

Society of SABRAO. 7 ref.

Eight of 106 cultivars and lines tested under natural infestation were resistant to Melanaphis sacchari. Results of genetic tests indicated that resistance was controlled by a single dominant gene. Content of epicuticular wax in leaves appeared to be related to aphid resistance.

1021 PORTER. K.B., PETERSON. G.. and VISE, O. 1982, A new greenbug biotype.Crop Science 22(A): 847-850.

A series of 11 laboratory tests of biotype C-resistant and C-susceptible small grain and sorghum lines infested with either biotype C or the Bushland collections clearly showed the Bushland greenbug to be other than the A, B, or C biotype. Sorghum lines possessing biotype C resistance from tunis grass (Sorghum virgatum) PI 38108 were susceptible, but sorghums PI 220248 and 'Capbam' were resistant to biotype E and should be useful sources of resistance.

1022 SUMMY, K.R.. and GILSTRAP, F.B. 1982. Greenbug populations: within-plant distribution on grain sorghum.Progress Report Texas Agricultural Experiment Station 3967. 7 pp.

Shootfly

1023 BA-ANGOOD, S.A., and HUBAISHAN, M.A. 1982. Varietal responses of grain sorghum to infestation by the shoot fly Atherigona yorki Deeming and stem borers Sesamic cretics Led. and Chilo partellus Swimboe in different sowing dates in P.D.R. Yemen.(Ar). Agricultural Journal (Yemen, D.). pp 42-57. 6 ref. (Summary :En).

1024 BAPAT, D.R., and MOTE, U.N. 1982. Sources of shootfly resistance in sorghum.Journal of Maharashtra Agricultural Universities 7(3): 238-240. 13 ref.

Sixty seven lines composing of fifty seven species, local varieties and checks were screened for resistance/tolerance to shootfly in kharif seasons of 1978 and 1979 under severe natural field infestation at the main campus, Mahatma Phule Agricultural University, Rahuri, Maharashtra, India. These species viz., s. versicolor, S. purpureosericeum and a wild species were observed to be immune to shootfly infestation and damage, since neither eggs nor dead hearts were noticed in both the years. Similarly, some of the tolerant types having desirable grain and plant type were also isolated. These could profitably be used in appropriate breeding programmes. The three immune species are reported for the first time, which provide additional source of resistance, which could be pyramided over the tolerant types possessing desirable grain and plant type.

1025 BAPAT. D.R., and MOTE, U.N. 1982. Upgrading the resistance level of derivatives from Indian X Indian crosses of sorghum against shootfly.Journal of Maharashtra Agricultural Universities 7(2): 170-173. 16 ref.

Testing of F3 material from Indian x Indian crosses was carried out against shootfly. The promising selections were further tested for their reaction to this pest in F4 and F5 generations. PJ-4R x Shenoli-4-2-5, ND-15 x Improved Saoner-10, M. 35-1 x PJ-4R-22, M. 35-1 X PJ-4R-25 and M.35-1 x Improved Saoner-12 derivatives were observed to be highly promising to shootfly and they were at par with resistant check IS-5490. These selections have shown 27.90, 15.34, 15.27, 13.80 and 9.96% improvement in their reaction (resistance) to shootfly when compared to their parental lines respectively. This confirms the additive nature of this character.

1026 BHUTI. S.G., and KULKARNI, K.A. 1982. Screening of breeders' material for resistance to shootfly.Sorghum Newsletter 25: 72.

Thirty-six selections from advanced genration material were screened for resistance to shootfly during kharif, 1981. Counts were made of the total number of plants and the number of deadhearts present among plants of each entry 28 days after germination. The shootfly incidence ranged from 43.1 to 62.3%. Percentage deadhearts due to shootfly was least among the following entries: PSF-14404 (45.8%), PSF-14449 (44.4%). PSF-14507 (43.1%), PSF-14531 (45.4%). PSF-14533 (45.4%), FVR-12-8 x M-35-1 x FR-173 (44.1%), SPV-86 x M-35-1-13 (45.3%) and PBM-2-1 (45.5%). PSF-12671 was the most severely infested entry.

1027 BORIKAR, S.T., and CHOPDE, P.R. 1982. Genetics of resistance to sorghum shoot fly.Zeitschrift fur Pflanzenzuchtung 88(3): 220-224. 10 ref. (Summary:De).

Eight parent F1 and F2 diallels involving four shootfly resistant and four susceptible lines of sorghum were studied for plant recovery and related characters. Additive gene action was pre-dominant for seedling height and plant recovery. Tillering was predominantly under non-additive genetic control. Both additive and non-additive genetic components were involved for grain yield. Recurrent selection for grain yield under high levels of shootfly infestations may help to combine both recovery and seedling resistance to shootfly in sorghum.

1028 BORIKAR, S.T., and CHOPDE, P.R. 1982. Stability for sootfly resistance in sorghum.Indian Journal of Genetics and Plant Breeding 42(2): 155-158. 3 ref.

Stability parameters for shootfly resistance were studied by evaluating eight parents and twenty eight hybrids under three different levels of shootfly infestation. 'IS 5490', 'IS 5604', 'IS 5490 X IS 5604' exhibited high degree of resistance and greater phenotypic stability to changing shootfly population. In general, resistant parents, resistant x susceptible hybrids and susceptible parents registered less than 1, 1 and more than 1 regression coefficient respectively. The segregating populations of resistant X susceptible crosses can be exploited for isolating resistant lines with desirable agronomic attributes.

1029 BORIKAR, S.T., CHUNDURWAR, R.D., and CHOPDE, P.R. 1982. Genetic variability for shootfly resistance in sorghum. Journal of Maharashtra Agricultural Universities 7(3): 223-225. 7 ref.

The genetic variability for shootfly resistance was assessed under three levels of shootfly infestation in Fl and F2 generations of inter-varietal crosses of sorghum. The mean values for seedling mortality and oviposition increased with increase in shootfly population. The estimates of genotypic coefficients of variability, heritability and genetic advance were higher for both the traits when material was tested under optimum shootfly population. Shootfly tolerant genotypes can be selected by growing the breeding material under optimum shootfly population as indexed by 67 to 70% seedling mortality and 1 to 2 eggs/plant on susceptible check.

1030 BORIKAR, S.T., CHUNDURWAR, R.D.. and CHOPDE, P.R. 1982. Note on genetic variability for traits related with primary and recovery resistance to shootfly in sorghum.Indian Journal of Agricultural Sciences 52(12): 867-869. 6 ref.

1031 CHUNDURWAR, R.D., MUNDHE, D.R.. and MOKAT, R.B. 1982. Efficacy of new insecticides for the control of sorghum shootfly Atherigona soccata (Rond).Sorghum Newsletter 25: 78.

Eleven insecticide treatments significantly reduced shootfly damage based on percentage deadhearts compared to the untreated control. Fewest deadhearts were recorded in the plots treated with cypermethrin .005%. fenvalerate .02%, bromophosethyl .04%, F.M.C. .05%. carbofuran 5% seed treatment and permethrin 0.005%. Significantly greater grain and fodder yields were obtained from plots treated with carbofuran 5% seed treatment, fenvalerate 0.02%, and FM.M.C 0.05%.

1032 DELOBEL, A.G.L. 1982. Effects of sorghum density on oviposition and survival of the sorghum shootfly, Atherigona soccata.Entomological Experimentalis et Applicata 31: 170-174. 9 ref. (Summary:Fr).

The effect of six different plant densities of sorghum on oviposition by Atherigona soccata was assessed by counting eggs 19 days after emergence of the crop. In low density plots (22 plants/sq m), plants received 3.35 times more eggs than plants in the densest plots (704 plants/sq m). In terms of egg density per unit area, the increase in plant density fitted the regression equation y= axb at lower densities, and y = a + b Log x at higher densities. The relationship between plant density and oviposition is explained by the interaction of the deterring effect of an excess of vegetation with the non-attractiveness of plants grown at excessive densities. Larval mortality resulting from competition increased from high to low plant density.

1033 DELOBEL, A.G.L. 1982. Oviposition and larvel survival of the sorghum shootfly, Atherigona soccata Rond. as influenced by the size of its host plant (Diptera, Muscidae).Zeitschrift fur Angewandte Entomologie 93(1): 31-38. 16 ref. (Summary:De).

Atherigona soccata females laid more eggs on sorghum plants measuring 4 to 8 cm height (in the field) or 12 to 16 cm (under cages) than on plants of any other size. Newly hatched larvae survived only on plants measuring less than 24 cm in height. Survival of the first instar larva depended on the size of the host plant. It was influenced by the resistance to penetration of the leaf sheaths and the distance between infestation site, in the case of artificial infestation, and growing point. Survival therefore depended on the ability of the female to select for oviposition a leaf of suitable position.

1034 JADHAV, G.D., and JOTWANI, M.G. 1982. Efficacy of different formulations of carbofuran and isofenphos for the control of sorghum shootfly, Atherigona soccata (Rondani).Journal of Entomological Research 6(1): 13-17. 6 ref.

In field-plot tests in India in 1978-79, the effectiveness of different formulations of carbofuran and isofenphos for the control of Atherigona soccata on sorghum was evaluated. Carbofuran was generally found to be superior to isofenphos.

1035 JADHAV, G.D., and JOTWANI, M.G. 1982. Ovipositon by the shootfly, Atherigona soccata (Rondani) on sorghum seedlings emerging from carbofuran treated and untreated seeds.Journal of Entomological Research 6(2): 206-208.

4 ref.

Field trial was conducted to determine oviposition by the sorghum shootfly. Atherigona soccata. Significant difference was recorded in the number of eggs laid on sorghum plants emerging from carbofuran treated and untreated seeds. The shootfly damage was significantly lower in plots sown with only carbofuran treated seeds, two treated and one untreated rows, and treated and untreated seeds in 60:40 ratio. Obviously, the potential of this method in reducing population level of the shootfly was based on attracting them for more oviposition on carbofuran treated sorghum seedlings or to provide protection to the adjacent untreated seedlings involving escape mechanism.

1036 JADHAV, G.D.. and JOTWANI, M.G. 1982. Site of action of systemic insecticides on freshly hatched maggots of sorghum shootfly.Indian Journal of Entomology 44(4): 405-407. 5 ref.

1037 MOTE, U.N. 1982. Efficacy of different formulations of some insecticides against sorghum shootfly.Entomon 7(3): 265-269. 12 ref.

Seven insecticides for the control of Atherigona soccata on sorghum was evaluated in field-plot tests in India in the kharif and rabi seasons of 1980-81, the results indicated that seed treatment with a soluble powder of carbofuran at 5% w/w was the most satisfactory.

1038 MOTE, U.N. 1982. Performance of new insecticides for control of shootfly (Atherigona soccata Rondani) on sorghum.Pestology 6(4); 9-11.

Twelve insecticides were tested in different concentrations and formulations for the control of shootfly on four recommended cultivars in rabi, 1979. Bromophos seed treatment 4 and 6 g/kg of seed reduced the germination drastically. Treatments with phorate gr., bromophos gr, aldicarb gr, carbofuran gr and isofenphos gr. were quite promising in controlling shootfly as compared to carbofuran seed treatment. Bromophos ST 2 kg of seed and carbofuran S.T. were effective as compared to other seed treatments and sprays. Pyrethroids were found to be ineffective to shootfly.

1039 MOTE, U.N. 1982. Retesting of promising material for multiple resistance especially to shootfly and stemborer.Sorghum Newsletter 25: 79.

20 derivatives (from E-101 to E-120) along with resistant (IS-5490) and susceptible (CS-3541 and CSH-1) were tested for multiple resistance to shootfly and stemborer in kharif 1981. The incidence of shootfly-caused deadhearts ranged from 12.5 to 69.0%. Significantly fewer shootfly eggs were laid on IS-5940 (0.32 egg/plant) than the other entries except E-109 (0.64/plants). Entries, E-109, (23.56%) and E-112 (27.75%) were as resistant as IS-5490 (12.46%). E-109 was significantly superior to E-114, E-101, E-118, E-115, E-lll, CRS-1 and CS-3541. E-118 was found to be free of stemborer attack. Other promising entries included SPV-102, E-109, E-101, E-lll, CS-3541, E-104 and E-106, as percentage of borer-infested plants ranged from 1.9 to 6.8 compared to 7.7 to 14.6 for the other entries. Considering grain weight per 5 panicles E-105 (325g) and E-110 (542g) have given higher yields than SPV-102 (308g), however, test weight of grain was inferior to SPV-102 (42g).

1040 MOTE, U.N. 1982. Screening for shootfly/stemborer resistant breeding material.Sorghum Newsletter 25: 79.

Thirty-six selections from different coordinating centers were tested for resistance to shootfly/stemborer in kharif 1981. The material was developed from crosses of good agronomic lines and resistant lines. Resistant progenies with desirable agronomic attributes were selected from advanced generations by respective research centres. The crop was sown 21-7-81 with a plant spacing of 45x15 cm in a plot size of 0.9x3 m. A randomized block design with three replications was used. Observations were recorded on percentage of deadhearts due to shootfly 28 days after germination and percentage of stem tunnelling due to stemborer at harvest.

1041 MOTE, U.N., BAPAT, D.R., SHIROLE, S.M., and MURTI, T.K. 1982. Effect of carbofuran and Azotobacter culture on the shootfly incidence and sorghum yield. Indian Journal of Plant Protection 9(1): 45-49. 15 ref.

Experiments were carried out on the effect of carbofuran and Azotobacter seed treatment to determine their compatibility and effect on shootfly incidence and yield in kharif 1977. 78 and 79. Treatments with carbofuran and Azotobacter individually and in combination has given promising results for the control of shootfly. In the case of Azotobacter treatment, there was marked decline in the incidence of shootfly. From the Azotobacter counts, it was concluded that carbofuran is compatible with Azotobacter. Grain and fodder yields were quite higher in seed treated with carbofuran and Azotobacter individually and in combination as compared to control. However, highest yields recorded in carbofuran treatment alone.

1042 NARKHEDE, P.L., UMRANI, N.K., and SURVE, S.P. 1982. Shootfly incidence in relation to "p" fertilization to winter sorghum. Sorghum Newsletter 25: 79-80.

A field trial on the response of winter sorghum (M 35-1) to applied P in vertisol soil was conducted during 1979-80 and 1981-82 at Dry Farming Research Station, Solapur, India. In this trial, shootfly infestations in relation to applied P levels to sorghum was recorded. Shootfly incidence, based on percent deadhearts, was high in sorghum without P, compared to sorghum with P application. Infestation levels ranged from 21.8 to 50.5% and 15.2 to 23.5% during 1979-80 and 1981-82 respectively. The damage caused by shootfly was relatively greater at the lowest levels of P (27.5 kg P205/ha) compared to higher levels. At P205 levels of 55, 110 and 220 (kg/ha) the shootfly incidence was similar.

1043 PATEL, J.R., and JOTWANI. M.G. 1982. Efficacy and economics of certain insecticides used for the control of sorghum shootfly, Atherigona soccata (Rondani) and stemborer, Chilo partellus (Swinhoe). Entomon 7(4): 389-395. 7 ref.

Effectiveness of combinations of several insecticides in various formulations against the sorghum pests Atherigona soccata and Chilo partellus, respectively were determined in field trials in New Delhi, India. The cost-benefit ratio was most favourable in the case of seed treatment with 5% carbofuran (against Atherigona soccata) plus 2% phenthoate dust (against Chilo partellus) followed by seed treatment with 5% carbofuran (against A. soccata) plus a granualr formulation of endosulfan (against C. partellus).

1044 RAINA, A.K. 1982. Daily rhythms in the sorghum shootfly, Atherigona soccata: oviposition, egg-hatch and adult eclosion. Physiological Entomology 7(1): 65-70. 10 ref.

Daily rhythms controlling oviposition. egg-hatching and adult eclosion in the sorghum shootfly were investigated. Eggs were laid only during the photophase of a LD 12:12 cycle. in two peaks. Under continuous light, this ovipositon was considerably attenuated but not made immediately arrhythmic. Egg-hatching and adult eclosion both commenced just before dawn. Some feature of the scotophase during or immediately after black-head formation apparently acts as a signal for hatching. Eclosion was controlled by light but its timing in the field was modified by temperature. The last 2-3 days of the pupal period constituted the most sensitive stage, and light signals received during this period determined the time of eclosion. Ecologiacl advantages of these rhythms to the shootfly are discussed.

1045 RAINA. A.K. 1982. Fecundity and oviposition behaviour of the sorghum shootfly. Atherigona soccata.Entomologia Experimentalis et Applicata 31: 381-385. 11 ref. (Summary:De).

Fecundity and oviposition behaviour of the Atherigona soccata were studied under controlled conditions on CSH-1. a susceptible sorghum hybrid. Females laid an average of 78.4 + or - 5.5 eggs. Males and females lived for an average of 7 and 17 days, respectively. Under low infestation (average 1.2 eggs/plant) egg distribution followed a Poisson distribution. The middle region of the abaxial surface and the 4th leaf of a 5-leaf-stage plant were most preferred for oviposition. Green colour and a surface with ridges were preferred to white and/or smooth substrate for oviposition. The adaptive significance of some of these observations is discussed.

1046 RAO. D.V.S.. and KRISHNA. J.G. 1982. Screening of new insecticides for the control of sorghum shootfly.Sorghum Newsletter 25: 73.

Seed coating with chlorpyriphos 20 EC at 6 ml. 8 ml. and 10 ml/kg of seed, seed coating with phosalone 35 EC at 6 ml. 8 ml. and 10 ml/kg of seed, seed soaking with phosalone 35 EC in 0.5% and 1.0% insecticidal solution for 15 hours, seed dressing with bendiocarb 80 W.P. at 25 gms. 37.5 gms and 50 gms/kg of seed dressing with isofenphos 40 S.D. at 40 gms and 60 gms/kg of seed were tested along with carbofuran seed treatment which is a standard recommendation for shootfly control.

1047 SALUNKHE. G.N.. GANDHALE. D.N.. MURTI. T.K.. and NAIK. L.M. 1982. Field screening of sorghum lines for resistance of shootfly. Journal of Maharashtra Agricultural Universities 7(3): 270. 5 ref.

The resistance of 43 lines of sorghum to Atherigona soccata was evaluated in field-plot tests in Pune. India, in the rabi season of 1978. On the basis of percentage of dead-hearts. 15 of the lines were classed as 'promising toward resistance'; of these, the 3 check lines Improved Saoner. GM-2-3-1 and IS-3922 (405) had no dead-hearts.

1048 SANDHU. *G.S.,* and DHALIWAL. G.S. 1982. Control of sorghum shootfly. Atherigona soccata Rond. with insecticidal dusts on fodder sorghum.Entomon 7(1): 57-61. 9 ref.

Four insecticidal dusts, i.e.. BHC 10% fenitrothion 5%. malathion 5% and carbaryl 5% were dusted once and twice at the rate of 25 kg/ha on April and September-sown crops of sorghum fodder 7 and 14 days after germination for the control of sorghum shootfly. Observations were recorded for the number of eggs laid and the deadhearts produced by the pest. In most of the observations one and two applications of BHC were the most efective treatments in reducing the number of eggs and deadhearts. However, malathion, carbaryl and fenitrothion were also as effective as BHC in some observations. Maximum yield of green fodder was obtained with two dustings of BHC in both the experiments. Of all the treatments, two applications of BHC dust gave the most consistent results for the control of the pest and also for the increased yield of the green fodder.

1049 SHINDE, C.B.. and BHARAJ, G.S. 1982. Efficacy of some new insecticides in controlling the sorghum shootfly, Atherigona soccata, Rond. on CSH-5.Sorghum Newsletter 25: 74.

A field experiment was conducted to determine the efficacy of some new insecticides against sorghum shootfly, on CSH-5 sorghum. Among the 8 treatments, percentage deadhearts due to shootfly 28 days after germination ranged from 20.28 to 100.00% compared to 100.00% in the untreated control plots. The least percentage of deadhearts was found in plots treated with carbofuran 50SP at 5% a.i. (20.28) followed by isophenphos 5G (35.38). Carbofuran 3G was found to be superior to chlorpyriphos 20 EC, monocrotophos 40 EC, phosalone 35 EC and bendiocarb which provided no control.

1050 SUKHANI, T.R., and J0TWANI, M.G. 1982. Insecticidal seed soaking technique for the control of sorghum shootfly, Atherigona soccata (Rondani).Journal of Entomological Research 6(1): 104-106. 1 ref.

Effectiveness of the seed soaking technique for the control of Atherigona soccata on sorghum was evaluated with a total of 18 systemic and non-systemic insecticides. The most promising insecticides tested were methidathion, trichlorfon and monocrotophos.

1051 SUKHANI, T.R., and JOTWANI, M.G. 1982. Spot treatment of granular insecticides for the control of sorghum shootfly, Atherigona soccata (Rondani).Indian Journal of Entomology 44(2): 117-120. 7 ref.

Field trials were conducted in two different seasons to explore the possibility of reducing the doses of granular systemic insecticides, recommended for sorghum shootfly control, by spot application. Observations were recorded on seed germination, oviposition, deadhearts caused by shootfly and grain yield. Adverse effect on germination was observed in disulfoton treatments, while significant improvement in germination was observed in carbofuran and chlorpyrifos treatments. The data on oviposition by shootfly indicated higher oviposition on the seedling emerging from insecticidal treated plots, however, there was variation in the response which is attributed to the different levels of shootfly infestation in the two trials. Between the insecticides disulfoton treatments were found to be inferior to carbofuran and chlorpyrifos treatments. Carbofuran treatments followed by chlorpyrifos yielded more than disulfoton granualar treatments.

Armyworms

1052 DHAKA, K., KHALSA, M.S., VERMA, S.K., and SACHAN, G.C. 1982. On growth and development of Mythimna separata (Walker) on some monocot weeds.Sorghum Newsletter 25: 75.

1053 FUXA, J.R. 1982. Prevalence of viral infections in populations of fall armyworm, Spodoptera frugiperda, in southeastern Louisiana.Environmental Entomology 11(1): 239-242. 18 ref.

Prevalence of the nuclear polyhedrosis virus (NPV) and granulosis virus (GV) was determined in populations of fall armyworm, Spodoptera frugiperda. in southeastern Louisiana. Both diseases reached their peak mean infection rates in mid-August in fall armyworms infesting pastures, the NPV at 50.8% and the GV at 2.8%. NPV prevalence in some pastures peaked at 60 to 68%. Infection rates by NPV in fall armyworms infesting corn and sorghum were initially lower than in pastures but were similar after mid-July (corn) or late July (sorghum). Infections by a mermithid nematode, an entomogenous fungus, and a microsporidium were rare.

1054 GARDNER, W.A., and DUNCAN. R.R. 1982. Influence of soil pH on fall armyworm (Lepidoptera: Noctuidae) damage to whorl-stage sorghum.Environmental Entomology 11(A): 908-912. 17 ref.

Soil pH-induced stress conditions affect the amount of foliar damage to whorl-stage sorghum caused by larvae of the fall armyworm. Visual ratings of foliar damage demonstrated that sorghum plants grown on more acidic soils (pH below 5.4) incur greater foliar loses than plants grown on soils with more optimal pH levels (pH above 6.0). Adverse soil pH retarded plant development and growth rate which caused plants grown on the more acidic soils to remain in the seedling and whorl stages longer than plants grown on the less acidic soils, thereby extending the period in which fall armyworms attack sorghum foliage.

1055 GARDNER. W.A., MARTIN, P.B., and SCHWEHR. R.D. 1982. Efficacy of selected chemical and microbial insecticides in controlling fall armyworm in whorl-stage grain sorghum.Journal of the Georgia Entomological Society 17(4): 518-524. 10 ref.

Field tests in central and southern Georgia during the 1978-81 growing seasons demonstrated that sprayable formulations of methomyl 1.8L, permethrin 2E, and chlorpyrifos 4E consistently suppressed fall armyworm (FAW), Spodoptera frugiperda larvae in whorl-stage grain sorghum, when applied over the rows in a final volume of 140 liters/ha (multiple applications) or 468 liters/ha (single applications). Granular formulation of methomyl and chlorpyrifos also significantly (P=0.05) suppressed FAW in plant whorls. Control with the granules did not differ significantly from control with the sprays. Other insecticides demonstrating acceptable control included cypermethrin, acephate, and thiodicarb. Carbaryl spray and granules provided no control. Permethrin and dicarbosulf baits, carbofuran and fonofos granules, and fenvalerate sprays were inconsistent and/or ineffective against FAW.

1056 KHAKA, K., KHALSA, M.S., VERMA, S.K., and SACHAN, G.C. 1982. Growth indices of Mythimna separata (Walker) on some monocot weeds.Sorghum Newsletter 25: 74-75.

1057 RAO, B.N., RAO, D.V.S.. and KRISHNA, J.G. 1982. Chemical control of armyworm (Mythimna separata) on sorghum by dust formulations of insecticides.Sorghum Newsletter 25: 72.

Dust formulations of BHC 10%, carbaryl 2.5%, endosulfan 4%, phenthoate 2%, quinalphos 1.5%, phosalone 4%, and malathion 5% were applied at 10 kg/ha in the whorls of the CSH-5 plants through muslin cloth during kharif, 1980. All insecticides proved to be equally effective in reducing the incidence of the armyworm. Large numbers of pupal masses of parasites were recorded 5 and 10 days after treatment on larvae in the plots treated with dusts of phenthoate, endosulfan and carbaryl. This reflected the activity of the larval parasite Apanteles sp.

1058 SACHAN, G.C., and VERMA, S.K. 1982. Host range of Mythimna separata (Walker) (Lepidoptera: Noctuidae).Sorghum Newsletter 25: 75-76.

The armyworm, Mythimna separata is one of the most important insect pests of sorghum. Various plants have been recorded as hosts of this insect by various workers. The insect appears to prefer to feed on monocot plants of the Poaceae family, order Graminales and of the family Cyperaceae, order CYperales. Among dicotyledonous plants, a few plant species of the family Fabaceae (Leguminales), Solanaceae (Solanales). Brassicaceae (Brassicales), Chenopodiaceae (Chenopodiales), Polygonaceae (Polygonales) and Linaceae (Malpighiales) are used as hosts by this insect.

1059 SACHAN, G.C., ATTAL, O.G., and VERMA, S.K. 1982. Consumption and utilization of sorghum by Mythimna separata (Walker).Sorghum Newsletter 25: 78.

1060 SACHAN. G.C.. ATTAL, O.G., and VERMA, S.K. 1982. Development of Mythimna separata (Walker) on some sorghum varieties/hybrids.Sorghum Newsletter 25: 76.

Development and survival of Mythimna separata was investigated on eight sorghum varieties, CSV-3, CSV-4, CSV-5, SPV-136, SPV-237, SFV-245. SPV-260 and SPV-126T and two hybrids, CSH-5 and CSH-6. Developmental parameters were larval survival, larval development period, percent pupation, pupal development period, pupal weight, percent adult emergence, adult longevity, sex ratio, fecundity, percent egg hatch, and incubation period.

1061 SCHWEHR, R.D., and GARDNER, W.A. 1982. Disease incidence in fall armyworm and corn earworm populations attacking grain sorghum.Journal of Georgia Entomological Society 17(1): 38-46. 3 ref.

Five entomopathogens were found in populations of fall armyworms, attacking whorl-stage sorghum in central Georgia in 1979-80. A nuclear polyhedrosis virus (NPV) was the most common pathogen observed with mortality resulting from infection reaching 38% and 50% in 1979 and 1980, respectively. Other pathogens present in fall armyworms collected from sorghum whorls included a granulosis virus (GV), Nomuraea rileyi, Entomophthora aulicae, and a microsporidium. Infection by a NPV caused mortality levels reaching 80% in corn earworm, Heliothis zea, larvae collected from sorghum grain heads in September, 1979. N. rileyi and a GV also were present. Fall armyworm larvae on sorghum heads were affected by a NPV, GV, and N. rileyi.

1062 SHARMA, H.C., and DAVIES, J.C. 1982. The oriental armyworm, Mythimna separata Walker-distribution, biology, and control; a literature review.London, UK: Centre for Overseas Pest Research. (Miscellaneous Report No. 59).

1063 SHARMA, H.C., BHATNAGAR. V.S.. and DAVIES, J.C. 1982. Studies on Mythimna separata at ICRISAT, progress report 1980-81.Patancheru, A.P., India: ICRISAT. 44 pp. 41 ref. (Sorghum Entomology progress report - 6).

1064 TRIPATHI, A.K., BHATTACHARYA, A.K., and VERMA, S.K. 1982. Developmental behaviour of Mythimna separata (Walker) on some monocotyledonous plants.Indian Journal of Entomology 44(4): 355-367. 10 ref.

Growth and development of Mythimna separata was studied on eleven monocotyledonous plants. Larvae of both the sexes showed faster development of maize while prolonged development was observed on paddy. Pupal period of male and female ranged from 9.0 to 13.1 days. Significantly higher male pupal weight was observed on fingermillet but in female heavy pupae were recorded when larvae were fed on sugarcane and fingermillet. The adult emergence on maize, pasture grass, sugarcane, sorghum, paddy, fingermillet, wheat, brown top millet and triticale ranged from 74 to 100% while 40 and 60% adult emergence was observed on oat and Italian millet respectively. Several types of growth indices proposed by various workers were also discussed with reference to the feeding behaviour of this pest on food plants.

1065 WISEMAN, B.R., and GOURLEY, L. 1982. Fall armyworm (Lepidoptera: Noctuidae): infestation procedures and sorghum resistance evaluations. Journal of Economic Entomology 75(6): 1048-1051. 5 ref.

Infestation procedures were evaluated for screening sorghum, for resistance to Spodoptera frugiperda in the greenhouse and in the field. Seedling sorghums infested in the greenhouse when ca. 2 days old at the rate of two or four larvae per seedling and rated for damage when the susceptible check approached the maximum rating produced results to differentiate among seedling genotypes. Whorl stage sorghum, 10 to 12-leaf stage, infested twice in the field with 10, 20, or 40 larvae per plant, resulted in detecting genotype differences at all infestation levels. Both a susceptible, 'SGIRL-MR1', and a moderately resistant sorghum variety, '1821 cm.,' were identified and are now available for use as standards.

Stem Borers

1066 ALL, J.H., GARDNER, W.A., SUBER, E.F., and ROGERS, B. 1982. Lesser cornstalk borer as a pest of corn and sorghum. Pages 33-46 In A review of information on the lesser cornstalk borer Elasmopalpus lignosellus (Zeller) (ed. H.H., Tippins). Georgia, USA: University of Georgia. (Special Publication No. 17).

A review of the damage done to sorghum and corn by Elasmopalpus lignosellus and control procedures are discussed.

1067 AMOAKO-ATTA, B., and KIDEGA, E.K. 1982. Influence of maize, cowpea and sorghum intercropping systems on stem-pod-borer infestations. Insect Science and its Applications 4(1-2): 47-57.

1068 AMOAKO-ATTA, B., and OMOLO, E.O. 1982. Yield losses caused by the stem-pod-borer complex within maize, cowpea, sorghum intercropping systems in Kenya. Insect Science and its Application 4(1-2): 39-46.

1069 BURTON, R.L., STARKS, K.J., and WEBSTER, J.A. 1982. Corn, sorghum, and millet as hosts for southwestern corn borer. Southwestern Entomologist 7(1): 1-3. 5 ref.

When corn, sorghum, and pearl millet were infested with southwestern corn borers, Diatraea grandiosella, in the greenhouse, the larvae survived best on corn, its primary host. Larvae established poorly on millet and intermediately on sorghum. The weights of larvae grown on sorghum were greater than those on millet, but significantly less than those on corn. There was no difference between field collected larvae from sorghum and millet, but those from corn were significantly larger. In the field, the larvae established poorly on both sorghum and millet.

1070 CHUNDURWAR, R.D., MUNDHE, D.R., and MOKAT, R.B. 1982. Evaluation of some high yielding hybrids for resistance to stemborer, Chilo partellus (Swinhoe). Sorghum Newsletter 25: 78-79.

Twelve hybrid sorghums were screened in trials planted on two different planting dates for resistance to stemborer in kharif, 1981. Resistance was based on percentage deadhearts and stem tunnelling. There were no significant differences in survival (deadhearts) of plants from borer infestation in the early or late sown trials. However, fewest deadhearts were recorded in plots of SPH-185, SPH-176, and SPH-221. Significantly, less stem tunnelling was recorded in plants of SPH-185, SPH-176, SPH-196, and CSH-5 in the early planted crop. In the late plant trial, plants of CSH-5 had less stem tunnelling. Based on these data, resistance for deadheart is not always linked to resistance to stem tunnelling.

1071 DABROWSKI. Z.T., and KIDIAVAI, E.L. 1982. Resistance of some sorghum lines to the spotted stalk-borer, Chilo partellus under western Kenya conditions. Insect Science and its Application 4(1-2): 119-126.

1072 DESHPANDE, V.P., THONTADARYA, T.S.. and KULKARNI. K.A. 1982. Studies on the incidence of diapause of sorghum stemborer (Chilo partellus Swinhoe) at Dharwad (Karnataka State). Sorghum Newsletter 25: 71.

Ten randomly selected sorghum stems were split at weekly intervals to monitor the presence of larvae and pupae of the sorghum stemborer from October 1974 to July 1975. The number of diapausing larvae ranged from 1 to 14 with an average of 4.67/10 stems. The average number of diapausing larvae ranged from 1 in June to 7.40/10 stems in December. No pupae were found from October to March. Diapausing larvae started pupating in April and numbers of pupa increased in May and June. The average number of diapausing larvae pupating during April was 0.6 and gradually increased to 1 and 2.75 during May and June, respectively. There were no diapausing larvae found during the first week of July. The emergence of the months from pupae of these diapausing larvae began in April and continued until July. The percentage of emerging moths was greatest in June.

1073 GARDNER, W.A. 1982. Artificial infestations of sorghum and corn seedlings with lesser cornstalk borer using the modified "Bazooka". Sorghum Newsletter 25: 80-81. 3 ref.

1074 GARDNER, W.A. 1982. Lesser cornstalk borer control in sorghum, 1981. Insecticide and Acaricide Tests 7: 175.

1075 GARDNER, W.A., and ALL, J.N. 1982. Chemical control of the lesser cornstalk borer in grain sorghum. Journal of the Georgia Entomological Society 17(2): 167-171. 6 ref.

Field tests during the 1978-80 growing seasons demonstrated that chlorpyrifos (0.56 and 0.84 kg a.i./ha) and moderately high rates (2.24 kg a.i./ha) of fonofos and diazinon were most consistent in reducing damage by lesser cornstalk borer, Elasmopalpus lignosellus, larvae to grain sorghum. Carbofuran (0.84 and 2.24 kg a.i./ha) granules produced inconsistent control of infestations with significant suppression occurring in only one of three tests. Parathion and isofenphos were ineffective in reducing damage by lesser cornstalk borer larvae.

1076 KHURANA, A.D., and VERMA, A.N. 1982. Amino acid contents in sorghum plants, resistant/susceptible to stemborer and shootfly. Indian Journal of Entomology 44(2): 184-188. 6 ref.

A study carried out to determine whether the amino acid contents of sorghum lines could be correlated with their level of resistance to attack by Atherigona soccata and Chilo partellus showed the presence of all the 17 amino acids evaluated in both the susceptible and resistant lines. The quantities of the acids were greater in the resistant lines than in the susceptible ones.

1077 KISHORE, P.. and GOVIL, J.N. 1982. Utilization of host plant resistance for judicious use of insecticides in sorghum. Agricultural Science Digest 2(2): 101-104.

Sorghum stemborer, Chilo partellus causes serious grain loss to high yielding sorghum hybrids and varieties as a result of which the benefits of such high yielding cultivars have not been fully realized by cultivaters in an equal measure in all area. A few high yielding borer resistant derivatives had, therefore, been developed by the breeders. These derivatives were evaluated under field conditions to determine the extent of variation in grain yield by application of a proven effective insecticide with a view to explore the possibility of doing away with the use of insecticides in sorghum. Data collected over two years have indicated that two derivatives viz., P 37 and P 151 could be recommended for cultivation under moderate level of borer infestation to obtain higher grain yield without incurring any monetary expenditure towards insecticides for stem borer control.

1078 KULKARNI, K.A., and BHUTI, S.G. 1982. Incidence of Apanteles falvipes from the sorghum stemborer, Chilo partellus Swinhoe. Sorghum Newsletter 25: 71.

A survey for natural enemies of the sorghum stemborer was made during kharif 1981 at the Regional Research Station Farm, Dharwad, Karnataka, India. Parasite emergence from collected larvae indicated a very high amount of larval parasitization by Apanteles falvipes. During the first week of September, larval parasitization by Apanteles falvipes ranged from 62.23 to 82.48%, with an average of 72.35%.

1079 LAL. G., and SUKHANI, T.R. 1982. Antibiotic effects of some resistant lines of sorghum on post-larval development of Chilo partellus (Swinhoe). Indian Journal of Agricultural Sciences 52(2): 127-129. 9 ref.

Under controlled temperature and humidity, pupation in Chilo partellus was significantly less when the larvae were reared on resistant lines than on susceptible checks of sorghum. Pupae reared on resistant lines were much smaller and lighter than those reared on susceptible hybrid 'CSH 1'. Females were significantly more on susceptible checks. At the same time, female moths reared on resistant lines laid fewer eggs than those reared on susceptible lines. However, the differences between resistant lines and susceptible checks regarding pupal period, percentage moth emergence and incubation period of eggs were not significant.

