Indian Agricultural sciences Abstracts January-June, 2007

(Volume 6, Number 1)

F01 Crop Husbandry

001. Mahala, H.L.; Shaktawat, M.S. (Maharana Pratap University of Agriculture and Technology, Udaipur (India). Dept. of Agronomy). Effect of sources and levels of phosphorus and FYM on yield attributes, yield and nutrient uptake of maize (Zea mays L.). Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 571-576 KEYWORDS: PHOSPHORUS; FYM; YIELD; NUTRIENT UPTAKE; MAIZE.

Experiments were conducted to study the effect of sources and levels of phosphorus and FYM on yield attributes, yield and nutrient uptake of maize. Phosphorus application through SSP recorded maximum yield attributes, grain and stover yield and Nand P uptake by the crop. Application of SSP was found at par with-URP+SSP (1:1) but both these sources were found significantly superior over URP+PSB and URP alone in improving grain and stover yield as well as Nand P uptake by the crop. Further" URP+PSB 'Yas found at par with URP application. Increasing P levels signifkantly increased yield attributes and consequently grain and stover yield of maize upto 60 kg P20s/ha while nutrient uptake (N and P) increased significantly upto ,application of 80 kg P20s/ha. FYM application0 t/ha also had significant arid positiv~effect on yield attributes, grain and stover yield as well as N and P uptake by the crop over without FYM.

002. Sharma, H.G.; Agrawal, N.; Dubey, P.; Dixit, A. (Indira Gandhi Agricultural University, Raipur (India). Plasticulture Development Centre, Dept. of Horticulture). Comparative performance of Capsicum under controlled environment and open field condition. Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 638-640 KEYWORDS: GREENHOUSE CROPS; FARMING SYSTEMS.

003. Kumar, P.; Joshi, N.L.; Singh, D.V.; Saxena, A. (Central Arid Zone Research Institute, Jodhpur (India). Div. of Soil Water Plant Relationship)). Evaluation of pearl millet production systems for high yield and net carbon accumulation in soil and crop. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 95-99 KEYWORDS: PENNISETUM GLAUCUM; FERTILIZER APPLICATION; PRODUCTION; PEARL MILLET; NITROGEN; FARMYARD MANURE; CARBON; FARMING SYSTEMS; SOIL ANALYSIS; AGROECOSYSTEMS.

Higher accumulation of carbon in agro-ecosystems by increasing crop production and soil organic carbon (SOC) through N-fertilizers and manure application is currently being discussed as one ~ of the options to decrease the load of atmospheric CO2 so as to reduce the greenhouse effect. We' studied this possibility for eight consecutive year-s in eight high-input-based and three traditional production systems (PSs) of pearl millet. High input PSs involved application of urea, manure and' urea+manure in varying quantities whereas in traditional 'PSs crop was grown without' fertilizers and ' manure and in rotation with a legume crop or by keeping land fallow for one year between two pearl millet crops. Values of total and net C accumulated in high input PS ranged from 8735 to 15340 kg ha.1 and 242

to 10049 kg ha-I, respectively. Values of total C accumulated for traditional PS ranged from 4811 to 7313 kg ha-I and were similar to net C accumulated. Most of the accumulated C could be accounted for in crop biomass. Only in the PS involving manure application a substantial part of accumulated C was added to SOC. Crop biomass production was highest with application of urea+manure followed by urea' and was lowest in the traditional PS. Biomass production increased with increasing application of both urea and manure. Combined application of urea (40 kg N) with 5 t manure ha-1 yr-I produced highest crop biomass but showed a net C accumulation of only 839.6 kg C ha-1 (second lowest). On the contrary, urea application (40 kg N ha.l) that resulted in highest net accumulation of C ranked sixth in biomass production. Few PSs fell between these two extremes showing a balance between high biomass production and high C sequestration. These results when analyzed in the background of high productivity, a major objective of agriculture, suggest that high production in a PS does not necessarily mean high net C accumulation, but it can be achieved through proper selection of inputs.

004. Kumar, J.; Yadav, S.S.; Kumar, S. (Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics)). Influence of moisture stress on quantitative characters in chickpea (Cicer arietinum L.). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 149-150 KEYWORDS: STRESS; PRODUCTION; DROUGHT STRESS; AGRONOMIC CHARACTERS; CHICKPEA; MOISTURE CONTENT; CICER ARIETINUM.

005. Palsaniya, D.R.; Chaplot, P.C.; Parihar, C.M. (Maharana Pratap University of Agriculture and Technology, Udaipur (India). Dept. of Agronomy). Response of clusterbean (Cyamopsis tetragonoloba (L.) Taub) to sowing time, plant population and fertilizer levels. Annals of Agricultural Research (India). (Mar 2005) v. 26(1) p. 144-146 KEYWORDS: PLANT POPULATION; SOWING DATE; FERTILIZER; CYAMOPSIS TETRAGONOLOBA.

006. Nath, A.K.; Kumari, S.; Sharma, D.R. (Dr. Y.S. Parmar University of Horticulture and Forestry, Solan (India). Dept. of Biotechnology). In vitro selection and characterization of water stress tolerant cultures of bell pepper. Indian Journal of Plant Physiology (India). (Jan-Mar 2005) v. 10(1) p. 14-19 KEYWORDS: WATER TOLERANCE; CALLUS; TISSUE CULTURE; CAPSICUM ANNUUM; ENZYME ACTIVITY.

Callus of bell pepper (Capsicum annuum L.) was initiated from hypocotyl on MS medium supplemented with NAA (0.5mg\l) and HAP (0.2mg\l). For proliferation of callus the hormone concentrations were reduced to half. Cell clumps of about Imm diameter were exposed to increasing concentration of polyethylene glycol (PEG) ranging from 10 g\l to 100 g\l for water stress tolerance. Upon incubation for 30 days, the cells, which could tolerate this concentration of PEG, grew to form calli. Selected calli were further subcultured on to the selectiv;-medium (iOO g\l) PEG for 8 weeks and then transferred to normal MS medium for proliferation. The selected calli when transferred from the normal to the selective medium, were capable of growing on it. Although, there were difference in their growth, the pattern was sigmoidal in both the cell lines. Compared to the control, selected cells contained significantly higher levels of soluble proteins, total sugars, reducing sugar, and free amino acids. The water stress tolerant cells also revealed enhanced activities of enzymes, malate dehydrogenase, alkaline invertase, NADP+ isocitrate dehydrogenase, aspartate amino transferase, glutamate pyruvate transaminase and acid phosphatase.

007. Thakur, P.S.; Sood, R. (Dr. Y.S. Parmar University of Horticulture and Forestry, Solan (India). Dept. of Silviculture and Agroforestry). Drought tolerance of multipurpose agroforestry tree species during first and second summer droughts after transplanting. Indian Journal of Plant Physiology (India). (Jan-Mar 2005) v. 10(1) p. 32-40 KEYWORDS: DROUGHT RESISTANCE; GROWTH; TRANSPLANTING; AGROFORESTRY; LEAVES; WATER USE.

The aim of this experiment was to select suitable drought tolerant agroforestry tree species. The findings of this investigation indicated that summer drought from April to June for 25, 50 and 75 days during first and second year after transplanting adversely but differentially affected growth and physiological attributes of five tree species namely, Grewia optiva, Morus alba, Dalbergia sissoo, Acacia catechu and Populus deltoides. Plant height, collar diameter and leaf biomass were less in water stressed plants compared to unstressed plants within each tree species and within each drought level. In general, 75 days of drought exerted more pronounced effect on the performance of tree species. The minimum adverse effect of summer drought was seen on M. alba and D. sissoo, while the maximum on G. optiva and P. deltoides. Xylem water potential was significantly higher in unstressed plants compared to water stressed plants of all the five tree species. The water potential ('I') in water stressed plants during second summer drought was higher compared to first summer drought. The lowest potential was recorded at 75th day of drought. M. alba and D. sissoo maintained relatively high xylem water potential under water stress, whereas G. optiva and P. deltoides recorded the lowest values. Reduction in photosynthesis under drought over control was least in M. alba and D. sissoo, whereas maximum in stressed plants of P. deltoides up to 75th day of drought. Drought injury index was minimum in M. alba (40.4 percent), followed by D. sissoo (52.1 percent) up to 75th day. P. deltoides exhibited maximum injury index during the summer drought (83.8 percent).

008. Bhat, R.M.; Rao, N.K.S. (Indian Institute of Horticultural Research, Bangalore (India). Influence of pod load on response of okra to water stress. Indian Journal of Plant Physiology (India). (Jan-Mar 2005) v. 10(1) p. 54-59 KEYWORDS: GROWTH; OKRA; PHOTOSYNTHESIS; WATER TOLERANCE.

Effect of fruit load on plant responses to water stress was studied in two cultivars (Arka Anamika and Parvani Kranti) of okra ('A.belmoschus esculentum L). Plants were divided into two groups before imposing the stress at reproductive stage: (i) in one group the pods were regularly harvested (depodded) and (ii) in other group the pods were not harvested (podded). Plants were subjected to water stress for five weeks. Leaf area reduction was more in podded plants of both the cultivars under water stress. Water stress resulted in significant decrease in photosynthetic rate. There was 12 to 40 percent reduction in photosynthesis in depodded and 16 to 52 percent in podded plants of Arka Anamika, while it was 2.5 to 54 percent in depodded and 1.0 to 66 percent in podded plants of Parvani Kranti. Maximum reduction in total dry matter accumulation was 51 percent in depodded plants of Arka Anamika, while 43 percent in podded plants of Parvani Kranti under the stress. Though there was recovery in physiological parameters after releasing the stress, a reduction of 47 (depodded) to 55 percent (podded) in biological yield was found in Arka Anamika and 10 (depodded) to 46 percent (podded) in Parvani Kranti in stressed plants at final harvest of crop. The results indicated that the pod influences the plant responses to water stress as indicated by the differences in leaf area production, plant height and carbon exchange characteristics in podded and depodded plants during water stress.#e.

009. Pandey, I.B.; Kumar, K. (Rajendra Agricultural University, Pusa, (India). Dept. of Agronomy). Response of wheat (Triticum aestivum) to seeding methods and weed management . Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 48-51 KEYWORDS: WHEATS; TRITICUM AESTIVUM; WEED CONTROL; HERBICIDES; WEEDS; ISOPROTURON; YIELD COMPONENTS; YIELDS; DIRECT SOWING; BROADCASTING.

A field experiment was conducted during the winter seasons of 2000-2001 to 2001-2002, to study the reo w sponse of wheat (Triticum aestivum L. emend. Fiori & Paol.) to seeding methods and weed management. Criss- cd cross and unidirectional sowing resulted in significantly higher yield attributes, grain yield and net returns than as broadcasting. Criss-cross sowing significantly reduced weed count and weed dry biomass than broadcasting. Test weight and protein content in grain were unaffected by seeding methods. Among the weed-control treatments, no hand-weeding although recorded higher yield attributes, grain and straw yields but was found at par with those recorded under sulfosulfuron 33.3 g/ha and significantly higher than those recorded under isoproturon and 2,4-D. Net returns recorded among the weed-control treatments did not differ significantly. However, it was higher in t, isoproturon followed by sulfosulfuron, hand-weeding and 2,4-0. Weed-control treatments also recorded higher' protein content weedy check.

010. Dass, A.; Patnaik, U.S.; Sudhishri, S. (Central Soil and Water Conservartion Research and Training Institute, Koraput (India). Research Centre). Response of vegetable pea (Pisum sativum) to sowing date and phosphorus under on farm conditions . Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 64-66 KEYWORDS: SOWING DATE; PEAS; PISUM SATIVUM; PHOSPHORUS; FERTILIZER APPLICATION; PHOSPHORUS; YIELD COMPONENTS; ECONOMICS; ORISSA.