1080 MANOHARAN, T., and BALASUBRAMANIAN, M. 1982. Effect of lindane in controlling the sorghum stemborer, Chilo partellus (Swinhoe) and their persistence in sorghum. Madras Agricultural Journal 69(1); 33-38. 15 ref.

In sorghum, whorl application of lindane 6 G on 25th DAS recorded the least stemborer damage. Whorl application of lindane 6 G 0.37 kg a.i./ha on 25th day + 0.45 kg a.i./ha on 35th day (or) lindane 6 G 0.45 kg a.i./ha on 25th day + 0.45 kg a.i./ha on 35th day registered less leaf injury, deadhearts. percentage of tunnelling and higher yield. There was a continuous absorption of lindane by sorghum plant upto 15 days following the treatment. The presence of lindane residues in grains in these treatments clearly indicates that lindane gets translocated from the treated sorghum plants to grains, which ranged from 0.40 to 0.77 ppm in grain, from 0.65 to 1.04 ppm in straw and these residues were less than the tolerance limit of 3 ppm.

1081 OGWARO. K. 1982. Intensity levels of stemborers in maize and sorghum and the effect on yield under different intercropping patterns.Insect Science and its Application 4(1-2): 33-37.

1082 REDDY, K.V.S. 1982. Studies on the stemborer complex of sorghum in Kenya.Insect Science and its Application 4(1-2): 3-10.

1083 ROSS. W.M.. KINDLER. S.D., KOFOID, K.D.. HOOKSTRA. G.H.. GUTHRIE. W.D.. and ATKINS. R.E. 1982. European corn borer resistance in half-sib families from a sorghum random-mating population.Crop Science 22(5): 973-977. 9 ref.

One hundred half-sib families from a sorghum random-mating population were artificially infested with European corn borer (*Ostrinia nubilalis*) egg masses, and the same families were treated with an insecticide to reduce natural infestation. A two-replicate split-plot design with treatments as whole plots and families as subplots was used for 2 years. Agronomic effects of insect damage were assessed, and a quantitative genetic analysis provided information for use in recurrent selection. Total grain yield was reduced 13.0% by infestation and subsequent damage, combine grain yield was reduced 18.4%. and potential yield loss was 48.7%. Weight of 100 seeds determined from total grain yield samples was reduced 7.9% by infestation. Borer damage traits generally had strong negative correlations with grain yield in the infested families.

1084 STARKS. K.J.. BURTON. R.L.. WILSON. R.L.. and DAVIS. F.M. 1982. Southwestern corn borer: influence of planting dates and times of infestation on damage to corn, pearl millet, and sorghum.Journal of Economic Entomology 75(1): 57-60. 7 ref.

Field plots of corn, pearl millet, and sorghum were hand infested with egg masses of *Diatraea grandiosella* to study the effects of infestation time and planting date. Host plants reacted similarly, but corn had the greatest amount of damage, millet had the least. and sorghum had an intermediate amount. Plants infested 2 weeks after anthesis had the least stalk tunnelling, but the earliest infestation time had fewer ears of corn tunnelled. Late plantings of corn and male fertile sorghum had more damage than earlier plantings. The intermediate planting of millet had the least tunnelling. Late-planted corn yielded the least. Conversely, millet and sorghum had heavier losses when planted earlier. Male sterile sorghum (no pollen) had a higher percentage of tunnelled plants and slightly longer tunnels, but fewer heads tunnelled when compared with male fertile sorghum.

Chinch Bugs

1085 KINDLER, S.D.. and COBIA, L.R. 1982. Foliar applications of insecticides for control of chinch bugs on grain sorghum, 1980.Insecticide and Acaricide Tests 7: 177-178.

1086 KINDLER. S.D., and STAPLES, R. 1982. Foliar applications of insecticides for control of chinch bugs on grain sorghum, 1981.Insecticide and Acaricide Tests 7: 176.

1087 KINDLER, S.D., STAPLES, R., and COBIA, L.R. 1982. Planting time applications of insecticides for control of chinch bugs on grain sorghum, 1980.Insecticide and Acaricide Tests 7: 177.

1088 PETERS, L.L. 1982. Susceptibility of chinch bugs to selected insecticides: laboratory study (Hemiptera: Lygaeidae).Journal of the Kansas Entomological Society 55(2): 317-322. 6 ref.

Methods used to obtain information on the relative efficacy of 24 insecticides, in the laboratory, against adult chinch bugs are described. Adult chinch bugs were directly exposed to the insecticides by passing solutions of different concentrations over confined insects. Adult chinch bugs were indirectly exposed to the insecticides by placing them on filter papers that had been treated with insecticides at varying concentrations. Insect mortality data was subjected to probit analysis and LD95's calculated. The LD95's for direct exposure ranged from 7.64 to nearly 500 ppm. The LD95's for the indirect exposure method ranged from 4.81 to over 1000 ppm.

1089 STARKS, K.J., and WEIBEL. D.E. 1982. Sorghum cultivars rated for resistance to chinch bug.Sorghum Newsletter 25: 82-83.

A natural infestation of chinch bugs was utilized to evaluate 60 sorghum cultivars. Winter barley surrounded the test area and was the winter host for the insect. The test was planted on May 20, 1981. Individual plots consisted of single rows 3 meters long spaced 1 meter apart. Four replications were rated on July 5 using a scale of 0 for no damage to 6 for dead or severely damaged plants (no economic yield). 50% bloom, plant height, kernel color, and head type were also recorded. Days to 50% bloom ranged from 57 to 66. None of the heavily damaged entries bloomed late but many of the early blooming ones appeared resistant. Thus, maturity did not seem to be a factor in resistance. No relationship was apparent between plant height and resistance.

Spider Mites

1090 BYNUM, E.D. JR., and ARCHER, T.L. 1982. Distribution of female spider mites on grain sorghum plants.Sorghum Newsletter 25: 84-85.

This study was initiated to describe the distribution of spider mites, predominately Oligonychus pratensis, on sorghum plants. To compare mite distributions within sorghum plants, leaf infestation percentages were cumulated for specific leaf combinations (4-7) beginning with leaf position 1. Mite distributions were studied on plants grown with different fertilizer rates (0, 90, 180 kg nitrogen (N)/ha; 0, 45, 90 kg phosphorus (F)/ha; and all combinations) and on different sorghum varieties (b 35, TX 7000, BTX 378, SC 599-6, SC 56-14, and 1709-E). The date demonstrated that regardless of other factors, mite distribution on plants change throughout the growing season. Mites were confined to the lower leaves early in the season and as plants matured, mites migrated up the plant becoming more uniformly distributed over the entire plant. This suggested that mites are closely associated with their host and physiological changes within the plant may influence mite distribution,

1091 HALEM, S.M.A. 1982. Studies on mites of stored products in Fayoum.M.Sc. thesis, Cairo University, Egypt. 61 pp. (Summaries:Ar, En).

1092 NEWTON, R.J., MONTEMAYOR, J.L., and ARCHER, T. 9182. Soluble components in sorghum leaves as influenced by mite-induced stress.Agronomy Abstracts: 125.

The banks grass mite (BGM, Oligonychus pratensis) reduces yield in grain sorghum by inflicting leaf damage which interferes with physiological processes. It is hypothesized that tolerance to BGM is due in part to the cyanoglycoside (dhurrin) content present in the leaves. Mite number/plant, leaf damage, and leaf dhurrin content were measured in nonsenescent (SC0599-6), senescent (TX7000), early maturing (60M) and late maturing (100M) lines of field-grown grain sorghum. Mite number/plant and leaf damage were greater in TX7000 than in SC0599-6. Dhurrin content was lower in TX7000 than in SC0599-6. Leaf damage was lower in 100M compared to 60M, but mite number/plant was larger in 100M compared to 60M. The greater leaf damage with less mite number/plant in 60M compared to 100M was attributed to a reduced total leaf area* Dhurrin content in 60M was lower thah 100M. The reduced BOM damage in leaves of both nonsenescent and early maturing lines which contain high dhurrin levels indicates that cyanogenesis is one mechanism of tolerance to BGM.

1093 PERRING, T.M., ARCHER, T.L., JOHNSON, J.W.. and PHILLIPS, J.M. 1982. Evaluation of several grain sorghum characteristics for resistance to the banks grass mite.Journal of Economic Entomology 75(2): 257-260. 12 ref.

Five grain sorghum, characteristics were evaluated to determine their effectiveness for resistance to Oligonychus pratensis. Characteristics tested were leaf tannin, maturity, senescence, leaf "bloom", and midrib juiciness. Field evaluation indicated no resistance attributable to leaf tannin, leaf "bloom" or midrib juiciness. Similar mite numbers occurred on early- and late-maturing lines, but mite damage was lower on later-maturing lines, suggesting tolerance to mite feeding. In the senescence comparison, higher mite numbers and damage occurred on senescing than on nonsenescing plants. These data indicate that leaf stress associated with reproductive physiology may be a key factor leading to spider mite outbreaks and should be of primary consideration in the development of mite-resistant varieties.

Sorghum Midge

1094 BARRION, A.T., and LITSINGER, J.A. 1982. The sorghum midge, Contarinia sorghicola (Coq.) Deptera: Cecidomyiidae), and its parasites in the Philippines.Philippine Entomologist 5(4): 463-467. 7 ref.

1095 BHUTI, S.G., and KULKARNI, K.A. 1982. Screening of breeders' material for resistance to midge.Sorghum Newsletter 25: 72.

Forty-two selections from advanced generation material were screened for resistance to sorghum midge during kharif. 1981. Percentage of sorghum midge damaged heads was lowest for PMR-1060 (17.8%) and PMR-39833 (18.6%). Highest percentage damaged heads occurred to MRL-Sleetion-1. Other promising entries were PMR-1052 (23.1%) and PVK-58 (24.6%). PVK-42 sustained the greatest amount of grain damage (62.7%). The entry PMR-39833 had the least amount of grain damage (21.3%). Other promising entries were PMR-1052 (22.4%). PMR-1060 (25.8%). PVK-54 (26.0%), PVK-56 (26.1%). PVK-58 (26.3%). PVk-46 (27.1%). PMR-1154 (29.3%) and PVI-60(29.6%).

1096 BRUN. L.O. 1982. New Caledonia-sorghum midge.Quarterly Newsletter. FAO Plant Protection Committee for the South East Asia and Pacific Region 25(3): 10. 1 ref.

1097 BUSOLI. A.C., and AYALA OSUNA, J. 1982. Resistance of genotypes of sorghum (Sorghum bicolor (L.) Moench) to Contarinia sorghicola (Coquillett. 1898) (Diptera-Cecidomyiidae). under field conditions.(Pt). Anais da Sociedade Entomologica do Brasil 11(2): 169-180. 17 ref. (Summary:En).

Resistance of 95 sorghum genotypes to Contarinia sorghicola was evaluated from visual rating of damage to the panicles. The line EA 73 was found highly resistant to the midge and that the lines EA 256. EA 261. EA 361 and Huerin INTA were moderately resistant.

1098 CHUNDURWAR. R.D.. MUNDHE, D.R.. and MOKAT. R.B. 1982. Efficacy of different pyrethroids for the control of sorghum midge (Contarinia sorghicola Coq.).Sorghum Newsletter 25: 78.

An experiment was conducted during kharif, 1981 to determine the efficacy of pyrethroid insecticides, cypermethrin 50 EC. permethrin 25 EC. and fenvalerate 20 EC compared to endosulfan for the control of sorghum midge. Adult sorghum midge density two days after spraying was significantly reduced by all insecticide treatments compared to the untreated control.

1099 CHUNDURWAR. R.D.. MUNDHE. D.R.. MOKAT. R.B.. and MUNDHE. S.S. 1982. Screening for midge resistance.Sorghum Newsletter 25: 78.

Twenty-one sorghum lines were screened for resistance to sorghum midge. The entries were sown in kharif, 1981 and replicated three times, with an average of 20 plants in each row. Testing for screening was done under natural levels of infestation. Fewer sorghum midge were observed on all sorghum lines compared to the susceptible check CSH-1. Significantly less population of midge was observed in the line IS-1335 and it was at par with S-Girl-MR-1. IS-12609C. IS-12611. IS-12612. IS-8721. IS-1151 and IS-5141. Significantly less damaged spikelets were observed in EC-92792 and which was at par with all the lines except IS-12611 and IS-8721.

1100 DICKSON. T.. and DWYER. J.C. 1982. The estimation of sorghum yield following grain losses due to midge damage (experimental methods).Page 220 In Proceedings. Second Australian Agronomy Conference (ed. Norman, M.J.T.). Parkville, Victoria. Australia: Australian Society of Agronomy. 1 ref.

1101 DORI. F.M. 1982. Entomology bulletin no. 15: the sorghum midge.Harvest 8(1): 32-35. 2 ref.

1102 FISHER. R.W.. and TEETES. G.L. 1982. Effect of moisture on sorghum midge (Diptera: Cecidomyiidae) emergence.Environmenta-1 Entomology 11(4): 946-948. 10 ref.

Laboratory and field experiments

revealed the importance of relative humidity (RH) and panicle-wetting (artificial or rainfall) on emergence of adult sorghum midge from sorghum spikelets. In the laboratory, more midges emerged from spikelets maintained at high relative humidity (RH) (90%) than at 10% RH and 50% RH. In field trials, male emergence occurred at higher RH, lower temperature, and earlier in the day than female emergence. Artificially wetting panicles for 3 h or heavy rainfall resulted in reduced adult emergence. Increased adult emergence occurred during periods of high RH before and after heavy rainfall.

1103 GARDNER, W.A. 1982. Sorghum midge control, 1981.Insecticide and Acaricide Tests 7: 174.

1104 GARG, D.O. 1982. Biological warfare against midge: a potential enemy in sorghum seed production.Seeds and Farms 7(3): 13-14.

Keeping in view the increasing seriousness of Contarinia sorghicola each year despite regular use of chemical control, an attempt was made to find out suitable biological control measure. During the survey an ectoparasite identified as Tetrastichus species was discovered parasitizing diapausing midge larvae. This parasite was found widely occurring enemy and was reported from all sorghum seed growing areas. It is suggested that fertilized females may be liberated on the sorghum crop before midge actually appears in the field.

1105 LIPPINCOTT, C.L., and TEETES, G.L. 1982. Vespid predator of sorghum midge.Sorghum Newsletter 25: 85.

A vespid wasp was observed to prey on adult sorghum midges in Guatemala during May, 1979. Several female specimens of Polybia diguetana were collected from sorghum panicles 75 km south of Guatemala city. These wasps actively crawled up and down sorghum panicles, preying on several adult sorghum midge per panicle. This species was first described as Polybia occidentalis by R. du Buysson in 1905, and is distributed throughout Central America. This species was previously reported to feed solely on nectar.

1106 MELTON, K.D., and TEETES, G.L. 1982. Effects of resistant grain sorghum hybrids on the biology of the sorghum midge.Sorghum Newsletter 25: 86*

Nonpreference of 2 resistant sorghum hybrids, ATx2755 x RTx2767 and ATx2761 x RTx2767 by ovipositing female midges as compared to the susceptible hybrids, ATx2752 x RTx430 and ATx3042 x RTx2737, was apparent at various times through the 1981 growing season. The occurrence of nonpreference, however, was very erratic, and did not follow any perceivable pattern. It was, therefore, concluded that nonpreference is not a major mechanism in the resistance of these hybrids.

1107 MOTE, U.N. 1982. Evaluation of midge resistant sources.Sorghum Newsletter 25: 79.

Fourteen sorghum lines were screened for sorghum midge resistance. Data were collected on five panicles from each entry selected at random. Also, three spikelets from each panicle of each line were collected at the milk and harvest stages. The percentage of infestation was determined by counting total grains and blasted grains due to midge attack. No blasting due to midge were observed in IS-12664C and IS-12666C at the milk stage. These lines were significantly superior to the rest of the lines except TAM-2566 (1.72%), DJ-6514 (2.16%) and AF-28 (2.13%). Significantly less damage was recorded at harvest for IS-12664C (4.22%) than the remaining lines except IS-12666C (4.33%). DJ-6514 (5.39%), TAM-2566 (5.98%). AF-28 (5.80%). IS-2612 (6.32%) and S-Girl-MR-1 (6.60%).

1108 PATIL. R.C.. and THOMBRE. M.V. 1982. Inheritance of earhead midge incidence in sorghum.Sorghum Newsletter 25: 90.

1109 RAO. D.V.S.. RAO. B.N., and KRISHNA. J.G. 1982. Screening of breeder material in advanced yield trial against earhead midge damage in sorghum.Sorghum Newsletter 25: 73.

Twenty-six sorghum lines and 19 hybrids were screened for sorghum midge resistance in a normal and late planted trial during rabi, 1980-81. Adult midge density ranged from 2 to 5 adults/panicle in sorghum planted at the normal time and from 10 to 50 in the late planted sorghum. Entries were rated from 0 (no damage) to 9 (over 81% damage) at the time of harvest. Damage ratings to sorghum planted at the normal time ranged from 1.3 to 6.7 and SPV 105, 107. 216. 354. 422. 424, 425 and MSH 37 received the lowest ratings ranging from 1.3 to 2.7. Damage ratings to sorghums planted late ranged from 1.3 to 9.0 and the lowest ratings of 1.3 to 2.7 was recorded for SPV 216. 354, 424, SPH 200 and CSH 8R. Among the entries which received low damage ratings, SPV 354 exhibited more resistance to sorghum midge attack both under normal and late planting than the other entries.

1110 WISEMAN, B.R., and DUNCAN, R.R. 1982. Effect of within row plant spacing on sorghum midge damage.Sorghum Newsletter 25: 81.

Head Caterpillars

1111 GARDNER. W.A. 1982. Com earworm control on sorghum grain heads. 1981.Insecticide and Acaricide Tests 7: 176.

1112 KISHORE, P., and JOTWANI, M.G. 1982. Estimation of avoidable losses caused by the earhead caterpillars on sorghum and their control.Entomon 7(1): 65-69. 3 ref.

Field trials were conducted for 3 years (1977-79) to determine the losses caused by earhead caterpillars on sorghum and to compare the relative efficacy of some of the insecticides found to be effective in preliminary trials. Data on decrease in population of earhead caterpillars showed significant reduction in all the insecticidal treatments, the order of efficacy being endosulfan % BHC ^l^A isofenphos % phenthoate dust % malathion 1/2 quinalphos 1/2 carbaryl + molasses 1/2 phenthoate spray. The average avoidable loss of grain in the insecticidal treatments ranged from 1.71 to 19.81% as against 44.35% in control. Endosulfan dust followed by BHC and phenthoate dusts and isofenphos spray gave better yields than other insecticides. Approximate net monetary benefit was also found to be higher in endosulfan 4% dust (Rs. 1954.25,) followed by BHC 10% dust (Rs. 1927.00) and phenthoate dust (Rs. 1721.80).

1113 RAO, D.V.S., RAO, B.N., and KRISHNA, J.G. 1982. Economical and effective methods of control of earhead bug in sorghum.Sorghum Newsletter 25: 73.

To determine an economical and effective method of controlling earhead bugs in sorghum, several treatments were compared during kharif, 1980. The treatments were: dipping panicles in kerosine and water (ratio of 1:10); carbaryl 5% dust at 1.5 kg a.i./ha; malathion 5% dust at 2.5 kg a.i./ha; endosulfan 4% dust at 0.6 kg a.i./ha. BHC 10% dust at 2.0 kg a.i./ha; and untreated control. The first treatment was applied after the completion of flowering and a second treatment 10 days later. Bug numbers per 10 panicles were counted 5 and 10 days after each treatment. The grain yield and the cost benefit ratio was calculated for each treatment. Dusting with either carbaryl 5% at 1.5 kg a.i./ha or malathion 5% at 2.5 kg a.i./ha was found to be superior in reducing the number of bugs compared to the other treatments. All the treatments resulted in significantly higher grain yield, ranging from 24.12 q/ha to 28.20 q/ha, than the untreated control plots which yielded 19.44 q/ha.

1114 RICCELLI, M. 1982. Platytylellus costalis, a new insect observed on sorghum panicles. Sorghum Newsletter 25: 86.

Platytylellus costalis, a dark brown sucking insect belonging to the Miridae family (Hemiptera), was observed for the first time feeding on heads of the sorghum variety "Monagas-1" in a field located in Macapo (11 deg 45'N), Aragua, Venezuela, during April and early May of 1981 at the end of dry season. The insects were active from the blooming to the milk stage of grain development. As many as 50 of the bugs could be counted at one time on a single panicle. Total grain loss occurred, giving the panicle a barren look.

1115 SCOTT. R.A., WEIBEL, D.E., and STARKS, K.J. 1982. Corn earworm and corn leaf aphid control on bagged sorghum heads. Sorghum Newsletter 25: 81-82.

Nine insecticides were evaluated for their effectiveness in controlling corn earworm and corn leaf aphid on bagged sorghum panicles and their effects on grain sorghum panicles. Diazinon, Dipe1, carbaryl, indane, malathion, methomy1. primicarb, permethrin, and toxaphene were applied in different dosage and combinations. Three different application methods (dusting inside of selfing-bags), impregnating selfing-bags, and injecting the chemical directly on to the panicle through the selfing-bag were used. All untreated bagged panicles suffered more corn earworm damage than treated panicles, although ideal control was not obtained from any of the treatments. Most of the chemicals tested against the corn leaf aphid reduced its incidence, but none of them gave complete control. Permethrin-diazinon combination gave the best control of the corn earworm, Diazinon impregnated, malathion injected, carbaryl-primicarb combination dusted, and permethrin-diazinon combination injected gave good control of both insects.

1116 TWINE, P.H., and KAY, I.R. 1982. A determination of an economic injury level of Heliothis armigera (Hubner) in sorghum for southeast Queensland. Pages 189-195 In Proceedings, International Workshop on Heliothis Management. Patancheru, A.P., India: ICRISAT.

A pest density-crop loss relationship for Heliothis armigera in sorghum (cv Texas 610) in southeast Queensland, Australia, was calculated from a series of trials, using caged heads or natural larval infestations. The loss of 1.56 g per larva derived from this regression has been developed into an economic threshold, and an appropriate sequential sampling program utilizing these values is proposed.

Stink Bug

1117 HALL, D.G. IV.. and TEETES, G.L. 1982. Damage by rice stink bug to grain sorghum.Journal of Economic Entomology 75(3): 440-445. 4 ref.

Although Oebalus pugnax fed on stems, rachis branches, and glumes of grain sorghum they were primarily seed feeders. Seeds damaged by rice stink bugs were smaller and lighter in weight than undamaged seeds. The percentage of seeds per panicle with feeding punctures and the number of punctures per seed generally increased as infestation levels of rice stink bug increased. Bugs reduced grain yield and percent seed germination, but reduction levels varied, depending on the number of bugs per panicle and infestation period during grain development. Bugs caused more seed damage during early grain development. Larger reductions in yield occurred when 16 rice stink bugs were maintained on panicles from the milk stage of grain development to maturity (28 days) than when they were maintained on panicles from the soft-dough stage to maturity (20 days). Yield was not significantly reduced when 16 bugs infested panicles during the last 10 days of grain development, but small reductions occurred in percent germination.

1118 HALL, D.G. IV., and TEETES, G.L. 1982. Damage to grain sorghum by southern green stink bug, conchuela, and leaffooted bug.Journal of Economic Entomology 75(4): 620-625. 5 ref.

Adults of southern green stink bug (SGSB), Nezara viridula, conchuela (C), Chlorochroa ligata, and leaffooted bug (LFB), Leptoglossus phyllopus, fed on the stem, branches, and glumes of sorghum panicles, but they were primarily seed feeders. Each of these three species caused reductions in yield and germination of sorghum seed, but reduction levels varied depending on the bug species, the infestation period during grain development, and the number of bugs per panicle. Grain was more susceptible to damage by bugs early during seed development. Two adult bugs were generally not enough to cause significant reductions in yield. Sixteen bugs per panicle did not significantly reduce yield when infestations occurred during the last 10 days of grain development, but they cause large reductions when they infested panicles from early grain development to maturity. Reductions in grain yield were largely due to direct seed feeding, but seed molds and nonseed feeding may have contributed to losses.

1119 HALL, D.G. IV., and TEETES, G.L. 1982. Yield loss-density relationships of four species of panicle-feeding bugs in sorghum.Environmental Entomology 11(3): 738-741. 5 ref.

Constant infestation levels of rice stink bug, Oebalus pugnax, southern green stink bug, Nezara viridula, conchuela stink bug, Chlorochroa ligata or leaffooted bug, Leptoglossus phyllopus, maintained on caged sorghum panicles from the milk, soft-dough and hard-dough stages of grain development to maturity, sometimes caused reductions in yield of grain. The largest reductions in yield occurred when panicles were infested from milk stage to maturity (28 days). No yield reductions occurred when panicles were infested during hard-dough, the last 10 days of grain development, at levels up to 16 bugs per panicle. Regression analyses indicated that percent yield reductions increased quadratically as the number of rice stink bugs, southern green stink bugs, conchuela stink bugs, or leaffooted bugs increased per panicle. Equations [E(Y) = bsqX] were determined which estimated percent yield losses at different infestation levels for infestations from milk and soft-dough stages to maturity, and these were used to calculate injury levels for each species.

Stored Grain Pests

1120 ALMEIDA NETO. J.A. DE.. and SANTOS. J.H.R. DOS. 1982. Biology of, and damages caused by Sitotroga cerealella in sorghum grains.Ciencia Agronomica 13(1-2): 97-107.

1121 ATANASOV. KH.. and 0BRETEN0V. D. 1982. A dangerous non-quarantine storage pest for our country.(Bg). Rastitelna Zashchita 30(5): 26-28.

The morphology. biology and distribution of Latheticus oryzae a non-quarantine pest of stored products which might well be introduced into Bulgaria in shipments of such foods as rice, groundnut, sorghum and maize, especially in view of the recent increase of such shipments, are described briefly.

1122 KHAN. M.I.. RAJURKAR. B.S.. and BORLE. M.N. 1982. Assessment of storage losses due to insect pests in grain sorghum treated with non toxic plant origin substances.P.K.V. Research Journal 6(1):45-48.

Four indiginous plant origin substances, alone and in combination, were tested under laboratory condition to see their effectiveness in reducing storage losses in grain sorghum (I.S. 84). Of these substances the sweet flag rhizome (Acorus calamus) in powder from (300 mesh) @ 0.1% by weight coupled with burning camphor, to deplete oxygen at the time of storage, has been found quite effective in reducing the storage losses (2.82%) due to insects at the end of 12 months storage period. This treatment was closely followed in effectiveness by ash 2.0% coupled with burning camphor, ash 2.0% alone and sweet flag rhizome 0.1% + ash 2.0% in recording minimum storage losses (3.04%. 3.24% and 4.42% respectively) due to insects.

1123 LAMA TIADE. 1982. Biodynamics of a lesser grain borer population. Rhyzopertha dominica Fabricius (Coleoptera: Bostrychidae) in a mass of sorghum under simulated tropical conditions.(Fr). Thesis, Institut National de la Recherche Agronomique, Pont-de-la-Maye, France. 38 pp. 28 ref. (Summary:En).

1124 PATEL. R.C.. YADAV. D.N., and SARAMMA, P.U. 1982. Bracon hebator Say infesting laboratory culture of Corcyre cephalonica St.and its effectiveness in a warehouse stacked with jowar.Gujarat Agricultural University Research Journal 7(2): 121-123. 3 ref.

1125 SALUNKHE. G.N. 1982. Chemical control of rust red flour beetle on stored sorghum.Journal of Maharashtra Agricultural Universities 7(3): 274-276. 5 ref.

The effectiveness of seed treatments with 6 insecticides at various concentrations for the control of Tribolium castaneum infesting stored sorghum grain was evaluated in laboratory tests and showed that malathion at a concentration of 25 p.p.m. was the best treatment.

1126 SAMUI. T.N.. DEB. D.C.. and CHAKRAVORTY, S. 1982. Note on the effect of hydroprene on pupal web formation by Corcyra cephalonica (Lepidoptera, Galleriidae).Indian Journal of Agricultural Sciences 52(8): 547-548.

1127 SINGH. O.P., ALI. S.I..

SINGH. U.C.. and MISRA. U.S. 1982. Note on the toxicity of newer insecticides against the adult weevils of Myllocerus undecimpustulatus maculosus Desb. infesting hybrid sorghum in Madhya Pradesh.Indian Journal of Agricultural Sciences 52(11): 796-798. 7 ref.

Birds, Rodents, and Other Pests

1128 ABD-EL-GAWAD, K.H.. ALI, A.M.. and SALIT, A.M. 1982. Assessment of damage caused by rodents in some field crops.Assiut Journal of Agricultural Sciences 13(2): 73-78. (Summary:Ar).

1129 BRUGGERS. R.L.. and JAEGER, M.M. 1982. Bird pests and crop protection strategies for cereals of the semi-arid African tropics.Pages 303-312 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum. 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 47 ref.

1130 BULLARD. R.W. 1982. New developments in bird resistant sorghum.Pages 229-234 In Proceedings, Eighth Bird Control Seminar. Ohio, USA: Bowling Green State University.

1131 SARWAR, H.A.K., and RAO, G.K. 1982. Destruction of sorghum in the sowing stage (nursery) by the bird pest, blue rock pigeon (Columba livia).Sorghum Newsletter 25: 6.

1132 SONI, B.K., and RANA, B.D. 1982. Feeding behavior and selection of poison base for the control of Rattus meltada pallidior populations.Saeugetierkd Mitt 30(2): 81-88.

The soft-furred field rat, Rattus meltada pallidior, one of the dominant pest rodent in the Indian agriculture, causes considerable losses to natural grasslands, standing crops and vegetables. Metads were found to be consistent in their food choice. In both single and multiple food choice experiment in preferred sorghum among cereals, groundnuts, and carrots, among the oil seeds and fresh vegetables respectively. Carrot, jowar and groundnut are the adequate bait for mixing poison in the control of this pest of national importance. The consumption rate of food is not influenced by the texture but the taste (oily and non-oily) and energy richness may influence the consumption rate. The calorific intake under both choices (SFC and MFC) was found to be much lower in comparison to other desert rodents studied so far. For maintaining its body weight the calorific values ranged from 10.08 to 15.69 Kca1/day.

1133 YAPA, A. 1982. Pests of a feather: bird pests in developing countries.IDRC Reports 11(3): 20-21.

Plant Protection and Seed Treatment

1134 BRANCAO, N., COSTA, R.A.S., CASELA. C.R., SILVEIRA JUNIOR. P., AZAMBUJA, N.H.B., and MARTINS, R.M. 1982. Chemical treatment of grain sorghum seeds (Sorghum bicolor).(Pt). Pages 46-49 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1135 ELIAS. M.C., GONCALVES. P.R., B0NGI0L0 NETO, A., BLAAS, J.L., LUZ, J.L.S.. and RANGBL, M.A.S. 1982. Conservation of grains with a high moisture content, by using organic acids (sorghum).(Pt). Pages 66-68 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de

Execucao de Pesquisa de Ambito Estadual de Pelotas.

1136 ICRISAT. 1982. Plant quarantine.Pages 351-355 In Annual report, 1981. Patancheru, A.P., India.

1137 NAIDU, P.H. 1982. Seed health testing for sorghum.Patancheru, A.P., India: ICRISAT. 5 pp.

1138 RANGEL, G.T. DE. 1982. Effect of pesticides on production of basic grains.(Pt). Pages 70-84 In Use of pesticides in Panama: their effect on health and on environment. Panama: Ministerio de Salud. 8 ref.

1139 SOLANKE, R.B., and KULKARNI. L.P. 1982. Standardizing the dosages of seed dressings in response to seed germination and mycoflora in sorghum.Sorghum Newsletter 25: 115-116.

Out of nine concentrations of six fungicides tried, maximum germination was observed at the concentrations of 2.5 to 3.5 g/kg of seed. With minimum seed mycoflora, for all the fungicides tested, Thiram, Seedex, Zineb-75, Blitox and Monosan seed treatments were superior over Bavistin and untreated control. For these fungicides germination of about 90% was observed at concentrations of 2.5 g/kg of seed tested with Monoson and Blitox and 1.5 g/kg of seed treated with Seedex or Zineb-75. These economical seed treatments are equal to that of thiram at a concentration of 1.5 g/kg seed and can replace the recommended Thiram sorghum seed treatment.

1140 TANWEER, A. 1982. Effect of a new fungicide on the viability of rice and sorghum seeds.Pestology 6(2): 9-10.

All TCMTB seed treatments, viz., 0.5 ml, 1.0 ml, 1,5 ml, 2.0 ml, 2.5 ml/kg of seed increased the viability of rice seeds upto 180 days and sorghum seeds upto 365 days after treatment. TCMTB at the rate of 2.5 ml/kg of seed increased the viability of rice seeds upto 365 days after treatment.

CHEMICAL COMPOSITION

1141 AKINGBALA, J.O., ROONEY, L.W.. PALACIOS, L.G.. and SWEAT, V.E. 1982. Thermal properties of sorghum starches.Pages 251-261 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 21 ref.

The different scanning calorimeter (DSC) and the Brabender visco/amylo/graph were used to measure the thermal properties of sorghum starch, pure endopserm, and flour. The gelatinization temperature of the waxy starch was higher than that of the nonwaxy starch in measurements by the DSC, while the pasting temperature or apparent gelatinization temperature of the nonwaxy starch was higher by the visco/amylo/graph. Sorghums with WxWxWx, WxWxwx, Wxwxwx and wxwxwx alleles were compared. The gelatinization temperature of sorghum starches measured with the DSC increased as the number of waxy alleles (wx) in the endosperm increased. However, it appeared that a two waxy allele (Wxwxwx) difference was required before the difference in the gelatinization temperatures were significant. The specific heat of sorghum starch can be accurately measured on finely milled flour. The swelling and solubility properties of sorghum starches and starch cooking properties are good indicators of textural properties of food made from sorghum.

1142 APPAIAH, K.M.,

RAMAKRISHNA, R.. SUBBA RAO, K.R., and KAPUR. O. 1982. Spectrophotometric determination of carbaryl in grains.Journal of the Association of Official Analytical Chemists 65(1): 32-34. 5 ref.

A method has been developed for determining carbaryl in grains* based on hydrolysis of carbaryl with methanolic potassium hydroxide to 1-naphthol, reaction with 4-aminophenazone in the presence of alkaline oxidizing agent. and spectrophotometric measurement at the absorption maximum at 475 nm. The relationship between absorbance and concentration is linear in the range of 0.5-20 micro g/mL. The method can be applied to levels as low as 0.3 ppm carbaryl in grains.

1143 ARROLIGA. R., ALTAMIRANO, R.M. DE., GONZALEZ, F.. and PERTZ. G. 1982. Contamination of Nicaraguan sorghum (Sorghum vulgare) with mycotoxins.(Es). Boletin Tecnico LABAL 3(1): 26-32. 8 ref. (Summary:En).

Sixty one samples of sorghum were collected in 42 silos-located in 12 different departments of the country. The samples were analyzed for mycotoxins using the Velasco microcolumn method and the results were confirmed using thin layer chromatography. Only 4 samples were found to contain mycotoxins below the 20 ppb. U.S.F.D.A. action level and 34 samples were found to contain more than 50 ppb.

1144 ATKIN, D.S.J., HAMILTON, R.J.. MITCHELL, S.F., and SEWELL, P.A. 1982. Infra-red detection of waxes in HFLC.Chromatographia 15(2): 97-100. 16 ref.

The chromatography of wax components using infra-red detection coupled with gradient elution has been studied* The use of binary and tertiary gradients with eluent monitoring at 5.75 micro m affords a non-destructive wax class assay, thus complementing and improving the range of techniques available for wax analysis.

1145 BAROCCIO, A., DESIDERIO, E., GADDI, S., PACI, V., ROTURflO, M.R., and SCARINO, D. 1982. Effect of different storage contidions on the tannin content of sorghum grains and flours estimated by the vanillin method.(It). Agricoltura Italians 3(3-4): 121-122. (Abstract).

1146 BRANDON, M. J., FOO, L.Y., PORTER, L.J., and MEREDITH, P. 1982. Proanthocyanidins of barley and sorghum: composition as a function of maturity of barley ears.Phytochemistry 21(12): 2953-2957. 24 ref.

Sorghum seeds contain a proanthocyanidin polymer consisting largely of 2,3-cis procyanidin units with average molecular weight 2500. Barley ears contain low levels of proanthocyanidin oligomers containing 2-4 units, and composed largely of 2,3-trans procyanidin and prodelphinidin units with catechin as the terminal unit. The concentration of the oligomers in barley ears was virtually constant throughout the 33 day growth and ripening period.

1147 BUTLER, L. 1982. Polyphenols of sorghum.Pages 226-229 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT.

1148 BUTLER, L.G. 1982. Polyphenols and their efects on sorghum quality.Pages 294-311 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 60 ref.

The condensed tannins and other polyphenols of sorghum grain provide agronomic advantages, such as bird resistance, but can be harmful in the diet, severely reducing weight gains of rats and chicks. Investigated the assay, purification, characterization, distribution, metabolism, detoxification, genetics, and significance of sorghum polyphenols. Binding of proteins, the probable basis of tannin's dietary effects, is quite protein-specific. Proteins rich in proline may be selectively bound by tannin out of a 1/2 100-fold excess of other proteins. A promising approach for overcoming the antinutritional effects of tannin is chemical detoxification. Wetting high-tannin, bird-resistant sorghum grain with dilute aqueous ammonia (0.2% NH3) for a few hours before feeding or processing lowers the assayable tannin, eliminates the capacity of the grain to bind extraneous proteins such as those in the digestive tract, and increases rate and chick weight gains upto those of low-tannin controls.

1149 CEH, M., STROPNIK, C., DOLECEK, V., and LESKOVAR, S. 1982. Stepwise elution analysis of thermally dispersed starches.(De). Starke 34(3): 85-88. 7 ref. (Summary:En).

Qualitative changes of kernels of sorghum, wheat, maize and potato starch and decomposition of their pastes during thermic dispersing at 120 deg C were observed by elution analysis. After thermic dispersing potato and sorghum starch were the most decomposed. The chromatograms of their pastes showed after thermic dispersing in water at smaller concentrations of perchloric acid new zones of the iodine starch complex. Due to the molecular decomposition the intensity of the coloured zones decreased in the lower and middle part of the chromatogram, while new zones with increased colour intensity appear in the upper parts. The chromatograms of all native starches showed more coloured zones than their pastes. This is in good correlation with previous determinations where all investigated native starches showed smaller average molecular weights than their corresponding pastes.

1150 DAIBER, K.H., and TAYLOR, J.R.N. 1982. Effects of formaldehyde on protein extraction and quality of high- and low- tannin sorghum.Journal of Agricultural and Food Chemistry 30(1): 70-72. 16 ref.

Dilute solutions of formaldehyde were used to inactivate the tannins in high-tannin sorghum. By means of this treatment it was shown that high- and low-tannin sorghums contain similar proportions of the different classes of protein. The differences observed in protein yield, when high-tannin sorghums are extracted by using the Landry and Moureaux fractionation, are due to interactions between tannins and albumin, globulin, and prolamin proteins, the majority of these proteins being rendered insoluble in their usual solvents. In addition, electrophoresis indicated that those proteins which were extractable from high-tannin sorghum were bound to tannins. As formaldehyde facilitated the quantitative extraction of proteins from high-tannin sorghum, it is suggested that it may have a more general application in the study of proteins from plant material rich in polyphenols.

1151 DOHERTY, C., FAUBION, J.M., and ROONEY, L.W. 1982. Semiautomated determination of phytate in sorghum and sorghum products.Cereal Chemistry 59(5): 373-377. 31 ref.

Thirty sorghum varieties were analyzed for phytate phosphorus using a semiautomated method. Phytic acid was isolated by extraction with dilute HCl-Na2-S04 and precipitated as Fe(III)-phytate through addition of FeC13. Following precipitation, Fe(III)-phytate was digested utilizing the micro-Kjeldahl procedure to release phytate-P. Phytate-P was determined colorimetrically using a modified Technicon method. Whole sorghums analyzed contained phytate-P levels of 0.17-0.38% (dry weight), accounting for 80-87% of the total phosphorus in the kernel. Highest levels of phytate-P were found in bran fraction, with lesser amounts in the whole grain and dehulled grain. respectively. Processing effectively concentrated phytate-P levels in both sorghum and corn tortillas, whereas total phosphorus levels remained unchanged. To. a thick African porridge prepared under acid conditions, had slightly less phytate-P than its parent flour.

1152 DURLEY. R.C.. KANNANGARA. T.. and SIMPSON. G.M. 1982. Leaf analysis for abscisic. phaseic and 3-indolylacetic acids by high-performance liquid chromatography.Journal of Chromatography 236(1): 181-188. 24 ref.

High-performance liquid chromatography (HPLC) is described for the purification and analysis of abscisic acid (ABA). phaseic acid (PA) and 3-indolylacetic acid (IAA) extracted from sorghum leaves. The method is rapid. suitable for automation and capable of accommodating large numbers of samples. Detection limits are less than 1 ng for each hormone. Recovery efficiency is 75% for ABA and PA and 64% for IAA. After initial extraction and partition. ABA. PA and IAA were purified together as ammonium salts (ion pairs) on polyvinylpyrrolidone. This was followed by further purification and separation of the three hormones on preparative C18 reversed-phase HPLC. Analysis of ABA and PA was by absorption phase silica HPLC with detection by UV absorption. Analysis of IAA was by C18 reversed-phase HPLC with fluorescence detection.

1153 EARP. C.F., and ROONEY. L.W. 1982. Scanning electron microscopy of the pericarp and testa of several sorghum varieties.Food Microstructure 1(2): 125-134. 24 ref.

Pericarp thickness varies greatly among sorghum varieties ranging from very thin (8 micro m) to very thick (160 micro m). Pericarp thickness also varies within an individual kernel. The areas below the style and near the hilum are the thickest with the sides of the kernel being thinnest. Scanning electron microscopy was used to document differences in pericarp thickness and to explain milling differences. Varieties with a thick pericarp had starch granules in the mesocarp cell layers. Sorghums with a thin pericarp did not have starch granules in the mesocarp except near the hilum and stylar area. U.S. sorghum varieties studied had a testa thickness of 16-40 micro m (side of the kernel) but recently four Malian sorghums from a recent collection had very thin testae of 8-16 micro m. The Sudanese sorghum Shawaya had a testa ranging in thickness from 28-40 micro m.

1154 FRITZ. B.A.. and GALLAHER. R.N. 1982. Some plant tissue preparation and storage problems that cause erroneous analytical analysis.Florida Scientist 45(suppl. 1): 6. (Abstract).

Many scientists require analytical analysis of plant tissue. This research was designed to illustrate many of the plant sample technique preparation problems that can cause erroneous analytical results. Grain sorghum plants were sampled at mid-flowering stage of growth. One experiment dealt with plant parts and age of leaves. Drying facilities and length of drying time were the variables in the second study. The third dealt with grinding procedures and the further study illustrated problems with moisture absorption from improper sample storage. These data illustrate that N concentration is lowest in stems and highest in young leaves. Old leaves tend to have highest mineral concentrations. Improper sampling, mixing, drying, and grinding gave erroneous data. Precise drying at 70 deg C or higher was necessary to give good N-mineral data. Digestibility data was highest when samples contained some water and when drying was less than 70 deg C.

1155 GARCIA, B.H. 1982. Evaluation of tannin and phenol content of different (various) lines of sorghum. Pages 230-242 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT. 13 ref.

1156 HAHN. D.H., FAUBION, J.M., RING, S.H., DOHERTY, C.A., and ROONEY, L.W. 1982. Semiautomated in vitro analysis of sorghum protein availability via pronase hydrolysis. Cereal Chemistry 59(2): 132-136. 24 ref.

Sorghum varieties with varying kernel structures were analyzed for availability of protein. Small (100-mg) samples of ground grain were digested with a protease enzyme, pronase, and optimum pH, time, and temperature. The hydrolysate was assayed for alpha-amino groups by monitoring absorbance at 570 nm following reaction with ninhydrin. Pronase digestibility was determined for 196 sorghum samples, including those without a testa, with a testa and a spreader gene, and with waxy and nonwaxy endosperm types. Sorghums with a testa showed significantly lower in vitro digestibility than sorghums without a testa. Sorghums with waxy endosperm had slightly higher digestibility than did nonwaxy sorghums. Pronase digestibilities of 11 sorghum samples were compared with those obtained by a multienzyme in vitro digestibility method, which grouped sorghums together in a narrow range of digestibilities.

1157 HARAKI, T., HORINO, T., and INUYAMA, S. 1982. Yield and mineral content of grain in commercial sorghum hybrids. Sorghum Newsletter 25: 101.

The dry-ashed material of grain was analyzed by the colorimetric procedure for P and by the atomic absorption spectrometry for K and Mg. The grain yields of the ten hybrids (1580, Savanna 5, R 1090, GS 76 Y, 2884. 8311. NK 265, 8454, 828, E 59) out of 23 hybrids were more than 7 ton per ha. These 10 hybrids will be promising hybrids on acid-soil which is widely located in southwestern Japan. Total amount of P, K and Mg in grain of the promising hybrids were generally lower than that of the other 13 hybrids. P content in each of the promising hybrids was slightly lower than the sum of K and Mg. These tendencies were found more readily within maturity groups when the 23 hybrids were classified into three maturity groups.

1158 HUBBARD, J.D., LAI, F.S., MARTIN, C.R., MILLER, B.S.. and POMERANZ, Y. 1982. Amino acid composition on grain dusts. Cereal Chemistry 59(1): 20-22. 9 ref.

The amino acid compositions of wheat, corn, grain sorghum, soybeans, a wheat-corn mixture, and rice and of dusts from those grains were determined by automated ion-exchange chromatography. Protein content was 2-3% (dry basis) less in dust than in corresponding grains, except for soybeans, in which the protein content of dust was about 13% compared to about 41% in whole seeds. However, the concentration of lysine, the most limiting amino acid in most grains, was higher in each type of dust than in the parent grains, except soybean dust.

1159 ISHIN, A.G., and SUSLOVA, T.A. 1982, Amino acid composition of protein of grain sorghum.(Ru). Kukuruza 6: 30.

1160 LEUCERE J.N. 1982. Polyphenols in grain sorghum-chemistry and nutritional adversities of condensed tannins.Abstracts of papers of the American Chemical Society 183: 21.

The condensed tannins located in the testa and pericarp of bird-resistant sorghums comprise procyanidins. Analytical measurements show that low molecular weight forms of procyanidins are virtually absent beyond the "firm dough" stage of maturation. The literature indicates that the procyanidin polymers in mature sorghum seeds have an average molecular weight of 1700-2000. Consequences of tannin-protein interactions are responsible for growth inhibition of microorganisms and animals and inhibition of certain metabolic enzymes. Enzyme-tannin interactions are usually strong and apparently nonspecific. Tannins reduce the palatability, digestibility, and nutritional quality of sorghum foods and feeds. Complex formulations between tannins and digestive enzymes are dependent upon pH, ionic strength of environment, ratio of tannin to enzyme, and other factors. Both in vitro digestibility measurements and animal feeding studies indicate depressed biological value of sorghums containing high levels of tannins.

1161 MATHEWSON, P.R., FAHRENHOLZ, C.H., and POMERANZ, Y. 1982. Applicability of the colorimetric ' alpha-amylase assay to evaluate sprouted sorghum.Cereal Chemistry 59(2): 156-157. 3 ref.

A colorimetric alpha-amylase assay for evaluating sprout damage in sorghum is reported. A standard curve relating alpha-amylase content to absorbance at 620 nm was used to evaluate sorghums germinated in the laboratory. Increase in visual sprouting generally resulted in higher absorbance at 620 nm. The modified colorimetric procedure differentiated sound from visually sprouted sorghum and detected incipient damage.

1162 MCGRATH, R.M., KALUZA. W.Z., DAIBER, K.H.. RIET, W.B. VAN DER., and GLENNIE, C.W. 1982. Polyphenols of sorghum grain, their changes during malting and their inhibitory nature.Journal of Agricultural and Food Chemistry 30(3): 450-456. 16 ref.

An automated system for the detection of tannins is described. It uses the precipitation of bovine serum albumin (BSA), and this, in tandem with an automated detection of phenolic groups, has been used for the rapid investigation of four sorghum varieties. Two of the varieties were bird resistant and were distinguishable from the non-bird-resistant grains by the presence of a tannin fraction that precipitates protein. The noninhibiting fraction (F1) of all four varieties contained a large number of varied phenolics. During malting the roots and shoots developed a large complement of F1 polyphenols and the properties of the tannins changed. The ability of the grain to resist mold growth is related to polyphenol content; resistance was ascribed to the physical barrier set up by the tannin-containing tests. Formaldehyde treatment of whole grain reduced both the number of available phenolic hydroxyl groups in the tannin and its ability to precipitate BSA.

1163 NEUCERE, J.N. 1982. Lectins in grain sorghum (Sorghum bicolor (L.) Moench).Journal of

Agricultural and Food Chemistry 30: 603-604. 17 ref.

Five varieties of grain sorghum with different chemical compositions and seed structural characteristics were analyzed for lectin activity by hemagglutination tests. Three varieties showed inhibition of hemagglutination by N-acety - D-glucosamine and D-maltose. Lectins in the three varieties did not differentiate the A, B. and 0 human blood groups; however, minor differences in agglutination titers were observed. For high tannin sorghum, extractability of lectin was increased after meals were treated with hexane or methanol. Divalent cations enhanced the hemagglutination titer of lectins in two of the varieties.

1164 OGUNLELA, V.B., and OLOGUNDE, 0.0. 1982. Effect of nitrogen fertilization and plant density on sorghum grain nitrogen and crude protein contents.Sorghum Newsletter 25: 22-23. 2 ref.

Nitrogen and crude protein contents of sorghum grain, head: straw ratio, and protein yield as affected by nitrogen fertilization, plant population density, and cultivar are studied. Both total N and crude protein contents increased markedly as the rate of N fertilization was increased, reflecting CP increases of about 8 and 21% from applying 60 and 120 kg N/ha over no N, respectively. Increased protein content in sorghum grain resulting from N fertilization has been associated with a decrease in lysine and an increase in the prolamine fractions in the protein.

1165 0LEA, M.B. 1982. A dry process for the production of starch and protein fractions from legumes and cereals.M.Sc. thesis, University of the Philippines at Los Banos, College, Laguna, Philippines. 70 pp. 53 ref.

1166 PATEL, D.M., BHAPKAR, D.G., and PATIL, R.C. 1982. Qualitative analysis of free sugars in germinating seeds of sorghum.Sorghum Newsletter 25: 128.

Two gram seeds, each of CK 60A, IS 84, and its hybrid CSH-1, were taken for the experiment. The sugars were separated and studied qualitatively as per the method described by Partridge (1949). The data were collected from the seed before sowing, 48 and 96 hours after sowing from CK 60A, IS 84, and CSH-1. The intensity of sucrose increased two days after germination in all the three lines but decreased on the fourth day in the two parents and remained unaltered in their hybrid. Raffinose did not show variation and presence of maltose was doubtful in all the three lines. Glucose and fructose were traced initially in the female parent, but were not clear in the male and hybrid. Both increased in their amounts during germination and on the fourth day the hybrids contained amount equal to the higher containing parent.

1167 PATEL, D.M., BHAPKAR, D.G., and PATIL. R.C. 1982. Quantities of free amino acids during germination of seed in sorghum.Sorghum Newsletter 25: 128-129.

About two gm seeds each of CK 60A, IS 84, and their hybrid CSH-1 were taken and different amino acids were separated with the paper chromatographic method. The observations were recorded before sowing, 48 and 96 hours after sowing the seed, at College of Agriculture, Pune, India. The male parent (IS 84) initially contained more total amino acids than the female (CK 60A) but both were surpassed by the CSH-1. The two parents and their hybrid showed increased amounts of total amino acids during the four days of germination. CK 60A gave slightly higher total amino acids than the IS 84 at the end of the fourth day. Methionine and phenylalanine were absent in all the three lines. Proline was present in traces initially but disappeared during germination. Valine was initially absent but appeared in traces later in all the three lines. Arginine initially was absent in the parents but it was present in the hybrid.

1168 RING, S.H., AKINGBALA, J.O.. and ROONEY, L.W. 1982. Variation in amylose content among sorghums.Pages 269-279 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 14 ref.

An automated method of determining amylose content of sorghum endosperm and isolated starch based on the amylose-iodine blue complex, was applied to sorghum samples from the world collection. The mean apparent amylose content as a percentage of starch of sorghum endosperm was 22.0 for 567 normal sorghums. For 24 samples of sorghum grown at ICRISAT in India in 1979 and 1980, the mean amylose content was 23.1 and 27.4% from isolated starch and 22.2 and 24.9% of starch in ground endosperm. For 24 sorghums grown at Lubbock, Texas, USA, in 1979, the mean was 26.2 for amylose as a percent of isolated starch and 23.0 for amylose as a percent of starch in endosperm. In general, the amylose content was 2 to 3 points lower when amylose was expressed as a percentage of starch in pearled grain compared with isolated starch. The amylose content of sorghum was affected by environmental as well as genetic factors. In general, apparent amylose content appears to have less effect on cooking characteristics of sorghum than on those of rice.

1169 ROONEY, L.W., and MILLER, F.R. 1982. Variation in structure and characteristics of grain sorghum.(Es). Pages 180-222 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT. 22 ref.

1170 ROONEY, L.W., and MILLER, F.R. 1982. Variation in the structure and kernel characteristics of sorghum.Pages 143-162 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 22 ref.

The structure of the sorghum kernel plays a major role in determining the processing properties of the grain. Structure is affected by genotype and environmental conditions. Knowledge of kernel structure and its relation to grain quality can be utilized on a practical basis in field selection for sorghum quality. Considerable progress can be made by scrapping, cutting, and evaluation processing quality in the field by making a close examination of the kernels. The basic structure of sorghum kernels is described in sufficient detail using light, fluorescene, and electron microscopy to provide general information of use in crop improvement programs.

1171 VIDAL, J.. GODBILLON, G., and GADAL, P. 1982. Estimation of sorghum leaf phosphoenolpyruvate carboxylase protein using an immunoadsorbent column.Phytochemistry 21(12): 2829-2830. 24 ref.

The present work described a very simple technique for the isolation within 2-3 hours of inactive phosphoenolpyruvate carboxylase protein starting from a crude extract of sorghum leaves by using an immunoadsorbent column prepared with a glutaraldehyde-activated gel. The conditions for the total elution of the enzyme protein are optimized. For quantitative determinations cyanogen bromide-activated gels should avoided as the release of fixed immunoglobulin G (IgG) has been observed during washing with the acidic buffer needed to elute the enzyme. In that respect, glutaraldehyde-activated gel does not lose antibodies and consequently gives accurate results.

1172 WANKHEDE, D.B., and UMADEVI, S. 1982. Preparation and some physico-chemical properties of pyrodextrins of ragi, wheat, jowar and rice starches.Starke 34(5): 162-165. 18 ref.

1173 WOODHEAD, S., GALEFFI, C, and BETTOLO, G.B.M. 1982. P-hydroxybenzaldehyde as a major constituent of the epicuticular wax of seedling Sorghum bicolor.Phytochemistry 21(2): 455-456. 7 ref.

P-hydroxybenzaldehyde is present in concentrations upto 30% in the wax of sorghum seedlings. It is highly diterrent to locusts reducing their normal feeding by 90%.

POSTHARVEST OPERATIONS

1174 ALL INDIA COOR ICAR SCHEME POST HARVEST TECHNOL. 1982. Highlights of post harvest research in India 1972-1982.Bhopal, India: Central Institute of Agricultural Engineering. 40 pp.

This report includes sections on harvesting technology (rice, sorghum, Groundnut) cleaning and grading technology, drying technology, storage technology, shelling and decortication technology, and milling technology. Technology under research and ready for research is listed.

1175 BABU, M. 1982. Studies on solar heated air drying of hybrid sorghum (CSH-1) seed and the effect of drying parameters on seed viability.M.Sc. thesis. University of Agricultural Sciences, Bangalore, Karnataka, India. 86 pp.

The drying tests were conducted for four different seed loading weights of 50, 100, 150 and 200 kg at seed bed depths of 7, 14, 21, and 28 cm with initial moisture contents of 8.4, 8.8, 9.0 and 11.3% in 16, 16, 24 and 24 h, respectively. The moisture content obtained after drying was below the maximum moisture content of 12% (w.b.) fixed for certification of hybrid sorghum seeds. The drying rate was found to be higher initially upto about 14% moisture content and then decreased with increased drying time. The drying took place completely in falling rate period at all the initial moisture contents of 23, 21, 24 and 21%. The viability of hybrid sorghum seed was not affected by the solar heated air temperature, four levels of seed bed depth and four levels of initial moisture content used in the experiments.

1176 BRIDGES, T.C., WHITE, G.M., ROSS, I.J., and LOEWER, O.J. JR. 1982. A computer aid for management of on-farm layer drying systems.Transactions of the ASAE 25(3): 811-815. 12 ref.

An interactive computer model was developed to provide layer drying schedules for corn, milo or soybeans for the individual grain producer. The model utilizes ambient daily weather conditions as well as specific drying fans and drying bin diameters to determine layer volumes and drying times for the individual layers. The production of aflatoxin and model growth in the drying bin is taken into account in the determination of the drying schedules.

1177 BRUNELLO, G., and DONASCIMENTO CAO. 1982. The kinetics of sorghum grains drying in a mechanically stirred bed dryer.Pages 56-60 In Drying 1982. (ed. A.S., Mujumdar). Wahington, D.C., USA: Hemisphere Publ. Corp. (ISBN:0-89116-236~4).

1178 CHUNG, D.S., and DEYOE, C.W. 1982. Grain postharvest technology for developing countries.Pages 527-532 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

1179 DE FRANCISCO, A., SHEPHERD, A.D., HOSENEY, R.C., and VARRIANO-MARSTON, E. 1982. Decorticating pearl millet and grain sorghum in a laboratory abrasive mill.Cereal Chemistry 59(1): 1-5. 18 ref.

The decortication behavior of random mating populations of pearl millet and cultivars of grain sorghum was studied with Shepherd's modification of the Udy cyclone mill. Sorghum bran was removed in large flakes during decortication, and pearl millet bran was removed in smaller flakes. Neither sorghum nor millet was degermed during decortication. Millets grown in Sudan required less time to decorticate than Kansas-grown millets. Fractionation of the decorticate and the decorticated grain, using screens and a seed blower, indicated that differences in decortication rate were largely related to endosperm softness.

1180 DE FRANCISCO, A., VARRIANO-MARSTON, E., and HOSENEY, R.C. 1982. Hardness of pearl millet and grain sorghum.Cereal Chemistry 59(1): 5-8. 11 ref.

The hardness of various populations of pearl millet and cultivars of grain sorghum was determined by particle size analysis after the grains were milled on attrition and roller mills. Millets grown in Sudan were, in general, softer than Kansas-grown ones. However, kernel vitreousness did not parallel grain hardness as determined by particle size analysis. Furthermore, tempering either millet or sorghum before milling shifted the particle distribution to larger sizes compared with those of nontempered samples.

1181 DE FRANCISCO, A., VARRIANO-MARSTON, E., and HOSENEY, R.C. 1982. Hardness of pearl millet and sorghum.Pages 242-250 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 12 ref.

The hardness of grain from six populations of pearl millet and three cultivars of sorghum was determined by particle size analysis after milling the grains on attrition and roller mills. Millets grown in Sudan were, in genral, softer than those grown in Kansas. However, kernel vitreosity did not parallel grain hardness as determined by particle size analysis. Furthermore, tempering either millet or sorghum before milling shifted the particle distribution to larger sizes compared with nontempered samples.

1182 DESIKACHAR, H.S.R. 1982. Pearling and milling studies on sorghum.Pages 194-199 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 8 ref.

Removal of bran from sorghum is highly desirable to increase its palatability and versatility for culinary use. It was found that short-period moist conditioning of grain with 2-3% moisture enables removal of the bran by an abrasive machine similar to that used in rice milling. For soft-endosperm sorghums, the moist conditioned grain can be ground in a plate grinder and the major proportion of bran can be eliminated by sieving. Illustrative data are provided to relate the effect of polishing to the nutritive value of sorghum. Overmilling is to be avoided as this results in depletion of nutrients from the grain.

1183 DETHE. M.D., DHARNE, P.K.. and KALE, V.D. 1982. Studies on deterioration of grains of sorghum hybrids in storage in Maharashtra.Journal of Maharashtra Agricultural Universities 7(1): 98-99. 5 ref.

1184 DEV, D.K., SATWADHAR, P.N., and INGLE. U.M. 1982. Effect of variety and moisture on certain selected physical properties of sorghum grain.Journal of Agricultural Engineering 19(2): 43-48.

1185 EGGUM, B.O., BACH KNUDSEN, K.E.. MUNCK, L.. AXTELL, J.D., and MUKURU, S.Z. 1982. Milling and nutritional value of sorghum in Tanzania.Pages 211-225 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 25 ref.

Three consecutive hand decortications of the hard local low-tannin varieties produced 73-83% four of light color that was acceptable to Tanzanian villagers. To obtain the same color the new agronomically improved, but softer low-tannin varieties (e.g.. Lulu) required four decortications, and even so flour yield was reduced to about 50%. The digestibility of protein and energy of whole unprocessed sorghum flour was in the same range as that of other food cereals, whereas the biological value was lower in sorghum grain due to a low lysine content. Decortication of the whole kernel had a positive effect on protein and energy digestibility, whereas the biological value was reduced due to a 40% reduction in lysine. The cooking procedure used had a moderately negative effect (5-8%) on digestibility, while the lysine content and the biological value were unaffected. It is concluded from the present work that food prepared from low-tannin sorghum is digested to the same extent as food from other cereal grains.

1186 HAQUE, E., AHMED, Y.N., and DEYOE, C.W. 1982. Static pressure drop in a fixed bed of grain as affected by grain moisture content.Transactions of the ASAE 25(4): 1095-1098. 12 ref.

Description is given of a model developed for calculating change in resistance to airflow in stored maize cobs and sorghum or wheat grain at various initial moisture content.

1187 HOOK, K.T., DIEHL, K.C., KUNZE, O.R.. SWEAT, V.E., and FAUBIAN, J.M. 1982. Fracture energy of sorghum kernels as affected by temperature, moisture and loading rate.Paper, American Society of Agtricultural Engineers 82-3549: 17 pp. 16 ref.

1188 JAMES, A.W. 1982. Sorghum and millet development, Kenya: processing of sorghum and millet.Rome, Italy: FAO. 55 pp.

1189 KIRLEIS, A.W., and CROSBY, K.D. 1982. Sorghum hardness: comparison of methods for its evaluation.Pages 231-241 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 19 ref.

Sorghum grain hardness measurements were made with six different procedures on a set of 15 cultivars covering a range of grain hardness. A comparison of the methods showed that the particle size index and pearling index procedures provide a rapid and sensitive measure of the physicomechanical properties of sorghum, related to grain hardness. A multiple linear regression analysis revealed that the abrasive-milling performance of sorghum is related to all the hardness parameters investigated. In addition, the analysis indicated that kernel size had an effect on the milling performance. Cultivars with vitreous or hard endosperm texture yielded better pearling results than those with a floury or soft endosperm. Sorghum grain with large kernel size appears to have better pearling properties than grain with small kernels, given the same endosperm hardness.

1190 MAHAJAN. R.B., KULKARNI, L.P., and SOLANKE, R.B. 1982. Effect of drying methods and initial moisture content on sorghum seed during storage.Sorghum Newsletter 25: 54-55.

This study was undertaken to determine the effects of seed initial moisture content after physiological maturity in sorghum grain at the time of harvesting and drying methods on the quality of seed as measured by germination.

1191 MCDONALD. D., and MEHAN, V.K. 1982. Post harvest programme in ICRISAT.Paper presented at the Workshop on Post Harvest Losses and Small Farmer Storage for South Asia and ECS Africa, 19-24 April 1982, New Delhi, India. 14 pp. 7 ref.

1192 MERTENS. A. 1982. Contribution to the study of on-farm storage of foodstuffs in Burundi: changes in amounts of food stored and variability over time of socio-economic parameters for three agro-ecological areas.(Fr). Bujumbura, Burundi: Institut des Sciences Agronomiques du Burundi, Ministere de 1'Agriculture et de l'Elevage. 274 pp. 31 ref. (Summaries:De, En, Es).

1193 MUNCK, L.. BACH KNUDSEN, K.E.. and AXTELL, J.D. 1982. Milling processes and products as related to kernel morphology.Pages 200-210 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 10 ref.

A new industrial-milling process was devised on the basis of experience gained from traditional hand-decortication studies on sorghum. This system yields 80% flour at the same or higher level of whiteness as the traditional system. Grain structure of sorghum was studied in relation to decortication performance, using an abrasive dehuller. The problem of relating laboratory-milling data to large-scale milling is discussed. It is concluded that the hardness of sorghum grain determines the flour color and yield of the traditional-decortication products as well as the products from the abrasive dehullers. In the new industrial-millingsystem, moderately hard and semisoft varieties like Lulu-D can be used with good results, whereas hand pounding and abrasive milling require hard seed. Implementation of this new milling technique will render the soft endosperm, high-yielding types of sorghum useful for industrial milling.

1194 MUNCK, L., KNUDSEN, K.E.B., and AXTELL, J.D. 1982. Industrial milling of sorghum for the 1980s.Pages 565-570 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 4 ref.

1195 RAVE. S.G., and KANAWADE, L.R. 1982. Critical temperature for drying sorghum earheads.Journal of Maharashtra

Agricultural Universities 7(2): 134-135. 5 ref.

Critical temperature of drying is one of the important factors affecting quality of seed. An experiment was, therefore, conducted by subjecting CSH 8 R earheads with different initial moisture contents to varying heating air temperatures. The samples taken at various intervals were analysed for their germination. It was observed that temperature upto 50 deg C can be employed for drying sorghum earheads.

1196 REICHERT, R.D. 1982. Sorghum dry milling. Pages 547-563 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 54 ref.

1197 REICHERT, R.D., YOUNGS, C.G., and OOMAH, B.D. 1982. Measurement of grain hardness and dehulling quality with a multisample tangential abrasive dehulling device (TADD). Pages 186-193 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P.. India: ICRISAT. 16 ref.

Mechanical dehulling on an industrial- or village-scale is usually accomplished by the action of vertically- or horizontally-mounted abrasive disks. A tangential abrasive dehulling device (TADD) was constructed to simulate the action of these large-scale dehullers. A carborundum stone or resinoid disk, mounted horizontally beneath 5 to 12 sample cups, provides the abrasive action. Advantages of this unit include its multisample capability, high reproducibility, minimal maintenance requirements, and convenience. Two parameters are determined with the aid of the TADD. The abrasive hardness index (AHI) is defined as the time in seconds required to abrade 1% by weight of the kernel. Secondly, the extraction rate is a measure of the percent by weight of the kernel that can be recovered as acceptable flour. Flour color was used to determine the extraction rate. These parameters showed wide variation for 31 nontesta sorghum varieties. The AHI was significantly correlated with other measures of grain hardness.

1198 SCHUUMAN, C., and PARNELL, C.B. 1982. Characterization of secondary grain dust explosions. Paper, American Society of Agricultural Engineers 82-3581, 22 pp. 6 ref.

Analysis of explosion tests on different fractions of sorghum, rice, wheat, maize and soyabean dusts indicated that the explosion characteristics of dust are dependent upon ash content and particle size distributions.

1199 SHEPHERD, A.D. 1982. Assaying for sorghum milling quality with a laboratory decorticating mill. Pages 175-185 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 4 ref.

A laboratory decorticating mill produced by modifying a UD cyclone sample mill has been tried as a test instrument for assaying the milling quality of sorghum. A fixed set of mill variables and milling conditions for decortication were selected experimentally and maintained throughout the testing. Milling quality is related to the weight removed from the grain in the standard test. Lower weight removal indicates better milling quality. An average of 99% of the sample was recovered as the two mill fractions over the 2-year test period. Coefficient of variation of unadjusted weight removed was less than 8%. A definite year effect was found. Milling quality (1.523%

removed) was better in 1980 than in 1979 (1.845% removed). It is projected that the standard milling can be done repetitively every 90 sec. On this basis, 40 assays per hour are possible. Refined determination of milling quality is possible but at a substantially slower rate. Several other possible uses for the mill are pointed out.

1200 SHEPHERD, A.D. 1982. Facsimile of WRRC laboratory decorticating mill. Sorghum Newsletter 25: 102.

1201 S0P0NR0NNARIT, S.. and PEYRE, A. 1982. Low temperature sorghum drying in the south of France. Pages 375-384 In Proceedings, Third International Drying Symposium Vol. 1 (ed., J.C., Ashworth). Wolverhampton, UK: Drying Research Ltd. 12 ref.

1202 STEWART, B.A. 1982. Technology and development: the case of a millet processing factory in Zinder, Niger. Journal of African Studies 9(2): 83-88.

Evaluates a new technology for the processing of millet and sorghum and finds inadequate pre-project assessment work.

1203 ZACAPA MEJIA, R.A. 1982. Storage of small quantities of food grains.(Es). Thesis, Universidad Nacional Autonona de Honduras, Teguigalpa. Centro Universitario Regional del Litoral Atlantico. Carrera de Ciencias Agricolas. La Ceiba, Honduras. 50 pp. 7 ref.

1204 ZHANG, G.L., XU, B.Z., LI, Y.H., XUE, L.S., YE, Z.X., and SHEN, Z.C. 1982. Effect of pesticides on stored seeds quality.(Ch). Grain Storage (Liangshi Chucang) 3: 11-16, 55. 9 ref.

Laboratory tests in Zhejiang revealed that bromophos, fenitrothion, pirimiphos-methyl and malathion at less that 30 p.p.m. had no significant effect on the germination of sorghum, rice, wheat, maize, and barley. Among the 4 pesticides for the 5 crops the safe dose was bromophos followed by fenitrothion, pirimiphos-methyl and malathion.

SEEDS AND SEED PRODUCTION

1205 BASAVARAJU, G.V., and BOMMEGOWDA, A. 1982. Hybrid seed production studies in CSH-6 sorghum. Sorghum Newsletter 25: 6-7.

1206 CHOPRA, K.R. 1982. Sorghum seed production and distribution. Pages 499-505 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

1207 CHOPRA, K.R. 1982. Technical guidelines for sorghum and millet seed production. Rome, Italy: FAO. 110 pp. 27 ref. (ISBN 92-5-101259-8).

1208 CLARA VALENCIA, R. 1982. Criteria for the production of hybrid sorghum seed.(Es). Pages 76-82 In Third regional seed meeting at the twenty eighth annual meeting of the Central American Cooperative Program for Food Crops Improvement, PCCMCA. San Jose, Costa Rica: IICA. 3 ref. (No. 268).

1209 GRAND-PIERRE, C. 1982. Final report on grain experimental work in Brumdec (Contract D.Kingston, Jamaica: IICA. (No. 352).

1210 HONDURAS: SECRETARIA DE RECURSOS NATURALES. 1982. Norms and general procedures related to seed production and certification.(Es). Tegucigalpa, Honduras: Secretaria de

Recursos Naturales, IICA. 95 pp.

UTILIZATION

Feeds

1211 AMERIO, M., SANTI, E., CERIOLI. C, and FIORENTINI, L. 1982. Nutritive value of sorghum grain: research on the possibility of increasing sorghum value at medium tannin level.(It). Annali della Facolta di Agraria - Universita Cattolica del Sacro Cuore 22(2): 271-284. 27 ref. (Summary:En).

Preliminary trials were carried out to increase the nutritive value of grain sorghum. Wet sorghum grain was ensiled in small silos with sodium hydroxide, ammonium hydroxide or formaldehyde. Tannin level, protein digestibility in vitro, and rumen degradability of proteins were reduced by formaldehyde treatment.

1212 ANDERSON, G.D., and RICHARDSON, C.R. 1982. Site and extent of digestion in growing steers fed dry rolled or steam flaked grain sorghum pre conditioned with sodium hydroxide.Journal of Animal Science 55(suppl. 1): 403-404. (Abstract).

1213 ANDERSON, G.D.. and RICHARDSON, C.R. 1982. The effects of commercial grain conditioners fungal enzyme preparations or sodium hydroxide on wetting rate and in-situ digestibility of corn and grain sorghum.Journal of Animal Science 55(suppl. 1): 24. (Abstract).

1214 ANDRADE, N. DE O., and NUCCI, T.A. DE. 1982. Silage.(Pt). Casa da Agricultura 4(2): 18-21. 6 ref.

Among the forage species use in Brazil, sorghum, maize and elephant grass are considered outstanding for silage. Silage making, silage types and nutritive value of silage from these species is described.

1215 ANDRES, G.E., and RUGERONI, P.M. 1982. Nutritive value of maize and sorghum grain for bovines.(Es). Thesis, Universidad de Buenos Aires, Facultad de Agronomia. Buenos Aires, Argentina. 17 pp. 21 ref.

1216 AZAMBUJA, V.E.R. DE,. and PEIX0T0, R.R. 1982. Study of liquid artificial diets and comparative value of sorghum and maize in feeding early weaned Holstein calves.(Pt). Revista da Sociedade Brasileira de Zootecnia 11(3): 529-557. 8 ref. (SummaryrEn).

1217 AZPIROZ COSTA, M.A. 1982. Effect of processing and supplementation levels on the sorghum grain digestibility.(Es). Thesis, Universidad de Buenos Aires, Facultad de Agronomia, Buenos Aires, Argentina. 8 pp. 20 ref.

1218 BART0V,I.. PASTER, N., and LISKER, N. 1982. The nutritional value of moldy grains for broiler chicks.Poultry Science 61(11): 2247-2254.

The moldy grains did not contain aflatoxin Bl, ochratoxin A, patulin, sterigmato cystin or zearalenone. Storage of whole or ground grains or of moistened whole corn did not result in differences in their fat content, in the metabolizable energy (ME) of the diets containing these grains, or in the performance of chicks fed these diets, but moistened whole sorghum affected performance adversely. Fat content in moistened ground grains decreased markedly during storage, but fatty acid ratios, vitamin E, carotene, xanthophyll, and protein levels were not markedly affected. These ground moldy grains reduced the dietary fat level during the 3 weeks of the feeding period in two out of three experiments and significantly (P1/2.05) lowered ME values and depressed performance. Soybean oil supplementations to diets containing these grains increased dietary ME values and partially or completely restored performance.

1219 BAXTER, H.D., OWEN, J.R., and MONTGOMERY, M.J. 1982. Comparison of soybean grain sorghum silage with corn silage for lactating dairy cows.Journal of Dairy Science 65(suppl. 1): 215. (Abstract).

1220 BONNEFOY., DID1ER., and HEBRARD. 1982. Use of whole sorghum plant silage for the fattening of young bulls. Comparison between two varieties of sorghum.(Fr). Paris, France: Institut Technique de l'Elevage Bovin. 24 pp.