A field experiment was conducted during the winter season of 1999-2000 and 2000-2001 at Kokriguda model watershed, block Semiliguda, district Koraput (Orissa), to find out optimum sowing time and phosphorus dose for vegetable pea (Pisum sativum L.). The earliest sowing date (18 October) resulted in significantly better growth, yield attributes, green pod yield and net returns than 2 November and 17 November. Between the later 2 sowing dates, 2 November was significantly superior. Increasing phosphorus levels from 0 to 75 kg pp/ha sig. nificantly improved growth, yield and net returns. Moreover, combination of 18 October sowing and 75 kg pp/ha resulted in highest green pod yield of 43.33 q/ha being significantly higher than all other combinations, Phorphorus-use efficiency was highest with 18 October sowing and with 25 kg P p/ha.Maximum water-use-effi. ciency was recorded with 2 November-sown and 75 kg pp/ha applied crop.

011. Thakur, K.S.; Kumar, A.; Manuja, S. (Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Kangra (India). Oilseeds Research Stn.). Performance of promising varieties of gobhi sarson (Brassica napus) at different nitrogen levels. Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 67-69 KEYWORDS: BRASSICA NAPUS; VARIETIES; NITROGEN; YIELD COMPONENTS; HIMALAYAN REGION; NUTRIENT UPTAKE; YIELDS.

A field experiment was carried out at Kangra during the winter (rabi) seasons of 1996-97 to 1998-99 to find out the suitable high-yielding variety of gobhi sarson (Brassica napus subsp. oleifera var annua) variety and its nitrogen requirement under mid-hill conditions of north-western Himalayas. The treatments consisted of 4 gobhi sarson varieties ('Hyola 401', 'Neelam', 'Sheetal' and 'GSL 1 ') tested against 'Kranti' (check) of Indian mustard [Brassica juncea (L.) Czernj. & Cosson] at 3 nitrogen levels (60, 90 and 120 kg N/ha). Among different

yield attributes, plant and seeds/siliqua were highest in gobhi sarson hybrid 'Hyola 401', while 1000-seed weight was highest in Indian mustard 'Kranti'. In spite of poor yield due to inferior quality seed during the third year, 'Hyola 401' gave significantly highest seed yield on pooled basis. The seed yield also increased with increasing nitrogen levels, being significantly highest with the application of 120 kg N/ha. The nutrient uptake followed the same trend as that of seed yield with highest uptake values recorded from 'Hyola 401' and with the application of 120 kg N/ha.

012. Kalita, H. (Assam Agricultural University, Nagaon (India). Regional Agricultural Research Stn.); Bora, P.C. (Assam Agricultural University, Jorhat (India). Dept. of Agronomy); Debnath, M.C. (Assam Agricultural University, Nagaon (India). Regional Agricultural Research Stn). Effect of sowing date and tillage on soil properties, nutrient uptake and yield of linseed (Linum usitatissimum) grown in winter rice (Oryza sativa)-fallows. Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 70-72 KEYWORDS: SOWING DATE; TILLAGE; LINSEED; RICE; LINUM USITATISSIMUM; NUTRIENT UPTAKE; ORYZA SATIVA; CROPPING SYSTEMS; FALLOW SYSTEMS.

An experiment was conducted during the winter seasons of 1997-98 and 1998-99 under rainfed medium. land situation, to find out the effect of sowing date and tillage practices on soil properties, nutrient uptake and seed yield of linseed (Linum usitatissimum L.) grown in winter rice (Oryza sativa L.)-fallows at Jorhat. The ,crop sown on 10 November recorded significantly higher seed yield and total N, P and K uptake in both the years. Normal tillage with rice straw mulching resulted in significantly higher uptake of N, P and K and seed yield. This treatment recorded the lowest values for available N, PPs and KP in soil at crop harvest. Bulk density of 0-15 cm and 15-30 cm soil layers was also minimum and as a result total porosity was maximum under this treatment. Minimum tillage with standing rice straw intact emerged superior to normal tillage without straw mulch and mini. mum tillage without standing straw in respect of seed yield and nutrient uptake.

F02 Plant Propagation

013. Arora, N.; Ranjana, R.; Kaur, J.; Singh, P.; Parmar, U. (Punjab Agricultural University, Ludhiana (India). Dept. of Botany). Alleviation of normal and late sown chickpea (Cicer arietinum L.) yield through foliar application of bioregulators. Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 628-630 KEYWORDS: FOLIAR APPLICATION; SOWING DATE; CICER ARIETINUM; BIOREGULATORS; YIELD.

014. Saini, N. (Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Biotechnology and Molecular Biology); Saini, M.L. (Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Plant Breeding); Jain, R.K. (Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Biotechnology and Molecular Biology). Large scale production, field performance and RAPD analysis of micropropagated sugarcane plants. The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 102-107 KEYWORDS: SACCHARUM; MICROPROPAGATION; SUGARCANE; PRODUCTION; CROP PERFORMANCE; RAPD; GENETIC MARKER.

An improved procedure has been developed for the micropropagation of true-to-type plants of two early maturing varieties of sugarcane, CoH92 and CoH99. The protocol involved (i) growth and proliferation of shoot tip explants in MS medium containing

gibberellic acid, indole-3-acetic acid and kinetin, (ii) 3-6 rounds of shoot multiplication in MS medium enriched with 6-benzylaminopurine and kinetin, (Iii) rooting in MS medium with (a-naphthalene acetic acid and sugar at higher concentrations, and (vi) hardening of plantlets and their transplantation into 1:1 mixture of unsterilized sand and soil under natural conditions. Shoot multiplication and rooting media contained food grade cane sugar and IsubgolTM as cheaper substitutes in place of sucrose (pure grade) and agar, respectively. This procedure does not require expensive equipment and facilities such as water purification units, greenhouse, polyhouse, etc. Plants propagated through micropropagation and conventional means using setts compared well for various agronomic (cane length, cane weight, number of internodes per cane, internode length) as well as sugar yield/quality traits (purity and CCS). Micropropagated plants had relatively higher number of millable canes, but they were thinner than the conventionally propagated cane. Plants propagated through setts of the micropropagated plants were genetically stable for all the traits. RAPD marker analysis using 20 primers clearly established the clonal fidelity in 90 percent of micro propagated plants.

015. Kale, V.P. (BGejo Sheetal Seeds Private Limited, Jalna (India); Bruno, T.V.; Bhagade, S.V. (B.R. Barwale Mahavidyalaya, Jalna (India). Dept. of Biotechnology)). Studies on callus initiation and plantlet regeneration in sugarcane (Saccharum Spp.) . The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 165-166 KEYWORDS: CALLUS; SACCHARUM; REGENERATION; TISSUE CULTURE; SUGARCANE; VITRO PLANTS.

F03 Seed Production and Processing

016. Mishra, S.K.; Singh, S.; Meena, K.N.; Tyagi, N.K.; Singh, B.B. (Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics). Electrophoretic variation for seed proteins of diverse genotypes in pea (Pisum sativum L.). Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 615-620 KEYWORDS: GENOTYPES; PISUM SATIVUM; ELECTROPHORESIS; SEED.

The seed protein patterns of twenty-varieties/advance breeding lines in pea were analysed by Sodium Dodecyl Solphate-Polyacrylamide Gel Electrophoresis (SDS-P AGE). A high similarly index (79.j6~97-14 percent) between the genotypes indicated a close evolutionary relationship among them. Some genotypes have unique bands, which may help in identification them in the germplasm. Several genotypes can als9 be identified by absence of the particular bands. Presence/absence of specific bands can be used as reference materials.

017. Jaiswal, S.; Sawhney, N.; Sawhney, S. (University of Delhi, Delhi (India). Dept. of Botany). Lidocaine modulates growth performance of some dicot and monocot seedlings. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 108-114 KEYWORDS: PHOTOSYNTHESIS; GROWTH; SEEDLINGS; ANAESTHETICS; ROOTING.

Local anaesthetic lidocaine caused significant inhibition of seedling growth of both monocot and dicot species investigated namely Lens culinaris, Vigna mungo, Brassica juncea, Triticum aestivum, Hordeum vulgare and Sorghum bicolor. Concomitant with reduced growth, anaesthetic treatment also lowered the extent of seed reserve mobilization to the seedling, indicated by higher levels of left over seed dry weights analysed in two representative species. A species-specific lidocaine-induced anthocyanin

production was observed in case of V. mungo cotyledons. All anaesthetic effects intensified with its concentration, although not always strictly in proportion to the dosage increment. These modulations being long-term and
irreversible would obviously involve an altered gene expression induced by a local anaesthetic agent.

F04 Fertilizing

018. Sharma, B.B. (Indira Gandhi Agricultural University, Raipur (India). Dept. of Plant Pathology). Effect of organic amendments on growth and yield of oyster Mushroom pleurotus spp.. Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 631-632 KEYWORDS: GROWTH; YIELD; PLEROTUS OSTREATUS.

019. Verma, M.L. (Chaudhary Sarwan Kumar Himachal Pradesh Krishi Viswavidyalaya, Shimla (India). Regional Horticultural Research Station); Acharya, C.L. (Chaudhary Sarwan Kumar Himachal Pradesh Krishi Viswavidyalaya, Palampur (India). Dept. of Soil Science)). Effect of nitrogen fertilization on soil plant water relationships under different soil moisture conservation practices in wheat. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 105-108 KEYWORDS: FERTILIZATION; NITROGEN; SOIL WATER CONTENT; PLANT SOIL RELATIONS; WATER POTENTIAL; PLANT WATER RELATIONS.

020. Hargilas, K.; Keshwa, G.L. (S.K.N. College of Agriculture, Jobner (India). Dept. of Agronomy). Seed yield response of fenugreek to integrats use of nitrogen through organic and inorganic sources and sulphur fertilization. Annals of Agricultural Research (India). (Mar 2005) v. 26(1) p. 164-166 KEYWORDS: ORGANIC; INORGANIC COMPOUNDS; SEED; YIELDS; FENUGREEK; NITROGEN; SULPHUR; FERTILIZATION.

021. Intodia, S.K. (Directorate of Extension Education, Udaipur (India); Sahu, M.P. (Rajasthan Agricultural University, Bikaner (India). Directorate of Res.). Effect of sulphur fertilization on growth of opium poppy in calcareous soils of South Rajasthan. Indian Journal of Plant Physiology (India). (Jan-Mar 2005) v. 10(1) p. 90-93 KEYWORDS: SULPHUR; GYPSUM; OPIUM POPPY; GROWTH.

A field study was conducted to investigate the effect of sulphur fertilization on growth of opium poppy in alkaline calcareous soils of, South Rajasthan. Sulphur application significantly increased dry matter accumulation/plant, leaf area index, crop growth rate and leaf area duration. Chlorophyll content of leaves of opium poppy increased while leaf sap pH reduced by S application. Increasing levels of S up to 150 kg! ha enhanced growth of crop, whereas, chlorophyll content of leaves increased up to 200 kg/ha sulphur application. Among three sources of S, elemental S proved to be a better source than gypsum and gypsum + elemental S (1:1) in respect of growth in alkaline calcareous soils. Gypsum + elemental S (1:1) also resulted in highest chlorophyll content in leaves at 110-115 DAS. This study conclude that application of S 150 kg/ha through elemental sulphur can improve opium poppy plant growth and leaf chlorophyll content and can reduce leaf sap pH significantly.

022. Sharma, O.P. (Maharana Pratap University of Agriculture and Technology, Churu, (India). Krishi Vigyan Kendra); Singh, G.D. (Rajasthan Agricultural University, Bikaner (India).

Extn. Edn.). Effect of sulphur in conjunction with growth substances on productivity of clusterbean (Cyamopsis tetragonoloba) and their residual effect on barley (Hordeum vulgare). Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 16-18 KEYWORDS: FERTILIZATION; SULPHUR; PLANT GROWTH SUBSTANCES; FERTILIZER COMBINATIONS; CYAMOPSIS PSORALIODES; CLUSTERBEANS; BARLEY; HORDEUM VULGARE; PRODUCTIVITY; RESIDUAL EFFECTS.