1221 BUENR0STR0, J.L., and KRATZER, F.H. 1982. Use of plasma and egg yolk biotin in white leghorn hens to assess biotin bio availability from feedstuffs.Poultry Science 61(7): 1427-1428.

1222 CACERES, O., and GARCIA. T.R. 1982. Nutritive value of tropical forages. 2. Sorghum bicolor.(Es). Pastos y Forrajes 5(1): 95-105. 16 ref. (Summary:En).

The nutritive value of sorghum was determined in four trials, with mole sheeps in different seasons and ages with fertilization levels of 60 kg N/ha/cut. The trials were made continuously with 7-10 days of adaptation and 5 days for measurement. The dry matter intake decreased from 60 to 50 g/kg W0,75 when the age increased from 35-49 to 63 days. The calculated potential of milk production was greater than 10 kg in the 35-36 days and decreased abruptly with age greater than 56 days. The results obtained showed that from 42 to 56 days, were the most appropriate age to cut the forage.

1223 CANEQUE, V., and UBILLA. E. 1982. Popped sorghum grain for feeding beef cattle.(Es). Anales del Instituto Nacional de Investigaciones Agrarias. Serie Ganadera 15: 25-30. 13 ref. (Summaries:En, Fr).

1224 CANEQUE, V., and UBILLA, E. 1982. Popped sorghum grain for feeding sheep.(Es). Anales del Instituto Nacional de Investigaciones Agrarias Serie Ganadera 15: 31-37. 13 ref. (Summaries:En, Fr).

1225 CARDOSO, R.M., SILVA, J.F.C. DA., MELLO, R.P. DE.. and MOTTA, V.A.F. DA. 1982. Milk production of cows fed with sorghum silage with addition of brewers yeast.(Pt). Revista da Sociedade Brasileira de Zootecnia 11(1): 38-45. 6 ref. (Summary:En).

1226 CARIDE, J., and DE WINNE, G. 1982. Effect of grinding on the sorghum grain digestibility supplied at different levels.(Es). Thesis, Universidad de Buenos Aires, Facultad de Agronomia, Buenos Aires, Argentina. 20 pp. 27 ref.

1227 CARRIGAN, M.J., and GARDNER, I.A. 1982. Nitrate poisoning in cattle fed sudax (Sorghum sp. hybrid) hay.Australian Veterinary Journal 59(5): 155-157. 14 ref.

Deaths in cattle fed sudax hay were attributed to nitrate poisoning. Seventy-three animals out of 157 cattle died after being fed the hay, and 11 of the surviving cows aborted in the next 6 days. Toxicological findings supported this diagnosis with samples of sudax hay containing upto 3.1% nitrate on a dry matter basis.

1228 CHIDICHIMO, H.O., ASBORNO, M.D., and SISTERNA, M.N. 1982. Grain sorghum: grain decay.(Es). Informacion Agropecuaria 5(26): 14-22. 16 ref.

1229 CLARK, A.K., and RAKES, A.H. 1982. Effect of methionine hydroxy analog supplementation on dairy cattle hoof growth and composition.Journal of Dairy Science 65(8): 1493-1502.

Fifty lactating Holstein cows were assigned randomly to one of two treatments, control and control plus approximately 30 g methionine hydroxy analog, and confined on concrete for 11 mo. The control diet consisted of sorghum silage and concentrate fed as a blended ration. Sulfur contents of dry matter were .12% and .16% for control and methionine hydroxy analog rations. Hoof growth and hardness were measured on front and rear right abaxial claws in the dorsal and lateral regions. Hoof growth rates were measured for four periods; summer-fall, fall-winter, winter-spring, and spring-summer, each 70 to 90 days. Cows fed methionine hydroxy analog had less cysteine and proline in hoof than control cows and greater percentages of methionine lysine, tyrosine, and glutamic acid. These results suggest that a decrease of disulfide bonding occurred in the hoof tissue of cows fed methionine hydroxy analog. Cows fed methionine hydroxy analog produced more actual milk, milk fat, and 4% fat-corrected milk during 180 days than did control cows.

1230 COUSIN, B.W. 1982. Sorghum for swine.(It). Selezione Veterinaria 24(8): 1186.

1231 CRENSHAW, J.D., PEO, E.R. JR., and LEWIS, A.J. 1982. Sorbic-acid as a mold inhibitor in high moisture sorghum grain diets fed to weanling pigs.Journal of Animal Science 55(suppl. 1): 267. (Abstract).

1232 CUARON, J.A., CHAPPLE, R.P., and EASTER, R.A. 1982. Effect of lysine and threonine supplementation of a sorghum based diet on nitrogen balance and immunological response of gravid swine.Journal of Animal Science 55(suppl. 1): 268-269. (Abstract).

1233 ELY, L.O.. and MOON, N.J. 1982. Inoculation of alfalfa corn sorghum and wheat silages with Lactobacillus plantarum.Journal of Dairy Science 65(suppl. 1): 142. (Abstract).

1234 ELY, L.O., MOON, N.J., and SUDWEEKS, E.M. 1982. Chemical evaluation of Lactobacillus addition to alfalfa, corn, sorghum and wheat forage at ensiling.Journal of Dairy Science 65(6): 1041-1046. 19 ref.

Fifty-five kilograms of fresh forage of alfalfa, corn, sorghum, or wheat were ensiled in .21-m3 steel drums lined with plastic. Treatments included addition of dry Lactobacillus acidophilus and Candida species at 5 g/kg fresh forage. Control and inoculated drums for each crop were opened on days 1, 2, 4, 8, 16, and 32 after filling. Samples were analyzed for pH, dry matter, proximate analysis, neutral detergent fiber, acid detergent fiber and lignin. Alfalfa, corn, and sorghum silages had recoveries of atleast 90% for all nutrients. There was no difference between control and inoculated silages for nutrient recoveries. Silages were fed to mature wether sheep at 2% of body weight. No difference from inoculation was significant. Data showed no advantage of addition of L. acidophilus and Candida species to crops at ensiling.

1235 FERNANDEZ, J.A., COPPOCK, C.E. and SCHAKE, L.M. 1982, Effect of calcium buffers and whole plant processing on starch digestibility of sorghum based diets in Holstein cows.Journal of Dairy Science 65(2): 242-249. 18 ref.

In 48 digestion trials, Holstein cows randomly were assigned to one of four diets formulated to contain .75, 1.00, 1.25, and 1.50% calcium in complete rations of 35:65 ratio of forage to concentrate, dry basis. In experiment 1, forage was sorghum-sudan hay; in experiment 2, sorghum silage. In experiment 3, three methods of whole plant processing for grain sorghum silage were compared: (a) whole plant conventional chop, (b) same material grain rolled prior to ensiling, and (c) regrowth with grain rolled prior to ensiling. Starch and energy digestibility were highest in silages from regrowth harvested sorghum. This study provides evidence that suggests additional calcium carbonate and plant processing increase starch digestibility in sorghum based diets fed to lactating dairy cows.

1236 FOWLER. M.E. 1982. Sorghum poisoning.Modern Veterinary Practice 63(1): 9.

1237 GARDINER. E.E.. MAJOR. D.J.. and DUBETZ. S. 1982. Substitution of sorghum for wheat in diets for laying hens.Canadian Journal of Animal Science 62(1): 305-306. 8 ref. (Summary:Fr).

The effects of substituting various levels of sorghum for wheat in diets for laying hens were studied. Egg production, egg weight, feed consumption. body weight and hatchability of eggs from Single Comb White Leghorn hens were not affected by the proportion of sorghum in the diet.

1238 GARG. A.K.. KHAN. M.Y.. and JOSHI. D.C. 1982. Nutritive evaluation of Pusa Chari fodder varieties as sources of energy for ruminants. 2. Pusa Chari 1 and 6 (Sorghum bicolor Lin. Moench).Indian Journal of Nutrition and Dietetics 19(7): 225-228. 6 ref.

Pusa Chari fodder varieties 1 and 6 cut at the pre-flowering stage, showed respectively 9 and 10% crude protein and the voluntary intake of the two fodders by adult rams was 75.4 g DM/kg W0.75 (3.27 kg DM/100 kg BW). The different energy values of the two fodders, as determined by bomb calorimetry and also by the rostock equations, in general showed a fairly close agreement. The intake of ME by rams from Pusa Chari 1 and 6 worked out to 170.6 and 165.6 kcal/kg W0.75 respectively which was appreciably higher than the maintenance allowance recommended by the ARC6. The DCP content in the two fodders was about 47 g/kg DM. The supply of calcium and phosphorus was alo satisfactory.

1239 GARREN. J.B.. KNABE. D.A.. and TANKSLEY. T.D. JR. 1982. Evaluation of digestible lysine in formulating growing swine diets.Journal of Animal Science 55(suppl. 1): 271-272. (Abstract).

1240 GOUS. R.M.. KUYPER. M.A.. and DENNIS0N. C. 1982. The relationship between tannic acid content and metabolizable energy concentration of some sorghum cultivars.South African Journal of Animal Science 12(1): 39-44. 11 ref.

The apparent and true metabolizable energy concentrations of 22 cultivars of sorghum grains, differing in their tannic acid content, were determined by feeding samples of the different varieties to adult roosters. A highly significant negative correlation was found to exist between the M.E. of the grain and its tannic acid content, this relationship being due to a decreased digestibility with increasing tannic acid concentration. This finding is discussed in relation to the possible causes of such reduced digestibility, means by which the adverse effects of tannic acid can be reduced, and the importance of determining the tannic acid content of sorghum grains destined to be fed to non-ruminants.

1241 GUPTA. S.K.. and ARORA. A. 1982. Development of jowar-soybean-skim milk based weaning food.Indian Journal of Dairy Science 35(1): 62-67.

1242 GUTIERREZ. G.G.. SCHAKE, L.M.. and BYERS, F.M. 1982, Whole plant grain sorghum silage processing and lasalocid effects on stocker calf performance and rumen fermentation.Journal of Animal Science 54(4): 863-868. 24 ref.

Two silage treatments and three concentrations of lasalocid (0, 33 and 49 ppm) were examined in a 100-d growth trial. Lasalocid at 33 ppm depressed feed intake of steers without affecting weight gain and, therefore, improved feed efficiency. Lasalocid at 49 ppm did not improve feed conversion over that observed in controls. Both concentrations of lasalocid increased rumen propionic acid and decreased acetic acid levels. Lasalocid did not affect ruminal concentrations of isobutyric, valeric or isovaleric acids. Dry matter intake and animal weight gain in the growth trial were greater for steers fed the nonprocessed whole plant grain sorghum silage (NPS) with grain in the whole form than for those fed processed silage (PS) with the grain rolled before ensiling. In a digestion trial, post-ensile rolling of the grain and stover of whole plant grain sorghum silage increased (P 1/4 .05) in vivo starch digestion above levels observed for PS or NPS silages. Digestibilities of dry matter, organic matter, crude protein and acid detergent fiber were similar for all silage treatments.

1243 HART, S.P. 1982. Digestibility of sorghum silage harvested at three cutting heights.Pages 85-87 In Research Report, Agricultural Experiment Station, Oklahoma, USA. (No. 824).

1244 HEIDKER, J.I., BEHNKE K.C., BOLSEN, K.K., and ILG, H.J. 1982. Time interval chemical changes in high moisture sorghum grain treated with molasses and Sila-bac.Journal of Animal Science 55(suppl. 1): 428. (Abstract).

1245 HEIDKER. J.I., ILG, H., BEHNKE, K., and BOLSEN, K. 1982. Sila-bac and molasses additives for high moisture sorghum grain.Pages 36-41 In Cattleman's day '82: report of progress, 413. Manhattan, Kansas, USA: Kansas State University.

Sila-bac, molasses, or both combined were evaluated as additives for ensiled high moisture sorghum grain. Control grain had the greatest increase in temperature during ensiling. Grain treated with Sila-bac had the highest Lactobacilli count but control grain had the fastest drop in pH. Sila-bac grain was the most stable in air and remained stable for 30 days. Control grain was stable for 21 days; grain treated with molasses or molasses plus Sila-bac was stable until day 5. Group-fed steers receiving Sila-bac grain gained faster and were more efficient than steers fed control or molasses-treated grain. Individually fed steers gained fastest when receiving molasses treated grain. Those receiving Sila-bac grain were the most efficient.

1246 HEMKEN, R.W., LANE, G.T., O'LEARY, J.. DOUGHERTY. C.T.. EVANS, J.K., and BITZER, M.J. 1982. Production and use of soybeans and milo for silage.Progress report Kentucky Agricultural Experiment Station, Lexington, Kentucky, USA. 5 pp. (No. 264).

1247 HIBBERD. C.A. 1982. Varietal, environmental and processing effects of the nutritive characteristics of sorghum.Ph.D. Thesis, Oklahoma State University, Oklahoma, USA. 133 pp.

1248 HIBBERD, C.A., WAGNER, D.G., and HINTZ, R.L. 1982. Effect of length of reconstitution on the chemical composition and in vitro digestibility of sorghum grain.Pages 184-188 In Animal Science Research Report, Oklahoma Agricultural

Experiment Station, Oklahoma, USA. (No. MP-112).

1249 HIBBERD, C.A.. WAGNER, D.G., and HINTZ, R.L. 1982. Effect of stage of maturity on the chemical composition and in vitro digestibility of sorghum grain. Pages 178-183 In Animal Science Research Report, Oklahoma Agricultural Experiment Station, Oklahoma, USA. (No. MP-112).

1250 HIBBERD, C.A., WAGNER, D.G., GRIFFIN, D.D., and HINTZ, R.L. 1982. Effect of variety and reconstitution on the site and extent of starch and protein digestion of sorghum grain. Journal of Animal Science 55(suppl. 1): 429. (Abstract).

1251 HIBBERD, C.A., WAGNER, D.G., HINTZ, R.L., and WEIBEL, D.E. 1982. Effect of additional nitrogen fertilization on sorghum grain composition and relative digestibility. Journal of Animal Science 55(suppl. 1): 429-430. (Abstract).

1252 HIBBERD, C.A., WAGNER, D.G., SCHEMM, R.L., MITCHELL, E.D. JR., HINTZ, R.L., and WEIBEL, D.E. 1982. Nutritive characteristics of different varieties of sorghum and corn grains. Journal of Animal Science 55(3): 665-672. 17 ref.

Nine varieties of sorghum grain, differing in endosperm type (waxy, normal or floury) and bird resistance, and four varieties of corn were evaluated for chemical composition, in vitro dry matter disappearance (IVDMD) and in vitro gas production (IVGP). Crude protein (CP) content of sorghum ranged from 11.1 to 16.5% and starch content from 61.9 to 83.0'%. Bird-resistant (BR) sorghum (brown testa) generally contained high tannin levels. The corn varieties showed slightly higher IVDMD than the sorghums. IVDMD of waxy sorghums was similar to or slightly higher than that of normal sorghums in all 3 years; however, IVDMD of both varieties was more similar to that of corn than to that of BR sorghum. Certain varieties or types of grain sorghum appear to be more similar to corn in composition, IVDMD and IVGP than do other types. Furthermore, the wide range in IVDMD and IVGP observed among these sorghums suggests that the wide variation in feeding value among grain sorghums may be due, in part, to variety or type.

1253 HIBBERD. C.A., WAGNER, D.G., SCHEMM, R.L., MITCHELL, E.D. JR., WEIBEL, D.E., and HINTZ, R.L. 1982. Digestibility characteristics of isolated starch from sorghum and corn grain. Journal of Animal Science 55(6): 1490-1497. 20 ref.

Purified starch was isolated from nine varieties of grain sorghum differing widely in seed and endosperm characteristics and from four varieties of corn. Six-hour in vitro dry matter disappearance (IVDMD) values were similar (P 1/2 .05) for most purified, isolated varietal starches in year 1 and 2. In year 3, however, IVDMD of one waxy starch was higher (P 1/4 .05) than that of starch isolated from a bird-resistant sorghum. Likewise, overall mean 6-hours IVDMD values were nearly identical for all sorghum and corn starches. In vitro gas production (IVGP), a procedure utilizing amyloglucosidase and commercial baker's yeast to assess susceptibility of the isolated starch to enzymatic degradation, was higher (P 1/4 .05) for sorghum starch than for corn starch in both year 1 and 2. Among sorghum types, isolated waxy starch (high in amylopectin) generally gave higher IVGP values than nonwaxy starches. Some differences in IVGP between nonwaxy starches were apparent, suggesting that other factors, such as granule size or chain length, may affect starch degradation.

1254 HINDS. M.. BRETHOUR. J.. BOLSEN. K.. and ILG. H. 1982, Inoculant and urea-molasses additives for forage sorghum silage.Pages 11-15 In Cattlemen's day '82: report of progress. 413. Manhattan. Kansas. USA: Kansas State University.

An inoculant (Sila-bac) and a non-protein nitrogen (LSA-100) silage additive were evaluated with whole-plant, forage sorghum silage. Sila-bac silage had the fastest temperature rise and peaked at 10 deg C above its initial temperature. LSA-100 silage had a slow, steady temperature rise and reached a maximum of 22 deg C above its initial. Control silage peaked at 15 deg C above its initial. Steers fed LSA-100 silage gained 7 to 9% faster than did those fed control or Sila-bac silages. LSA-100 silage was consumed in greatest amount; Sila-bac silage, in the least. The two additives improved feed efficiency by 3% over the control. Both additives improved aerobic stability; control silage heated after 3 days; Sila-bac and LSA-100 after 7. Dry matter recovery from the stave silos was similar for control (78.1%) and LSA-100 silages (77.3%). but higher for Sila-bac silage (81.2%). When fermentation, storage, and feedout losses were combined with steer performance, pounds of gain per ton of ensiled forage were 88.8 for Sila-bac. 84.5 for LSA-100. and 82.6 for control silages.

1255 HORN. G.W.. BURROWS. G.E.. and LUSBY. K.S. 1982. Effect of yeast culture on nitrate toxicity of lambs and steers fed high-nitrate sorghum-sudan hay.Oklahoma Agricultural Experiment Station Miscellaneous Publication 112: 58-66. 7ref.

1256 HORTON. J.M.. RICHARDSON. C.R., and HUTCHESON, D.P. 1982. Effect of source and level of calcium carbonate on in vitro dry matter digestibility.Journal of Animal Science 55(suppl. 1): 431-432. (Abstract).

1257 HULAN. H.W.. and PROUDFOOT. F.G. 1982. Nutritive value of sorghum grain for broiler chickens.Canadian Journal of Animal Science 62(3): 869-875. 23 ref. (Summary:Fr).

Sorghum grain (SG) contained more crude protein (103.5 g/kg) and ash (17.0 g/ka) but less crude fiber (17.7 g/kg) and total lipid (22.6 g/kg) than corn. The SG contained 0.37% + or - 0.02 tannin, had a higher apparent metabolizable energy value than corn or wheat and contained all of the amino acids considered essential for chickens at levels in general between those of corn and wheat. Two experiments were carried out to ascertain the nutritive value of SG as a partial replacement for corn and wheat in practical poultry diets using 320 male and 320 female Cobb chicks in each. Starter (finisher) diets fed from 0-21 days (22-42 days) contained the following levels of SG: 15(19); 30(39); 45(58)%. The diets were isoenergic and isonitrogenous. The inclusion of upto 45% SG in the starter diet and upto 58% in the finisher diet had no significant effect on mortality. live body weight, feed conversion or percentage of grade A carcasses.

1258 J0RGENSEN. L.M. 1982. Sorghum: its harvesting and fceding.Feedlot Management 24(10): 32-34.

1259 JOSHI, D.C.. GARG. A.K.. and KHAN.M.Y. 1982. Nutritive evaluation of Pusa Chari fodder varieties as sources of energy for ruminants. 1. Pusa Chari - 23 (Sorghum bicolor X Sorghum sudanense).Journal of Veterinary Physiology and Allied Sciences 1(1): 15-18. 4ref.

1260 KANIOK, R., ROZYCKA, B.. and WEZYK, S. 1982. Comparison of the nutritive value of American yellow sorghum grain no. 2 and Argentinian sorghum for laying hens.(P1). Przeglad Naukowj Literatury Zootechniczne 28(1-2): 334-341.

1261 KARAN, P.K. 1982. The effect of fibre modification in sorghum silage on chemical composition and animal utilization.Ph.D. thesis, Mississippi State University, Mississippi, USA.

Laboratory studies, field trials and digestibility trials have shown that compared to maize silage, brown midrib 12 sorghum silage has a lower lignin content and higher calculated bDM contents. Brown midrib 12 sorghum DM are also consumed more compared with maize silage. The compositions of silages are given.

1262 KLOPFENSTEIN, C.F., VARRIANO-MARSTON, E., and HOSENEY, R.C. 1982. Effects of supplementing grain sorghum diets with ascorbic acid on guinea pig growth rates and cholesterol levels.Pages 368-376 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 50 ref.

During the first 3 weeks of feeding a casein-based diet, growth rates of guinea pigs were enhanced by supplementing the diets with 40 mg ascorbic acid (AA)/day. During that same period, equal growth rates were obtained for animals on casein diets supplemented with 2 mg AA/day and sorghum-based diets supplemented with 2 or 40 mg AA/day. Conversely, after the 3rd week, growth rates of sorghum-fed animals receiving 2 mg AA/day were less than for the animals receiving 40 mg AA/day. Animals fed casein diets supplemented with 40 mg AA/day had higher cholesterol levels after 40 days than animals on other diets. In general, serum cholesterol ester/free cholesterol ratios were not affected by ascorbic acid supplementation or the type of diet. Supplementing a casein-based diet with 40 mg ascorbic acid/day elevated liver cholesterol values. Ascorbic acid supplementation level influenced liver Zn:Cu ratios. Those ratios were highest for animals fed sorghum plus 40 mg AA/day. Changes in Zn:Cu ratios resulted because large doses of ascorbic acid decreased copper absorption in guinea pigs.

1263 KNABE, D.A., and TANKSLEY. T.D. JR. 1982. Organic acid-preserved high moisture sorghum for growing-finishing swine.Journal of Animal Science 55(4): 745-751. 19 ref.

Dry sorghum (D), dry sorghum treated with 1% of a 60:40 acetic:propionic acid mixture (DA), high-moisture (24 to 36% moisture) sorghum stored anerobically (HM) and high-moisture sorghum treated with acid (HMA) were evaluated in growing-finishing swine diets. Initially, HMA was treated with 1.5% acid; however, 34 days after the growth trial had begun, the grain was retreated with an additional 1.9% acid to stop slight spoilage found at that time. Spoilage was minimal, and damaged grain was removed prior to retreatment. Over the entire trial, pigs fed high moisture diets (HM + HMA) grew as rapidly as pigs fed the dry diets (D + DA), but had 5% better (P 1/4 .01) feed efficiency. Pigs fed dry or high moisture diets with added acid had slightly slower (P 1/4 .10) gains than pigs fed diets without acid. Carcass traits were not affected by treatment. Nutrient digestibilities were greater for the high-moisture diets than the dry diets.

1264 KONISHI, Y., and FUWA, H. 1982. Effects of leucine/iso leucine ratio in amino-acid mixture diets simulating normal and high lysine maize proteins on growth nitrogen balance and tryptophan niacin metabolism in rats,Journal of Nutritional Science and Vitaminology 28(6): 609-620.

To re-evaluate nutritive values of opaque-2 (02) and brittle-2 opaque-2 (bt202) maize protein and to re-estimate Gopalan's hypothesis that pathogenesis of pellagra might be related with intake of excess leucine and with chronic consumption of maize or jowar which contains relative high leucine, rats were fed on synthetic diets composed of amino acid mixtures simulating the protein of normal and high-lysine maize, 02 and bt202 maize. In order to investigate the effect of intake of excess leucine, leucine was supplemented to 02 and bt202 diet at the level of 0.43 and 0.73%, respectively, to adjust the ratio of leucine to isoleucine to that of normal maize protein. Judging from body weight gains and carcass nitrogen of weanling rats fed on these diets, the protein quality (amino acid composition) of bt202 maize was 30% superior nutritionally to that of 02 maize, and body composition of bt202 diet group were similar to that of casein diet group. Leucine supplementation did not affect these values except for a significant decrease in plasma valine levels.

1265 LAMBERTINI, F. 1982. Grain sorghum: an alternative for maize and grain.(It). Informatore Zootecnico 29(10): 54-55.

1266 LEB0RDE, H.. LUTZ, E., and T0RREA, M. 1982. Quality of hay and forage derived from two sorghum cultivars.(Es). Pages 226-231 In Seventh scientific and technical meeting of animal production. Buenos Aires, Argentina: Asociacion Argentina de Produccion Animal. 10 ref. (Summary:En).

1267 LEGEL, S. 1982. Chemical composition and feeding value of feedstuffs in the Arab Republic of Egypt. 1st report. Content of crude nutrients and feeding value.(De). Archiv fur Tierernahrung 32(5-6): 369-376. 5 ref. (Summaries:Ru, En).

The content of crude nutrients of 292 samples of 74 different feedstuffs from the Arab Republic of Egypt was investigated. Generally, this concerns green fodder plants cultivated under conditions of irrigation and their preserves as well as grain and seed fruits and their industrially processed and by-products. The ascertained feed value parameters were compared with comparable values from literature; deviating content values were discussed. The tendency of the content of crude protein, crude fibre and N-free extractives showed equal values as well as upward and downward deviating values of the individual feedstuffs as compared to values of European tables. The biggest deviations could be registered with regard to the crude protein content of green fodder. The content of raw ash was above the values of European tables. A contrastive comparison of the content of nutrients respectively the feed value of analogous feedstuffs from equivalent climatic areas in Egypt and Syria showed no significant differences.

1268 LUIS. E.S., SULLIVAN, T.W.. and NELSON. L.A. 1982. Nutrient composition and feeding value of proso millets, sorghum grains, and corn in broiler diets.Poultry Science 61(2): 311-320. 35 ref.

Three trials with brioler chicks were conducted to determine the feeding value of proso millets, sorghum grains, and corn. All diets were made isocaloric and isonitrogenous by adjusting the levels of soybean meal, glucose, and cellulose in each trial. When the millets, sorghum grains, and corn were fed at nearly the same level in broiler diets which contained suboptimal protein (15%), the millet and BR-65 sorghum diets with no amino acid supplementation significantly depressed body weight gain and feed efficiency at 4 weeks of age. Methionine and lysine supplementation of these diets resulted in significant improvements in body weight gain and feed efficiency, with chicks fed millet and BR-65 sorghum diets showing the greatest improvements. When the "Dawn" (D) cultivar of millet was compared to commercial milo and yellow corn on an equal weight or a protein equivalent basis in brioler diets with adequate protein (22.5%), there were no significant differences in body weight gain or feed efficiency.

1269 LUIS, E.S., SULLIVAN, T.W., and NELSON, L.A. 1982. Nutritive value of proso millets, sorghum grains, and corn in turkey starter diets.Poultry Science 61(2): 321-326. 8 ref.

One cultivar of proso millet (Dawn) and three cultivars of grain sorghum (commercial milo, RS 626, and high lysine) were compared on a protein equivalent basis with or without methionine supplementation in turkey starter diets containing a suboptimal protein level (18%). Poults fed millet D with no methionine supplementation showed significant depressions in body weight gain but not in feed efficiency. Body weight gains of poults fed the commercial milo diet were numerically greater than gains of poults fed RS 626 and high lysine sorghum when methionine was omitted. Methionine supplementation increased gains and improved feed efficiency of poults receiving all sorghum grains. Two proso millet cultivars, Cerise and Dawn, four sorghum cultivars (commercial milo, AR 64, 9040, and CK 60), and yellow corn were compared in turkey starter diets containing adequate protein (28%) with supplemental methionine and lysine to meet National Research Council requirements. Poults fed the millet diets were significantly heavier than poults fed corn or sorghum diets at 28 days of age.

1270 MADER, T.L. 1982. Effects of feeding low-quality roughages on performance and wheat forage utilization of stocker cattle.Ph.D. thesis, Oklahoma State University, Stillwater, Oklahoma, USA.

1271 MCCORMICK, M.E., and MCCULLOUGH, M.E. 1982. Energy and protein supplementation of wheat and sorghum silage for growing calves.Journal of Animal Science 55(suppl. 1): 316-317. (Abstract).

1272 MEISSNER, H.H., STADEN, J.H. VAN., RENSBURG. N.J. VAN., and SLABBERT, H. 1982. Sorghum grain as substitute for maize in fattening diets for beef steers.South African Journal of Animal Science 12(2): 129-133. 19 ref.

The possibility of substituting maize for sorghum grain in fattening diets was studied in a digestibility trial with weathers and a growth study with steers. In die digestibility trial a 6 x 6 Latin square design was used with maize, bird-resistant and non bird-resistant sorghum grain as energy sources and sunflower oil cake or urea as protein supplement. In the growth study diets in which maize was replaced by either 0, 33, 67 or 100% bird-resistant or non bird-resistant sorghum grain, were tested. In the mass interval 200 to 300 kg sunflower oil cake was used as protein supplement and between 300 and 400 kg, urea. All diets were supplied in the ground form. In the growth study there were no significant differences between the maize and non bird-resistant sorghum grain treatments in intake, gain, kg feed/kg live mass or kg feed/kg carcass mass produced. The bird reistant grain sorghum realized a highly significantly (P1/40.01) higher intake. Protein supplement did not have a significant differential effect in either the digestibility trial or the growth study.

1273 MENA. A., ELLIOTT. R., and PRESTON. T.R. 1982. The substitution of grain sorghum by sugarcane juice in diets for growing pigs.Tropical Animal Production 7(3): 226-231.

1274 MIAKI. T.. TANAKA. S.. and KAWAMURA, O. 1982. Studies on the improvement in utilization of sorghum silages. 3. The effect of stage of maturity at harvest and cutting frequency on the nutritive value and yield of hybrid sorgo silage.(Ja). Bulletin of the Faculty of Agriculture. Miyazaki University 29(2): 311-322. 29 ref. (Summary:En).

The nutritive value of hybrid sorghum silages cut at the boot, flowering and milk stages in 1977-80 was compared. Silage preservation was good when cut at the milk stage in all but was poor when cut at the boot stage.

1275 MITARU. B.N., REICHERT. R.D.. BLAIR. B.. and ROE. W.E. 1982. Effect of high moisture storage reconstitution of high and low tannin sorghums on digestibility of protein and amino-acids in cannulated pigs.Journal of Animal Science 55(suppl. 1): 286. (Abstract).

1276 MONTGOMERY. C.R.. ALLEN. M.. and MASON, L. 1982. Nutritional and agronomic comparisons of cowpeas. millet. and sorghum.Bulletin. Louisiana State University Agricultural Experiment Station. 735. 12 pp. 8 ref.

1277 MONTGOMERY. M.J, 1982. Soybeans-grain sorghum vs. corn for silage for lactating cows.Pages 41-46 In Proceedings, Thirty eighth Southern Pasture and Forage Crop Improvement Conference. Louisiana. USA: Agricultural Research Service (Southern Region).

In feild trials. grain sorghum cultivar DeKalb C 42A soybean cultivar Lee 74 were sown at 2 bu and 15 lb/ac. respectively in a mixture. The mixture was ready for harvest early compared to maize cv. Pioneer 3147 or FFR 929 W. Maize silage yield was higher but the mixture had a higher CP, ADF, and acid insoluble lignin content. Milk production and composition and body weight change in lactating cows were favourable when fed pot-stage soybean-sorghum silage.

1278 MOSER. R.L.. PEO. E.R. JR.. MOSER, B.D.. and LEWIS. A.J. 1982. Effect of grain source and dietary level of oat hulls on phosphorus and calcium utilization in the growing pig.Journal of Animal Science 54(4): 800-805. 24 ref.

Three metabolism trials were conducted to determine the effect of grain source and dietary level of oat hulls on dry matter digestibility, P and Ca retention and intestinal phytase activity of growing pigs. Twenty-four crossbred pigs (39 kg) were used. Dry matter digestibilities of corn-based diets were greater (P 1/4 .01) than grain sorghum-based diets (74.7 vs 63.5%). Diets containing 10% oat hulls had lower (P % .01) dry matter digestibilities than diets containing no oat hulls (64.0 vs 74.2%). The reduction in dry matter digestibility was similar with the addition of oat hulls to the diet, regardless of the source of grain. P and Ca retentions were not affected by dietary treatments. Fecal excretion of P was higher (P % .10) for pigs fed 10% oat hulls than for those fed no oat hulls. Fecal excretion of Ca and urinary excretion of Ca and P were not affected by dietary treatment. Intestinal phytase activity was evident in all pigs, but the dietary treatments had no apparent influence on phytase production in the small intestine.

1279 MOSER, R.L., PEO, E.R. JR., MOSER, B.D., and LEWIS, A.J. 1982. Effect of grain source, level of Solka floe and caloric content of the diet on performance, blood and bone traits of growing-finishing swine.Journal of Animal Science 54(6): 1181-1195. 29 ref.

In two trials, pigs fed grain sorghum gained faster (P 1/4 .05), ate more (P X .05) feed and had a poorer (P 1/4. 05) feed conversion ratio than pigs fed corn pigs fed diets containing Solka floc had lower (P X .05) average daily gains and a poorer (P X .10) feed conversion ratio than pigs fed diets with no Solka floc. Feed consumption was depressed (P X .05) in pigs fed Solka floc in trial 2, but was not affected by similar Solka floe levels in trial 2. Pigs fed isocaloric diets gained more (P X .01), ate less (P X .01) feed and had a better (P X .01) feed conversion ration than pigs fed nonisocaloric diets. Analysis of blood constituents from multiple bleedings in both trials showed that pigs fed grain sorghum had lower (P X .05) serum Ca concentrations and tended to have lower serum alkaline phosphatase concentrations than pigs fed corn. In both trials, metatarsals from pigs fed grain sorghum had greater (P 1/4 .10) peak force than pigs fed corn.

1280 MUNDHEIM, H., and OPSTVEDT, J. 1982. The value of Norwegian herring-type fish meal and soybean meal' as protein supplements to poultry diets based on different types of cereals. II. Interaction between fish meal and cereal source in broiler diets.Acta Agriculturae Scandinavica 32(3): 273-281. 23 ref.

The influence of the type of cereals in the diets on the effect of fish meal additions has been studied in four experiments with broiler chicks. Experiments 1 and 2, used various combinations of maize meal and sorghum meal (100/0, 65/35, 50/50, 35/65, 15/85, and 0/100), experiment 3 various combinations of maize meal, sorghum meal and barley meal (90/10/0, 55/20/25, 25/25/50 and 0/30/70) and experiment 4 various combinations of maize meal, sorghum meal and wheat meal (60/15/25 and 0/30/70). Fish meal plus soyabean meal was compared with soybean meal alone as the protein supplument. All diets were isocalorific and isonitrogenous and crystalline L-lysine and DL-methionine were added to meet the requirements. The addition of fish meal gave no increase in performance over that obtained by soybean meal plus crystalline L-lysine and DL-methionine when 60% or more of the cereals was maize meal. When less than 60% of the cereals were maize meal, the reminder being sorghum, barley or wheat meal, the addition of fish meal caused significant improvements in growth rate and feed conversion.

1281 NARDIELLO, R., OLSEN. C., and CASAL. J. 1982. Tannin incidence on sorghum fed pig.(Es). Pages 112-122 In Seventh scientific and technical meeting on animal production. Buenos Aires, Argentina: Asociacion Argentina de Produccion. Animal. 12 ref. (Summary:En).

1282 NOBLE, R.M., and BARRY, G.A. 1982. Survey of selenium concentrations in wheat, sorghum and soybean grains, prepared poultry feeds and feed ingredient from Queensland.Queensland Journal of Agricultural and Animal Sciences 39(1): 1-8. 21 ref.

1283 OKOH, P.N., OBILANA, A.T., NJOKU, P.C., and ADUKU, A.O. 1982. Proximate analysis, amino acid composition and tannin content of improved Nigerian sorghum varieties and their potential in poultry feeds.Animal Feed Science and Technology 7: 359-364. 15 ref.

Grains of 16 improved varieties of Nigerian sorghum were analysed. Comparatively little difference was found among the varieties in ash, crude fibre, fat and carbohydrate content. In contrast, the crude protein and tannin content showed considerable variation. Of all the amino acids analysed, major differences among varieties were observed only for lysine. The suitability of most of the varieties for poultry feeds in Nigeria is likely to be affected by their high tannin content.

1284 OWSLEY, M.R., RICHARDSON, C.R., and ANDERSON, G.D. 1982. The effect of temper and PER-ME-8 grain conditioners on nutrient availability in corn and grain sorghum.Journal of Animal Science 55(suppl. 1): 449. (Abstract).

1285 PASIERBSKI, Z.. WAWRZYNCZAK, S., LEGIEC, J., and MAZURKIEWICZ. W. 1982. Complete feed mixtures with sorghum, maize or barley in the fattening of young cattle.(P1). Roczniki Naukowe Zootechniki, Monografie i Rozprawy 20: 79-91. 12 ref. (Summaries:En, De, Ru).

The aim of experiment was to compare the influence of barley (group I), maize (group II), Argentine Brown Sorghum (group III), and American Yellow Sorgum (group IV) on production and economic results, when fattening young cattle. The grain of barley, maize, and sorghum was in the ground form. The experiment was performed on 60 bulls of the Black-White breed at the initial weights about 260 kg. The animals were divided into 4 groups, and fed on dry, loose, complete mixtures which differed among themselves in the share of the studied feeds. The analyses showed that sorghum contained more proetin (12% in dry matter) from maize (10%) however less than barley (14.3%). Maize had more fat, but less fibre. Considering the lower, prices of sorghum in 1980, in relation to maize, the most favourable economic results were obtained in group IV, next in groups III, II and I. Finally, it has been found that in commercial and complete mixtures such components as barley, maize, brown sorghum, or yellow sorghum can be freely replaced each other in the same weight proportion.