A field study was carried out during 2000-01 and 2001-02 to assess the effect of levels and sources of sulphur along with growth substances on clusterbean [Cyamopsis tetragonoloba (L.) Taub] as well as their residual effect on succeeding barley (Hordeum vulgare L. s.I.) crop was undertaken at ARS, Fatehpur-Shekhawati. The treatments consisted combinations of 3 levels of S (0, 25 and 50 kg/ha), 2 sources of S (Gypsum and SulFer 95) and 3 growth substances (thiourea, DMSO and brassinolids). Sulphur fertilization up to 50 kg/ha significantly increased pods/plant, grains/plant, test weight and subsequently increased yield of clusterbean. Application of sulphur through Sui Fer 95 was found superior to gypsum for improvement in yield attributes and yield of clusterbean. Significant variation among foliar-applied growth substances was observed for yield attributes and yield of clusterbean. Thiourea recorded the maximum grain yield followed by brassinolids and DMSO. Residual 1 studies revealed that application of S at 25 kg/ha was optimum for single crop of clusterbean, while for in clusterbean-barley crop sequence higher level of S, i.e. 50 kg/ha was found effective. SulFer 95 as a source of S it was found superior to gypsum in increasing grain yield of succeeding crop of barley.

023. Guggari, A.K.; Kalaghatagi, S.B. (University of Agricultural Sciences, Bijapur (India). All India Coordinated REsearch Project on Pearl Millet). Effect of fertilizer and biofertilizer on pearl millet (Pennisetum glacum) and pigeaonpea (Cajanus cajan) intercropping system under rainfed conditions. Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 24-26 KEYWORDS: PEARL MILLETS; PIGEONPEAS; CAJANUS CAJAN; YIELDS; ECONOMICS; FERTILIZERS; INTERCROPPING; BIOFERTILIZERS; PENNISETUM GLAUCUM.

A field experiment was conducted during 3 rainy seasons of 2000-2002 at Regional Agricultural Research Station, Bijapur, in medium black soil, to study the effect of fertilizer and biofertilizer on pearl millet [Pennisetum glaucum (L.) R. Br. emend. Stuntz] under sole and intercropping system. The grain yield of pearl millet was signifi-cantly higher under sole cropping (18.88 q/ha) compared to intercropped pearl millet (16.69 q/ha). However, pearl millet-equivalent yield, net returns and benefit: cost ratio were higher with pearl millet + pigeonpea [Cajanus cajan (L.) Millsp.] (2:1) intercropping system (47.38 q/ha, Rs 113,988/ha and 2.79 respectively) over sole crop of pearl millet (18.88 q/ha, Rs 4,864/ha and 2.25 respectively). Irrespective of cropping systems, application of 60 kg N + 40 kg P p/ha recorded significantly higher pearl millet-grain equivalent yield (36.17 q/ha) over absolute control, seed treatment with biofertilizer alone and application of 20 kg N+ 15 kg P p/ha (28.30, 31.22 and 33.42 q/ha respectively) but was on par with 40 kg N + 30 kg P2O/ha + biofertilizer and recommended fertilizer dose (50 kg N + 25 kg Pp/ha) of the region (35.41 and 33.71 q/ha respectively). Net monetary returns were higher with application of 60 kg N + 40 kg P p/ha (Rs 10, 144/ha) and it was on a par with 40 kg N + 30 kg P p/ha + biofertilizer seed treatment (Rs 10, 130/ha).

024. Singh, P.K.; Chandel, A.S. (Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). College of Agriculture). Effect of biozyme on yield and quality

of wheat (Triticum aestivum). Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 58-60 KEYWORDS: FERTILIZER APPLICATIONS; NPK FERTILIZERS; FARM GROWTH SUBSTANCES; WHEATS; TRITICUM AESTIVUM; GRANULES; YIELD COMPONENTS; YIELDS; QUALITY.

A field experiment was conducted during 1998 and 1999 at Pantnagar, to evaluate the effect of recommended NPK and 'Biozyme' granule on wheat (Triticum aestivum L. emend. Fiori & Paol.). Biozyme granules or Biozyme crop' spray applied along with half of recommended NPK resulted in significant improvement in the yield attributes, grain, straw and biological yields and protein content. Highest value of yield attributes like number of spikes and 1,000-grain weight were recorded with Biozyme granule 40 kg/ha + half of recommended NPK, whereas highest number of grains/spike were recorded under Biozyme crop' spray 400 ml/ha done in conjunction with half of C recommended NPK. On pooled basis, highest grain, straw and biological yields and protein content were recorded under Biozyme crop' spray 400 ml/ha + half of recommended NPK. Application of Biozyme crop' spray 400 mil ha + half of recommended NPK resulted 12.90, 3.24 and 6.76 higher grain straw and total biological yield respectively. The yields under the pure treatments of the Biozyme were comparable to half of recomended NPK.

025. Bhunia, S.R.; Chauhan, R.P.S.; Yadav, B.S. (Rajasthan Agricultural University, Sriganganagar (India). Agricultural Research Stn.)_. Effect of nitrogen and irrigation on water use, moisture-extraction pattern, nutrient uptake and yield of fennel (Foeniculum vulgare). Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 73-76 KEYWORDS: WATER LUSE; YIELD COMPONENTS; EFFICIENCY; NUTRIENT UPTAKE; SOIL WATER CONTENT; VARIETIES; FENNEL; FOENICULUM VULGARE; NITROGEN; IRRIGATION.

A field experiment was conducted during the winter seasons of 2001-03 at Agricultural Research Station, Sriganganagar, Rajasthan, to study the water use, nutrient uptake, yield and economics of fennel (Foeniculum vulgare Mill.) cultivars under vrious levels of nitrogen and irrigations. The highest yield (25.16 and 19.04 q/ha) and yield attributes were recorded with 80 kg N/ha. Net returns and gross returns and benefit: cost ratio were also the highest at 80 kg N/ha. Increasing levels of nitrogen also recorded higher consumptive, use of water and significantly higher nutrients uptake. Higher level of nitrogen extracted more water f(orp lower depth of rhizosphere than lower level of N. With an increase in irrigation frequency from IW : CPE ratio 0.4 to 0.8, yield and most of the yield attributes increased significantly. Similarly, water use and nutrients uptake were also higher with higher levels of irrigation. At lower irrigation level (IW : CPE ratio 0.4) more water was extracted from upper layers than higher irrigation level. Increasing levels of irrigation also recorded higher gross, net returns and benefit: cost ratio. Between the 2 varieties, 'RF 125' outperformed 'RF 101 '.

026. Sarkar, S. (Central Research Institute for Jute and Allied Fibres, Kolkata (India). Agronomy Div.). Determination of optimum fertilizer and spacing requirement for sustaining higher growth and fibre yield of Indian ramie (Boehmeria nivea). Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 80-82 KEYWORDS: FERTILIZERS; NPK FERTILIZERS; SPACING; GROWTH; RAMIE; BOEHIMERIA NIVEA; INDIA; FIBRE CROPS; YIELDS.

A field experiment was conducted during 1997-2000 on medium fertile, sandy-loam acidic soil of Ramie Re-search station, Sorbhog, Assam, to study the effect of fertilizer and spacing on growth and fibre yield of ramie' [Boehmeria nivea (L.) Gaud.] cv. 'R 1411'. Total 14 cuttings could be taken in the order of 2,5,4 and 3 cuttings in I the 1 st, 2nd, 3rd and 4th year respectively. The highest fibre yield of 164 to 650 kg/ha/cutting was recorded with i,

40:20:20 kg NPK/ha/cutting of lIi"Iereas the lowest spacing, Le. 20 cm x 40 cm resulted in the highest fibre yield! cutting ranging between 172 and 654 kg/ha/cutting, may be due to accommodation of higher cane numbers per)' unit area. Interaction of fertilizer and spacing showed that 40:20:20 kg/ha/cutting of NPK along with 20 cm x 40 cm spacing resulted in the highest fibre yield per cutting (184-690 kg/ha/cutting) which was at par with fibre yield (179-687 kg/ha/cutting) obtained with 30:15:15 kg/ha/cutting of NPK with 20 cm x 40 cm spacing. Second year of the plantation provided the highest total fibre yield of 2,469 kg/ha with 40:20:20 kg/ha of NPK along with 20 cm x III 40 cm spacing. Regarding the cutting-wise fibre yield, it was observed that 2 cutting (July) gave the highest fibre yield (597kg/ha/cutting) followed by 3rd, 1st and 4 cutting in descending order.

F07 Soil Cultivation

027. Sharma, P.; Tripathi, R.P.; Singh, S.; Kumar, R. (Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Soil Science)) . Effect of tillage on soil physical properties and crop performance under rice-wheat system. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 12-16 KEYWORDS: TILLAGE; CONVENTIONAL TILLAGE; ZERO TILLAGE; SOIL CHEMICOPHYSICAL PROPERTIES; CROPPING SYSTEMS; RICE; WHEAT; CROP PERFORMANCE; PUDDLING.

A field experiment was conducted during 1999-2002 to evaluate tillage-induced changes in soil physical properties and yield of rice and wheat in rotation. Tillage treatments for rice were puddling by 4 passes of rotary puddler (PR), reduced puddling by 2 passes of rotary puddler (ReP), conventional puddling (CP), direct seeding without puddling (DSWP) and those for wheat were zero tillage (ZT) and conventional tillage (CT) superimposed over the rice tillage treatments. Puddling index was 1.23 and 1.2 times higher in PR and CP plots than in the ReP plots. Cracking after rice harvesting increased with degree of puddling. Among the puddle plots, crack volume was lowest in the ReP plots. Among the puddling treatments, plasticity index was lowest in the ReP plots and highest in the PR plots. Effect of wheat tillage (ZT and CT) on plasticity index was non-significant. Among the puddle plots, bulk density measured at 30 days after transplanting and at harvesting was highest in the PR plots and lowest in the ReP plots. Influence of wheat tillage (ZT and CT) on bulk density was non-significant. Compared to the DSWP plot infiltration rate reduced 2.3 times at 30 DA T and 2.8 times at harvesting in PR plots and 1.1 times at 30 DA T and 1.3 times at harvesting in ReP plots due to puddling. Rice yield was maximum in PR plots but was statistically equal to those in ReP plots, and wheat yield was minimum in PR plots and maximum in DSWP plots. The total grain yield (rice + wheat) was highest (9447 kg ha-1) in the ReP plots of rice under ZT for wheat. The ReP condition for rice and ZT for wheat not only optimized yield but also caused minimum deterioration of soil structure.

028. Pandey, I.B.; Sharma, S.L.; Tiwari, S.; Mishra, S.S. (Rajendra Agricultural University, Pusa (India). Dept. of Agronomy). Economics of tillage and weed management system for wheat (Triticum aestivum) after lowland rice (Oryza sativa). Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 44-47 KEYWORDS: TILLAGE; WEED CONTROL; WEEDS; WHEATS; TRITICUM AESTIVUM; RICE; ORYZA SATIVA; LOWLAND; ECONOMICS; CROP ROTATION.

A field experiment was conducted during the winter seasons of 1997-98 and 1998-99, to study economics of tillage and weed-management system for wheat (Triticum aestivum L.

emend. Fiori & Paolo] after lowland rice (Oryza sativa L.). Tillage practices significantly reduced the moisture content and bulk density of the soil than zero-tillage. Farmer's practice recorded the lowest moisture content in the soil, whereas minimum bulk density of the soil was associated with rotavator twice. Rotavator twice significantly reduced the weed population and weed dry biomass than farmer's practice and zero tillage and recorded significantly higher values for yield attributes and grain and straw yields. Rotavator twice also recorded significantly higher net returns than farmer's practice and zero tillage. Farmer's practice recorded significantly lower benefit: cost ratio than rotavator once or twice. Higher values for yield attributes and grain and straw yields were recorded in hand-weeded plot which were at par with mixture of 2,4-0 + isoproturon but significantly higher than 2,4-0 or isoproturon applied alone. Net returns with hand-weeding and 2,4-0 + isoproturon were at par, while the later recorded significantly higher benefit: cost ratio than hand-weeding.