1286 PROUTY, F.L., DELFINO, F.J., SWINGLE, R.S., and HALE, W.H. 1982. Digestibility and nitrogen balance of steers fed reconstituted whole or steam processed flaked sorghum grain.Proceedings of the Annual Meeting. American Society for Animal Science Western Section (USA) 33: 16-20.

1287 PROUTY, F.L., HALE, W.H., SWINGLE, R.S., and THEURER, G.B. 1982. The effects of sorghum grain processing method and protein mineral and alfalfa hay levels on performance of finishing steers.Journal of Animal Science 55(suppl. 1): 452-453. (Abstract).

1288 RENOUX, E. 1982. Feeds for pigs (1. part).(Fr). Abreuvoir 106: 5-11.

1289 ROSSO, O.R., CHIFFLET DE VERDE, S., and BERRIOS, J. 1982. Rotational grazing of sorghum forage with fattening steers, 1: Effect of three final forage availabilities on body weight gain.(Es). Pages 35-48 In Seventh scientific and technical meeting on animal production. Buenos Aires, Argentina: Asociacion Argentina de Produccion Animal. 8 ref. (Summary:En).

1290 SAGEBIEL. J.A., and MUNROE, P.L. 1982. Comparison of the effect of lasalocid sodium and monensin sodium on the feedlot performance of beef steers.Journal of Animal Science 55(suppl. 1): 507. (Abstract).

1291 SANDS. M.W., FITZHUGH, H., and CHEMA, S. 1982. Seasonal variation in feed resources on small farms of western Kenya.Journal of Animal Science 55(suppl. 1): 322. (Abstract).

1292 SARANI, S., TEETER, R.G., and HIBBERD. C.A. 1982. Influence of reconstitution on the chemical composition, lysine availability and overall feeding value of two sorghum grain varieties.Poultry Science 61(7): 1538. (Abstract).

To evaluate the influence of reconstitution on chemical composition and feeding value Redlan (normal; low tannin) and Darset (bird - resistant; high tannin) varieties of sorghum grain were grown and harvested under similar conditions. Grains were reconstituted to 30% moisture and stored under oxygen limiting conditions for 48 hours. Following reconstitution the sorghum was freeze dried to approximately 10% moisture and ground through a screen (2 mm). The reconstitution process had little effect upon the starch or protein content of the two varieties. Tannin content of the Darset variety was reduced from 2.25 catechin to .95 catechin equivalent per gram milo with reconstitution while the Redlan tannin level was unaffected by reconstitution. Lysine availability and milo digestibility estimates for the two varieties and processing methods were determined utilizing chick assay procedures. The beneficial effects gained by reconstituting sorghum grain containing high tannin levels appear promising and may be one way to increase feed utilization with the high yielding high tannin varieties.

1293 SAURAMBAEV, B.N. 1982. Nutritional value of licorice and fodder grasses in mixed crops.(Ru). Izv Akad Nauk Kaz SSR Ser Biol 5: 14-17.

1294 SCHAKE. L.M., BYERS, F.M., and BULL, K.L. 1982. Energy and economic evaluation for corn and grain sorghum processing for cattle.Energy in Agriculture 1(2): 185-195.

Five grain processing alternatives were compared for corn and grain sorghum in feedlots of 5,000 and 20,000 head capacity. Net value per tonne of processed grain dry matter ranged from $7.71 to a negative $9.35 for 5,000 head feedlots, and from $9.33 to a negative $8.50 for 20,000 head feedlots. Processing energy cost per tonne of grain dry matter for a 20,000 head feedlot was $0.08, 2.96, 0.20, 0.11 and 0.33, respectively, for dry processed, steam flaked, reconstituted, early harvest-ground-ensiled an early harvest-acid treated grains. Comparable values for a 5,000 head feedlot were $0.08, 4.25, 0.23, 0.13 and 0.46 per tonne. Reconstitution appeared to represent the most favourable processing alternative for either grain or size of feedlot combination. Energy balance data indicated that for each MJ of energy applied to processing, 3.5, 32.6, 23.3 or 2.1 MJ of empty body energy were recovered in cattle fed reconstituted, early harvest-ground-ensiled, steam flaked or ealy harvest-acid treated corn, respectively. Energy balance was more favourable for grain sorghum than corn.

1295 SCHAKE, L.M.. ELLIS. W.C., SUAREZ, W.A.. and RIGGS, J.K. 1982. Preservation of sorghum plant portions harvested, processed and ensiled at ten stages of maturity.Animal Feed Science and Technology 7: 257-269. 21 ref.

Two varieties of grain sorghum were

harvested at 10 intervals from 35-189 days post planting. Leaf, stem and head portions were separated before being prepared for chemical analysis of ensiled for 30 days in 11-soils with or without perservative. The taller variety (FS-lb) accumulated 60% more dry matter than ORO-T with advancing plant maturity, while whole plant crude protein content decreased from near 20 to less than 7% for both varieties. Dry matter ensiling loss (DMEL) was different (P 1/4 0.05) for each plant portion but was lower and less variable after the 77-day harvest. Immature leaves and heads resulted in the greatest average DMEL of 31 and 24%, respectively. Propionic acid decreased DMEL, while an ammonia solution was ineffective when compared to control leaf, stem and heads. The DMEL of leaves was influenced (P 1/4 0.05) by a varietal X modulus of fineness interaction while the stem exhibited an interaction with plant maturity x modulus of fineness. These data indicated that numerous combinations of silage preservation techniques affected DMEL of sorghum.

1296 SELL, D.R.. and ROGLER, J.C. 1982. Effects of sorghum grain tannins on the activity of UDP-glucuronyltransferase in chick liver. Poultry Science 61(7): 1540. (Abstract).

The activity of liver microsomal UDP-glucuronyltransferase (EC 2.4.1.17), an enzyme known to detoxify phenolic compounds, was measured in chicks fed high (HTS) and low tannin sorghums (LTS). In the first experiment, 20-day weight gains were significantly depressed in chicks fed HTS as compared with those fed LTS. Expressed either as micro moles of substrate conjugated per mg microsomal protein, per g of liver, or per 100 g body weight, UDP-glucuronyltrasferase activity was significantly higher (P % .01) in chicks fed HTS. A second experiment was designed to differentiate between the effects due to tannin and those resulting from a protein deficiency, which had previously been reported to increase the activity of this enzyme. Although enzyme activity was increased (P 1/4 .05) by lowering the protein content of the LTS diet, a much greater increase was noted in chicks fed the HTS diet, which was significantly greater (P 1/4 .001) than the activity in chicks fed the LTS diets regardless of the means of expressing activity.

1297 SERRA, P.M.A.A., OLIVEIRA, O.E.R., and FERNANDES, T.H. 1982. A note on the use of sorghum as a substitute for maize in a diet for growing pigs. Animal Production 35(3): 443-445. 6 ref.

1298 SIMPSON. E.J., SCHAKE, L.M., and BYERS, F.M. 1982. Effects of high moisture grain sorghum processing methods on nutrient digestibility. Presented at the joint annual meeting of the American Society of Animal Scince and Canadian Society of Animal Science, 8-11 August 1982, Guleph, Ontario, Canada. 1 pp. (Abstract).

1299 SMITH, D.H., MARTEN, G.C., and BRITTON, R.A. 1982. Takadiastase emzyme pretreatment for determining cell wall constituents in corn and sorghum silages. Agronomy Journal 74(1): 77-80. 13 ref.

Studies were conducted using 13 corn and 13 sorghum silages to compare the reliability of CWC values obtained from VS, TEP, and a procedure suggested by Fonnesbeck and Harris (FH) that utilizes acid and pepsin pretreatment before neutral detergent extraction. The mean CWC values obtained by using TEP were lower for both types of silages than were those from VS and FH methods. Use of a 24-hour TEP prior to normal extraction in neutral detergent produced more easily filtered CWC residues for high-grain silages than did the VS procedure, and the TEP residues were closer to being starch free. The CWC values from TEP and FH procedures were significantly (P1/40.01) correlated (r = 0.77 and 0,90 for corn and sorghum silages, respectively) while those from the TEP and VS procedures were not significantly correlated.

1300 SODERLUND. S., BOLSEN. K., POPE. R., RILEY, J., and BRENT, B. 1982. Whole sorghum grain stillage for beef cattle.Pages 42-47 In Cattlemen's day '82: report of progress, 413. Manhattan, Kansas, USA: Kansas State University.

1301 SODERLUND, S., BOLSEN, K., RILEY, J., and BRENT, B. 1982. Whole sorghum grain stillage for growing and finishing lambs.Journal of Animal Science 55(suppl. 1): 110. (Abstract).

1302 SPICER, L., SOWE, J., and THEURER, B. 1982. Starch digestion of sorghum grain, barley and corn based diets by beef steers.Proceedings, Western Section, American Society of Animal Science 33: 41-44. 19 ref.

Six abomasally fistulated steers were used in a replicated 3 x 3 Latin square design to determine starch digestion of sorghum grain, barley and corn based diets. Diets averaged 81% grain and 94.6% organic matter (OM) and 55% starch and .2% chromium oxide. Each trial included a 6-day period of total fecal collection and abomasal sampling. Mean daily OM and starch intakes were 6.32 and 3.48 kg, respectively. Chromium oxide recovery averaged 94%. Mean total tract OM digestion coefficients for sorghum grain, barley and corn based diets were 76.5, 79.0 and 80.6%, respectively. Total tract and postruminal digestibilities of OM were lower (P1/4.05) for sorghum grain and barley than for corn, Ruminal starch digestion averaged 75 vs. 88 and 84% for sorghum grain vs. barley and corn based diets, respectively, and 87 vs. 93 and 94%, respectively, for postruminal digestion. Inspite of the lower postruminal digestion coefficient with the sorghum grain based diet, more intestinal starch digestion (g/day) occurred with this diet due to the greater rumen bypass of starch from sorghum grain.

1303 STALLCUP, O.T., and AL-HAYDARI, S. 1982. Ammonia and volatile fatty-acid levels in the rumen and glucose in blood of steers fed control and ammonia treated bermuda and sorghum sudan hays.Journal of Dairy Science 65(suppl. 1): 135. (Abstract).

The sorghum-sudan hays were fed to 6 steers in 3 series of 3 X 2 Latin square designs. Conventional digestion trial data were collected. On the last day in digestion stalls for each diet, jugular blood was drawn 3 hours after feeding the analyzed for blood urea and glucose. A rumen fluid sample was taken at 3 hours after feeding and analyzed for ammonia by microdiffusion, and volatile fatty acids by gas chromatography. Blood glucose levels were 77.3 and 60.3 mg/100 ml for steers fed control and NH3 treated bermuda hays. Differences were sign. (P1/4.05). Rumen NH3 levels (mg/100 ml) were 6.1, 8.7 and 13.3 for control and NH3-3.5% and NH3 5.5% sorghum-sudan hays respectively. Rumen fluid acetic acid (molar-%) was 60.9, 57.1 and 54.3; propionic acid, 24.1, 29.8 and 30.9; and butyric acid 14.7, 13.0 and 14.9 for steers fed control, NH3-3.5% and NH3-5.5% sorghum sudan hays respectively.

1304 TAKANO, N., and MASUDA. J. 1982. Studies on the preservation of whole-crop silage. II. Effect of the harvesting method and the cutting length with corn and sorghum on silage quality.(Ja). Bulletin of the National Grassland Research Institute

22: 69-73. 15 ref. (Summary:En).

Experiments were carried out to investigate the effects of harvesting method and cutting length for whole-crop sorghum and corn on; field loss, ensiled dry matter density, voluntary intake and fermentative quality of the silages. Dent stage sorghum was harvested at two theoretical lengths of 5 and 20 mm and ensiled in separate experimental 4.5 m3 silos. Ensiled dry matter density, 92.3 and 121.0 kg per cubic and m and DDM intake; 3.81 and 4.17 kg per head per day. From the results in ensiled dry mater density, voluntary intake and fermentative quality, the 10 ram cylinder cut was considered to be the most favourable cutting length for making whole crop silage with sorghum and corn.

1305 TANNER, J.W., BYERS, F.M., SCHAKE, L.M., ELLIS, W.C., SCHELLING, G.T., LONG, C.R., and MAY, R. 1982. Ionophore effects on growth rates of grazing stocker cattle.Journal of Animal Science 55(suppl. 1): 469. (Abstract).

1306 WESLEY-SMITH, R. 1982. Feed for export cattle.N.T. Rural News 7(3):14-15.

Various types of hay, including sorghum, are reviewed for feeding to exported cattle. The effect of alkali treatment to increase palatability and digestibility is briefly discussed.

1307 YOKOYAMA, M.. OWAKI, S., and KUBOTA, H. 1982. Feeding value of silage made of mixed cultivation of corn and sorghums.(Ja). Kyushu Agricultural Research 44: 177-178.

1308 YORK, J.O., BULLARD, R.W.. NELSON, T.S., and STALLCUP, O.T. 1982. Dry matter digestibility in purple testa sorghums.Annual Corn and Sorghum Industry Research Conference 37: 1-9. 31 ref.

1309 YOUNG, B., BOLSEN, K.K.. and ILG, H.J. 1982. High moisture corn with additives for steer finishing rations.Journal of Animal Science 55(suppl. 1): 477. (Abstract).

Food Products

1310 ANDERSON, R.A. 1982. Water absorption and solubility and amylography characteristics of roll-cooked small grain products.Cereal Chemistry 59(4): 265-269.

For many years, cereals and cereal products have been gelatinized or cooked on heated rolls to prepare special products. Corn and grain sorghum grits or flours have been the raw materials used most frequently. Examination of the roll cooking of several other cereal derivatives (i.e., grits from wheat, barley, rye, and oats) has shown that rheological characteristics differ when the various products are processed under like conditions. Comparisons made of water absorption (WAI), water solubility (WSI), and Brabender amylograph patterns of the resulting products revealed not only many similarities between the different cereals but also some interesting differences. Cooked grits from oats had consideraly lower WAI and WSI values than the other grains under study; the WAI peaked about 100 deg F (37 deg C) lower than that of grits from wheat, barley, rye, corn, and sorghum. Oat products gave amylograph patterns similar to those of corn, sorghum, and wheat, whereas cooked barley grits gave atypical viscosity patterns, with elevated values at all critical points.

1311 AXTELL, J.D., EJETA, G., and MUNCK, L. 1982. Sorghum nutritional quality: progress and prospects. Pages 589-603 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 25 ref.

1312 BEDOLLA, S. 1982. Determination of roti quality of sorghum flour.(Es). Pages 144-149 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT.

1313 BEDOLLA, S.. and ROONEY, L.W. 1982. Optimization of technology to utilize sorghum in tortillas. Pages 140-143 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT.

1314 BEDOLLA, S.. and ROONEY, L.W. 1982. Utility of sorghum for preparation of roti.(Es). Pages 150-152 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT.

1315 BEDOLLA, S., PALACIOS, M.G., KHAN, M.N., and ROONEY, L.W. 1982. The cooking characteristics of sorghum and corn for tortilla preparation by traditional methods.(Es). Pages 56-79 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT. 23 ref. (Summary:En).

The total dry matter losses (DML) were the same for corn (13.3%) and white sorghum, Funks G766W (12.6%). Sorghum required 1/3 the cooking energy of corn. Corn lost more (13.3%) dry matter when cooked traditionally than when steam cooked (8.0%). Unpearled white sorghum lost 16.0% and 5.0% dry matter with the traditional and the steam cooking methods, respectively. The chemical composition of nixtamal, masa, steep, wash waters, and tortillas of both corn and sorghum was similar except for the slightly higher protein content of the sorghum products. Taste and aroma of sorghum tortillas were comparable to those of corn tortillas. The greenish-yellow color of nonpearled sorghum tortillas was not acceptable but it was dramatically improved by pearling or decortication (13% of weight removed). Both a mixture containing a 60:40 corn-pearled sorghum ratio and a 80:20 corn-nonpearled sorghum blend produced tortillas with color similar to a 100% white corn tortillas as evaluated subjectively.

1316 BOLING, M.B., and EISENER, N. 1982. Bogobe: sorghum porridge of Botswana. Pages 32-35 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

Bogobe, the sorghum porridge of Botswana, is prepared from fermented and nonfermented sorghum meal. Grain color and texture of the meal produced are important characters contributing to the quality of the porridge. Mechanical dehulling and grinding of grain are becoming important since these operations eliminate a considerable amount of hand labor and generally increase the quality of meal produced.

1317 CAGAMPANG, G.B., GRIFFITH, J.E., and KIRLEIS, A.W. 1982. Modified adhesion test for measuring stickiness of sorghum porridges. Cereal Chemistry 59(3): 234-235. 10 ref.

1318 CHUKWURA, E.N., and MULLER, H.G. 1982. Effect of tannic acid on a low tannin African sorghum variety in relation to carbohydrate and amylase. Journal of Food Science 47(4): 1380-1381.

The effect of concentrations of

0-3% tannic acid on root growth, starch, soluble carbohydrate and alpha and beta amylase was determined during germination of a low tannin sorghum variety. At higher concentrations of tannic acid root growth was suppressed. Starch degradation and accumulation of soluble carbohydrates were reduced and both alpha and beta amylase synthesis was decreased. This suggests that tannins retard starch degradation indirectly by inhibiting the synthesis of starch hydrolytic enzymes during germination.

1319 CIMMYT. 1982. Proceedings of the grain quality workshop for Latin America.13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT. 251 pp.

1320 DA. S., AKINGBALA. J.O., ROONEY, L.W.. SCHEURING, J.F.. and MILLER, F.R. 1982. Evaluation of To quality in a sorghum breeding program.Pages 11-23 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 9 ref.

A procedure for cooking to from less than 10-g sorghum flour has been perfected and used in evaluating several sorghums from the International Food Quality Trials and from ICRISAT sorghum breeding programs in Burkina Faso and Mali for to quality. The method is effective in separating sorghums of good, average, and poor to-making properties. The results compare favorably with traditional large quantity to evaluation methods currently in use in ICRISAT, Mali, and Burkina Faso. The method is relatively simple and will reduce time and effort in screening for good to quality sorghums.

1321 DARWISH, A.H. 1982. Nutritional evaluation of different types of Egyptian bread.Ph.D. thesis, Azhar University, Cairo, Egypt. 228 pp. (Summary:Ar).

1322 DESIKACHAR, H.S.R., and CHANDRASHEKAR, A. 1982. Quality of sorghum for use in Indian foods.Pages 262-268 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981. Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 6 ref.

Sorghum varieties with a low gelatinization temperature (GT), high peak viscosity (PV) and setback, and high water uptake give doughs with better rolling quality. Adequate water retention in the roti after baking is necessary for good eating quality; otherwise the product may be too dry and chewy. Addition of pregelatinized starch or puffed cereal flours to sorghum flour increases its water absorption capacity and thus improves the rolling quality of dough and eating quality of the roti. Overstickiness is an undesirable characteristic in mudde. It has been found that varieties with high GT and low PV and setback can give mudde with adequate consumer acceptability. Sorghum semolina has high resistance to water absorption during cooking as compared with wheat or maize semolina, the reasons for which need further study. Varietal differences in puffing and cooking qualities of sorghum have been noted and studied.

1323 DEWALT, K.M. 1982. Sorghum use in southern Honduras.Pages 48-55 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT.

1324 DIEHL, K.C. JR. 1982. Rheological techniques for texture and quality measurement of sorghum food products.Pages 312-322 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 24 ref.

Of the many physical properties available, rheological properties provide the most direct and convenient methods for measuring indicators of quality and texture. With the use of sound rheological methods and the avoidance of potential adverse influences, good results can be obtained without expensive equipment and cumbersome equations. Rheological methods are presented for solid and liquid foods. Some of the methods require a universal testing machine such as an Instron. while others utilize a much simpler instrument. Experimental configurations and examples are presented for measuring the response of solid and liquid sorghum foods which can be used with any of the rheological methods.

1325 DOGGETT, H. 1982. The importance of food quality in sorghum improvement programs. Pages 5-8 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 1 ref.

1326 DOHERTY. C., ROONEY, L.W., and FAUBION. J.M. 1982. Phytin content of sorghum and sorghum products. Pages 328-333 In Proceedings, International Symposium on Sorghum Grain Quality. 28-31 October 1981. Patancheru, A.P., India. Patancheru. A.P., India: ICRISAT. 16 ref.

Thirty varieties of sorghum grown in India during 1979 and 1980 were analyzed for phytate and total phosphorus by a semiautomated method. Levels of phytate phosphorus (phytate-P) ranged from 0.17% to 0.38% (dwb), accounting for 80-87% of the total phosphorus present in the kernel. Analysis of grain fractions obtained from six varieties through traditional hand-milling techniques showed that the bran contained the highest levels of phytate-P, with lesser amounts in the whole grain and dehulled grain, respectively. Difference in phytate-P levels in these fractions was due to varietal effects and was related to the degree of milling. The phytate-P content in to and tortilla and the intermediate products were determined. The level of phytate-P in sorghum was similar to that of other cereals.

1327 EJETA, G. 1982. Kisra quality: testing new sorghum varieties and hybrids. Pages 67-72 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 2 ref.

Eleven new sorghum varieties and eight promising experimental hybrids were compared for kisra making quality with popular local varieties in two separate experiments. A group of five panelists, men and women who regularly consumed kisra, served as judges. Results showed that not all cultivars selected on the basis of conventional evident grain quality parameters make good kisra. Some sorghum cultivars with pearly, yellow grains were identified for making acceptable kisra, but the local sorghums with white chalky pericarp and without subcoat were rated the best by the panelists. There was, however, no significant association between other physical grain properties and kisra quality as determined by the panelists. Color and texture of kisra stood out as the most important criteria determining quality.

1328 ENGELHARDT, T. 1982. Examining yield and taste of hybrid and local varieties of Sorghum vulgare (L.) in Botswana. Quarterly Journal of International Agriculture - Special Issue 21(2): 59-72. 35 ref.

1329 FERNANDO, M.B., HECTOR. E.C.G., and GUIRAGOSSIAN, V. 1982. Analysis and selection of sorghum varieties for preparation of roti (chappathi).(Es). Pages 129-139 In Proceedings. Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT. 6 ref.

1330 FUTRELL, M. 1982. Use of grain sorghum as food in southern Honduras.Pages 27-47 In Proceedings. Grain Quality Workshop for Latin America. 13-17 April 1982. Londres. Mexico. Londres. Mexico: CIMMYT.

1331 FUTRELL, M.. and JONES. R. 1982. Sorghum use in southern Honduras.Page 26 In Proceedings. Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT.

1332 FUTRELL, M., MCCULLOUCH, E., and JONES, R. 1982. Use of sorghum as food in southern Honduras.Pages 100-102 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

A survey made in southern Honduras from May to August 1981 revealed that 29% of the families in Corpus, 80% in Guajinquil, and 37% in Pavana were making tortillas from the traditional tall, white tropical varieties of sorghum. The sorghum tortillas observed were heavier, darker, and more grainy in texture than corn tortillas; sorghum was used more for tortillas during the last 2 months of the dry season and the beginning of the wet or planting season. New varieties of sorghum with more desirable characteristics for tortillas would be well received.

1333 GEBRE-HIWOT, B. 1982. Nutritional and consumer preference aspects of sorghum.Pages 71-78 In Proceedings, Regional Workhop on Sorghum Improvement in Eastern Africa, 17-21 October 1982, Nazreth and Debre Zeit. Ethiopia. Nazreth, Ethiopia: Ethiopian Sorghum Improvement Project.

1334 GEBREKIDAN, B., and GEBREHIWOT, B. 1982. Sorghum Injera preparations and quality parameters.Pages 55-66 In Proceedings. International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 10 ref.

Injera is a leavened, flat and round, Ethiopian traditional bread made from cereals. Sorghum is second only to tef as the preferred cereal for injera. The best quality sorghum injera is made from the dehulled grain. Since sorghum dehulling machines are not available to the Ethiopian housewife, the job is all done by the tedious, traditionalmortar-and-pestle method. Recipes, cooking procedures, and equipment for injera preparation are given in the paper. Tha major sorghum injera quality parameters discussed in the paper are color, "eyes", texture, taste, overall appearance, and storability. The poor storability of sorghum injera compared to that of tef is considered a major problem. The use of composite flours of sorghum with tef or barley is the traditional solution to this problem. Results of international and national experiments have established varietal differences for the major quality attributesofsorghuminjera.

1335 GLENNIE. C.W., DAIBER, K.H., and TAYLOR, J.R.N. 1982. Reducing the tannin content in sorghum grain by heat.S.A. Food Review June/July: 51,55.

Bird-proof sorghum grain was heated in various ways in attempts to reduce the tannin content. Dry heating or micronization did not reduce the tannin content while cooking in water did. When milled sorghum was boiled for 20 minutes the decrease in tannin was 47%. When such techniques as milling or the addition of formaldehyde were used in conjunction with cooking, then further reductions in tannin were obtained. It appears that cooking not only reduces the extractable tannins but also reduces the available protein,

1336 GOMEZ, H.E.C., and BUSTOS. P.M. 1982. Methodologies for selection of sorghum genotypes for human food.(Es). Pages 113-119 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT. 5 ref.

1337 GONZALEZ, M.P. 1982. Determination of chemical and physical properties of extrused sorghum grits and flour (Sorghum bicolor (L.) Moench).(Pt). Thesis, Universidade Federal Rural do Rio de Janeiro, Itaguai, Brazil. 104 pp. 93 ref. (Summary:En).

1338 HECTOR, E.C.G.. FERNANDO, M.B.. and GUIRAGOSSIAN, V. 1982. Evaluation of roti quality of sorghum and maize-sorghum mixture.(Es). Pages 120-128 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT. 5 ref.

1339 HERRERA, A.V. 1982. Use of sorghum for human food in E1 Salvador.(Es). Pages 15-24 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT.

1340 HEWITT, D., and FORD, J.E. 1982. Influence of tannins on the protein nutritional quality of food grains.(Lecture). Proceedings of the Nutrition Society 41(7): 7-17. 20 ref.

1341 ICRISAT. 1982. Proceedings, International Symposium on Sorghum Grain Quality.28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 407 pp.

1342 IRUEGAS, A., CEJUDO, H., and GUIRAGOSSIAN, V. 1982. Screening and evaluation of tortilla from sorghum and sorghum-maize mixtures.Pages 92-99 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P.. India: ICRISAT. 4 ref.

The objective of this study is to screen food-type sorghum genotypes, using different analyses, and to evaluate sorghums with different kernel characteristics for making tortillas from different combinations of maize and sorghum. Results from this experiment indicated that it is possible that sorghums with improved properties for use in tortilla production can be found, using the screening methods applied by INIA (Mexico), and used in breeding programs to develop sorghum cultivars for use in making tortillas. One SEPON 78 selection and RTAM 428 produced unacceptable tortillas because they have high phenols, and their color difference values were among the lowest of sorghum entries. In adding, their organoleptic qualities were poor.

1343 JOSEPH, A. 1982. Traditional cassava and sorghum technology and its effect on mineral food value.Pages 511-520 In Handbook of nutritive value of processed food (ed. M. Rechcigl, Jr.). Boca Raton, FLA: CRC Press.

1344 KNABE, D.A. 1982. Nutritive value of sorghum compared.Pages 80-83 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT.

1345 MAC LEAN, W.C. JR., LOPEZ DE R0MANA. G., PLACKO, R.P., and GRAHAM, G.G. 1982. Nutritional value of sorghum in preschool children:

digestibility, utilization, and plasmafree amino acids. Pages 377-382 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 20 ref.

Digestibility of protein and energy and nitrogen balance were studied in 13 Peruvian children consuming diets in which sorghum (two conventional, two high-protein high-lysine varieties) supplied all of 256 or 300 mg N/100 Kcal. Apparent N absorption during 6-day balance studies was 56% apparent N retention 37% of casein control. Stool weights and energy losses were excessive. Studies of postprandial changes of plasma-free amino acid concentrations following a sorghum meal demonstrated that lysine was the first limiting amino acid. A comparison of the results from sorghum with similarly obtained data from other major staple foods underscored the importance of digestibility in determining food value, especially as it related to amino acid requirements.

1346 MAGBOUL, B.I., and BENDER, D.A. 1982. The nature of niacin in sorghum. Proceedings of the Nutrition Society 41(2): 50A. 4 ref.

1347 MONDOT-BERNARD, J. 1982. Bibliography on utilization of cereals: millets and sorghum. Paris and Ouagadougou: club du Sahel, OCDE, CILSS. 16 pp. (SDC D0.AK.19). 32 ref.

1348 MUKURU, S.Z., MUSHONGA, J.N., and MURTY, D.S. 1982. Sorghum Ugali. Pages 39-44 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 2 ref.

Ugali (Kiswahili language) is a thick porridge popular in Eastern and Southern Africa and is prepared using flour from whole or dehulled grains. Traditional methods of ugali preparation and consumption are described. Ugali quality characteristics of 61 sorghum cultivars, including those of the International Sorghum Food Quality Trials, were evaluated by taste panels. It was observed that a light colored ugali with least tackiness was the most desirable. In general, cultivars with corneous grains and high breaking strength produced ugali with the most desirable texture and keeping quality.

1349 MURTY, D.S. and HOUSE, L.R. 1982. Sorghum food uses. Pages 9-14 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT.

1350 MURTY, D.S., and SUBRAMANIAN. V. 1982. Sorghum Roti: I. Traditional methods of consumption and standard procedures for evaluation. Pages 73-78 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 12 ref.

Roti (an unleavened bread) is the most popular sorghum food consumed in India. The traditional method of milling, dough and roti preparations are described in detail. Standard procedures for the dough and roti evaluation evolved at ICRISAT are outlined.

1351 MURTY, D.S., PATIL, H.D., and HOUSE, L.R. 1982. Sankati quality evaluation of sorghum cultivars. Pages 36-38 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 3 ref.

Sorghum sankati is a type thick porridge consumed in South India and is prepared by cooking coarse flour/grits from either dehulled or whole grain. Domestic methods of sankati preparation and consumption are described. Thirty sorghum cultivars were evaluated for sankati quality by using taste panels at two locations. Grain with intermediate and hard endosperm texture and a white/creamy pericarp produced sankati with the preferred qualities.

1352 MURTY, D.S., PATIL, H.D., and HOUSE, L.R. 1982. Sorghum Roti: II. Genotypic and environmental variation for Roti quality parameters. Pages 79-91 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 13 ref.

Grain, flour, dough, and roti characters of a large number of sorghum cultivars were evaluated in the laboratory by using standard methods. Roti quality of 422 genotypes of different pericarp colors and endosperm texture were evaluated with the help of a trained taste panel. The range of variation for the various quality parameters under study was broad even among cultivars with pearly white grains. Pericarp color, endosperm type, and endosperm texture had significant effects on roti quality. Corneous grains, in general, exhibited more density and breaking strength, lower percent water absorption, and better dough and roti quality. Significant effects for season, year, and genotype x year interaction were recorded for grain, dough, and roti quality parameters. The effect of the nitrogen fertility level on roti quality was insignificant. However, a considerable effect of soil moisture stress on dough characters was noticed. Wet weather leading to grain deterioration caused the most significant effect on roti quality.

1353 MURTY, D.S., PATIL, H.D., and HOUSE, L.R. 1982. Studies on processing and cooking characters in sorghum. Paper presented at the All India Coordinated Sorghum Improvement Project Workshop, 17-19 May 1982, Pune, India. 14 pp.

1354 MURTY, D.S., PATIL, H.D., RAO, K.E.P., and HOUSE, L.R. 1982. A note on screening the Indian sorghum collection for popping quality. Journal of Food Science and Technology 19(2): 79-80. 4 ref.

The Indian sorghum germplasm collections (3682 accessions) maintained at the ICRISAT center was screened for superior pop sorghums and 36 accessions exhibiting more than 80% popped grains per sample were identified. In general, the pop sorghums possessed a small grain size, medium thick pericarp, hard endosperm and a very low germ endosperm size ratio.

1355 MURTY, D.S., ROONEY. L.W., PATIL, H.D., and HOUSE, L.R. 1982, A report on the International Sorghum Food Quality Trials (ISFQT). Patancheru, A.P., India: ICRISAT. 42 pp.

1356 NARKHEDE. P.L., and PATIL, T.N. 1982. A conventional practice: enriching sorghum bread by adding black gram (Phaseolus mungo L.) Sorghum Newsletter 25: 100-101.

A conventional practice of preparing sorghum bread by adding black gram is most popular among people in Buldana, one of the sorghum growing districts of Maharashtra, India. Locally, this breed (sorghum + black gram) is called "Kalnyachi Bhakar.". It is prepared by adding 20 to 40% black gram (grain) to sorghum, grinding them into flour, and adding a small quantity of a common salt (NaC1) to the flour.

1357 NEUCERE, J.N. 1982. Agglutinating factors in grain sorghum, Sorghum bicolor. Journal of the American Oil Chemists Society

59(4): 293A. (Abstract).

1358 NOVELLIE, L. 1982. Fermented porridges. Pages 121-128 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 45 ref.

This paper surveys African fermented porridges and notes the ways in which they resemble and differ from fermented beverages of alcoholic and nonalcoholic nature. Problems in the organoleptic assessment of African foods are discussed, together with those of linking process parameters with consumer likes and dislikes.

1359 OBILANA, A.T. 1982. Traditional sorghum foods in Nigeria: their preparation and quality parameters. Pages 45-54 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 18 ref.

Ogi, a smooth, creamy, free-flowing thin porridge and tuwo, a soft, binding thick porridge are two major staple foods prepared from sorghum in Nigeria. The processing of sorghum into these to dishes is compared in detail. The nutritional quality and consumer preference for traditional and laboratory methods of processing sorghum is compared. Consumers prefer sorghum ogi and tuwo prepared from traditionally processed flour and paste. Irrespective of nutritional qualities, they prefer soft white or cream-colored grain without a subcoat, which gives a high percentage of ogi recovery and a light color ogi or tuwo with good keepingquality.

1360 OKEIYI, E.C. 1982. Evaluation of protein quality of formulations of sorghum grain flour and legumes seeds. Ph.D. thesis, Mississippi State University, Mississippi, USA. 150 pp.

1361 OLATUNJI, O., AKINRELE, I.A., EDWARDS, C.C., and KOLEOSO, O.A. 1982. Sorghum and millet processing and uses in Nigeria. Cereal Foods World 27(6): 277-280. 16 ref.

In an experimental study, sorghum and millet grains were fermented to make ogi or polished on laboratory and pilot plant equipment and dry milled to make flour and grits. The flour was test-baked in blends with wheat and soy flours. Satisfactory bread was made from wheat flour diluted with 10% of either sorghum or millet flour. Blends consisting of as much as 45% of either sorghum or millet made acceptable biscuits.

1362 OSINUBI. O.A., and EKA, O.U. 1982. Effect of cooking on the nutritive value of koko/kosai - a traditional breakfast meal of the Hausas in northern Nigeria. Food Chemistry 7(3): 181-187. 24 ref.

The effect of cooling on the nutritive value of koko/kosai was assessed by chemical analysis. There was significant loss in the proximate composition due to cooking. In addition, loses of some mineral elements and vitamins were observed. The losses in potassium, iron, zinc and phosphorus were found to be 23%, 6.7%, 25% and 13.3%, respectively. Losses of vitamins B1, B2, C and carotene were found to be 20%, 46%, 37% and 9.6% respectively. The amino acid pattern of the koko/kosai was only slightly affected by the traditional method of cooking employed. Some suggestions and recommendations are made on how to retain most of the nutrients when cooking the meals.

1363 PRASAD. D., and MANDOKHOT, V.M. 1982. Effect of storage on the nutritional value of sorghum flour. Indian Journal of Nutrition and Dietetics 19(12):

370-376. 13 ref.

High tannin content (4.0%) in the sorghum variety (JS-20) prevented insect infestation. In CSH-5, CSH-6 and SPV-220 varieties of sorghum the insect infestation can be graded as high, medium and low on six months of storage. The uric acid content of the flour can be used as a basis to grade the infestation damage. Highly infested sorghum flour did not support the growth of the rats at all. It also reduced the testes weight of the rats and prevented spermeogenesis.

1364 **PUSHPAMMA, P.. and VOGEL. S.M. 1982. Consumer acceptance of sorghum and sorghum products.** Pages 341-353 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 20 ref.

In screening cultivars for better agronomic properties, grain characteristics that influence consumer acceptability need consideration. Though plant breeders are aware of the benefits to be derived from such screening, the lack of simple laboratory tests that use small samples of grain and are fast enough to screen large number of sample is a disincentive. To develop standard test procedures, it is necessary to identify grain characteristics influencing food quality attributes that have a major bearing on consumer acceptability of the grain. In addition to consumer and market surveys, utilization tests and consumer product tests can be used effectively to develop parameters to measure sorghum product quality attributes, which can be linked to physical or chemical grain characteristics. Acceptability of sorghum and sorghum products can be improved by introducing better and easy methods of processing and developing "high status", foods using refined sorghum flour or composite flour, in addition to breeding varieties with better food quality.

1365 **RAO VARALAKSHMI. 1982.** Development and nutritional evaluation of extrusion cooked ready-to-eat foods from jowar, wheat, horsegram and defatted sunflower seed meal combinations.M.H.Sc., thesis. University of Agricultural Sciences, Bangalore, India. 98 pp.