029. Yadav, D.S.; Shukla, R.P.; Sushant; Kumar, B. (Narendra Deva University of Agriculture and Technology, Faizabad (India). Dept. of Agronomy). Effect of zero tillage and nitrogen level on wheat (Triticum aestivum) after rice (Oryza sativa). Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 52-53 KEYWORDS: ZERO TILLAGE; FERTILIZER APPLICATION; NITROGEN; WHEATS; TRITICUM AESTIVUM; RICE; ORYZA SATIVA; CROP ROTATION; YIELDS.

A field experiment was carried out during the winter seasons of 1999-2000 and 2000-2001 to .assess the per-formance of zero tillage in wheat (Triticum aestivum L. emend. Fiori & Paol.) under varying levels of nitrogen. The pooled analysis of data revealed that grain yield and number of effective tillers/m row increased significantly by 7.7 and 6.6percentage, respectively, with zero tillage over conventional tillage. Significant reduction in dry weight of weeds was observed with zero tillage over conventional tillage. Application of 150 and 180 kg N/ha being at par resulted in significantly higher grain yield over 120 kg N/ha. The growth and yield parameters showed significant variation owing to N application. The dry weight of weeds was minimum with 120 kg N and it increased signifi-cantly up to 180 kg N/ha.

030. Kumar, R.; Yadav, D.S. (Narendra Deva University of Agriculture and Technology, Faizabad (India). Dept. of Agronomy). Effect of zero and minimum tillage in conjunction with nitrogen management in wheat (Triticum aestivum) after rice (Oryza sativa). Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 54-57 KEYWORDS: ZERO TILLAGE; FERTILIZER APPLICATION; WHEATS; NITROGEN; TRITICUM AESTIVUM; RICE; ORYZA SATIVA; CROP ROTATION; YIELD COMPONENTS; YIELDS.

An experiment was conducted to find out the effect of tillage and nitrogen management on the productivity of wheat (Triticum aestivum L. emend. Fiori & Paol) after rice (Oryza sativa L.) during winter seasons of 1997-98. and 1998-99 at Faizabad, Uttar Pradesh. Sowing of wheat by Chinese seeder recorder significantly higher valuables of growth characters, yield attributes, yield and nitrogen uptake by wheat followed by Pantnagar zero till drill and lowest in conventional tillage. Chinese seeder recorded 23.83 and 25.85percentage more grain yield over conven.: tional tillage during first and second year respectively. All the growth characters, yield attributes, yield and N uptake were significantly higher with 150 kg N/ha over 120 kg N/ha. Application of N as half basal + half after first ir. rigation recorded significantly higher yield and N uptake over rest of the treatments but test weight was higher I with the application of N as half after first irrigation + half after second irrigation.

F08 Cropping Patterns and Systems

031. Dhakad, A.; Rajput, R.S.; Mishra, P.K.; Sarawgi, S.K. (Indira Gandhi Agricultural University, Raipur (India). Dept. of Agronomy). Effect of spatial arrangement and N-scheduling on nodulation, wheat equivalent yield and land equivalent ratio of wheat + chickpea intercropping system. Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 621-623 KEYWORDS: SPATIAL DISTRIBUTION; ROOT NODULATION; YIELD; CROPPING SYSTEM; WHEAT; CHICKPEA.

032. Nautiyal, N.; Srivastava, R. (Lucknow University, Lucknow (India). Botany Dept.). Abscisic acid modifies boron stress in cultured maize kernels. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 103-107 KEYWORDS: ABA; ZEA MAYS; KERNELS; BORON; SEED STORAGE; PLANT GROWTH SUSTANCES; ABSCISIC ACID.

Fertilized ovules of maize (Zea mays L.) were cultured at 14 days after anthesis in MS medium devoid of growth regulators. The developing kernels were supplied boron at three levels O.OlmM (low), O.lmM (normal and (high), each without or with Img I-I abscisic acid (ABA). Growth of kernels, after 8 days in culture, was observed as increase in length, breadth, fresh and dry weight wilW concomitant decrease in concentration of sugars and increase in that of nitrogen, protein and starch. Maize kernels cultured in absence of ABA showed growth enhancement at low B and poor growth at high B from those at normal B. In kernels at low B the concentration of sugars and phenols increased and that of nitrogen, proteins and starch decreased, while at high B protein nitrogen and starch contents increased. A supply of ABA increased the level of seed reserves and almost reversed the effects of boron stress in maize kernels cultured in vitro.

033. Rajput, S.S.; Jakhar, M.L. (Rajastan Agricultural University, Jobner (India). Dept. of Plant Breeding and Genetics). Influence of kanamycin on explant and callus of moth bean. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 115-119 KEYWORDS: CALLUS; TISSUE CULTURE; REGENERATION; EXPLANTS; KANAMYCIN; VIGNA ACONITIFOLIA.

Various tissues and explants of Vigna aconitifolia (Jacq.) Marechal cv. RMO-256 grown in vitro were incubated in the presence of a selectable marker antibiotic, kanamycin sulfate. Among the various tissues! explants, leaves showed maximum tolerance to high levels of kanamycin (up to even 500 pglml). Shoot growth and root induction were affected severely and root induction was completely inhibited at 50 pgl ml kanamycin. Callus tissues were found to be highly susceptible to kanamycin and callus induction reduced up to 50 per cent at 20 pglml levels. Low levels of kanamycin (20, 50 pglml) had a promotory effect on shoot bud morphogenesis in callus cultures. Higher levels (200-500 pglml) however, inhibited regeneration completely. Promo tory effects of kanamycin were not observed in case of direct regeneration from leaf explants. Direct regeneration was completely inhibited at 100 pglml kanamycin.

034. Majumdar, B.; Venkatesh, M.S.; Kumar, K.; Patiram (ICAR Research Complex for North Eastern Hill Region, Umiam (India). Div. of Soil Science)). Effect of different farming systems on phosphorus fractions in an acid alfisol of Meghalaya. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 29-34 KEYWORDS: FARMING SYSTEMS; ACID SOILS; SOIL TYPES; LUVISOLS; PHOSPHORUS; MEGHALAYA; SOIL CHEMICOPHYSICAL PROPERTIES; FRACTIONATION.

The effect of eight watershed-based farming systems consisting of livestock farming (FSWl), forestry (FSWz), agroforestry (FSW3), agriculture (FSW4), agri-horti-silvi-pastoral (FSWs), horticulture (FSW6), natural fallow (FSW7) and abandoned jhum land (FSWg) on different forms of P was studied after 17 years of adoption under rainfed condition on hill slopes of Meghalaya. All the forms of P except organic P were significantly highest in FSW4 followed by FSWl and FSWs and the lowest values of inorganic P were recorded in FSWg followed by FSW7. The FSWg registered the highest value of organic P, which was 60.7 percent of total P while the contribution of organic P to total P was lowest (32.7 percent) in FSW4 suggesting higher P mineralization in this system. Among the inorganic fractions of P, the highest value was recorded for reductant soluble P, followed by AI-P, Fe-P, occ1uded-P, Ca-P and saloid bound P, respectively, in all the systems except FSW7 and FSWg. There was a continuous increase in all the P fractions from top to bottom of the watersheds under different farming systems. The FSW" FSW4, FSWs and FSW6 with terraces in the bottom retained relatively higher magnitude of all the forms of P. Soil pH, ECEC and base saturation showed significant positive correlation with all the forms of P.

035. Prasad, S. (Banaras Hindu University, Varanasi (India). Dept. of Agronomy); Dixit, R.S.; Singh, U.; Sutaliya, R. (Narendra Deva University of Agriculture and Technology, Faizabad (India). Dept. of Agronomy). Effect of integrated nitrogen management on wheat (Triticum aestivum L.) varieties under late sown condition. Annals of Agricultural Research (India). (Mar 2005) v. 26(1) p. 157-160 KEYWORDS: SOWING DATE; NITROGEN; INTEGRATED CONTROL; TRITICUM AESTIVUM.

036. Yadav, S.K.; Lakshmi, N.J.; Maheshwari, M.; Vanaja, M.; Venkateswarlu, B. (Central Research Institute for Dryland Agricultre, Hyderabad (India). Div. of Crop Sciences). Influence of water deficit at vegetative, anthesis and grain filling stages on water relation and grain yield in sorghum. Indian Journal of Plant Physiology (India). (Jan-Mar 2005) v. 10(1) p. 20-24 KEYWORDS: SORGHUM; METABOLITES; GROWTH; DROUGHT STRESS.

The physiological response of short term water deficits and its relief was assessed on water relations and accumulation of certain metabolites in sorghum hybrid CSH-14 at vegetative, anthesis and grain filling stages. The leaf water potential, osmotic potential and relative water content decreased in the stressed plants at all the stages studied. The decrease in osmotic potential was more compared to decrease in water potential at all the stages indicating the ability of the leaves to maintain turgor through osmotic adjustment (OA). The stressed plants recovered by 48 h after re-watering in terms of all these parameters. Stomatal conductance decreased drastically under stress and recovered partially after rewatering indicating its high sensitivity to water stress. The accumulation of total soluble sugar and free amino acids under stress at all the growth stages indicate the possibility of their involvement in osmotic adjustment. However, the relative contribution of proline and potassium appears to be marginal.

037. Jain, V.; Jain, V.; Vishwakarama, S.K.; Sharma, R.S. (Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur (India). Dept. of Agronomy). Maximization of productivity for soybean (Glycine max)-wheat (Triticum aestivum) system in Kymore plateau and Satpura hill zone of Madhya Pradesh. Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 19-21 KEYWORDS: CROPPING SYSTEMS; SOYBEANS; WHEATS; GLYCINE MAX; TRITICUM

AESTIVUM; FERTILIZER APPLICATION; HIGHLANDS; YIELD COMPONENTS; YIELDS; MADHYA PRADESH.

A field experiment was conducted with soybean [Glycine max (L.) Merr.]-wheat (Triticum aestivum L. emend. Fiori. & Paolo) cropping system for 3 consecutive years during 1999-2000 to 2001-2002 in .e.lay-loam soils of Jabalpur, Madhya Pradesh, with the objective to maximize the productivity and profitability of system. Application of 125percentage recommended dose of fertilizers to both crops significantly increased the grain yields of crop components and it was remunerative also without deterioration of soil properties. Application of 10 tonnes FYM/ha to soybean along with different fertilizer doses increased the grain yields of both crops, besides build-up in organic carbon and K contents in soil. Sowing of 125percentage recommended seed rate of wheat also helped to incease the productivity, net monetary returns and benefit : cost ratio of entire soybean-wheat system.

038. Sree, P.S.S.; Sridhar, V. (Acharya N.G. Ranga Agricultural University, Nandyal (India). Regional Agricultural Research Stn.). Production potential, economics and soil fertility status of sunflower (Helianthus annuus)-based cropping sequences under scarce rainfall zone of Andhra Pradesh. Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 22-23 KEYWORDS: PRODUCTION POSSIBILITIES; RAINFED FARMING; SOIL FERTILITY; ANDHRA PRADESH; YIELDS; YIELD COMPONENTS; CROPPING SYSTEMS; HELIANTHUS ANNUS; SEQUENTIAL CROPPING; SUNFLOWER.

A field experiment was conducted for 5 years (1996-97 to 2000-2001) at Regional Agricultural Research Station, Nandyal, revealed that among different cropping sequences involving sunflower (Helianthus annuus L.) the sunflower-equivalent yield of groundnut (Arachis hypogaea L.)-sunflower was the highest (1,555 kg/ha) and was at par with setaria (Setaria sp.)-sunflower (1,545 kg/ha) and sunflower-sunflower (1,503 kg/ha). The net returns and benefit: cost ratio were the highest for setaria-sunflower followed by sunflower-sunflower sequence. The soil fertility status of rainfed cropping systems involving pulse crops was better than that involving non-pulse crops in the sequence.

039. Ahlawat, I.P.S.; Gangaiah, B.; Singh, O. (Indian Agricultural Research Institute, New Delhi (India). Div. of Agronomy). Production potential of chickpea (Cicer arietinum)-based intercropping systems under irrigated conditions. Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 27-30 KEYWORDS: INTERCROPPING; CHICKPEAS; CICER ARIETINUM; YIELDS; PRODUCTION POSSIBILITIES; IRRIGATED FARMING; BRASSICA JUNCEA; BARLEY; LINSEED.

A field experiment was conducted during 2000-2002 at New Delhi, to evaluate the productivity of chickpea (Gicer arietinum L.)-based intercropping systems. The yield of chickpea was adversely affected by intercropping with Indian mustard [Brassica juncea (L.) Czernj. & Cosson], barley (Hordeum vulgare L., s.l.) and linseed (Linum usitatissimum L.). However, the magnitude of reduction was relatively greater in Indian mustard. Further, the yield of chickpea increased as the proportion of chickpea increased in the mixture from 2:1 to 4:1, while reverse trend was noticed in the yield of intercrops. Sole Indian mustard recorded the highest total productivity in terms of chickpea-equivalent yield (CEY), followed by chickpea + Indian mustard (2:1), chickpea+linseed in various row proportions and sole chickpea recorded similar CEY, which was markedly lower than sole barley and linseed and chickpea intercropped with Indian mustaqrd and barley in various proportions, except chickpea + barley in 4:1 row proportion. Among various intercropping systems, chickpea + barley especially in 4:1 and row portions, showed yield advantages in terms of land-

equivalent ratio (LER), while all the sole intercros and chickpea-based intercropping systems, except chickpea+linseed (4:1) recorded higher income equivalent ratio over sole chickpea. All the intercrops were more competitive and aggressive than chickpea. Based on relative crowding coefficient, chickpea intercropped with barley in all row proportions and with Iinseed in 3:1 and 4:1 row proportions were the compatible intercropping systems.

040. Tripathi, H.N.; Chand, S.; Tripathi, A.K. (Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (India). Dept. of Agronomy). Biological and economical feasibility of chickpea (Cicer aritinum)+Indian mustard (Brassica juncea) cropping systems under varying levels of phosphorus. Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 31-34 KEYWORDS: CROPPING SYSTEMS; INTERCROPPING; CHICKPEAS; CICER ARIETINUM; BRASSICA JUNCEA; ECONOMICS; PHOSPHORUS; PRODUCTIVITY.

A study was undertaken by introducing Indian mustard [Brassica juncea (L.) Czernj. & Cosson] as an interI crop with chickpea (Gicer arietinumL) in 2 row proportions, viz. 6:2 and 8:2, fertilized with 0, 30, 60 and 90 kg I pp/ha during the winter season of 1998-99 and 1999-2000, to assess the biological and economical feasibility of chickpea + Indian mustard in association under varying levels of phosphorus. Intercropping systems reduced the values of yield attributes and seed yield of chickpea, while reverse was true in case of Indian mustard than sole cropping of chickpea and Indian mustard respectively. 80th intercropping systems recorded significantly higher chickpea-equivalent yield, net monetary returns and benefit: cost ratio than its sole cropping. I Among the intercropping systems, 8:2 row ratio proved most efficient and profitable system resulting in maximum I chickpea-equivalent yield (24.31 q/ha), net monetary returns (Rs 17,1 01/ha), benefit: cost ratio (2:11) and land equivalent ratio (1.19). 80th chickpea and Indian mustard in sole and intercropping systems responded favourably up to 60 kg P p/ha only for yield attributes, yield and net monetary returns over no phosphorus and 30 kg pp/ha. The interaction effects of the factors showed that mean chickpea equivalents responded to P application up to 60 kglha in sole stands and upto 90 kg pp/ha in intercropping systems.

041. Singh, A.; Singh, R.; Pannu, R.K. (Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Agricultural Meteorology). Performance of wheat (Triticum aestivum) varieties in Eucalyptus plantation. Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 61-63 KEYWORDS: EUCALYPTUS; VARIETIES; FOREST PLANTATIONS; YIELD COMPONENTS; SHADING; AGROFORESTRY; CROPPING SYSTEMS; WHEATS; TRITICUM AESTIVUM; ENVIRONMENTAL FACTORS; SHADING.

A field experiment was conducted for 2 crop seasons (1999-2000 and 2000-2001) at Hisar, Haryana, to study the performance of wheat (Triticum aestivum L. emend. Fiori & Paol.) genotypes in association with Eucalyptus plantation. Among the yield attributes, the effect of shade was maximum on effective tillers and was minimum on test weight. The yield attributes and grain yield of wheat decreased significantly with successive increase in shade level from 824 to 86 during both the years except effective tillers/plant and test weight between 812 and 818. The quantum of decrease in grain yield with increased shade from 86 to 818 over 824 was 49.2percentage, 29.1 "la, 13.1 percentage respectively. Among the varieties, 'PBW 343' yielded highest followed by 'PBW 175'. The yield re-duction was least in 'IWP 72'.

F30 Plant Genetics and Breeding

042. Hazra, K.; Mukherjee, S.K.; Maiti, G.G. (University of Kalyani, Kalyani (India). Dept. of Botany); Mandal, N. (Bidhan Chandra Krishi Visavidyalaya, Mahanpur (India). Dept. of Biotechnology). Studies on genetic diversity in grain amaranth genotypes (Amaranthus spp.). Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 577-582 KEYWORDS: GENETIC DIVERSITY; GENOTYPES; AMARANTHUS.

Genetic divergence using Mahalanobis D2 statistic was worked out in 47 genotypes of 3 species of grain amaranth of Indian and exotic origin. The genotypes were grouped in 22 clusters. Intra-cluster distance was highest for cluster VII followed by cluster II which included maximum (13) number of genotypes from different states of India. The higher inter cluster 'D' values were recorded between cluster XII and XIII followed by cluster VI and XVII. The clustering pattern indicated that the geographic diversity was not necessarily related with genetic diversity. Shoot dry weight, biological yield, seed weight from branch and terminal panicle, seed yield/ plant and protein content (percent) Were identified as potential variabilities which can be used as parameters while selecting diverse parents in the hybridization programme for yield and quality -improvement.

043. Swati; Goel, P.; Ramesh, B.R. (Chaudhary Charan Singh University, Meerut (India). Dept. of Agric. Botany (Genetics and Plant Breeding). Nature and divergence in relation to yield traits in rice germplasm. Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 598-602 KEYWORDS: YIELD; RICE; GERMPLASM; GENOTYPES; GENETIC DISTANCE; SEGREGATION.

Fifty nine genotypes of rice including Indian and exotic collections were evaluated for 18 yield and related characters. Five characters (grain yield, length of third internode, secondary branches per panicle, fertile and sterile seeds per panicle) exhibited high variability. Of the remaining thirteen traits, length of second, fourth, fifth and sixth internodes, flag leaf area, tiller number per plant, 109 grain weight and plant height showed moderate variability while panicle length, flag leaf length, length of first ioternode and primary branches per panicle showed relatively low variability. Following the non-hierarchical Euclidean cluster analysis, all the 59 genotypes were grouped into 10 clusters with variable number of genotypes. On the basis of data on genetic divergence and mean performance of yield and other traits, six diverse and superior genotypes namely Bengawan, Red awned mustant, Surya, IR-65598-112, Palghat-l and Pant Dhan-12 were selected. Each of these genotypes was good for one or more yield contributing traits. Therefore, these genotypes may be involved in multiple crossing programme to recover transgressive segregants.

044. Nayak, A.R.; Pattnaik, A. (Central Rice Research Institute, Cuttack (India)). Genetic study for early maturity and dwarfism in scented rice. Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 636-637 KEYWORDS: DWARFISM; MATURITY; RICE.

045. Sharma, N.; Ruchi (CSK Himachal Pradesh Krishi Vishwavidyalaya, Palampur (India). Dept. of Agronomy). Nitrogen assimilationn potential, periodic nitrate reductase activity and its relationship to grain protein in field grown rice in presence of butachlor. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 196-198 KEYWORDS: NITRATE REDUCTASE; NITROGEN; BUTACHLOR; PROTEIN CONTENT; RICE.

To assess comparative copper tolerance and its inhibitory effect on metabolism of rice (Oryza sativa L.) two genotypes viz. Pusa Basmati and Pusa Sharbati were grown in refined

sand in complete nutrient solution for 36 days after sowing. On 37th day plants were divided into 3 lots. One lot was allowed to grow'with complete nutrient solution to serve as control (0.001 mM Cu) while the other two lots were supplied with excess copper (as copper sulphate) at 0.1 and 0.2 mM, respectively. After 9 days of metal supply (d 46), at 0.2 mM Cu, growth of rice was depressed and young leaves developed marginal interveinal chlorosis. Later the effects intensified and irregular brown necrotic spots developed on the affected leaves. With increase in age the affected leaves were completely bleached, The symptoms were delayed by seven days in plants at 0.1 mM Cu. Excess copper reduced the biomass, concentration of chlorophylls a, b, total and active iron and activities of catalase, acid phosphatase and polyphenol oxidase. and increased the activity of peroxidase in leaves. In both the genotypes, the accumulation of Cu was higher in roots, than leaves, more so in Pusa Sharbati than Pusa Basmati. Rice genotype' Pusa Sharbati appears to be more sensitive to Cu toxicity.

046. Rana, M.K.; Singh, S.; Bhat, K.V. (National Bureau of Plant Genetic Resources, New Delhi (India). National Research Centre on DNA Fingerpring)). Amplified fragment length polymorphism (AFLP) based diversity in advanced breeding lines of cotton (Gossypium hirsutum L.). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 91-93 KEYWORDS: POLYMORPHISM; GOSSYPIUM HIRSUTUM; GENETIC RESOURCES; COTTON; PROGENY.

Amplified fragment length polymorphism (AFLP) analysis was carried out in 29 advanced breeding lines of cotton (G. hirsutum L.) for diversity analysis. Total genomic DNA isolated following CTAS method was purified and subsequently used for AFLP analysis employing fluorescent dye labeling and detection technology. Using 308 amp Ii cons generated by three AFLP primer combinations, Jaccard's similarity estimates between all possible pairs of 29 lines were calculated. High level of diversity was observed in the studied material. Cultivars Pusa 8-6 and RS 810 had the maximum dissimilarity between them, whereas lines RAH 30 and NDH 1001 were having the highest similarity. Cluster analysis revealed lines AKH 081, NDH 1010, RS 810, RST 13 and Pusa 8-6 to be the most distinct ones. Advanced breeding lines from different sources were found to be interspersed and no source-wise clustering was evident.

047. Dongre, A.B.; Kharbikar, L.L. (Central Institute for Cotton Research, Nagpur (India). Biotechnology Div.)). RAPD-based assessment of genetic diversity in cotton (Gossypium hirsutum L.) race stock accessions. The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 94-96 KEYWORDS: GOSSYPIUM HIRSUTUM; RAPD; COTTON; GENETIC RESOURCES; GENETIC VARIATION; POLYMORPHISM.

Twenty-five cotton (Gossypium hirsutum) accessions from Africa, Australia, USA and India were subjected to RAPD analysis using 86 random oligonuceotide primers. The major objectives of the study were to study the extent of genetic variation and find out the duplicates if any. Sixty three primers detected polymorphism. A total ot 296 DNA fragments were generated by the 63 primers, of which 113 were polymorphic. The accessions revealed genetic divergence ranging from 0.13 to 0.33 among themselves. RAPD analysis using SIMQUAL-Dice Coefficient of NTSYS-pc showed that the 25 accessions could be split into 2 groups of 24 and 1 accessions at 67 percent similarity. The first group of 24 accessions could be divided into cluster A consisting of 20 accessions and cluster B consisting of 4 accessions. Accessions AC 53 and AR 43 were found to be 100 percent similar based on molecular

analysis, but could not be considered as duplicate, because of very low reproducibility of the RAPD markers.