The study was undertaken to develop low-cost protein rich extruded product from combinations of cereal-pulse-defatted oilseed mixtures. Two blends were extruded viz., blend A: jowar (60) + horsegram (30) + sunflower seed meal (10) and blend B: wheat (60) + horsegram (30) + sunflower seed meal (10). Three variations in each blend were extruded varying in their extent of cook from fully cooked to hard. The extrudates were analysed for their proximate composition and physical characteristics. The protein content of blend A was 21.9 and of blend B was 24.8. The extrudates were utilized to prepare instant mixes for selected dishes like uppittu, weaning food, beverage mix, porridge and hot and sweet packs. Sensory evaluation of their acceptibility including quality characteristics were scored on a four-point scale. The mean scores ranged between fair (2) to good (3) and statistical analysis revealed no significant difference between blends A and B.

1366 **RAO, K.E.P., and MURTY, D.S. 1982.** Sorghum for special uses.Pages 129-134 In Proceedings, International Symposium on Sorghum Grain Quality. 28-31 October 1981. Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 22 ref.

Sorghum is used for various special purposes such as popping, roasting, chewing, malting, and flavoring. Germplasm accessions known for these uses are presented with their geographical origin and taxonomic status* Germplasm accessions from India (3682) were screened at ICRISAT and 36 lines that exhibited superior popping quality were identified. Empirical selection for sweet stalks among 7000 accessions of the World Collection resulted in the identification of 253 lines for chewing purposes. Landraces preferred for malting cooking like rice. and Basmati sorghums for flavoring are indicated.

1367 **ROONEY, L.W. 1982.** Sorghum food quality workshop for Central America and Mexico.Sorghum Newsletter 25: 103.

1368 **ROONEY. L.W. 1982.** Sorghum quality update - Much progress and more to come! Achievements.Sorghum Newsletter 25: 103.

1369 **ROONEY. L.W., and MURTY, D.S.** 1982. Color of sorghum food products.Pages 323-327 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 9 ref.

Color of sorghum milled products and foods is an important aspect of quality that must be measured. Color measurements on sorghum grain, roti and tortilla samples using the Hunter Lab Color Difference Meter and the Munsell Soil Color Charts showed that Munsell Color Charts are effective for a rapid and inexpensive assessment of a large number of samples from quality breeding programs. It would be possible to obtain standardized color schemes to assess a wide array of sorghum food products among laboratories. Sophisticated instruments such as the Hunter Lab Color Difference Meter can be used for fundamental studies to backup crop improvement programs.

1370 **ROONEY. L.W., and MURTY, D.S.** 1982. Evaluation of sorghum food quality.Pages 571-588 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 60 ref.

1371 **SANCHEZ. L.M.. and SALAZAR, M.G.** 1982. Fortification of sorghum flour for tortillas with soybeans, lysine and methionine.(Es). Pages 153-176 In Proceedings, Grain Quality Workshop for Latin America, 13-17 April 1982, Londres, Mexico. Londres, Mexico: CIMMYT. 13 ref. (Summary:En).

Due to the importance of tortilla consumption in Mexico and Central America (7,8) and now in other countries as the United States of America, several formulations and processes were designed to prepare a lime treated sorghum flour for high nutritional value and low cost tortillas, that were compared with other foods including corn products. The product has good acceptibility. P.E.R. values were close to casein and the cost was similar to corn products.

1372 **SCHEURING. J.F., SIDIBE. S., and KANTE, A.** 1982. Sorghum alkali To: quality considerations.Pages 24-31 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 7 ref.

Sorghum alkali to quality studies over 3 years in Mali have revealed four quality criteria that must be considered when selecting new varieties and hybrids destined for alkali to consumption. These criteria in increasing order of importance are taste, color, texture, and keeping quality. Sorghums with a colored testa or a yellow pericarp often make to with astringent taste. To color is greatly affected by pH. It lightens in acid pH while alkali pH levels result in dark colors especially gray. yellow, and red. Very dark red or gray color is unacceptable. Grain weathering can cause unacceptable dark to colors from varieties whose clean grain makes light to color. The color of to can be evaluated from samples prepared in a 20-g mini-test. Sticky or dense to texture is unacceptable. To with poor texture also has poor keeping quality. The elimination of varieties whose to has poor keeping quality will assure the elimination of to with poor texture.

1373 SHIAU, S.Y.. and YANG. S.P. 1982. Effect of micronizing temperature on the nutritive value of sorghum.Journal of Food Science 47(3): 965-968. 22 ref.

Micronization is a process of heat treatment of grains using infrared radiation followed immediately by processing in an extruding-type roller mill. A laboratory model Pierce micronizer was used to process sorghum under three different temperatures: 102 deg, 250 deg, and 282 deg C. Sorghum processed at 250 deg had the highest starch availability value followd by sorghum processed at 282 deg C, sorghum processed at 102 deg, and raw sorghum. The extent of protein solubility was in decreasing order: raw, processed at 102 deg, processed at 250 deg, and processed at 282 deg. Increasing the temperature of the process destroyed more lysine. Animal study showed that a diet containing 15% protein from sorghum micronized at 250 deg and casein had a higher growth response than the diets containing raw sorghum or sorghums micronized at 102 deg or 282 deg C.

1374 SIDIBE, S., DIARRA, M., and SCHEURING, J.F. 1982. Sorghum Couscous: quality considerations.Pages 110-112 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT.

Couscous is the major sorghum food of the Sahelian zone of West Africa. With the exception of varieties with a thick testa or waxy endosperm, most sorghums can be prepared into acceptable couscous. In Mali, the most important couscous quality criterion is the yield of the final product compared with the original flour. There are large varietal differences for couscous yield that can be detected with the 20-g sample laboratory test described in this paper.

1375 SINGH, T., TYAGI, R.P.S.. and VARMA, B.K. 1982. Study of the occurrence of aflatoxin Bl in foodgrains.Journal of Food Science and Technology 19(1): 35-37. 14 ref.

Of the 125 samples of foodgrains and oilseeds analysed, aflatoxin Bl was found in 23.2% of the samples. Among the 15 samples of each foodgrain analysed, aflatoxin Bl was found in 2 samples of rice, 6 samples of jowar, 10 samples of raw groundnut, 5 samples of roasted groundnut and in 6 samples of maize.

1376 SUBRAMANIAN, V., and JAMBUNATHAN, R. 1982. Properties of sorghum grain and their relationship to Roti quality.Pages 280-288 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 18 ref.

Physicochemical characteristics of 45 sorghum genotypes were determined. The 100-grain weight, grain hardness, protein, water soluble protein, amylose, and sugars contents in the grain showed considerable variation. The roti quality of flour from the 45 genotypes was evaluated for color, appearance, taste, flavor, and texture by a trained taste panel.

The texture of dough was measured using an Instron machine. Relationships between the physicochemical characteristics of grain and roti qualities were identified. The quantity of water soluble protein, amylose and sugars jointly influenced the roti quality of the sorghum genotypes studied.

1377 SUBRAMANIAN, V., and JAMBUNATHAN, R. 1982. Studies on sorghum grain quality. Paper presented at the All India Coordinated Sorghum Improvement Project Workshop, 17-19 May 1982, Pune India. 18 pp. 11 ref.

The variations in nutrient composition including mineral contents of sorghum grains are discussed. The distribution of amino acids and the variation in amino acid chemical score of elite cultivars are presented. The tannin (catechin equivalents) content of brown sorghum grains varied considerably. The rheological properties of sorghum dough, nutrient composition and digestibility of sorghum roti are discussed. Preliminary experiments conducted on the acceptance of sorghum revealed that consumers could not distinguish the bhakri prepared from either local or hybrid sorghum. The sugars content of sorghum stalks varied from 16.2 - 42.7% on dry weight basis.

1378 SUBRAMANIAN. V., MURTY. D.S., JAMBUNATHAN, R., and HOUSE, L.R. 1982. Boiled sorghum characteristics and their relationship to starch properties. Pages 103-109 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 11 ref.

Traditional methods of boiled sorghum preparations are described. The cooking quality of boiled sorghum prepared from dehulled grain of 25 cultivars was evaluated using laboratory procedures. The percent increase in volume and weight of grains due to cooking, time required for cooking, texture of the cooked grain, and the overall acceptability of the cooked product varied among the genotypes. Color, taste, texture, and keeping quality of boiled sorghum were evaluated using a taste panel. Swelling power, solubility, and inherent viscosity of starch were dertemined for 12 cultivars. The relationship between starch characteristics and cooking quality of boiled sorghum was studied. Cooking quality characteristics of boiled sorghum were significantly correlated with the swelling power and solubility of the starch.

Industrial Uses

1379 ANONYMOUS. 1982. Sorghum beer research. Scientiae 23(3): 26-27.

As a result of research at CSIR, South Africa, the shelf life of sorghum beer has increased from 3 to 4 days, to 12 weeks before deteriorating. Based on their inherent properties, sorghum cultivars are classified into different malting and feed classes.

1380 BARTOLELLI, M., ADILARDI, G., and BARTOLELLI. V. 1982. Preliminary analysis of alternative energy resources from agricultural products and by-products: a possible contribution of some herbaceous crops. (It). Informatore Agrario 38(31): 22023-22038.

1381 FAO. 1982. The potential for industrial processing of sorghum for baking and allied food industries in Africa. Report of a regional workshop, 7-12 December 1981, Shambat, Khartoum. FAO, Rome, Italy. (FAO-AG-DP/RAF/78/057). 32 pp.

1382 HURST. W.C. 1982. Making syrup for profit.Bulletin - Cooperative Extension Service, University of Georgia, College of Agriculture, Georgia, USA, 15 pp. 9 ref. (No. 868).

1383 MICHE,J.C. 1982. Industrial utilization of sorghum for human nutrition.(Fr). Industries Alimentaires et Agricoles 99(9): 723-729. 1 ref.

Surveys the world production and uses of sorghum, the main characteristics of grain and its potential food use in arid zones. Some processing methods are briefly described, including milling, incorporation in breadmaking, pasta, biscuits and cooking-extrusion products.

1384 NOUT, M.J.R., and DAVIES, B.J. 1982. Malting characteristics of finger millet, sorghum and barely.Journal of the Institute of Brewing 88(3): 157-163. 36 ref.

Malting characteristics of the finger millet variety Imele (FI), sorghum variety Andivo (SA) and Ingumba (SI) and the barley variety Research (BR) were compared in relation to the brewing of traditional African opaque beer as well as conventional lager beer. The investigations include: effect of steeping and germination conditions; influence of gibberllic acid and kilning temperature on activity of important brewing enzymes; and an appraisal of the brewing potential of the worts obtained. Results are tabulated. FI, SA and SI malts were considered unsuitable as barely malt extenders for conventional lager beers, but Fl and possibly SI malts would be suitable for darker tropical lager beer manufacture.

1385 NOVELLIE, L. 1982. Fermented beverages.Pages 113-120 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 42 ref.

Fermented beverages, both alcoholic and nonalcoholic, of Africa are surveyed from a number of interlinked points of view, including low and high level food technology, organoleptic qualities and their changing nature, problems involved in reconciling consumer preferences and processing qualities with agronomic needs and realities, types of cultivars available, the polyphenol and bird problems.

1386 SHIN, K.C., HONG, B., and FAN, L.T. 1982. Fermentative production of butanol from sorghum molasses.Abstracts of Papers of the American Chemical Society 184: 52. (Abstract).

The fermentative production of butanol and acetone from sorghum molasses could provide significant economic benefits for agricultural communities. This work was concerned with identifying several crucial fermentation parameters and determining how improvements in the sorghum molasses in producing solvents. Clostridium acetdbutylicum strain ATCC 4259 was found to give the highest solvent yield. Furthermore, the effects of concentrations of the substrate and inorganic salts and addition of other nutrients were investigated. For a batch fermentation the final concentrations of the products in g/1 were: butanol, 8.0; acetone, 1.2; ethanol, 2.4; acetate, 3.0 and butyrate, 6.0. The fractions of the sugar converted into butanol, acetone and ethanol were 0.2, 0.03 and 0.06, respectively. The liquid chromatographic analysis of fermentation broth indicated that glucose and fructose were more readily consumed than sucrose.

1387 TEGGE, G., and RICHTER, G. 1982. Sorghum and broken rice as basic materials for glucose production.(De). Starke 34(11): 386-390, 7 ref. (Summary:En).

Two starch containing raw materials, Mexican sorghum flour and Pakistan broken rice, were processed to various saccharification products without previous starch isolation. The low viscosity fluids received by "direct" enzymatic saccharification of the starch material were worked up into high maltose or high glucose syrups, respectively, the latter of which was undergone isomerization by means of glucoseisomerase. The used immobilized glucoseisomerase lost its activity very early and was not reactivated by treatment with pure glucose solution. From both raw materials saccharification products of lower purity were obtained, in comparison with purified starches. It is pointed out, however, that in the food sector as well as in the field of technical products exaggerated demands of purity are senseless, because in most cases starch saccharification products are contaminated again during further processing or are subjected to purification processes after conversion.

1388 TURHOLLOW. A.F. JR. 1982. Large-scale alcohol production from corn, grain sorghum, and crop residues.Ph.D. thesis, Iowa State University, Iowa, USA. 121 pp.

ECONOMICS AND MARKETING

1389 ANONYMOUS. 1982. Exports of 9 major agricultural products.Asia Research Bulletin:Commodities and Primary Industries 11(12): 923-924.

1390 ANONYMOUS. 1982. Ivory Coast: The main crops in 1979 and 1980.Pages 14-15 In Banque Centrale des Etats de l'Afrique de l'Ouest, notes d'information et statistiques. Dakar, Senegal, BCEAO. (No. 302).

1391 ANONYMOUS. 1982. Maize and sorghum.(Fr). Cultivar 150: 65.67.

1392 ANONYMOUS. 1982. Senegal: the main crops in 1979-1980 and 1980-81.Pages 14-15 In Banque Centrale des Etats de l'Afrique de l'Ouest notes d'information et statistiques. Dakar, Senegal: BCEAO. (No. 301).

1393 ANONYMOUS. 1982. Togo: the main crops in 1979-80 and 1980-81.Pages 14-15 In Banque Centrale des Etats de l'Afrique de l'Ouest notes d'information et statistiques. Dakar, Senegal: BCEAO. (No. 301).

1394 ANONYMOUS. 1982. Upper Volta: the main crops in 1979-80 and 1980-81.Page 13 In Banque Centrale des Etats de l'Afrique de l'Ouest, notes d'information et statistiques. Dakar, Senegal: BCEAO. (No. 302).

1395 AGOSTINI. E.R. DE., MOLINO, E.J., and BEVILACQUA, M.T. DE. 1982. Operational costs, gross income, and gross profitability in corn, sorghum, sunflower, soybean of first and second planting for 1982-83 (Argentina).(Es). Buenos Aires, Argentina: Univ. de Buenos Aires. 10 pp.

1396 ANDREW, CO., and ALVAREZ, J. 1982. Adoption of agricultural technology: developments in agro-socio-economic thought.Social and Economic Studies 31(3): 171-189.

1397 ARAKERI, H.R. 1982. Some important socioeconomic issues concerning sorghum in India.Pages 675-687 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 12

ref.

1398 AUGUSTIN, C. 1982. Comparative study of the role of cotton and sorghum "Pitimi Madam Michel" in the production system of the Basse Plaine des Gonaives (Haiti)(Fr). Damien, Haiti: Faculte d'Agronomie et de Medecine Veterinaire. 43 pp.

1399 AUSTRALIA:BUREAU OF AGRICULTURAL ECONOMICS. 1982. Coarse grains; situation and outlook 1982.Canberra, Australia: Australian Government Publishing Service. 51 pp.

1400 BAYCHELIER, G. 1982. Revival of interest in sorghum.(Fr). Cultivar 149: 37.

1401 BUSCH. L., and LACY, W.B. 1982. Research systems.Pages 689-697 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 22 ref.

1402 CABELGUENNE, M., MARTY, J.R.. and HILAIRE, A. 1982. Technical and economic comparison of the cost effectiveness of irrigation for four summer crops: maize, soybean, sorghum, sunflower.(Fr). Agronomic 2(6): 567-576. 17 ref. (Summary:En).

The importance of technical and economic factors is assessed for the irrigation of four summer crops: maize, soybean, sorghum, sunflower, in the conditions of South West France. The methodology used accounts for biological aspects for each crop, and specially water response curves. On the basis of yields and water consumption, the water-yield and water-yield value ratios are discussed according to agricultural prices in 1980. On the basis of cropping costs for each species, with different water costs per cubic meter, it is possible to grade different levels of gross margins, in relation to three cases of natural water availability (rainfall plus soil water reserve) representative of the principal pedoclimatic conditions of the area. With 1980 price ratios, the value of irrigation for the four crops decrease as follow: 1 soybean, 2 maize, 3 sunflower, 4 sorghum.

1403 CHOWDRY, K.R. 1982. A study on agricultural growth rates in Andhra Pradesh.Economic Affairs 27(7-9): 491-499.

In Andhra Pradesh, India, sorghum, rice and groundnut constitute more than 55% of the total cropped area and more than 85% of the total irrigated area. The total area and total irrigated area under these crops are steadly increasing. Groundnuts has, however, shown the highest growth rates in net area, irrigated area, production and productivity.

1404 CORRADINI, E.F. 1982. Argentine agricultural production: cereals and oilseed crops, trends and location.(Es). Contabilidad y Administracion, Argentina 11(62): 289-304.

A study is made of area, production, yields and geographical location of sorghum, wheat, oats, barley, rye, maize, linseed, sunflowers, soyabeans and groundnuts,

1405 COX, L.J. 1982. The economics of information in agricultural commodity markets.Ph.D. thesis, Texas A & M University, USA. 113 pp.

An analysis of information contained in weekly sorghum, maize and beef cattle prices at Texas producer/first handler markets and Kansas City terminal markets, showed that in the case of sorghum, neither of these markets was efficient in the weak form sense. While prices adjust gradually to information in Texas, price first overadjusts to information and then adjusts to it in Kansas City.

1406 FERNANDEZ URQUIZA. E.C. 1982. Foreign trade: rates of exchange, incomes and export of wheat, maize and sorghum.(Es). Thesis, Universidad de Buenos Aires, Argentina. 74 pp.

1407 FUTRELL, M., MCCULL0UCH,E., JONES, R., and BLUHM, L. 1982. Factors affecting sorghum consumption in Honduras.Page 756 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

This interdisciplinary research dealt with the agronomic, economic, social and nutritional factors which influenced the production, storage, and consumption of sorghum in Honduras. An interview schedule covering the above areas was developed and used by Mississippi INTSORMIL researchers in two surveys in the summer of 1981 in mountainous and lowland areas of southern Honduras. Data on household size, sex roles, decision-making patterns, attitudes, values, consumer preferences of grain and methods of food preparation were recorded. Food intake studies, as well as anthropometric measurements, were used to assess the nutritional status of each child. This was a base-line study to develop criterion for future nutritional improvement through the use of improved strains of sorghum grown in Honduras for human consumption.

1408 GADSON, K.E., PRICE, J.M., and SALATHE, L.E. 1982. Food and Agricultural Policy Simulator (FAPSIM): structural equations and variable definitions.United States Department of Agriculture, Economic Research Service, Washington, D.C.. USA. (ERS Staff report No. AGES 820506). 394 pp. 23 ref.

This report provides a detailed description of the structural equations and their statistical attributes in the current version of the Food and Agricultural Policy Simulator (FAPSIM). FAPSIM is an annual econometric model of the U.S. agricultural sector. It estimates a simultaneous price-quantity equilibrium solution for a set of individual commodity models developed for beef, pork, dairy, chickens, eggs, turkeys, corn, oats, barley, grain sorghum, wheat, soybeans, and cotton. It also endogenously estimates farm production expenses, cash receipts, net farm income. Government deficiency and reserve storage payments, consumer price indexes for food products, and farmer participation in Government commodity programs.

1409 GHODAKE, R.D., and WALKER, T.S. 1982. Yield gap analysis in dryland agriculture: perspectives and implications for the eighties.Presented at the National Seminar on A Decade of Dryland Agricultural Research in India and Thrust in the Eighties, 18-20 January 1982, All India Coordinated Research Project for Dryland Agriculture, Hyderabad, India.

1410 GRUBE, A.H. 1982. Preliminary benefit analysis of captan for seed treatment of corn, small grains and soybeans.University of Illinois, Department of Agricultural Economics, Illinois, USA. 201 pp. 325 ref. (No. E-238).

This report is a preliminary benefit analysis of the fungicide captan used as a seed treatment on corn, soybeans, sorghum, wheat, barley, oats and rye. This analysis is intended as input to the risk/benefit decision by the Administrator of EPA as to the continued registration of captan under the Federal Insecticide, Fungicide, and Rodenticide Act.

1411 GUATEMALA:BANCO DE GUATEMALA. 1982. Statistics of the main agricultural products of internal consumption. Agricultural year. 1972-73 - 1982-83.(Es). Informe Economico 29: 83-89.

1412 HARRISS, B. 1982. Agricultural marketing in the semi-arid tropics of West Africa. A partially annotated and indexed bibliography and list of common abbreviations, addresses and a French-English technical glossary.Patancheru, A.P., India: ICRISAT. 225 pp. (Economics Program, Progress report - 30).

1413 HARRISS, B. 1982. The marketing of foodgrains in the west African Sudano-Sahelian states - An interpretive review of the literature.Patancheru, A.P., India: ICRISAT. 107 pp. 211 ref. (Economics Program, Progress report - 31).

1414 HILL, L.D. 1982. Iowa and Illinois share limelight in agricultural exports.Crops and Soils Magazine 35(1): 5-6.

1415 HINTON, R.A. 1982. Considerations for crop selection and acreage reduction in 1982.Farm Economics: facts and opinions - Illinois University, Cooperative Extension Service, Illinois, USA. 4 pp. (No. 82-3).

1416 HOYT, P.G. 1982. Crop-water production functions and economic implications for the Texas High Plains region.United States Department of Agriculture, Economic Research Service, Washington, D.C., USA. 30 pp. 12 ref. (ERS Staff Report No. AGES 820405).

Crop-water production functions are estimated by growth stage for corn, sorghum and wheat grown in the Texas High Plains regions. An economic analysis of these production functions provides useful information for farm level irrigation decisions to increase profits and for water conservation policy to lengthen the life of the Ogallala aquifer. The analysis indicates very little change in profit maximizing water quantities reaching the plant in response to changes in crop or water prices. Irrigation water reductions of upto 20% have very little effect on profits per acre and thus could be used to extend aquifer life.

1417 ICRISAT. 1982. Economics.Pages 285-309 In Annual report, 1981. Patancheru, A.P., India.

1418 J0DHA, N.S., and SINGH, R.P. 1982. Factors constraining growth of coarse grain crops in semi-arid tropical India.Indian Journal of Agricultural Economics 37(3): 346-354.

Stagnation or very slow growth of coarse cereals and pulses in recent years has become a serious concern of planners and policy makers in India. Heavy dependence on rainfall,lack of new technology, poverty of farmers and the absence of infrastructural support are often cited reasons for the slow growth of these crops. Nevertheless, the poor performance of these crops at the macro level is the result of farmers' decisions and actions vis-a-vis these crops. The farmer's approach to these crops in turn is conditioned by their characteristics, which are (1) low value status, (2) adaptation to poor habitat and resource base, and (3) production and consumption by the poorer members of society. These traits acquire differential significance in varying contexts but reinforce each other in creating a complex of constraints for coarse cereals and pulses. This paper illustrates the manner in which the constraints operate at the farm level. The paper concludes with possible directions to relax these constraints.

1419 JONES. M.L.. LIBBIN, J.D.. NELSON. D.C.. HINRICHS. J.. VAUGHN. R.. and HAMPTON. J. 1982. Costs and returns for producing irrigated crops on farms with above-average management in the lower Colorado Riber basin, Catron, Grant and Hidalgo counties. 1980.Research Report, Agricultural Experiment Station, New Mexico, USA. 28 pp. (No. 474).

A computer based crop budget generator was used in the construction of each crop and farm budget. Much of the information for the budgets was obtained from local individuals during meetings in the region during 1981. Costs and returns per acre were budgeted for production of six major flood-irrigated crops (alfalfa, cotton, grain sorghum, corn silage, permanent pasture and wheat pasture) on two farm types in Catron, Grant and Hidalgo counties: the Virden area of Hidalgo county, which is primarily alfalfa and row crops, and Grant and Catron counties, which consist mostly of forage crops.

1420 JOSHI, P.K., and KANEDA, H. 1982. Variability of yields in foodgrains production since mid-sixties.Economic and Political Weekly 17(13): A2-A3,A5,A7-A8. 1 ref.

The coefficient of variation of the yields of principal crops reveals a contrast between wheat and the other crops. For wheat, unlike for rice, etc. deviations of state yields around national average narrowed over the years. Also intra-state, or inter-district, variations in yield narrowed in much the same way as inter-state variations. What emerges is that, the more uniform the yields are around the best-practice level, and the less divergences there are between the yields of best-practice farmers and the majority of farmers, the higher is the national average yield. Hence the narrowing of variations in yields among large segments of farmers would be as important as aiming to increase the yields of a nation's best farmers.

1421 KASSIM, N.B. 1982. A study of agricultural land production for some agricultural crops in A.R.E.(Ar.). M.Sc. thesis, Ain-Shams University, Cairo, Egypt. 178 pp. (Summary:En).

1422 KELLER, O.R. 1982. Results from the application of the available techonolgy.(Es). Pages 67-71 In Publicacion Miscelanea - Estacion Experimental Regional Agropecuaria, Rafaela, Argentina. (No. 12).

1423 LAVERGNE, D.R., and PAXTON. K.W. 1982. Projected costs and returns - cotton, soybeans, corn, grain sorghum, and wheat, Louisiana, 1982.Louisiana Rural Economist - Louisiana State University, Department of Agricultural Economics and Agribusiness 44(1): 8-12.

1424 LENG, E.R. 1982. Status of sorghum production as compared to other cereals.Pages 25-32 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 5 ref.

1425 MAINA, S. 1982. On food security in Niger Republic: an economic analysis of millet and sorghum yield and acreage response.M.Sc. thesis, Mississippi State University, Department of Agricultural Economics, Mississippi, USA. 124 pp.

1426 MAJOR. D.J. 1982. Comparison of sorghums with wheat and barley grown on dryland.Pages 37-40 In Research Highlights 1981. Research Station. Lethbridge. Alberta, Canada.

1427 MCCALLA, I.E.. OSTEEN, C, and MCDOWELL, R. 1982. Pesticide use on grain sorghum in the major producing states, 1980.Washington, D.C., USA: U.S. Department of Agriculture. 15 pp. (ERS Staff Report No. AGES 820205).

In 1980, grain sorghum growers in six major producing states applied 14.8 million pounds (active ingredient) of pesticides in 12.2 million acre-treatments. Of the total quantity, 11.8 million pounds were herbicides and 3 million were insecticides. Coefficients of variation were computed for acres treated with specific pesticides and mixes of pesticides.

1428 MOHAMMED, G.B. 1982. An analysis of smallholder rainfed crop production systems: a case study of the Nuba mountains area. Western Sudan.Thesis, Michigan State University, Michigan, USA. 280 pp.

1429 MORRIS. W.M.M. 1982. Consumer preference and the adoption of new cultivars in Sahelian West Africa.Page 747 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 1-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

About 85% of the sorghum and millets produced in West Africa is consumed by the producer - it does not reach a market. Over the past 15 years the rate of increase in production of sorghum and millets has been 1.8%. year with a population increase of 2.8% year. Coastal countries, Senegal, Mauritania, and Gambia, have been increasingly importing wheat and rice at the rate of about 10%, year. While there are organized grain markets there is a failure to guarantee price because of a lack of ability by the government to buy, store, and market a surplus crop. Market prices fall and the farmer loses incentive to produce. The farmer has an array of varieties and he sows them according to such factors as soil type and fertility, rainfall, risk aversion and consumer preference. There are changes in food habits; the younger generation may prefer to eat pasta noodles or spaghetti ratherthan traditional to resulting in differences for grain type within a family. Preferences for good milling quality, color, clean, insect-free sound seed exist both in the market as well as the home.

1430 MORRIS, W.M.M. 1982. Consumer preferences and the adoption of new cultivars in Sahelian West Africa.Pages 365-367 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRIST.

Farmers and their families are fully aware of the cooking quality, flavor, and yield potential of each of the varieties available to them. Different generations within the family often have different preferences. Preferred varieties command a premium in the market. Sometimes farmer basis for the rejection of new varieties is founded on appearance and not on cooking or flavor. Farmers' choice of varieties grown is not made only on food quality; rotational needs, soils, and other factors are also important. White or yellow and red or brown sorghums are generally considered as two different crops, with different prices and different uses.

1431 NGENGE. A.W. 1982. A time series analysis of the efficiency of selected U.S. farm commodity markets.Thesis, Texas A & M University, Texas, USA. 225 pp.

1432 NORMAN, D.W. 1982. Socioeconomic considerations in sorghum farming systems.Pages 633-646 In Sorghum in the eighties:

proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 39 ref.

1433 OLUFOKUNBI. B. 1982. Marketing margin analysis as a tool for decision-making - the case of marketing Guinea corn and yam in Kaduna and Kano states of Nigeria.Oxford Agrarian Studies 11: 48-64.

1434 RAJU. V.T., and VON OPPEN, M. 1982. Marketing efficiency for selected crops in semi-arid tropical India.Patancheru, A.P., India: ICRISAT. 50 pp. 22 ref. (Economics Program, Progress report - 32).

The main objectives of this study are: (a) to examine some of the studies conducted on marketing margins and correlations coefficients as measures of marketing efficiency; (b) to calculate marketing costs and marketing margins for the five important Indian SAT crops: sorghum, pearl millet, pigeonpea, chickpea, and groundnut for different agencies involved: (c) to calculate correlation coefficients between markets for these five crops: (d) to attempt a comparison between marketing margins and correlation coefficients as measures of marketing efficiency: and (e) to identify the criteria determining marketing efficiency.

1435 RANGASWAMY, P. 1982. Improved technology for coarse grains: some constraints.Indian Journal of Agricultural Economics 37(3): 364-371. 7 ref.

Experiments are being conducted on a wide rang'e of crops including jowar, bajra, ragi, maize, gram, moong, groundnut, castor, etc., and proven results are carried on to the farmers through the agency of Integrated Dryland Agriculture Development Project (IDADP) in each area. This paper will confine itself to an economic analysis of some experimental and survey results in two centres, viz., Hisar in Haryana and Kovilpatti in Tamil Nadu, India, with respect to three crops - jowar, bajra and gram. It will focus on the profitability of the technology, its adoption rates and constraints.

1436 RICHARDSON, J.W., NIXON, C.J., and SMITH, E.G. 1982. Economic impacts of the 1981 Agricultural Act and the 1981 Tax Act on Texas High Plain farmers.Southern Journal of Agricultural Economics - Southern Agricultural Economics Association 14(2): 71-76. 7 ref.

An economic comparison of both the 1981 Agriculture and Food Act and the Economic Recovery Act of 1981 to their predecessors was made for a typical cotton-sorghum farm on the Texas High Plains. The comparison was done using a whole farm simulation model (FLIPSIM II) over a 10-year planning horizon. The results shown in the 1981 policy changes will increase the typical operator's average after-tax net present value by more than $129,000 over the previous set of policies.

1437 ROSSON, C.P. 1982. Price efficiency of marketing boards: the case of grain sorghum. (Volumes I and II).Thesis, Texas A & M University, Texas, USA. 453 pp.

1438 ROUCO OLIVA, J,O., and KELLER, O.R. 1982. Cost-profit analysis for the agricultural year 1982/83.(Es). Pages 53-66 In Publicacion Miscelanea - Estacion Experimental Regional Agropecuaria, Rafaela, Argentina. (No. 12).

1439 RYAN. T.J. 1982. The Australian demand for sorghum.Melbourne, Victoria, Australia: Department of Agriculture. 19 pp. 10 ref. (Research Project Series No. 131).

1440 RYAN, J.G., VIRMANI, S.M., and SWINDALE, L.D. 1982. Potential technologies for deep black soils in relatively dependable rainfall regions of India.Presented at the Indian Bank Seminar on Innovative Technologies for Integrated Rural Development, 15-17 April 1982, New Delhi, India.

1441 SANDOVAL, E.R. 1982. Agroeconomic analysis of price fluctuations of maize, sorghum, beans and rice in the southern region of Honduras.(Es). Thesis, Universidad Nacional Autonoma de Honduras, La Ceiba, Honduras. 40 pp.

1442 SHERMAN, J.R., and 0UEDRA0G0, I. 1982. Grain marketing in the West African semi-arid tropics.Pages 647-657 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 18 ref.

1443 SILVA ARREGUI, F., MENECHELLA, R., and WAGNER, O. 1982. Grain sorghum cultivation under irrigation: cost analysis and economical assessment of a hectare.(Es). Pedro Luro, BS. As. Argentina: Univ. de Buenos Aires. 19 ref.

1444 SINGH, R.P., ASOKAN, M., and WALKER, T.S. 1982. Size, composition, and other aspects of rural income in the semi-arid tropics of India.Patancheru, A.P., India: ICRISAT. 28 pp. 26 ref. (Economics Program, Progress report - 33).

1445 SMITH. V.E. 1982. Food consumption behaviour in three villages of northern Nigeria.MSU Working Paper. Department of Agricultural Economics, Michigan State University, Michigan, USA. 92 pp. (MSU Rural Development Series No. 22).

1446 STRZYBNY, X. 1982. The Spanish cereals market. Report of a journey to Spain by GFR cereals experts under the arrangements for GFR-Spanish agricultural exchange visits.(De). Berichte uber Landwirtschaft 60(1): 140-149.

1447 TANZANIA: MARKETING DEVELOPMENT BUREAU. 1982. Price policy recommendations for the July 1982 agricultural price review (Tanzania). Annex 2: Sorghum, millets, cassava and beans (prices for 1983/84 marketing season).Dar es Salaam, Tanzania: Marketing Development Bureau. 50 pp. (FAO-AGO-UTF/URT/057/URT).

1448 U.S. DEPARTMENT OF AGRICULTURE. 1982. Export markets for U.S. grain and feed commodities, March 26, 1982.Foreign Agriculture Circular, Grains FG - U.S. Foreign Agricultural Service, Washington, D.C., USA. 32 pp. (No. 10-82).

1449 U.S. DEPARTMENT OF AGRICULTURE. 1982. Export markets for U.S. grain and feed commodities.Foreign Agriculture Circular. Grains FG - U.S. Foreign Agricultural Service, Washington, D.C., USA. 30 pp. (No. 6-82).

1450 U.S. DEPARTMENT OF AGRICULTURE. 1982. Export markets for U.S. grain and feed commodities.Foreign Agriculture Circular. Grains FG-U.S. Foreign Agricultural Service, Washington, D.C., USA. 36 pp. (No. 14-82).

1451 U.S. DEPARTMENT OF AGRICULTURE. 1982. Grain exports by selected exporters.Foreign Agriculture Circular. Grains FG - U.S. Foreign Agricultural Sevice, Washington, D.C, USA. 18 pp. (No. 9-82).

1452 U.S. DEPARTMENT OF AGRICULTURE. 1982. World grain situation/outlook.Foreign Agriculture Circular. Grains FG - U.S. Foreign

Agricultural Service, Washington. D.C., USA. 33pp. (No. 23-82).

1453 U.S. DEPARTMENT OF AGRICULTURE. 1982. World grain situation/outlook.Foreign Agriculture Circular. Grains FG - U.S. Foreign Agricultural Service, Washington, D.C., USA. 38 pp. (No. 5-82).

1454 USA:MISSISSIPPI STATE UNIVERSITY. 1982. Estimated costs and returns, crops, black belt area of northeast Mississippi, 1982.Mississippi State University, Department of Agricultural Economics, Agricultural and Forestry Experiment Station, Mississippi, USA. 51 pp. 12 ref. (Agricultural Economic Report No. 4).

This publication provides information on production practices, costs, and returns for specified crops grown in the black belt of northeast Mississippi, USA. An enterprise budget lists and describes all operations used to produce each crop.

1455 USA:MISSISSIPPI STATE UNIVERSITY. 1982. Estimated costs and returns, crops, brown loam area of Mississippi, 1982.Mississippi State University, Department of Agricultural Economics, Agricultural and Forestry Experiment Station, Mississippi, USA. 60 pp. 20 ref. (Agricultural Economic Report No. 2).

This publication provides information on production practices, costs, and returns for specified crops grown in the brown loam area of Mississippi, USA. An enterprise budget lists and describes all operations used to produce each crop.

1456 USA:MISSISSIPPI STATE UNIVERSITY. 1982. Estimated costs and returns, crops, delta area of Mississippi.Mississippi State University, Department of Agricultural Economics, Agricultural and Forestry Experiment Station, Mississippi, USA. 65 pp. 16 ref. (Agricultural Economic Report No. 3).

This publication provides information on production practices, costs, and returns for specified crops grown in the delta of Mississippi, USA. An enterprise budget lists and describes all operations used to produce each crop.

1457 USA:MISSISSIPPI STATE UNIVERSITY. 1982. Estimated costs and returns, crops, sand clay hills area of Mississippi, 1982.Mississippi State University, Department of Agricultural Economics, Agricultural and Forestry Experiment Station, Mississippi, USA. 50 pp. (Agricultural Economic Report No. 1).