048. Pandey, R.N.; Dhanasekar, P.; Souframanien, J. (Bhabha Atomic Research Centre, Mumbai (India). Nuclear Agriculture and Biotechnology Div.)). RAPD based DNA fingerprinting and analysis of genetic diversity in radiation induced mutants of cowpea (Vigna unguiculata (L.) Walp.). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 97-101 KEYWORDS: VIGNA UNGUICULATA; GENETIC RESOURCES; RAPD; DNA FINGERPRINTING; MUTANTS; INDUCED MUTATION.

Thirteen radiation-induced mutants of cowpea [Vigna unguiculata (L.) Walp.] cv. V-130 showing distinct morphological differences, besides the parental line, were screened for random amplified polymorphic DNA (RAPD) variation. Sixty-four random decamer primers used for amplification generated a total of 495 bands, of which 230 (46.5 percent) were polymorphic.Mutant-specific polymorphic markers either alone or in combination, were detected. Eight mutants and the parent can be identified by using specific markers, while combination of two markers could identify three other mutants. The Jaccard's similarity coefficient revealed considerable genetic diversity among the mutants. The dissimilarity between the mutants was as high as 61per cent.The UPGMA based dendrogram showed two clusters, as supported by bootstrapping, with seven sub-clusters. The high range of genetic diversity observed among the mutants affirms the potentiality of radiation in inducing variability in cowpea. DNA fingerprinting of the mutants will facilitate their identification, registration and determination of seed purity.

049. Yadava, R.; Singh, T.B. (Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Genetics and Plant Breeding)). High molecular weight glutenin subunits variation in relation to biscuit making quality in wheat (Triticum aestivum L. am. Thell.). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 108-111 KEYWORDS: MOLECULAR WEIGHT; WHEAT; TRITICUM AESTIVUM; CHEMICOPHYSICAL PROPERTIES; GLUTENINS; GENOTYPES; GENERAL PRODUCTS; QUALITY PROTEIN; BISCUITS.

The SDS-PAGE of 30 wheat genotypes demonstrated the presence of 1, 2* and null HMW-GS at Glu-1A locus, 7+8, 7+9, 14+15 and 17+18 at Glu-1B and 2+12 and 5+10 HMW-GS at Glu-1D locus. The two durum wheats PDW 215 and WH 896 lacked all the HMW-glutenin subunits, viz., 1, 2*, null, 7+8, 7+9, 14+15, 17+18, 2+12 and 5+10. The 30 wheat genotypes displayed polymorphism for HMW-GS at Glu-1A, Glu-1B and Glu-1D loci. The diversity of the Genotypes for HMW-GS was also apparent from the dendrogram drawn using UPGMA cluster analysis. The wheat genotypes Raj 3765, UP 2576 and UP 2530 having cookie spread ratio of 6.1, 7.0 and 10.3, respectively carried 2+12 subunits at Glu-1D suggesting a relationship between better biscuit making quality and HMW-GS 2+12. HMW-GS 5+10 was shown to be associated with inferior biscuit making quality in PBW 175, PBW 343, UP 2567, UP 2569, UP 2425, UP 2562 and PBW 373. However, this relationship did not hold true in few cases possibly due to influence of other factors.

050. Chauhan, R.M.; Parmar, L.D.; Patel, P.T.; Tikka, S.B.S. (Gujarat Agricultural University, Sardarkrushinagar (India). Main Pulses Research Stn.)). Fertility restoration in cytoplasmic genic male sterile line of pigeonpea (Cajanus cajan (L.) Millsp.) derived from Cajanus scarbaeoides. The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2)

p. 112-114 KEYWORDS: PIGEONPEAS; CAJANUS CAJAN; CYTOPLASMIC MALE STERILITY; HYBRIDIZATION; INBRED LINES; FERTILITY; HYBRIDS.

For commercial exploitation of heterosis, efficient and stable cytoplasmic genic male sterility system is developed using first CGMS line GT-288A/B alongwith fertility restoration mechanism from interspecific hybridization. To identify perfect pollen fertility restorers, 543 derivative lines of Fs and F6 populations of Cajanus scarabaeoides x Cajanus cajan and 1365 germplasm accessions were used as pollen parent on stable cytoplasmic genic male sterile line GT-288A during kharif 1997 to 2003. The F1 progenies of all the crosses were evaluated during kharif 1998 to 2003 for their pollen fertility. The promising pollen fertility restoring parents were advanced and purified through selection and selfing. Finally eighteen fertility restorers were identified and characterized.

051. Mallikarjuna, N. (International Crops Research Institute for Semi Arid Tropics, Patancheru (India); Kalpana, N. (Government City College, Hyderabad (India) . Mechanisms of cytoplasmic-nuclear male sterility in pigeonpea wide cross Cajanus cajan x C. acutifolius. The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 115-117 KEYWORDS: CYTOPLASMIC MALE STERILITY; MEIOSIS; PIGEONPEAS; CAJANUS CAJAN; POLLEN.

Cytoplasmic-nuclear male sterile plants (CGMS) were obtained as a result of crossing cultivated Cajanus cajan with wild species C. acutifolius. There were two types of CMS plants which were distinguished by anther morphology. Both the types of CMS plants had complete sterility of the anthers. Type I CMS had partially or totally brown and shriveled anthers and the process of microsporogenesis was inhibited at the pre-meiotic stage. Type II CMS plants had pale while shriveled anthers and the break down in microsporogenesis was at the post-meiotic stage after the formation of tetrads caused sterility of the plants.

052. Nagaraj, K.M. (Central Potato Research Station, Shillong (India); Chikkadevaiah; Kulkarni, R.S. (University of Agricultural Sciences, Bangalore (India). Inheritance of resistance to sterility mosaic virus in pigeonpea (Cajanus cajan (L.) Millsp.). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 118-120 KEYWORDS: PLANT VIRUSES; PIGEONPEAS; PLANT DISEASES; CAJANUS CAJAN; DISEASE RESISTANCE; GENETIC INHERITANCE.

The inheritance of resistance in pigeonpea to the Bangalore strain of Sterility Mosaic Virus (PPSMV) was studied in crosses involving 2 resistant lines (ICP 7035 and MAL 14) with no apparent symptoms and susceptible lines (TIB 7, ICP 8863 and DBN1) with severe mosaic symptoms. The Fl' F2' BC1 and BC2 generations were sown in the field and screened following infector hedge, infector row and leaf stapling techniques. Resistance was recessive and appeared to be governed by two independent non-allelic genes exhibiting complementary epistasis. However, the presence of atleast one gene confering resistance to the disease, in homozygous recessive condition was found to be necessary to express resistance phenotype.

053. Rahangdale, S.R. (Vivekanand College, Kolhapur (India). Dept. of Botany); Raut, V.M. (Agharkar Research Institute, Pune (India). Dept. of Genetics)). Genetics of rust resistance in soybean (Glycine max (L.) Merrill). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 121-124 KEYWORDS: SOYBEAN; GENETICS; RUSTS; PLANT DISEASE; GLYCINE MAX; GENETIC INHERITANCE; DISEASE RESISTANCE.

Inheritance of rust resistance in soybean [Glycine max (L.) Merrill] was studied in nine crosses involving 2 susceptible and 5 resistant genotypes. The crosses were made in three triangles keeping one parent common in all the 3 triangles. Seeds of all the generations viz., P1' P2; F1' F2 and F3 were divided into two sets, one of which was used in field screening and other for controlled condition study in greenhouse. Results obtained from both the environments are similar. The F2 segregation analysis in all the six susceptible x resistant cross combinations revealed that rust resistance is governed by a single dominant gene. In Bragg x MACS 13, a cross of both susceptible parents revealed that, there is no complementation. In one of the 2 resistant x resistant cross combinations TS 98-21 x EC 389160, there are two different genes imparting resistance. Whereas in the cross, PK 1029 x EC 389165, there was no segregation for rust reaction in any of the generations which reveals presence of the same gene for resistance in both the parental lines. In all these crosses the F2 results were confirmed by studying the F3 progenies.

054. Bhatt, R.P. (Kumaon University, Nainital (India); Adhekari, R.S. (Government Post Graduate College, Phithoragarh (India); Biswas, V.R.; Kumar, N. (Defence Agricultural Research Laboratory, Pithoragarh)). Genetical analysis for quantitative and qualitative traits in tomato (Lycopersicon esculentum) under open and protected environment. The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 125-129 KEYWORDS: COMBINING ABILITY; GENETIC VARIATION; HETEROSIS; GENOTYPE ENVIRONMENT INTERACTION; AGRONOMIC CHARACTERS; TOMATOES; LYCOPERSICON ESCULENTUM.

Twelve divergent lines of tomato and their 66F1 hybrids were studied to investigate the extent of heterosis and general and specific combining ability effects for five quantitative and three qualitative traits under open and polyhouse environments in mid hill conditions of Central Himalayas. The additive as well as non-additive gene effects played significant role in the inheritance of the yield and other traits. Higher proportion of gea x environment interaction variance as compared to sea x environment estimates were recorded. Additive genetic variances were more sensitive than non-genetic variances to changing environment. Parent Azad T-2 and DARL-64 were, adjudged best general combiner for yield per plant, while parent EC 386037 and Sel-7 were the good general combiner for all the quality traits studied. Significant heterosis was found for yield per plant under open and polyhouse environment respectively over mid and top parent and commercial control revealed that there was a great scope of realizing higher yield in tomato through heterosis breeding. The cross combinations EC 386032" x BL-342, Mechin x EC 386023 and Azad T-2 x Hawaii-7998, Azad T-2 x DARL-64, were identified as the best heterotic combinations under open and protected environments respectively.

055. Roychowdhuri, S.; Sau, H.; Ghosh, P.L.; Saratchandra, B. (Central Sericultural Research and Training Institute, Berhampore (India)). Studies on anthesis and flowering pattern in mulberry germplasm. The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 130-131 KEYWORDS: GERMPLASM; MULBERRIES; MORUS; FLOWERING.

Mulberry (Morus sp.) dioecious (male) and monoecious germ plasm accessions of different geographical origin showed anthesis period between January and April. Indigenous and exotic accessions of Asian countries flowered during January to February except few accessions from Japan, China, Burma and Turkey which flowered during March and April months, while rest flowered during March to April. The number of catkins per axis was more in exotic accessions with small size and less number of florets compared to indigenous one.

Dehiscence of anther was highest during 10.00-11.30 AM and 3.00-4.00 PM in the day time, while the event occurred throughout the day and was restricted to 1-4 days (Indigenous 1. 3; Exotic 2.4 days) for a single catkin. The size of the pollen showed variation with two germpores irrespective of its origin, except in few cases where the germpores were 3-4. In vitro germination of pollen showed significant variation and did not relate with the origin of the accessions but declined with the increase of storage time.

056. Nassar, N.M.A. (Universidae de Brasilia, Brasilia (Brazil). Departmento de Genetica)). Polyploidy, chimera and fertility of interspecific cassava (Manihot esculenta Crantz) hybrids. The Indian Journal of Genetics and Plant Breeding (India) . (May 2004) v. 64(2) p. 132-133 KEYWORDS: CASSAVA; POLYPLOIDY; HYBRIDS; MANIHOT ESCULENTA; FERTILITY; INTERSPECIFIC HYBRIDIZATION.

Four interspecific hybrids between cassava and wild Manihot species were polyploidized by colchicine application to buds of cuttings. Totally tetraploid types as well as sectorial and periclinal chimeras were produced. Somatic selection applied to lateral buds of sectorial chimeras induced totally tetraploids. Fertility was restored in the sterile interspecific hybrids by chromosome doubling up to 93 percent viable pollen production in the tetraploids compared to 13 percent in diploids, which could lead to the evolution of nell\! Manihot species. Periclinal chimeras showed high vigour compared to both tetraploid and diploid plants.