This publication provides information on production practices, costs, and returns for specified crops grown in the sand clay hills of Mississippi, USA. An enterprise budget lists and describes all operations used to produce each crop.

1458 VON OPPEN, M.. and RAO. P.P. 1982. A market-derived selection index for consumer preferences of evident and cryptic quality characteristics of sorghum.Pages 354-364 In Proceedings, International Symposium on Sorghum Grain Quality, 28-31 October 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 9 ref.

A methodology has been developed for identifying relevant quality characteristics that determine consumer preferences for sorghum. The estimation results show that a complex mix of evident as well as cryptic quality characters are jointly affecting consumer preferences, as reflected in daily market prices. Two data sets (a) from one market over 4 years and (b) from four markets in 1 year were analyzed. The estimated coefficients of relevant qualities can be used as weights for predicting an index of consumer preferences for sorghum (SPI) for which the relevant quality characters are known. It is shown how 25 new sorghum samples are being ranked by SPI based on the two data sets. The rankings from both data sets are highly correlated, indicating that for predictive purposes the SPI performs consistently, regardless of whether it is derived from time series data or from cross-sectional data. The SPI is applicable for large-scale screening, although a few minor issues need to be resolved for increasing confidence and efficiency in its application.

1459 VON OPPEN, M.. and RAO, P.P. 1982. Sorghum marketing in India. Pages 659-674 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 8 ref.

1460 WALKER, T.S., and JODHA, N.S. 1982. Efficiency of risk management by small farmers and implications for crop insurance. Presented at the Conference on Agricultural Risk, Insurance and Credit, the Instituto Interamericano de Cooperacion Agricola (IICA) and the International Food Policy Research Institute (IFPRI), 8-10 February 1982, San Jose, Costa Rica.

1461 WALKER, T.S., and RAO. K.V.S. 1982. Risk and the choice of cropping systems: hybrid sorghum and cotton in the Akola region of central peninsular India. Patancheru, A.P., India: ICRISAT. 17 pp. 10 ref. (Economic Program, Progress report - 43).

Over 6 cropping years from 1975-76 to 1980-81 for the ICRISAT Village Level Studies (VLS) agronomic and socioeconomic information is gathered from 30 cultivator and 10 landless labour households at approximately monthly intervals by a resident investigator in each village. For cropping systems analysis, the unit of observations is the plot and field data.

SWEET SORGHUM

1462 ALBINO, L.F.T., NERY. J.R., and SILVEIRA, J.J.N. 1982. Substitution of maize by sweet sorghum in broiler rations.(Pt). Brasileira de Zootecnia 11(4): 706-720. 9 ref. (Summary:En).

The sweet sorghum (strain BR 501) was used as energy source replacing 0.0, 20.0, 40.0, 60.0, 80.0 and 100.0% of corn in broiler rations. 1104 chickens (Hubbard strain) were used, from one to 56 days of age, in a block randomized design experimental with six treatments and four replicates containing 46 chickens each (23 males and 23 females). For weight gain, there were not significant differences (P%0,05) among treatments. However, chickens feeding F treatment (Corn replaced in 100% by sweet sorghum) presented feed convertion better than chickens feeding A treatment (Corn did not replaced by sweet sorghum). The corn can be totally replaced by sweet sorghum in broiler rations, but it is necessary increase the pigment contents in rations when the corn be replaced by sweet sorghum in levels superior to 60%.

1463 ANGELLE, P. 1982. Sweet sorghum pilot program. Sugar Journal 44(10): 17-18.

1464 ASSIS, F.N. DE., MENDEZ, M.E.G., and SCHUCH, L.O.B. 1982. Response from a saccharine sorghum variety to different plant arrangements in two sowing periods in Pelotas, Rio Grande du Sul (Brazil).(Pt). Pages 113-115 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1465 ASSIS, F.N. DE., MENDEZ, M.E.G., and SCHUCH, L.O.B. 1982. Response from two saccharine sorghum varieties to different sowing periods in Pelotas, 1981/82.(Pt). Pages 119-121 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1466 ASSIS. F.N., MENDEZ. M.E.G., and SCHUCH, L.O.B. 1982. Evapotranspiration of saccharine sorghum.(Pt). Pages 116-118 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1467 BAPAT, D.R., SHINDE, M.D., and PADHYE, A.P. 1982. Initial observations on soluble stem sugars of some sweet sorghum lines.Sorghum Newsletter 25: 16-17. 2 ref.

During the winter of 1981, six sugary lines were grown without irrigation. The data on percentage of total soluble sugars (T.S.S.) were determined by a hand refractometer at the milk stage and at maturity. Most of the varieties showed greater T.S.S. at maturity, probably due to depletion of most of the stem moisture. In variety A 6344, two plants in which seed set was absent exhibited very high T.S.S. (24 to 25%) as compared to 14 to 15% in normal plants of this variety. Such increase could be attributed to greater accumulation of the metabolites in the stem instead of being directed to grain filling.

1468 BERNY, P.B., PORTO. V.H. DA F., and RAUPP, A.A.A. 1982. Evolution of the operatinal system of the microdistillery of the UEPAE/Pelotae.(Pt). Pages 151-154 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1469 BRAZIL:EMPRESA CATARINENSE PESQUISA AGROPECUARIA. 1982. Sorghum programme.(Pt). Pages 193-194 In Relatorio tecnico anual EMPASC 1981. Florianopolis. Brazil: Empress Catarinense de Pesquisa Agropecuaria.

Sixteen sweet sorghum cultivars were evaluated in 1980-81 to determine number of days for the crops to become ready for harvest and their yields.

1470 BROADHEAD, D.M. 1982. Registration of Keller sweet sorghum (Reg. No. 120).Crop Science 22(6): 1263. 1 ref.

1471 BROADHEAD, D.M., FREEMAN, K.C., and ZUMMO, N. 1982. "M81E" - a new variety of sweet sorghum.MAFES Research Highlights 45(1): 5.

1472 BROADHEAD, D.M.. FREEMAN, K.C., and ZUMMO. N. 1982. The use of trichlorfon to identify insecticide-resistant sweet sorghum cultivars.Journal of American Society of Sugar Cane Technologists 1: 5-6. 9 ref.

1473 BRYAN, W.L. 1982. Solid-phase fermentation of sweet sorghum.St. Joseph, Michigan: American Society of Agricultural Engineers. 18 pp. 7 ref. (Fiche No. 82-3603).

Solid-phae fermentations of chopped sweet sorghum produced 80% ethanol, compared to 73% juice. Heat loss from fermentors limited maximum temperatures to 38 deg C. Low ethanol yields may have been caused by natural inhibitors or by thermal inhibition.

1474 CASTELI, I . . BARROS,

A.C.S.A., ASSIS, F.N., and RAUPP, A.A.A. 1982. Maturing and effects of harvest delay on the physiological quality of saccharine sorghum seeds.(Pt). Pages 105-112 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1475 C0RDEIR0. D.S., KICHEL, A.N., and SILVEIRA, JUNIOR. P. 1982. Effects of increased potassium levels on the yield of saccharine sorghum stems, year 2.(Pt). Pages 143-146 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1476 CORDEIRO. D.S., KICHEL, A.N., PORTO, V.H. DA F., and SILVEIRA JUNIOR, P. 1982. Effect of levels and periods of nitrogen application in saccharine sorghum.(Pt). Pages 139-142 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1477 C0RDEIR0, D.S., KICHEL, A.N., PORTO, V.H. DA F., and ZONTA, H. 1982. Response of saccharine sorghum to amendment and phosphated maintenance in a planosol typical of the southeastern hillside of Rio Grande do Sul (Brazil).(Pt). Pages 147-151 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, FS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1478 CRISPIM, J.E. 1982. Storage of saccharine sorghum seeds.(Pt). Pages 127-138 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1479 DAY. D.F., and SARKAR. D. 1982. Fuel alcohol from sweet sorghum: microbial aspects.Developments in Industrial Microbiology 23: 361-366.

Sweet sorghum, the agricultural crop which has been claimed to be the potential feedstock for increasing U.S. ethanol production to 11 billion gallons per year by the turn of the century, does not ferment as well as sugarcane juices. Three problem areas have been identified. The content of fermentable sugars is at best 5% lower than for sugarcane. Yeast strains which efficiently fermented sugarcane juices were found to ferment sorghum juices less readily, although other strains were employed which gave excellent fermentation. The main problem was the apparent rise of fermentation inhibitors in the plant corresponding to the rise in fermentable sugars. These findings indicate a need for further research on fermentations of alcohol from this feedstock, and for a re-evaluation of proposed schemes and economics of fuel production from this crop.

1480 DINIZ, T.D. DE A.S., and BARRIGA, R.R.M.P. 1982. Preliminary assessment of the performance of sweet sorghum cultivars in Capitao Poco, Para.(Pt). Circular Tecnica, Centro de Pesquisa Agropecuaria do Tropico Umido No. 32. 16 pp. 5 ref. (Summary:En).

Sixteen cultivars of sweet sorghum, constant of the National Sweet Sorghum Trial 1980/81 of the CNPMS/EMBRAPA, were evaluated during 1981, in Capitao Poco, State of Para, Brazil (latitude 1 deg 46′S). The preliminary results demonstrated that although some genotypes have exhibited average Brix values above 14%, low stalk production was observed, as a consequence of reduction in height, caused by early flowering of all genotypes, given rise by sensitivity to photoperiodism. The results suggest that all genotypes are not adapted to low latitude areas, and that it would be interesting to test cultivars more suitable to those areas.

1481 DREMLYUK, G.K. 1982. Results of an evaluation of the combining ability of parental forms in breeding hybrids of sweet sorghum.(Ru). Nauchno-tekhnicheskii Byulleten Vsesoyuznogo Selektsionno - geneticheskogo Instituta 2: 43-47. 2 ref.

Various male-sterile lines of grain and sweet sorghum were crossed as maternal parents with sixteen sweet sorghum fertility restorers, two forms of broom corn and the variety Sarvas. The highest general combining ability (GCA) was shown by the pollinators Sarvas, Gibridnyi 1, Sorgo Krasnoplenchatoe K483, and Yantar' Rannii K735. Among the male-sterile lines, the highest GCA was shown by the sweet sorghum Oranzhevoe 66s and the grain sorghums A3084 and Nizkorosloe 81s.

1482 EILAND, B.R., CLAYTON, J.E.. and BRYAN, W.L. 1982. Harvesting and storage of sweet sorghum biomass in Florida.Sugar y Azucar 77(6): 47.

1483 EILAND, B.R., CLAYTON, J.E., and BRYAN, W.L. 1982. Losses of fermentable sugars in sweet sorghum during storage.Sugar Journal 45(4): 17-21. 10 ref.

The recovery of alcohol was shown to be affected by the method utilized to harvest sweet sorghums, when forage harvester was used, losses of sugars occurred during the first 24 hours of storage. The shredded material increased rapidly in temperature from the first day onwards. Billeted and whole-stalk sweet sorghum can be stored for 1 week without significant loss of alcohol yields. A regression equation was determined to estimate alcohol yields from the Brix of the extracted juice.

1484 FIGUEIREDO, I.B. DE., TEIXEIRA, C.G., and SHIROSE, I. 1982. Physical and chemical changes in sweet sorghum during ripening.(Pt). Coletanea do Instituto de Tecnologia de Alimentos 12: 111-122. 10 ref. (Summary:En).

Studies were conducted on changes in physical and chemical characteristics of sweet sorghum over the plant age range 97-155 days. Total sugar content increased upto 106 days, then stabilized; reducing sugar content decreased initially, subsequently increasing to a maximum at 126 days of age.

1485 HILLS, F.J., GENG, S., JOHNSON, S.S., and ABSHAHI, A. 1982. A two-year comparison of potential ethanol production by corn, sweet sorghum, fodderbeet, and sugarbeet.Agronomy Abstracts: 149.

On average, over two years at Davis, California, USA, potential alcohol yields were : fodderbeet 837, sugarbeet 768, sweet sorghum 605, and corn 541 gallons/acre. Minimum prices/gallon to the farmer to make it profitable to grow these crops for alcohol were estimated as sweet sorghum $1.26, fodderbeet $1.18, sugarbeet $1.17, and corn $1.15. Adjusting the relatively high yields from our experiments to the average yield of sugarbeet grown extensively in the area (25 tons/acre and 15% sucrose) indicates potential alcohol yields of: fodderbeet 587, sugarbeet 536, sweet sorghum 424, and corn 377 gallons/acre and minimum prices/gallon as: sugarbeet S1.62, sweet sorghum $1.61, fodderbeet $1.60, and corn S1.59.

1486 HOSHIKAWA, K. 1982. Sweet sorghum as a new fuel biomass.(En, Ja). Expert Bulletin Association for International Cooperation of

Agriculture and Forestry 2(6): 10-28.

1487 KELLEHER. F.M.. and MARTIN. P.M. 1982. The effect of row spacing on stem volume and its relationship to water soluble carbohydrate storage after anthesis.Page 213 In Proceedings, Second Australian agronomy conference (ed. M.J.T. Norman). Parkville, Victoria. Australia: Australian Society of Agronomy. 2 ref.

1488 KRESOVICH, S., and HENDERLONG. P.R. 1982. The potential of sorghum as a raw material for ethanol production in Midwestern cropping systems.Agronomy Abstracts: 150.

In a replicated field study conducted at West Jefferson. Ohio, during the 1980 growing season, the agronomic and economic potential of sorghum production for ethanol in the Corn Belt was assessed. Data collected included: (1) total biomas and sugar yields; (2) a characterization and quantification of stalk fiber at final harvest; and (3) quantification of the potential fermentable materials in the harvested grain. In addition, considerations were given to the length of the harvesting season and ease of processing of the raw material. Among the promising sorghums, the dry matter yields ranges from 13.0 to 19.3 Mg/ha with fermentable sugar yields ranging from 2.9 to 3.8 Mg/ha. The sweet-stemmed grain sorghum, Agroline, and two of the sweet sorghums. Wray and MN 1500, were the highest yielding cultivars. The time between flowering of the first cultivar, Agroline, and the first frost was 40 days. This period is much too short to allow for cost-effective processing and conversion of the sorghum to ethanol.

1489 KURNIAWAN. Y. 1982. Alcohol fermentation of sweet sorghum and molasses.(In). Bulletin Balai Penelitian Perusahaan Perkebunan Gula 1(91): 1-14. 11 ref. (Summary:En).

1490 LAMB, M.E.. VON BARGEN,. K.. and BASHFORD, L.L. 1982. Mechanical expression of sweet sorghum juice.St. Joseph, Michigan, USA: American Society of Agricultural Engineers. (Fiche No. 82-3110).

1491 LEARD, R.E., and MCCOWAN. J.R. 1982. Chemical enhancement and alteration of carbohydrate content in sweet sorghum and other vegetable crops.Abstracts of Papers. American Chemical Society 183: AFGD-91.

1492 LIRA, M. DE A., MACIEL, G.A., FRANCA, J.G.E. DE., MELO. A.M.L.T. DE., and TABOSA, J.N.T. 1982. Performance of the sweet sorghum in Pernambuco, Northeast Brazil.Sorghum Newsletter 25: 2-4.

1493 MARTIN. P.M., and KELLEHER, F.M. 1982. Row spacing and plant population effects on water soluble carbohydrates yield in sweet sorghum cv. Rio.Page 212 In Proceedings, Second Australian agronomy conference (ed. M.J.T., Norman). Parkville, Victoria, Australia: Australian Society of Agronomy. 4 ref.

1494 MONROE, G.E., SUMNER, H.R., and HELLWIG, R.E. 1982. A leaf stripper for sweet sorghum.St. Joseph, Michigan, USA: American Society of Agricultural Engineers. (Fiche No. 82-1532).

1495 NUESE, G.A., and HUNT, D.R. 1982. Sweet sorghum juice harvesting.St. Joseph, Michigan, USA: American Society of Agricultural Engineers. (Fiche No. 82-1038).

1496 PERDUE, W., and CUNDIFF, J.S. 1982. Sweet sorghum storage for processing into alcohol.Virginia Journal of Science 33(3): 85.

1497 PETERS. J.A., MADRUGA, L.A.N., MORAES, D.M., and PAULETTO.

E.A. 1982. Effect of sowing depth, soil temperature and humidity on the emergence of saccharine sorghum.(Pt). Pages 122-126 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1498 PETRINI, J.A.. RAUPP, A.A.A., and SILVEIRA JUNIOR, P. 1982. Regional trial of saccharine sorghum 1981/82. (Rio Grande do Sul, Brazil).(Pt). Pages 91-100 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1499 PETRINI, J.A., RAUPP, A.A.A., PORTO, M.P., and SILVEIRA JUNIOR, P. 1982. National trial of saccharine sorghum, 1981/82.(Pt). Pages 85-87 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1500 PIGGOT, G.J., and FARRELL, C.A. 1982. Sweet sorghum and beet crops for energy in northern North Island.Proceedings of Agronomy Society of New Zealand 10: 3-4. 5 ref.

As a preliminary stage in an energy farming research programme, fodder and sugar beets were grown at Pukekohe, and sweet sorghum at Pukekohe and 4 sites north of Auckland during the summer of 1979-80. Fodder and sugar beets yielded similar bulb dry matter (17.4 and 17.8 t/ha respectively) and sugar (13.9 and 14.6 t/ha respectively). Sweet sorghum cultivar Sugar Drip yielded from 16 to 26 t DM/ha by the soft dough stage with 16 to 19% sugar content in stem juice; this was calculated to provide from 3 to 5 t/ha of mill-extractable sugar.

1501 PORTO, M.P., RAUPP, A.A.A., DIAS, J.M.C.S., PETRINI, J.A., and CORDEIRO, D. DA. S. 1982. Agricultural and industrial phases of the alternative sources for obtention of hydrated alcohol in the UEPAE-Pelotas, Rio Grande do Sul.(Pt). Brasilia, DF, Brazil: Empresa Brasileira de Pesquisa Agropecuaria. 21 pp.

1502 PORTO, V.H. DA F., BERNY, P., RAUPP, A.A.A., CORDEIRO, D.S., and ALQUATI, P.H. 1982. Preliminary estimation of direct costs of the alcohol liter, in a microdistillery, from saccharine sorghum.(Pt). Pages 155-160 In Annals of the Eleveneth Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1503 REIDENBACH, V.G., and COBLE, C.G. 1982. Sugarcane or sweet sorghum processing techniques.St. Joseph, Michigan, USA: American Society of Agricultural Engineers. (Fiche No. 82-3562).

1504 REIN, B.K., OGDEN, R.L., WALKER, C.E., and SCHULTE, D.D. 1982. Effects of cooking on sweet sorghum juice fermentation.St. Joseph, Michigan: American Society of Agricultural Engineers. 9 pp. (Fiche No. 82-3602).

Sweet sorghum juice cooking prior to fermentation shows good results in sugar to alcohol conversion.

1505 RICAUD, R., and ARCENEAUX, A. 1982. Sweet sorghum for biomass and sugar production in Louisiana.Pages 364-369 In Louisiana Agricultural Experiment Station, Reports of Projects for 1982. Baton Rouge, Louisiana, USA: Louisiana State University Agricultural Centre.

1506 ROSOLEM, C.A.. and MALAVOLTA, E. 1982. Previous study on sweet sorghum foliar diagnosis.(Pt). Pesquisa Agropecuaria Brasileira 17(1): 33-38. 8 ref. (Summary:En).

Good results have been obtained when a sample of one leaf of medium height of the plant at boot stage is used for foliar diagnosis of grain sorghum. In this work the same technique was tested for two sweet sorghum cultivars (Brandes and Rio), grown in two soils ("Latossolo Roxo" and Dark-Red Latosol), under three N, P and K levels, and grown in greenhouse, with Hoagland and Arnon full strength solution, the same diluted 5 and 10 fold. In the greenhouse the following nutrient levels at boot stage could be considered as adequate: 3.2% of N, 0.80 to 0.95% of P, 2.60 to 3.10% of K, 0.45 to 0.65% of Ca, 0.A5 to 0.52% of Mg, 9 to 10 ppm of Cu and 48 to 54 ppm of Mn. The sampling utilized did not show sufficient sensitivity to detect differences among the treatments under field conditions. It was adequate however, in experiments in the greenhouse wherein there were large differences in the level of nutrient in the substrate.

1507 ROSOLEM. C.A.. MALAVOLTA, E., BRINHOLI, 0., and SERRA, G.E. 1982. Responses of sweet sorghum to N, P and K. II. Technological Characteristics.(Pt). Pesquisa Agropecuaria Brasileira 17(3): 385-391. 11 ref. (Summary:En).

This work deals with two experiments under field conditions, on a "Latosol Roxo" (clay) and on a Dark Red Latosol (loamy sand), at Barra Bonita, SP, Brazil, where two sweet sorghum cultivars were sown to study the effects of N, P and K on sugar and alcohol production. At ripening Brix, reducing sugar, total sugar, sucrose, fibre and alcohol production were determined. There was an increase on alcohol production of cultivar Brandes due to N fertilization on the clay soil and due to N and K fertilization on the loamy sand soil, although cultivar Rio didn't show production increase due to fertilizers. Stalk production was the most important component for alcohol yield. Considering the different soils and cultivars, the fertilizer effects on sucrose, reducing sugar and Brix levels were not consistent.

1508 SCHAFFERT, R.E., and GOURLEY, L.M. 1982. Sorghum as an energy source.Pages 605-623 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. 15 ref.

1509 SHARMA, R.D., and MEDEIROS, A.C. DE S. 1982. Nematodes associated with sweet sorghum in Federal District of Brazil.Pages 103-111 In Works submitted to the Sixth Brazilian Meeting of Nematology. Piracicaba, SP, Brazil: Sociedade Brasileira de Nematologia. 11 ref. (Summaries:En, Pt).

1510 SHARMA, R.D., and MEDEIROS, A.C. DE S. 1982. Reaction of some sweet sorghum genotypes to Meloidogyne javanica and Pratylenchus brachyurus.(Pt). Pesquisa Agropecuaria Brasileira 17(5): 697-701. 9 ref. (Summary:En).

Sixteen sweet sorghum genotypes were screened for resistance to Meloidogyne javanica and Pratylenchus brachyurus in a greenhouse with a temperature range of 25 to 28 deg C. Evaluations for root galls, egg mass development of Meloidogyne javanica and final populations of both nematode species in soil and in roots and plant growth were made separately for each container 54 days after inoculations genotypes BR 601, CMS x S 733, BR 502, SART, CMS x S 734 and BR 503 were highly resistant; BR 501 and CMS x S 719 as resistant; CMS x S 735, BR 500. CMS x S 623, CMS x S 516, BR 602 and CMS x S 603 as moderately resistant to M. javanica. All the genotypes were susceptible to P. brachyurus except SART, which is moderately resistant. Out of the four genotypes CMS x S 734, BR 503, CMS x S 719 and CMS x S 732 tolerant to P. brachyurus, only genotype CMS x S 732 is also tolerant to M. javanica.

1511 SHIH. S.F., RAHI, G.S., OZAKI, H.Y., and SMAJSTRLA. A.G. 1982. Effect of water table and crops on soil temperature. Soil and Crop Science Society of Florida Proceedings 41: 47-54.

1512 SOILEAU, J.M., MAYS, D.A., and BRADFORD, B.N. 1982. Sweet sorghum response to NPK and lime in an acid soil of the Alabama sand mountain region. Agronomy Abstracts: 221.

Interest in sweet sorghum has recently increased in the Southeastern United States because of its potential use as a fuel crop. The primary objective of this study was to determine major nutrient requirements for optimum growth of sweet sorghum on highly acid, sandstone-derived soils of low fertility in the Alabama Sand Mountain region. Total biomass, sugar yields, and nutrient uptake were measured at varying rates of NPK, with and without dolomitic lime, in a factorial split-plot field experiment. The study was conducted during 1981-82 on Wynnville fs1 (Glossic Fragiudult). Maximum biomass and sugar yields of 18 metric tons of dry matter and 2.7 metric tons of sugar per hectare, respectively, were obtained in 1981 with 8 metric tons of lime + 180-90-120 kg of NPK per hectare. Significant N-P-lime interactions were observed, suggesting that sweet sorghum is responsive to N only in the presence of adequate P and lime. The feasibility of sweet sorghum as an alternative crop grown primarily for conversion to alcohol is discussed.

1513 TOKESHI, H. 1982. The interaction of sugar-cane and sweet sorghum in alcohol production.(Pt). Brasil Acucareiro 100(1): 17-24. 11 ref.

1514 TZIMOURTAS, K.A. 1982. Sweet sorghum as a source of dehydrate ethanol production. Hellenike Biomechania Zachareos Trimeniaio Deltio (Hellenic Sugar Industry Quarterly Bulletin) 48-49: 50-62.

1515 VIDAL, A.A. 1982. The use of some potassium sources by saccharine sorghum.(Pt). Thesis, Escola Superior de Agriculture Luiz de Queiroz, Piracicaba, SP, Brazil 75 pp. 33 ref. (Summary:En).

1516 VIEIRA, R.E. 1982. Results of the national trial of saccharine sorghum in Cruz Alta, Rio Grande do Sul, 1981-82.(Pt). Pages 88-90 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1517 XAVIER, P.E., PINTO, J.J.O., and BRAUNER, G.L. 1982. Study of herbicide behaviour in saccharine sorghum.(Pt). Pages 101-104 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS, Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

FORAGE SORGHUM

1518 ANONYMOUS. 1982. Sorghum is the fodder of the summer.(Fr). Elevage Bovin 115: 65-66.

1519 ANONYMOUS. 1982. Sorghums as fodder crops.(Fr). Production Laitiere Moderne 103: 61-64.

1520 ADAMS, F. 1982. A comparison of the effects of monocalcium phosphate and diammonium phosphate on phosphorus and calcium availabilities. Soil Science Society of America Journal 46: 769-771. 6 ref.

Because monocalcium phosphate (MCP) is often a superior phosphorus (P) source to diammonium phosphate (DAP) when used at high rates, a short-term, growth-chamber experiment was conducted to compare the two P sources. An acid, P-deficient Lucedale sandy loam was treated with all combinations of five lime rates and four P rates (0, 75, 150, and 300 ppm) as MCP and DAP. Other needed nutrients and a nitrification inhibitor were uniformly added, and a sorghum-sudangrass hybrid was grown for 14 days. Soil pH was lower and soil-solution P and Ca were higher from MCP than DAP at each P rate. Several DAP-treated soils produced forage yields lower than that predicted from their P levels; the lower yields were positively correlated with lower soil-solution Ca. The critical ambient Ca level in DAP-treated soil was significantly lower for plants growing at the rate of 300 ppm P than at that of 150 ppm, possibly because high P levels enhanced the uptake or physiological utilization of Ca.

1521 ADRIANO. D.C., PAGE, A.L., CHANG, A.C., and ELSEEWI, A.A. 1982. Co-recycling of sewage sludge and fly ash:cadmium accumulation by crop.Environment Technology Letters 3(4): 145-150.

Applying alkaline fly ash on sludge-amended soils was effective in reducing the uptake of Cd by sudangrass by as much as 87%. The most apparent beneficial effect of a fly ash-sludge joint application was the diminution of plant tissue Cd for plants grown in the acid soil. However, fly ash also induced levels of soil salinity sufficient to damage crops. By weathering the fly ash before soil incorporation, the yield-depressing salinity effect was overcome.

1522 ADRIANO, D.C., PAGE, A.L., ELSEEWI, A.A., and CHANG, A.C. 1982. Cadmium availability to Sudangrass grown on soils amended with sewage sludge and fly ash.Journal of Environmental Quality 11(2): 197-203. 17 ref.

Greenhouse experiments were conducted using sudangrass as an indicator crop to evaluate the feasibility of co-recycling sewage sludge and coal fly ash on croplands. The rationale was that the contrasting acid-base properties of the two waste materials would be complementary, i.e., the acidifying tendency of protons from organic matter decomposition and N mineralization when applying sludge would offset the alkalizing tendency of the hydrolysis of CaO and MgO in fly ash. The fly ash, derived from lignite coal, was effective in raising the soil pH. Alkalinity and salinity were the two most immediate and apparent effects of fly ash application on soil properties; the former depressed Cd concentrations and uptake by plants while the latter reduced plant growth. Leaching and carbonation of unweathered fly ash alleviated the salinity problem permitting much larger quantities of ash to be applied to soils without adverse effects on plant growth.

1523 AGRAWAL, K.K. 1982. Relative performance of fodder crops (jowar, maize and bajra) under different methods of sowing and seed treatments.M.Sc. thesis, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, India.

An investigation was conducted to find out the relative performance of fodder crops (jowar, maize and bajra) under different methods of sowing and seed treatment. Three crops, three methods of sowing and two seed treatments were tried in a randomized block design and all the treatments were replicated thrice. Among the crops jowar proved its superiority in respect of green fodder as well as dry matter yields and protein contents than maize and bajra. Kera method of sowing produced higher green and dry matter yield and crude protein contents than pora and broadcast methods. Further, seed soaked treatment produced significantly higher green and dry matter yield as compared to unsoaked seed treatments,

1524 AHLUWALIA, M., and SOLOMON. S. 1982. Breeding improvement and production technology in forage sorghum.Seeds and Farms 7(5): 13-21.

1525 AHMAD, N., REID, E.D., NKRUMAH, M., GRIFFITH, S.M., and GABRIEL, L. 1982. Crop utilization and fixation of added ammonium in soils of the West Indies.Plant and Soil 67(1-3): 167-186. 31 ref.

At moderate rates of nitrogen application, NH_4^+_ fixation by clays during several week laboratory incubations was rapid and highly variable, ranging from less than 10% to over 70% of the NH_4^+_ added. Fixation increased with rate of NH_4^+_ N application and was higher at elevated temperatures in soils that were allowed to air-dry during incubation. NH_4^+_ N fixation was more active in the fulvic fractions of the soil organic matter than in the humic fractions (25-69% vs 0-3% of the added NH_4^+_ was fixed in each, respectively. There was little incorporation of fertilizer-N by the N-containing fractions of soils organic matter. Plant uptake of added NH_4^+_N in greenhouse pot experiments showed that a greater percentage of fertilizer-N was taken up by Sudangrass at a fertilizer ate of 40 kg NH_4^+-N/ha than at a rate of 200 kg NH_4^+-N/ha. However, the recovery was low, ranging from 10 to 25% of that applied.

1526 ARKEL, H. VAN. 1982. The identification of a new crop in the highlands of Kenya.Thesis, Landbouwhogeschool, Wageningen, Netherlands. 58 pp. (Summary:En).

Maize is not drought-tolerant and is lodging-susceptible, which makes it less attractive as a forage. In a search for alternative forages, a new group of plant material is introduced: high altitude, cold-tolerant sorghum. Some of the cultivars in this group apear to outyield maize both in terms of total dry matter and grain yield, over a large range of environmental conditions in the Kenyan highlands. Crop husbandry trials with the new sorghums and maize are reported. In an animal feeding trial the cattle performance of maize and sorghum silage based rations is compared. The introduction of new high-altitude, cold-tolerant grain type sorghums may eventually head to a substantial increase of the area under arable agriculture in Kenya, because it will make grain production feasible in areas which were previously considered too dry for reliable grain production.

1527 BARTSCH, B.O., CARROLL, P.D., COCHRANE, M.J., and NEWBERY, T.R. 1982. Maize and a late flowering sorghum as forage in autumn and early winter in the lower Murray district of South Australia.Pages 375-376 In Dairy production from pasture. Hamilton, New Zealand: New Zealand Society of Animal Production. 3 ref.

1528 BHANOT, J.P., VERMA, A.N., and GREWAL, R.P.S. 1982. Effect of controlling insect pests attacking forage sorghum earheads on grain yield of crop.Haryana Agricultural University Journal of Research 12(3): 521-522. 4 ref.

1529 BHANOT, J.P., VERMA, A.N., and RAM, H. 1982. Screening of forage sorghum lines for resistance to shootfly, Atherigona soccata (Rondani).Forage Research 8(2): 159-162. 8 ref.

1530 BOLSEN, K., ILG. H., NUWANYAKPA, M., and POSLER, G. 1982. Forage sorghum silage and summer annual silage and hays for growing steers and heifers.Pages 26-28 In Cattlemen's day'82: report of progress 413. Manhattan, Kansas, USA: Kansas State University, Agricultural Experiment Station.

1531 BOORA, K.S., and LODHI, G.P. 1982. Combining ability for toxic constituents in forage sorghum.Indian Journal of Agricultural Sciences 52(A): 211-214. 8 ref.

Heterosis and combining ability, studies were made in a line X tester analysis in forage sorghum consisting of 17 lines and 5 testers with their Fl hybrids in two environments. The estimates and their ratio revealed preponderance of non-additive genetic variance for tannin content and additive genetic variance for HCN content. Among the testers 'SPV 98' and "SPV 103', were good general combiners for both tannin and HCN content. 'S 153' X 'SPV 98', 'S 150' X 'SPV 98', 'S 77' X 'SPV 98' and 'JS 29/1' X 'SPV 103' were the best, having high negative heterosis as well as specific combining ability for both HCN and tannin.

1532 BOORA, K.S., and LODHI, G.P. 1982. Heterosis and combining ability for quality traits in forage sorghum.Indian Journal of Agricultural Sciences 52(9): 569-573. 5 ref.

Studies on heterosis and combining ability were made in a line x tester analysis for forage sorghum consisting of 17 lines and 5 testers with their F1 hybrids in 2 environments. For quality characters heterosis was better expressed in the rainy season (kharif) than in summer. The estimates and their ratio revealed the preponderance of non-additive genetic variance for both protein and in-vitro dry-matter digestibility. Among lines, 'PC 9' and 'JS 29/1', and among testers 'SPV 98' and 'SPV 103' were the best general combiners in both the seasons. Different croses showed high expression of heterosis as well as high sca effects for both the buality characters in summer as well as the rainy season. 'PC 9' X 'SPV 103', 'JS 29/1' X 'SPV 99' and 'S 150' X 'SPV 98' were best in summer and 'JS 20' X 'SPV 98' 'PC 6' X 'SPV 98' and 'HFS 566' X 'SPV 98', in the rainy season.

1533 BRUNO, O.A. 1982. Evaluation of forage sorghum cultivars (Sorghum spp.).(Es). Pages 141-143 In Annual meeting of technical information for producers. Rafaela, Santa Fe, Argentina: Estacion Experimental Regional Agropecuaria Rafaela.

1534 BUSTOS, T.W. 1982. Fodder sorghum, a good alternative for dryland farming in irrigated zones (Chile).(Es). Campesino 113(9): 14-19.

1535 CHAUDHARY, H.R., and MANRIQUEZ. J.P. 1982. Variation and correlation studies in broom sorghum.Agronomy Abstracts: 61.

27 diversed types of broom sorghum were studied. The objectives to assess the magnitude of variability and to detect some useful correlations between broom and forage characters. The experiment was laid out in a randomized complete block design with three replications and observations were made on various characters for broom as well as for forage. The data were subjected to the analysis of variance in order to estimate the genotypic and phenotypic variability. Additionally, simple correlation coefficients were computed for detecting useful correlations. Analysis of variance disclosed a greater magnitude of variability for some and a lesser for

the other characters. Furthermore, the estimates of genetic parameters revelaed that selection may he an effective procedure for the improvement of the cultivars under study. Computation of simple correlation between the broom and the forage traits provided information about the possibility of improving the cultivars simultaneously through selection both for broom and for forage characters.

1536 CHAUDHARY, S.L. 1982. Effect of phosphorus application on yield and quality of forage sorghunuM.Sc. thesis, Haryana Agricultural University, Hisar, India. 120 pp.

A pot culture experiment was conducted in sandy loam and loamy sand to study the effect of phosphorus (P) application on yield, nutrient concentration uptake and quality of yield in forage sorghum at different stages of growth with different P status and cultivars. Sorghum cultivars S-136 and PC-6 were grown with the possible treatment combinations of three P levels (0, 20 and 40 ppm) and N, K and Zn as 50, 25 and 5 ppm as basal dose, respectively, with three P status low, medium and high and two textures light and medium. Dry matter yield and nutrient uptake of NPK increased with the increasing levels of P application at all the stages of P crop growth. However, their concentrations decreased considerably with the advancement of the age of crop growth. A positive correlation was obtained between P concentrations and available P of soils.

1537 DE LA PUENTE VERA, H.J. 1982. Preliminary evaluation of maize (Zea mays) and forage sorghum cultivars in Ozorno zone.(Es). Thesis, Pontificia University, Facultad de Agronomia, Santiago, Chile. 87 pp. 71 ref. (Summaries:En, Es).

1538 DESAI, S.N., and WASHKO, J.B. 1982. Forage evaluation of 4 summer annuals at 4 harvest stages under different nitrogen levels. 1. Production and nutritive value.Journal of Maharashtra Agricultural Universities 7(1): 19-22.

A two-year study to evaluate four summer annuals was conducted in 1971 and 1972. The sorghum-sudangrass hybrid significantly outyielded the other species in dry matter production at all harvest stages. Hybrid sudangrass and maize were next in dry matter production at the mature stages. The dry matter yields of all the species increased as the harvests were delayed from the boot to mature stage. Maize and the sorghum-sudangrass hybrid produced higher crude protein yield than the other two species. Crude protein yields decreased with advancing maturity in sudangrass hybrids and increased in maize and forage sorghum. The sorghum-sudangrass hybrid significantly outyielded all the other species in calculated TDN production at all harvest stages except maize at the mature stage. Percent crude fibre and ash decreased and NFE increased with advancing maturity in all four species under investigation.