057. Basandrai, D. (Chaudhary Sarwan Kumar Himachal Pradesh Agricultural University, Sirmour (India). Hill Agricultural Research and Extension Centre); Saini, R.G.; Gupta, A.K. (Punjab Agricultural University, Ludhiana (India). Dept. of Genetics); Basandrai, A.K. (Chaudhary Sarwan Kumar Himachal Pradesh Agriculture University, Sirmour (India). Hill Agricultural Research and Extension Centre)). Genetics of durable resistance to leaf lrust in some exotic wheat cultivars. The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 134-136 KEYWORDS: GENETICS; GENETIC RESISTANCE; DISEASE RESISTANCE; RUSTS; LEAVES; PLANT DISEASES; WHEATS; VARIETIES.

058. Kaur, N.; Singh, P. (Punjab Agricultural University, Ludhiana (India). Dept. of Plant Breeding, Genetics and Biotechnology)). Gene effects for grain yield and related attributes in Triticum durum. The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 137-138 KEYWORDS: GENETIC ENGINEERING; GENES; GENETIC INHERITANCE; YIELDS; GRAIN; TRITICUM DURUM.

059. Senapati, B.K. (Bidhan Chandra Krishi Viswavidyalaya, 24 Parganas South (India). Regional Research Station); Sarkar, G. (Bidhan Chandra Krishi Viswavidyalaya, Nadia (India). Regional Research Station). Adaptability of Aman paddy under Sundarban areas of West Bengal. The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 139-140 KEYWORDS: RICE; GENOTYPES; ADAPTABILITY; YIELDS; WEST BENGAL.

060. Gill, P.; Kaur, G.; Saxena, V.K. (Punjab Agricultural University, Ludhiana (India). Dept. of Plant Breeding, Genetics and Biotechnology)). Genetics of resistance to charcoal rot in maize (Zea mays L.). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 141-142 KEYWORDS: GENETICS; GENETIC RESISTANCE; ROTS; ZEA MAYS; MAIZE; CHARCOAL; PLANT DISEASES.

061. Unnikrishnan, K.V.; Singh, B.; Singh, R.; Verma, A.P.S.; Singh, K.P. (Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics)). Evaluation of newly developed male sterile lines and restorer lines for their combining ability in pearl millet (Pennisetum glaucum L. R. Br.). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 143-145 KEYWORDS: PENNISETUM GLAUCUM; COMBINING ABILITY; PEARL MILLET; CYTOPLASMIC MALE STERILITY; GENOTYPES; GENETIC VARIATION; YIELDS.

062. Ammavasai, S.; Phogat, D.S.; Solanki, I.S. (Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Plant Breeding). Inheritance of resistance to mungbean yellow mosaic virus (MYMV) in green gram (Vigna radiata (L.) Wilczek). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 146 KEYWORDS: VIGNA RADIATA; DISEASE RESISTANCE; GENOTYPES; PLANT DISEASES; MUNGBEANS; GENETIC INHERITANCE; PLANT VIRUSES; YELLOW MOSAIC VIRUS.

063. Dogra, R.K.; Gupta, V.P.; Sood, B.C.; Katoch, D.C. (CSK Himachal Pradesh Krishi Vishwavidyalaya, Palampur (India). Dept. of Plant Breeding and Genetics)). Inheritance of some qualitative traits in genus Avena. The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 147-148 KEYWORDS: AVENA; GENETIC INHERITANCE; GENERA; AGRONOMIC CHARACTERS.

064. Meena, H.S.; Kumar, J.; Yadav, S.S. (Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics)). Inheritance of seed colour in chickpea (Cicer arietinum L.). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 151-152 KEYWORDS: GENETIC INHERITANCE; COLOUR; SEED; SEED CHARACTERISTICS; CHICKPEA; CICER ARIETINUM; SEED PELLETING.

065. Singh, J. (Nagaland University, Medziphema (India). Dept. of Genetics and Plant Breeding); Bajpai, G.C. (Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Genetics and Plant Breeding)). Pollen germination and pollen tube growth studies in interspecific crosses of pigeonpea (Cajanus cajan (L.) Millsp). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 153-154 KEYWORDS: POLLEN; POLLEN TUBES; HYBRIDIZATION; GERMINATION; GROWTH; INTERSPECIFIC HYBRIDIZATION; PIGEONPEAS; CAJANUS CAJAN.

066. Joshi, P.; Verma, R.C. (Ujjain University, Ujjain (India). Institute of Environment Management and Plant Sciences)). Radiation induced pod and seed mutants in faba bean (Vicia fava L.). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 155-156 KEYWORDS: BREEDING METHODS; MUTANTS; SEEDS; INDUCED MUTATION; MUTATION; FABA BEANS; VICIA FAVA; SEED CHARACTERISTICS.

067. Krishnawat, B.R.S.; Maloo, S.R. (Maharana Pratap University of Agriculture and Technology, Udaipur (India). Dept. of Plant Breeding and Genetics)). Combininb ability and heterosis on some stress tolerance traits of soybean (Glycine max (L.) Merrill). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 157-158 KEYWORDS: COMBINING ABILITY; STRESS; GENETIC VARIATION; HETEROSIS; RESISTANCE TO INJURIOUS FACTORS; AGRONOMIC CHARACTERS; SOYEANS; GLYCINE MAX.

068. Badere, R.S. (Jawaharlal Nehru University, New Delhi (India). School of Life Sciences); Choudhary, A.D. (Nagpur University, Nagpur (India). Dept. of Botany). Induced mutations in linseed (Linum usitatissimum L.). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 159-160 KEYWORDS: BREEDING METHDOS; MUTATION; MUTANTS; INDUCED MUTATION; LINSEED; LINUM USITATISSIMUM.

069. Mehetre, S.S.; Patil, V.R. (Mahatma Phule Krishi Vidyapeeth, Rahuri (India). All India Coordinated Cotton Improvement Project)). Genetics and morphological studies of new genetic male sterile line of cotton (Gossypium arboreum L.). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 161-162 KEYWORDS: GENETICS; BREEDING METHODS; PLANT ANATOMY; GENETIC ENGINEERING; CYTOPLASMIC MALE STERILITY; COTTON; GOSSYPIUM ARBOREUM.

070. Sinha, M.K.; Jana, A.K.; Nandy, S.; Mitra, S.; Sengupta, D.; Dutta, P.; Palve, S.M. (Central Research Institute for the Jute and Allied Fibres, Barrackpore (India). Div. of Crop Improvement)). Genetic analysis of dry matter production and nitrogen uptake in jute (Corchorus oiltorius L.). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 163-164 KEYWORDS: GENETICS; JUTE; CORCHORUS OILTORIUS; GENE EXPRESSION; DRY MATTER CONTENT; GENOTYPES; PRODUCTION; NUTRIENT UPTAKE; NITROGEN.

071. Suma, T.B.; Balasundaran, M. (Kerala Forest Research Institute, Thrissur (India)). Genetic diversity of eight Santalum album L. provenances of India based on RAPD analysis. The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 167-168 KEYWORDS: GENETIC RESOURCES; INDIA; GENETIC VARIATION; RAPD; SANTALUM ALBUM.

072. Sankariammal, L.; Saraswathyamma, C.K. (Rubber Research Institute of India, Kottayam (India)). Cytopalynological investigations in induced tetraploid of para rubber free (Hevea bvrasiliensis (Muell. Arg.). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 169-170 KEYWORDS: INDUCED POLYPLOIDY; GENETIC VARIABILITY; TETRAPLOIDY; HEVEA BRASILIENSIS; CLUNING; COLCHICINE; BREEDING METHODS; PALYNOLOGY.

073. Sankariammal, L.; Saraswathyamma, C.K. (Rubber Research Institute of India, Kottayam (India)). Cytopalynological investigations in tapping apnel dryness affected trees of Hevea brasiliensis (Muell. Arg.). The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 171-172 KEYWORDS: PALANOLOGY; TAPPING; PLANT DISEASE; CYTOGENETICS; HEVEA BRASILIENSIS.

074. Bindhani, B.K.; Dalai, A.K.; Behera, B. (Ravenshaw College, Cuttack (India). Dept. of Botany)). Role of auxins for callus induction and chromosomal variation in Polianthes tuberosa L. 'Single'. The Indian Journal of Genetics and Plant Breeding (India). (May 2004) v. 64(2) p. 173-174 KEYWORDS: CALLUS; INDUCED MUTATION; AUXINS; CHROMOSOMES; POLIANTHES; CHROMOSOME MANIPULATION; CELL CULTURE.

075. Sonawane, J.K.; Kashid, N.V.; Kamble, M.S.; Kardak, V.N. (Mahatma Phule Krishi Vidyapeeth, Rahuri (India). Growth and development pattern of soybean genotypes. Annals of Agricultural Research (India). (Mar 2005) v. 26(1) p. 21-26 KEYWORDS: GENOTYPES; GROWTH; SOYBEANS; GLYCINE MAX; GENOTYPES.

From the present investigation, it is concluded thatthe genotype G9 : EC - 34332 was found to be superior in respect of growth characters like plant height, number fully opened leaves, number of primary branches, leaf area of green leaves, phenological stages such as days required for initiation of flowe[ing, days required for 50 percent flowering and days required for physiological maturity.

076. Thakur, S.; Singh, P. (Indira Gandhi Agricultural University, Raipur (India). Dept. of Horticulture). Genetical studies in vegetable peaq (Pisum sativum L.) under Chhatisgarh condition. Annals of Agricultural Research (India). (Mar 2005) v. 26(1) p. 161-163 KEYWORDS: PISUM SATIVUM; HERITABILITY; GENETICS; VARIABILITY; GENETIC.

077. Khandelwal, V.; Sharma, V.; Shrikant (Rajasthan College of Agriculture, Udaipur (India). Dept. of Plant Breeding and Genetics. Heterosis studies in sorghum under different nitrogen levels and plant spacings. Annals of Agricultural Research (India). (Mar 2005) v. 26(1) p. 167-169 KEYWORDS: SORGHUM BICOLOR; NITROGEN; HETEROSIS.

078. Ramesh, B.; Kumar, B. (Chaudhary Charan Singh University, Meerut (India). Dept. of Agricultural Botany). Variation in chlorophyll content in barley mutants. Indian Journal of Plant Physiology (India). (Jan-Mar 2005) v. 10(1) p. 97-99 KEYWORDS: CHLOROPHYLL; BARLEY; MUTANTS.

A field study-was conducted to investigate variation in chlorophyll content in barley mutants. A significant decrease in chlorophyll content was observed in the chlorina mutant compared to parent while in most of the other mutants there was significant increase. The individual values of chlorophyll a and chlorophyl~ b revealed ibteresting trends. In the mutants, an increase in the chlorophyll a content had been associated with a decrease in chlorophyll b content.. The dwarf mutant with variable chlorophyll pattern from that of parental control could be of greater use in developmental studies. Correlation studies revealed a positive association of grain yield with total chlorophylls and flag leaf area.

079. Mishra, A.C. (Birsa Agricultural University, Ranchi (India). Forage Unit); Singh, N.P.; Ram, H.H. (Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Vegetable Science). Banding pattern of protein subunits with tuber development in Solanum tuberosum L.. Indian Journal of Plant Physiology (India). (Jan-Mar 2005) v. 10(1) p. 100-102 KEYWORDS: PROTEIN; POTATO; SOLANUM TUBEROSUM; GENETIC VARIABILITY.

Tubers of two developmental stages, viz. 45 days after planting (DAP) (5 g) and 80 DAP (25-30 g) were collected from five Indian genotypes viz., JX-l, MF-l, 85-P-ll, 85-P-670 and 85-P-718 grown in field conditions during Rabi 2000-2001. The protein was extracted and electrophoresed through 12.5 percent acrylamide SDS gels. Resultsindicat~d that protein composition in tubers 5g at 45 DAP of two stages was quite different in 40-68 kD and 20-35 kD regions. Banding patterns in small developing tubers 5g.at 45 DAP were almost uniform across the genotypes. Absence of polypeptides in 20-35 kD and presence of dark bands in 35-40kD and below 14 kD regions in mature tubers of 25-30g weight at 80 DAP were

reproducible and could be used for variability studies. Heat treatment to the crushed tubers before centrifugation resulted in destruction of protein subunits.