1539 DESAI, S.N., and WASHKO, J.B. 1982. Forage evaluation of 4 summer annuals at 4 harvest stages under different nitrogen levels. 2. Dry matter disappearance and forage quality.Journal of Maharashtra Agricultural Universities 7(1): 23-26.

Total in vitro dry matter disappearance (IVDMD) percent ADF, ADL, NDF and NDF-protein content of four summer annuals were determined at four harvest stages (boot, anthesis, milk and mature) under three levels of nitrogen fertilization at 56, 168 and 56/56 kg/ha. Maize produced significantly higher percent IVDMD than the other species. However, reduction in IVDMD over maturity stages was maximum in maize. The sudangass hybrids though were lower than maize in percent IVDMD, reduction in IVDMD over maturity stages was uniform. Besides they produced higher IVDMD than forage sorghum and maize. The fibre fractionation studies indicated that maize contained less lignin than the other species and its' content decreased with maturity. The lignin content in sudangrass hybrids increased upto milk stage and then decreased. Percent NDF generally declined with maturity. Maize and forage sorghum were lower in NDF contents than the sudangrass hybrids.

1540 DHILLON, G.S.. KLER, D.S.. RANDHAWA. S.S., and WALIA, A.S. 1982. Canopy shape, radiation absorption and forage yield in sorghum.Pages 255-261 In Proceedings, Second International Seminar, Energy conservation and use of renewable energies in the bio-industries. (ed. Vogt, F.). Oxford, UK: Pergamon Press.

15A1 DODDS, D.L., and BALL, W.S. 1982. Sorghum and sudangrass for forage in North Dakota.Report North Dakota State University Cooperative Extension Service, 762. 5 pp.

1542 EBRAHIM, M.E. 1982. Studies on some summer forage crops.M.Sc. thesis, Monoufeya University, Shebin-E1-Kom, Faculty of Agriculture, Egypt. 145 pp. (SummaryrAr).

1543 EVANS, J.K. 1982. Production and yield of silage crops in the south.Pages 1-12 In Proceedings, Thirty eighth Southern Pasture and Forage Crop Imrovement Conference, Louisiana, USA: Agricultural Research Service (Southern Region). 10 ref.

The current status of sorghum, X Sudangrass hybrids, maize, soyabean, millet, cowpea and lucerne forage crops in the southern states of the USA is reviewed.

1544 FALES, S.L., and CUMMINS, D.G. 1982. Reducing moisture-induced error associated with measuring forage quality using near IR reflectance.Agronomy Journal 74(3): 585-588.

Sample moisture may impair accuracy in predicting forage quality based on near infrared-reflectance (NIR), but the literature contains little specific information on the topic. The purpose of this study was to determine the extent to which moisture interferes with the ability of NIR to predict acid detergent fiber (ADF) in silage-type sorghums. Comparisons were made between laboratory and predicted ADF on samples that were over-dry or had been stored at 43% (low), 63% (medium), and 100% (high) relative humidities* Results showed no significant differences between laboratory and predicted ADF for samples that were dry or had been stored under conditions of low humidity. However, when samples were stored under medium or high relative humidities, a significant (P 1/4 or = 0.05) over-estimation of ADF resulted. Increased sample moisture lowered predictability, since the standard error of estimate increased from 1.27 and 1.18 for dry and low moisture samples, to 2.28 and 4.15 for medium, and high moisture samples, respectively.

1545 FERGUSON, J.J., and MENGE, J.A. 1982. The influence of light intensity and artificially extended photoperiod upon infection and sporulation of Glomus fasciculatus on sudangrass and on root exudation of sudangrass.New Phytologist 92(2): 183-191. 24 ref.

Mycorrhizal inoculum of Glomus fasciculatus, as measured by root infection and sporulation on sudangrass, increased with increasing light intensity. Compared to natural glasshouse daylight, spore numbers of G. fasciculatus also increased dramatically when mycorrhizal sudangrass was exposed to extended photoperiods with mercury vapour or metal halide lamps of high intensity. Results from both light experiments indicate that the level of sugars, but not amino acids, in root exudates from 2-month-old sudangrass plants was correlated with the spore production of G. fasciculatus. It appears that growing sudangrass at greater light intensities and under extended photoperiods will increase the quantity and quality of commercial G. fasciculatus inoculum.

1546 GHABOUR, S.K. 1982, The use of male sterility in the production of hybrid varieties of forage sorghum.M.Sc. thesis, Cairo University, Cairo, Egypt. 123 pp. (Summary :Ar).

1547 GORZ, H.J., and HASKINS, F.A. 1982. Performance of blends of short, medium, and tall sorghum for forage.Crop Science 22(2): 223-226. 9 ref.

Three groups of sorghum cultivars and hybrids, each including a 1-dwarf (tall), a 2-dwarf (medium), and a 3-dwarf (short) sorghum, were used in a 2-year study. Within each group the following seven blends were compared: tall (T), medium (M), and short (S); T and M; T and S; M and S; T alone; M alone; and S alone. Principal emphasis was given to total dry matter (DM) production. It was concluded that blends consisting of entries differing in stature had no significant DM yield advantage over pure stands of T types. Yields of leaf and stem digestible dry matter and crude protein were closely correlated with leaf and stem DM yields. Yields of DM per stalk for S plants were ususlly highest when these plants were grown in pure stand, but DM yields/salk for M and T entries were generaly highest when these entries were grown in blends.

1548 GORZ, H.J., HASKINS, F.A.. and PEDERSEN, J.F. 1982. Variability for mineral elements in forage sorghum hybrids.Agronomy Abstracts: 148.

The variation among 49 F1 forage sorghum hybrids from a 7 X 7 cross-classified design was explored in 1979 and 1980 for N, Mg, Si, P, S. CI, K, Ca, Mn, Fe, Cu, and Zn. Data combined over years (Y) indicated that differences among males (M) were significant for Ca and Cu; among females (F) for Ca and K. THe F X Y interaction was significant for K and Fe, as was the MX Y interaction for N, Mg, Si, P, S, C1, K, Cu, and Zn. General combining ability was of more importance than specific combining ability for all traits except C1. The genotypic component of variance for males was greater than that of females for all traits except K. Simple correlation coefficients greater than +0.6 were observed for N and P, N and S, N and Zn, Mg and Si, P and Cu, P and Zn, S and K, and Cu and Zn. Correlation coefficients among the mineral elements and various quality and agronomic traits also were calculated.

1549 GORZ, H.J., HASKINS, F.A., and VOGEL, K.P. 1982. Divergent selection for hydrocyanic acid potential in sudangrass.Crop Science 22(2); 322-325. 10 ref.

The effectivenes of recurrent phenotypic selection for increasing or decreasing HCN-p in sugangrass was evaluated in two cycles of individual plant selection in the cultivar 'Greenleaf. In cycle 1, HCN-p means of high and low populations were higher and lower, respectively, than for Greenleaf, but only the low-HCN-p population was significantly different from Greenleaf. In cycle 2, mean HCN-p values of both populations differed significantly from Greenleaf. The average realized heritability for the two cycles was 0.40 while broad-sense heritability estimates averaged 0.86. After two cycles of selection. the low and high HCN-p populations differed from Greenleaf by about 17 and 30%, respectively.

1550 GORZ. H.J., HASKINS. F.A.. ANDERSON. B.E.. SCHNEIDER. N.R.. VOGEL, K.P.. HILL. R.M.. and WARD. J.K. 1982. Beef cattle grazing trials with high- and 1ow-HCN-p sudangrass.Sorghum Newsletter 25: 102.

1551 HANNAWAY. D.B.. and MCGUIRE. W.S. 1982. Growing sorghum and sudangrass for forage.FS. Fact Sheet - Oregon State University Extension Service, USA. 2 pp. (No. 290).

1552 HARFOUSH. M.A.A. 1982. Effect of some cultural treatment on forage yield and quality in sorgo.Ph.D. thesis, Azhar University, Cairo, Egypt. 135 pp. (Summary:Ar).

1553 HASKINS. F.A.. and GORZ, H.J. 1982. Effect of pan size for growing sorghum seedlings for HCN assay.Sorghum Newsletter 25: 27. 1 ref.

1554 HASKINS, F.A.. and GORZ, H.J. 1982. Enhancement of the HCN-potential of sorghum leaves by various treatments.Agronomy Abstracts: 98.

Studies initiated in 1981 revealed that various treatments of freshly harvested field-grown sorghum leaves could cause increases as great as 3-fold in spectrophotometrieally determined HCN-p. Among the effective treatments were (a) freezing the tissue followed by incubation at room temperature, (b) heating the leaves at 70 deg C for ca 1 hour, and (c) grinding the fresh tissue in water. Treatment (b) was applied to fall-harvested leaves of 4 grain sorghums. 6 forage sorghums, and 8 sudangrasses; samples autoclaved without prior treatment were used as controls. Treatment-induced enhancement in HCN-p was considerably greater for the sorghums than for the sudangrass entries. It is suggested that the observed increase in HCN-p may have been caused by tissue disruption which permitted greater-than-normal interaction between the enzymes of dhurrin biosynthesis and their substrates.

1555 IBRAGIMOV. K.H.G. 1982. Economic effectiveness of Kazakh-SSR USSR forage production using underground water irrigation.(Ru). Probl Osvo Pustyn" 6: 46-53.

1556 JAYAL. M.M.. and JAIN. V.K. 1982. Utilization of urea-molasses impregnated Johnson grass kadbi by lactating Haryana cows.Livestock Adviser 7(6): 5-8.

1557 JOHNSON. J.C. JR.. HANNA. W.W.. MONSON. W.G.. and MCCORMICK. W.C. 1982. Composition of sorghum forage improved by brown midrib genetic trait.Journal of Dairy Science 65(suppl. 1): 216. (Abstract).

1558 JOSHI. P., and SHARMA, V. 1982. Productivity of forage sorghum strains developed at Udaipur Center.Sorghum Newsletter 25: 20-21.

1559 JOZSA, L. 1982. The effect of nutrient supply on the productivity of sudangrass and sweet sorghum.Sorghum Newsletter 25: 40-41.

1560 JOZSA, L. 1982. Yield of sudangrass and sweet sorghum varieties in Hungary.Sorghum Newsletter 25: 4-5.

1561 JOZSA. L.. and GYORI. Z. 1982. The effect of nutrient supply on the chemical composition of sudangrass and sweet sorghum.Sorghum Newsletter 25: 41-42.

1562 KAI. M.. SAWADA. T.. HIDAKA. M.. and KAMADA, T. 1982.

Influence of seedling density on the yield and the chemical composition of forage sorghum,(Ja). Kyushu Agricultural Research 44: 176.

1563 KIM. D.A., SEO. S., LEE, H.W., LIM, S.H., JO. M.H., and LEE, M.Y. 1982. Performance of sudangrass, sudangrass hybrids and sorghum-sudangrass hybrids for forage production. I. Comparison of soiling type hybrids.(Ko). Korean Journal of Animal Science 24(2): 192-197. 14 ref.

1564 KIM, D.A.. SEO. S.. LEE, H.W., LIM, S.H., JO, M.H., and LEE, M.Y. 1982. Performance of sudangrass, sugangrass hybrids and sorghum-sudangrass hybrids for forage production. I I . Comparison of silage type hybrids.(Ko). Korean Journal of Animal Science 24(2): 198-204.

1565 K0M0T0. Y.. and HORI. M. 1982. Factors affecting development of Curvularia leaf spot of sudangrass.(Ja). Bulletin of the Chugoku National Agricultural Experiment Station. Series E. Environment Division 20: 15-23. (Summary:En).

1566 LENOBLE, S., and PCISSON, C. 1982. Fodder sorghum.(Fr). Pages 84-85 In West Forage Forum. Paris, France: Institut Technique des Cereales et des Fourrages.

1567 LODHI, G.P., DANGI, O.P., HET RAM, LUTHRA, Y.P., and GUPTA. P.C. 1982. Genetics of toxic constituents in forage sorghum.Presented at the Annual Workshop of All India Coordinated Sorghum Improvement Project, 17-19 May 1982, Pune Maharashtra, India. 7 pp. 10 ref.

1568 MACKENZIE, J., MAYER, R., and BISSET, W.J. 1982. Productivity of five subtropical grasses on a black earth of the eastern Darling Downs of Queensland.Tropical Grasslands 16(4): 170-180.

Four subtropical perennial grass species and a perennial forage sorghum were compared for dry matter production and herbage nitrogen concentration at three levels of nitrogen fertilizer in a cutting trial on a cracking clay soil of the eastern Darlig Downs. At 3 months after sowing, Sorghum species hybrid cv. Silk had considerably outstripped the perennial grasses in dry matter yield while Chloris gayana cv. Pioneer outyielded Panicum coloratum var. makarikariense cv. Pollock, Bothriochloa insculpta cv. Hatch and Dichanthium aristatum. Over the next 5 years Silk and B. insculpta were the best dry matter producers at each rate of fertilizer. Although inferior to Silk, C. gayana and P. coloratum in spring growth, B. insculpta exceeded all these in autumn growth. Silk required more nitrogen and in the nil fertilizer treatment suffered a reduction of stand. In a comparison of cutting frequencies in the fifth year. Silk consistently outyielded the others at 8-weekly frequency.

1569 MAGID, E.A.A., MUSTAFA, M.A., and AYED, I. 1982. Effects of irrigation interval, urea and gypsum on N, P and K uptake by forage sorghum on highly saline-sodic clay.Experimental Agriculture 18(2): 177-182. 13 ref.

The effects of three irrigation intervals (7, 10 and 15 days), four nitrogen 1vesls (ON, 1N, 2N, and 3N where IN = 43.8 kg N/ha), and 0 or 11.9 tons/ha gypsum on leaf N, P and K uptake by forage sorghum grown on a high saline-sodic clay soil were investigated in two successive seasons. The two seasons' data consistently showed that both leaf-N and leaf-K increased significantly with increasing N-rate and by splitting the same quantity of irrigation water into more frequent irrigations. Gypsum had no consistent effect. The responses of both leaf-N and leaf-K to nitrogen rates were significantly linear and a linear response of dry matter yield to leaf-N was also observed. P uptake was improved by more frequent irrigations in the first cutting of 1978, but was not otherwise affected by treatments.

1570 MAL, B.. PATIL, B.D., and MISHRA, U.S. 1982. Analysis of internode patterns in forage sorghum.Sorghum Newsletter 25: 9-10.

1571 MAL, B., PATIL, B.D., and MISHRA, U.S. 1982. Intervarietal and interspecific hybridization in forage sorghum.Sorghum Newsletter 25: 10-11.

1572 MATHUR, P.N., and PATIL, B.D. 1982. Genetic variability, correlation and path coefficient analysis in forage sorghum.Indian Journal of Agricultural Research 16(4): 269-272. 5 ref.

Considerable variation was observed among 28 varieties of forage sorghum for plant height, number of leaves per plant, number of tillers per plant and dry matter yield. The leaf number showed the highest heritability, followed by the dry matter yield, plant height and number of tillers per plant. Plant height and number of leaves per plant were positively correlated with dry matter yield both at genotypic and phenotypic levels, whereas number of tillers per plant was only correlated at the genotypic level. Path-coefficient analysis revealed that the direct effect of plant height and number of leaves per plant were low and that of number of tillers per plant was high.

1573 MIKULAS, J. 1982. Study on the drought tolerance of Sorghum halepense.Acta Agronomica Academiae Scientiarum Hungaricae 31(1-2): 20-22. 8 ref.

1574 MISHRA. U.S., PATIL, B.D., and MAL, B. 1982. Evaluation of sudangrass lines for fodder attributes.Sorghum Newsletter 25: 11.

1575 MISLEVY, P., DANTZMAN, C.L.. PREVATT, J.W.. OVERMAN, A.J., HORTON, G.M.J., and JOHNSON, F.A. 1982. Forage production and utilization from a South Florida multiple cropping system.Bulletin Florida Agricultural Experiment Stations, 830. 37 pp. 19 ref.

1576 MONPARA, B.A., and SANGHI, A.K. 1982. Combining ability for fodder yield and other quantitative characters in forage sorghum.Indian Journal of Genetics and Plant Breeding 42(3): 311-313. 2 ref.

A diallel analysis with seven varieties of forage sorghum revealed that gca and sca variances were highly significant for days to flowering, plant height, number of leaves per plant, leaf length, leaf breadth, flag leaf area, green fodder and dry matter yield and crude protein percentage. 'PC 6', 'SSG 59-3' and 'PC 1' were good general combiners for green fodder as well as dry matter yield. Six crosses, 'SSG 59-3 X PC 6'. 'S 1049 X PC 1', 'SL 44 X PC 1', 'S 1049 X PC 6', 'SSG 59-3 X PC 1' and »S 1049 X SSG 59.3', were superior for green fodder and dry matter yield.

1577 MURTAGH, G.J. 1982. Use of nitrogen fertilizer to increase the autumn carrying capcaity of pasture in a humid subtropical environment.Pages 377-378 In Dairy production from pasture. Hamilton, New Zealand: New Zealand Society of Animal Production. 6 ref.

1578 MUSTAFA. M.A., and ABDEL MAGID. E.A. 1982. Interrelationships of irrigation frequency, urea nitrogen and gypsum on forage sorghum growth on a saline sodic clay soil. Agronomy Journal 74(3): 447-451. 19 ref.

Two field experiments were conducted in June. 1978, and April, 1979, at the Khartoum University Farm, Sudan, to study the effect of irrigation frequency, urea-nitrogen, and gypsum on the yield of forage sorghum grown on a semi-arid, saline sodic clay soil. Each experiment had four nitrogen levels: ON, IN, 2N, and 3N (IN = 43.8 kg N/ha) applied as urea; three irrigation frequencies: 7, 10, and 15 days; and zero or 11.9 tonnes/ha gypsum, each replicated thrice in a split-split plot design. The two seasons data consistently showed that dry matter yield of the first cuts of forage sorghum increased significantly with increase in N-level, with decrease in irrigation interval, and with gypsum application. Decreased irrigation frequency had greater effect than 3N fertilization. The benefits from gypsum application were low (5%) at the 7-day irrigation interval. Dry matter yields were increased from 1.84 to 6.12 tonnes/ha in 1978 and from 3.20 to 7.23 tonnes/ha in 1979, by irrigating every 7 days instead of 15 days, application of 3N and 11.9 tonnes/ha gypsum.

1579 NADA, Y., and JONES, R.M. 1982. Yield and quality of annual forage grasses and of perennial grasses in the year of sowing in south eastern Queensland. Journal of Japanese Society of Grassland Science 28(1): 48-58. 22 ref.

Twenty grass accessions were evaluated as annual summer growing forages in subtropical Australia. Eleven were annuals and nine were perennials but the latter were sown at a higher seeding rate than usual. Grasses were either cut five times throughout the growing season at four weekly intervals or were cut four times with an eight week period before the first cut and with four weekly harvests thereafter. Harvested material was separated into leaf, stem and reproductive heads. In vitro digestibility was measured on the separated components. The two most reproductive annuals, Zulu and Sudax sorghum, averaged 10,000 and 19,000 kg/ha for the same cutting treatments and leaf yields were 5,000 and 6,000 kg/ha. Thus less frequent cutting increased yield of stem much more than yield of leaf. The higher stem yields were associated with a depression of 5% in stemdigestibility.

1580 NAGAO, Y., and YANO, F. 1982. Quality of forage. 1. Absorption of minerals.(Ja). Kyushu Agricultural Research 44: 81.

1581 NAIK. S.M.P., and MATHUR. K. 1982. Varietal research of forage sorghums against major leafspot diseases. Indian Phytopathology 35: 689-690. 4 ref.

1582 NAIR, R.V., NAIR, M.S., and SALAM, M.A. 1982. Comparison of forage cropping systems in the oxisol of Kerala. Madras Agricultural Journal 69(10): 653-659.

An experiment conducted to compare the productivity of a few forage cropping systems and to study the feasibility of mixing cowpea with annual cereals and perennial grasses, in the laterite soils of Kerala, India revealed that among the grasses, hybrid napier was superior in terms of forage and crude protein yields followed by guinea grass. Mixing cowpea with perennial grasses (hybrid napier and guinea grass) does not appear to be compatible at the normal spacing of the grasses. Cowpea mixes well with the annual cereals (maize and sorghum) but the yields of these crops and crop combinations are comparatively low.

1583 OSHIMA, H.. OBAMA. S., and MOROOKA, M. 1982. Lysimeter experiment on forage crops. 1. Water balance.(Ja). Kyushu Agircultural Research 44: 82-83.

1584 OSMAN, A.E.. and OSMAN, A.M. 1982. Performance of mixtures of cereal and legume forages under irrigation in the Sudan.Journal of Agricultural Science 98(1): 17-21. 7 ref.

1585 PATRAS, J., and PINZARIU, D. 1982. Doubling cropping, ensures a very economical forage reserve.(Ro). Revista de Cresterea Animalelor 32(2): 14-17. 4 ref.

1586 PEDERSEN, J.F., GORZ, H.J., HASKINS. F.A., and ROSS, W.M. 1982. Variability for quality and agronomic traits in forage sorghum hybrids.Crop Science 22(4): 853-856. 24 ref.

The variation among 49 F1 forage sorghum hybrids from a 7 x 7 cross-classified design was explored in 1979 and 1980 for the following traits: dry matter (DM), crude protein (CP), in vitro dry matter disappearance (IVDMD), neutral detergent fiber (NDF), acid detergent fiber (ADF), and acid detergent lignin (ADL). Differences were found among hybrids for all traits. Parental means for males generally had a wider range of variation than for females. The means of hybrids involving the male parent, 'White Collier', were highest in IVDMD, and lowest in NDF, ADF, and ADL. IVDMD was the only triat that showed significant differences among hybrids averaged over both males and females. General combining ability (GCA) effects were more important than specific combining ability effects.

1587 PENOGLIO, H.P. 1982. Forage quality of different types of sorghum for silages in relation to their chemical features.Pages 145-147 In Annual meeting of technical information for producers. Rafaela, Santa Fe, Argentina: Estacion Experimental Regional Agropecuaria Rafaela.

1588 PEREZ INFANTE, F., ALFONSO, F., SENRA. A., and MENCHACA, M. 1982. Preliminary tests of sampling in a pasture.(Es). Ciencia y Tecnica en la Agriculture. Serie Pastos y Forrajes 5(1): 71-76. 7 ref. (Summary:En).

1589 PETRINI, J.A., RAUPP, A.A.A., PORTO. M.P., and SILVEIRA JUNIOR, P. 1982. National trial of forage sorghum (Brazil).(Pt). Pages 81-84 In Annals of the Eleventh Technical yearly Meeting of Sorghum. Pelotas, RS» Brazil: Unidade de Execucao de Pesquisa de Ambito Estadual de Pelotas.

1590 PRASAD, M.N., PALANISAMY, S., APPADURAI, R., PALANISAMY, G.A., SURENDARAN. C., and FAZLULLAKHAN, A.K. 1982. COH-3 a grain cum fodder sorghum hybrid for Tamilnadu.Madras Agricultural Journal 69(9): 564-565. 1 ref.

COH-3 was bred from a cross between 2077A and 699 Tall, has pearly white grains and sweet, juicy stems. For maturity, it takes 110-115 days and gives high yields of grain and fodder. It is resistant to lodging and tolerant to major pests and diseases. The leaves remain green till harvest.

1591 PRASAD, S.. HAZRA, C.R., and PATIL, B.D. 1982. Pigeonpea (Cajanus cajan) based forage intercropping systems - light relations and growth performance.Zeitschrift fur Ackerund Pflanzenbau 151(6): 417-429. 17 ref. (Summary:De).

1592 PRISTAS, J. 1982. Effect of dates of first and second cuts on the amount and quality of yield in hybrid Sudangrass.(Sk). Pol'nohospodarstvo 28(3): 225-234. (Summaries:En, Ru).

1593 RENEAU. R.B. JR., and JONES, G.D. 1982, Forage sorghum response to P and K application.Better Crops with Plant Food 66: 12-13.

1594 ROTONDA, A.M. 1982. Evaluation of initial growth of sorghum germplasm for grazing in early sown pastures.(Es). Thesis, Universidad Nacional de Mar del Plata, Balcarce, Bs. As., Argentina. 63 pp. 16 ref.

1595 RUSSO, S.L., MATHUVA, M., and HART, R.D. 1982. Different strategies to increase forage production from maize, sorghum and bean cropping systems in western Kenya.Agronomy Abstracts: 49.

A series of experiments were conducted to evaluate different strategies to increase forage production from intercropped maize and beans, and intercropped maize and sorghum cropping systems. Strategies for both long and short rainy seasons include, (1) planting higher-than-optimum maize and sorghum populations, thinning to optimum and using the thinnings for forage, (2) stripping bottom leaves of maize and/or sorghum, (3) topping maize plants when the ear is at the milk stage, and (4) ratooning sorghum. The impact on grain yield (beans, sorghum, and maize), the total quantity and quality of the forage produced, the acceptability of the forage as goat feed, and the interaction among different strategies is being analyzed.

1596 SALEH, H.H., and TROEH, F.R. 1982. Salt distribution and water consumption from a water table with and without a crop.Agronomy Journal 74(2): 321-324. 7 ref.

This study was undertaken to quantify the soil salinization process and relate it to soil depth, cropping, and water table variables. Such information has been needed but unavailable. Data were gathered by measuring the upward movement of water and salt from simulated groundwater. The work was done with 30-cm square soil columns 50 and 75-cm tall that were suspended in trays of artificial groundwater. The experiment was located in a greenhouse to create an arid environment. Sudangrass was grown on half of the columns and the others were fallowed. Water consumption was increased by the shallower depth to groundwater, by the less saline groundwater and by the presence of a crop. The crop had little effect on the salt concentration at the moist suface of the 50-cm columns but reduced the salt accumulation at the already drier and less salty surfaces of the taller columns. Salt accumulation in the root zone was increased by the presence of a crop,

1597 SALMIN, L.N., and SHAVSHA, N.A. 1982. The effect of fertilizers, sowing methods, and sowing norms on the harvest and sowing quality of sudangrass seeds in western Siberia.Soviet Agriculture Sciences 4: 26-29.

1598 SANDHU, S.S., SINGH, B., and AUJLA, T.S. 1982. Effect of irrigation, N-fertilization and straw mulching on forage yield of summer sorghum.Pages 80-81 In Abstracts, Forty seventh Annual Convention, Indian Society of Soil Science, 2-4 October 1982, Nagpur, Maharashtra India. Nagpur, Maharashtra, India: Indian Society of Soil Science, Nagpur Chapter.

A 3-year field study was conducted on a sandy loam soil to evaluate direct and combined effects of (1) three IW/PAN-E ratios of 0.6, 0.9 and 1.2, (2) four rates of N viz. 0, 50, 100, 150 kg/ha and (3) two rates of paddy straw mulch viz. 0 and 6 tonnes/ha, on forage yields of pre-monsoon summer sorghum. The optimum IW/PAM-E ratio was 0.9, which caused a mean significant yield increase of 27 q/ha (7.3%) compared with 0.6 ratio. Straw mulching effected an average significant yield increase of 71 q/ha (19.8%). Compared with no-nitrogen, 50 and 100 kg N/ha showed significant yield increase of 110 (38.1%) and 147 (50.,9%) q/ha respectively. Straw mulched crop with 40 cm irrigation gave 29 q/ha (7.6%) more yield than the unmulched crop with 63 cm irrigation.

1599 SESHAVATHARAM. V., and MURTY, U.R. 1982. The starch for apospory in Sorghum L.Page 753 In Sorghum in the eighties: proceedings of the International Symposium on Sorghum, 2-7 November 1981, Patancheru, A.P., India. Patancheru, A.P., India: ICRISAT. (Abstract).

The possibility of producing perpetual hybrids in sorghum has prompted an investigation of the embryology of Sorghum halepense. Sorghum halepense was on record as having some apomictic tendencies as revealed through its breeding behaviour. The mechanism underlying such a behaviour could be due to the occurrence of apomixis in the aposporous embryo sacs, as the embryological study of this species reveals the existence of somatic apospory in some ovules that are potentially capable of developing into an aposporous embryo sac. The aposporous initials could be discerned in slightly older ovules, only after the differentiation of the megaspore mother cell or its further development.

1600 SHARPLEY, A.N., and REED, L.W. 1982. Effect of environmental stress on the growth and amounts and forms of phosphorus in plants.Agronomy Journal 74(1): 19-22. 16 ret.

Sorghum, cotton, little bluestem and soybean plants were grown in the field on Durant loam, a member of the fine, montmorillonitic, thermic Vertic Argiustolls. Fertilizer P additions of 0, 50, 100, and 200 kg/ha were made and a water stress treatment initiated by applying only one third the amout of water lost as evapotranspiration. Plant growth and P content were determined at weekly intervals following plant emergence. Growth and total P content increased with an increase in applied fertilizer P for all plants except little bluestem. The total P and inorganic P content of the plants decreased gradually with growth. Inorganic P constituted the major proportion of plant P and remained constant during plant growth. A three-fold reduction in soil-water content resulted in a decrease in plant growth and total and inorganic P content. The effect of the soil-water stress was reduced by increase in applied fertilizer P. It was calculated, however, that the additon of fertilizer P was not a viable economic method of increasing crop yields to negate any drop in yield due to drought conditions.

1601 SINGH, R.P. 1982. Effect of atrazine on control of weeds, growth and seed yield of fodder sorghum.M.Sc. thesis, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, India.

The present investigation was carried out during kharif season of 1982-83. The soil of the experimental field was clay loam and its pH was 7.8. The experiment was laid out in a randomized block design with 21 treatments and each treatment was replicated three times. Results showed that the forage sorghum varieties (JS 20, J6 and S 136) could not supress the weed intensity. Variety J6 was found superior than the JS 20 and S 136 in respect of seed and karbi yield of crop. Among the different time and doses of Atrazine, application of Atrazine at 0.5 kg a.i./ha as pre-emergent +0.5 kg a.i./ha as post-emergent (20 DAS) was found superior in respect of reducing weed intensity, dry weight of weed and increasing the seed and karbi yield of forage sorghum. This treatment also gave highest net profit (Rs. 2,105.60/ha) than the other herbicide treatments, one hand weeding at 30 days and weed free (4 hand weedings) too.

1602 SINHA, M.N.. and RAI, R.K. 1982. Effect of rate and time of nitrogen application on yield of berseem fodder and residual effect on sorghum/maize fodder.Haryana Agricultural University Journal of Research 12(2): 259-265. 8 ref.

Effect of nitrogen and its time of application of berseem was studied during 1975-76 and 1976-77. With the increase of rate of nitrogen from 40 to 120 kg N/ha, the yield of berseem fodder increased. Phosphorus alone gave about 90% higher yield over the unfertilized control treatments. Although, there was no significant difference in yield due to split application of nitrogen, there was an indication that two-split application proved slightly superior to other treatments. 40 kg N/ha in combination with 150 kg P205/ha proved the best treatment for return per rupee of investment. There were no consistent results on the yield of succeeding crop of sorghum or maize fodder obtained due to residual effect of N or P applied to berseem crop. Soil analysis revealed that nitrogen status increased with increase in the level of N or its application frequency after each crop.

1603 SMITH, S.J., DILLOW. D.W.. and YOUNG, L.B. 1982. Disposition of fertilizer nitrate applied to sorghum-sudangrass in the southern plains.Journal of Environmental Quality 11(3): 341-344. 16 ref.

Results are reported for a 3-year field plot study on the fate of fertilizer N associated with sorghum-sudangrass production. The fertilizer was applied under dryland conditions at a 112-kg N/ha annual rate of eight area soils representative of five soil orders. On a seasonal average, slightly more than half the fertilizer was taken up by the plants (tops + roots), and about a third was incorporated in the soil organic matter. Very little (1/251/2) remained in an inorganic leachable form, and about 7% was unaccounted. The unaccounted is considered to represent denitrifications, since soil profile sampling during and after the cropping season showed no evidence of fertilizer-N leaching below the root zone. Preplant soil nitrate was a better indicator of total soil N availability the first 2 years, whereas the mineralization potential was better the third year. From an environmental standpoint, use of N fertilizer at the described rate and prevailing farming conditions appeared to pose no potential pollution problems.

1604 SWISHER, B., and CORBIN, F.T. 1982. The uptake and metabolism of sethoxydim in soybean, Glycine-raax cultivar Coker-156 and johnsongrass, Sorghum halepense cell.Proceedings of the Nebraska Academy of Science and Affiliated Societies 92: 81. (Abstract).

1605 SWISHER, B.A., and CORBIN, F.T. 1982. Behavior of BAS-9052 OH in soybean (Glycine max) and johnsongrass (Sorghum halepense) plant and cell cultures.Weed Science 30(6): 640-650. 21 ref.

Research involved the behavior of BAS-9052 OH in johnsongrass and soybean plants, and the fate of 14C-BAS-9052 OH in intact plants and cell cultures of both species. Microscopic examination of seedling johnsongrass plants treated with foliar applications of 0.48 micro g/plant revealed disorganized apical regions and necrotic cells within the apex and leaf primordia of the shoot.

Necrotic zones were also evident at the base of expanding leaves and in root apices 1 day after treatment. Following application of 14 C-BAS-9052 OH, the same radioactive products were isolated from cell cultures and intact plants. Products included BAS-9052 OH and three unidentified metabolites. Greater proportions of unchanged BAS-9052 OH were extracted from the apical leaves, roots, and cell cultures of johnsongrass than of soybean.

1606 TANEJA, K.D.. and LODHI, G.P. 1982. Effect of preceding crops on nitrogen requirement of forage sorghum.Sorghum Newsletter 25: 46-47.

1607 TAO, K.L.J. 1982. Improving the germination of johnsongrass seeds.Journal of Seed Technology 7(1): 1-9.

1608 TAO, K.L.J. 1982. The 10-day germination test of johnsongrass seeds.The News Letter of the Association of Official Seed Analysts 56(2): 20-25.

1609 TOY, J.J., GORZ, H.J., and HASKINS, F.A. 1982. Comparison of male-sterile lines with male-sterile F1 hybrids as female parents for sorghum-sudangrass seed production.Sorghum Newsletter 25: 28.

1610 VARADINOV, S.G. 1982. Results of studying specimens of sorghum and other panicoideae forage crops in the lower Volga River area.(Ru). Trudy po Prikladnoi Botanike, Genetike I Selektsii 74(1): 129-133.

1611 VECCHIETTINI, M., and GASPARI, F. 1982. Choice of crops on arable dry land for rotations on the Bologna foothills, with particular regard to forage production.(It). Rivista di Agronomia 16(2): 231-241. 17 ref. (Summary:En).

A six-years trial was carried out in the east Emilia low hills in order to evaluate the suitability of changes in the pattern crop in arable dry soils particularly for the improvement of the forages production. The following productions were compared: wheat, barley, grain maize, grain sorghum, maize at dough stage, maize ears, italian ryegrass and hairly vetch + maize at dough stage or sorghum forage, lucerne. The autumn sowed crops were followed by maize and viceversa, while sorghum was continuos. Wheat and sorghum yielded respectively more than barley and maize. Grain sorghum gave better economical results than wheat. Sorghum also gave better economical results than wheat. Sorghum also gave the highest forage production with the two harvest methods: first grain and then crop residues.

1612 VIJAYA KUMAR, T. 1982. Effect of irrigation and fertilizer use on nitrogen fractions in sundhia jowar (S 1049).Madras Agricultural Journal 69(2): 116-118. 11 ref.

Sundhia jowar is widely grown in Gujarat, India because of its good qualities such as quick maturity, profuse tillering and its high protein content. The important factors which influence the quality of fodder are soil moisture and nutrient availability. Both quality and yield will be affected if any one of these are in short supply. Restricted moisture supply and heavy nitrogen applications may retard the conversion of absorbed nitrogen into protein, leading to the accumulation of nitrogen in different forms. When the cattle is fed on this type of fodder there is often a possibility of death of the animal. This study has been undertaken to see the effect of irrigation intervals and fertilization (N and P) on the nitrogen fractions in the Sundhia jowar.

1613 WITT ROJAS, R.R. 1982. Study of yield and quality of maize and sorghum as forage.(Es). Thesis, Universidad Catolica de Valparaiso, Quillota, Chile. 64 pp. 41 ref.

1614 YONETANI, T., and SAWADA. M. 1982. Comparison of characteristics of varieties in forage crop, 1. Comparison of characteristics of corn and sorghum in middle area of Japan.(Ja). Bulletin of the Hyogo Prefectural Agricultural Center for Experiment, Extension and Education 30: 67-72.

1615 YUN, I.K., and KOH, T.S. 1982. Effect of the nitrogen fertilization on the hydrocyanic acid in the growing days and first growth and regrowth of a sorghum x sudangrass (Pioneer 988).(Ko). Korean Journal of Animal Sciences 24(5): 413-421. 20 ref.

The effect of nitrogen fertilization level on the content of HCN in a hybrid (Pioneer 988) of sorghum x sudangrass was studied. The HCN content of plants was decreased with the growth of plants, and the HCN content of the leaf blades and sheath was also decreased. The 3rd or 4th leaf blade from the top contained higher HCN than those of others until the 58th day after emergence.

1616 YUN, J.I., and LEE, H.J. 1982. Effect of nitrogen fertilizer application on growth, forage yield and nitrogen use in Sudangrass.(Ko). Korean Journal of Crop Science 27(1): 66-71. 16 ref.

Author Index

Subject Index

RA-00107

ICRISAT

International Crops Research Institute for the Semi-Arid Tropics
Patancheru, Andhra Pradesh 502 324, India

ISBN 92-9066-117-8

ICR 86-0018