080. Khandelwal, V.; Dadlani, M. (Indian agricultural REsearch Institute, New Delhi (India). Div. of Seed Science and Technology); Sharma, P.C. (Guru Govind Singh Indraprastha University, New Delhi (India). School of Biotechnology); Pareek, A. (Jawaharlal Nehru University, New Delhi (India). School of Life Sciences); Vashisht, V.; Sharma, S.P. (Indian Agricultural Research Institute, New Delhi (India). Div. of Seed Science and Technology)). Application of proteins and isoenzyme markers for DUS testing of Indian rice (Oryza sativa L.) varieties. Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 261-266 KEYWORDS: RICE; ORYZA SATIVA; GENETIC MARKERS; PROTEINS; ISOENZYMES; TESTING.

Characterization of 32 Indian rice (Oryza sativa L.) varieties cultivated in different agro-ecosystems was undertaken, using biochemical marker system Le. Total soluble protein profile and isoenzymes. The average similarity index, average heterozygosity values for polymorphic loci and marker index were 0.77, 0.79 and 3.73 respectively. The protein and isoenzyme marker systems in combination generated 35 polymorphic markers (63.6 percent) out of a total of 55 bands. The probability of obtaining an identical match by chance between two varieties was 9 x 10-2, indicating that biochemical markers reveal only a moderate level of polymorphism. The uniformity and stability of these markers were assessed in the Nucleus and Breeder seed samples of one aromatic (Pusa Basmati-1) and one non-aromatic (Pusa 44) variety. The possible application of these markers for DUS (distinctness, uniformity and stability) testing for the grant of plant variety protection is discussed.

081. Kumar, M.B.A.; Sherry, R.J.; Varier, A.; Sharma, S.P. (Indian Agricultural Research Institute, New Delhi (India). Div. of Seed Science and Technology)). Seed esterase - a descriptor for characterization of pearl millet [Pennisetum glaucum (L.) R. Br.] genotypes. Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 267-270 KEYWORDS: PEARL MILLET; PENNISETUM GLAUCUM; SEEDS; ESTERASES.

Plant morphological characters have been the universally undisputed descriptors for genotype characterization. But these descriptors, besides being limited in number, makes the process time consuming and also less reliable, owing to their interaction with the environment in which the variety is grown. In this regard, the potential of biochemical descriptors like seed esterases, merits investigation. In the present study, 47 pearl millet [Pennisetum glaucum (L.) R. Sr.] genotypes comprising 14 hybrids and their parental lines were used to examine the suitability of seed esterases for characterization of pearl millet genotypes. Among the 47 genotypes studied, 36 could be differentiated from each other and 11 were grouped into four categories at 2.22 x 10-3 probability of identical match by chance. Esterases were also found suitable for testing hybrid purity. The possibility of this descriptor for testing Distinctness, Uniformity and Stability (DUS) of new pearl millet genotypes has been discussed.

082. Srivastava, S.; Gupta, P.S. (Indian Institute of Sugarcane Research, Lucknow (India). Div. of Crop Improvement)). Diversity of peroxidase isozyme for identification and characterization of Saccharum species clones. Indian Journal of Genetics and Plant Breeding

(India). (Nov 2004) v. 64(4) p. 271-274 KEYWORDS: SACCHARUM; SUGARCANE; IDENTIFICATION; ENZYME ACTIVITY7; PEROXIDASES.

Peroxidase isozyme pattern was resolved in genus Saccharum to explore the possibility of using it for taxonomic inferences. A total of 12 isozymes designated as POX 1 to POX 12 were present in the clones belonging to four species of Saccharum (S. officinarum, S. spontaneum, S. barberi and S. sinense). The Rf values of different isozyme bands ranged from 0.13-0.63. Only POX 1 and POX 6 were present in all the species clones. Maximum polymorphism of POX isozymes was observed in S. officinarum. Electrophoretic spectra of peroxidase isoenzyme in these species clones exhibited both homology and diversity in their banding pattern. The polymorphism of peroxidases in number, position and intensity revealed in the study indicated multimeric isozymic profile for peroxidase which could be defined as a valuable means for distinguishing accessions of Saccharum to exploit the genetic diversity of sugarcane.

083. Srivastava, A.P.; Chandra, R. (Central Institute for Subtropical Horticulture, Lucknow (India). Biotechnology Lab.); Ranade, S.A. (National Botanical Research Institute, Lucknow (India). PMB (Genomics) Group)). Applicability of PCR based molecular markers for percentage analysis of mango (Mengifera indica L.) hybrids. Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 275-280 KEYWORDS: MANGOES; MANGIFERA INDICA; HYBRIDS; PCR; GENETIC MARKERS; PARENTAGE.

Major efforts at mango (Mengifera indica L.) breeding have resulted in the release of several new promising mango hybrids such as Amrapali (Dasheri x Neelum), Mallika (Neelum x Dasheri), Ratna (Neelum x Alphonso) and Sindhu (Ratna x Alphonso). In present work the application of molecular markers for parentage analysis of commercial mango hybrids has been studied. Primarily, three different Single Primer Amplification Reaction (SPAR) methods, Random Amplified Polymorphic DNA (RAPD), Inter-Simple Sequence Repeat (ISSR) and Directed Amplification of Minisatellite DNA (DAM D), have been used for establishing parent-hybrid relationship in case of three commercially important mango hybrids, that were developed using Neelum as one of the parents, and their respective parents. We show that hybrid Ratna (Neelum x Alphonso) is genetically closer to its male parent Alphonso. While reciprocal hybrids Amrapali (Dasheri x Neelum) and Mallika (Neelum x Dasheri) are closer to Neelum. Further, one RAPD and two DAMD primers have revealed Neelum-specific bands present in all three hybrids and Neelum exclusively. Such bands will be useful in breeding programs by tagging .genes as well as by enabling a more efficient early selection of progeny with desirable qualities.

084. Das, A.; Sarkar, J.; Mondal, B. (Bidhan Chandra Krishi Viswavidyalaya, Nadia (India). Dept. of Plant Physiology); Chaudhuri, S. (Bidhan Chandra Krishi Viswavidyalaya, Nadia (India). Dept. of Plant Pathology)). Genetic diversity analysis of citrus cultivars and rootstocks of the north eastern India by RAPD markers. Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 281-285 KEYWORDS: CITRUS; ROOTSTOCKS; GENETIC MARKERS; RAPD; GENETIC VARIATION.

Random amplified polymorphic DNA (RAP D) markers were used to evaluate genetic diversity among 12 cultivars and rootstocks of citrus of the North Eastern India. Ten selected decamer primers produced 97 amplified fragments, all of them except one were polymorphic and 11 were unique to some germplasms. The genetic distance measured based on Squared Euclidean Distance ranged from 16-60 percent which showed the

presence of low to moderate genetic diversity among the germplasms. By Ward's method of cluster analysis 12 germplasms were classified into two major clusters. All the mandarin orange cultivars viz.,' Darjeeling mandarin, Khasi mandarin and a wild type formed one of the distinct clusters. Sweet orange cv. Mosambi having its clear genetic identity formed another cluster with the rest of the rootstocks and cultivars. The commercial cultivar of lemon, Pati nimbu showed the closest genetic relations with the commercial cultivar of acid lime, Kagzi lime but showed a moderate distance from cultivar Gandharaj lemon and farther distance from cultivar Assam lemon. The rootstocks Rangpur lime, trifoliate orange and sour orange in order showed closer proximity with the sweet orange cv. Mosambi and that of rough lemon cv. Kata Jamir was with the common acid lime and lemon cultivars. The RAPD markers confirmed the distinction of close cultivars and also the interrelationship among different land races that can be used for the genetic improvement of citrus in this region.

085. Ingale, B.V.; Waghmode, B.D. (Bidhan Chandra Krishi Vishwavidyalaya, Karjat (India). Regional Agricultural Research Stn.); Sawant, D.S. (Bidhan Chandra Krishi Viswavidyalaya, Ratnagiri (India). Agricultural Research Stn.); Shinde, D.B. (Bidhan Chandra Krishi Viswavidyalaya, Karjat (India). Regional Agricultural Research Stn.)) . Evaluation of newly developed CMS lines of rice (Oryza sativa L.) for their agronomical and floral traits. Indian Journal of Genetics and Plant Breeding (India) . (Nov 2004) v. 64(4) p. 286-290 KEYWORDS: RICE; ROYZA SATIVA; CYTOPLASMIC MALE STERILITY; AGRONOMIC CHARACTERS; FLOWERING.

Newly developed 20 CMS lines of rice (Oryza sativa L.) derived from five different sources of cytoplasm were evaluated for agronomical traits viz., days to 50 percent flowering, plant height (em), number of tillers/plant, panicle length (em), panicle exertion (percent) and number of spikelets per panicle and their floral traits viz., angle of floret opening, stigma exertion (percent), blooming duration (days), duration of floret opening (min), anthesis duration, pollen sterility (percent) and out crossing (percent) with standard check CMS line IR-58025A. Four CMS lines viz., RTN-2A, RTN-11 A, RTN-14A and RTN-13A were of early duration and rests of the 16 lines were of medium duration (91-106 days). The CMS lines exhibited significantly maximum values in RTN-19A (plant height), RTN-9A (productive tillers planC\ RTN-17A (panicle length), RTN-18A (percent panicle exertion), RTN-5A (spikelets panicle-1), RTN-10A (blooming duration, outcrossing percent and angle of floret opening), RTN-11 A (stigma exertion per cent), RTN-2A (duration of floret opening), RTN-7A (duration of anthesis), RTN-12A (outcrossing percent) and RTN-9A, RTN-3A, RTN-12A, RTN-16A, RTN-18A (100 percent pollen sterility) for various characters. Out of twenty CMS lines, 7 CMS lines viz., RTN-10A, RTN-9A, RTN-18A, RTN-7A, RTN-12A, RTN-3A, and RTN-16A were found promising for almost all agronomical and floral traits under study. These promising CMS lines showed over all excellent phenotypic acceptability and could be used for development of new hybrid rice combinations.

086. Tomar, S.M.S.; Anbalagan, S.; Singh, R. (Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics)). Genetic analysis of male fertility restoration and red kernel colour in restorer lines of wheat (Triticum aestivum L.). Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 291-294 KEYWORDS: WHEAT; TRITICUM AESTIVUM; GENETIC PARAMETERS; FERTILITY; KERNEL.

Genetic analysis was carried out to determine the inheritance of male fertility restoration in wheat using two exotic lines PWR 4099 and PWR 4101. PWR 4099 was used as male to

cross three CMS lines viz., Pusa arar/2046 A, Pusa 11/2019 A and Pusa 20/2046 A, while Pusa 9/2041 A and Pusa 20/2046 A were crossed with PWR 4101. The source of cytoplasm of all the CMS lines, except 2046A, which carries Triticum araraticum cytoplasm, was not known. Based on the observations recorded on pollen and floret fertility, the F2 segregants were categorised into completely fertile, partially fertile and completely sterile classes. The genetic analysis in F2 generation revealed that two dominant genes in PWR 4099 control male fertility restoration. Of these, one has major effect. While PWR 4101 carried a single dominant gene for fertility restoration. The kernel colour (red) in both the restorer lines was found to be under monogenic dominant genetic control. The independent segregation pattern for inheritance of kernel colour and fertility restoration indicated that genes for fertility restoration and kernel colour are not linked. The information acrued from the study will be useful in breeding amber colour restorer lines for the development of heterotic wheat hybrids with desirable kernel colour.

087. Unnikrishnan, K.V.; Govila, O.P.; Singh, R.; Verma, A.P.S.; Singh, B.; Singn, K.P. (Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics)). Population improvement in pearlmillet [Pennisetum glaucum (L.) R. Br.]. Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 295-298 KEYWORDS: PEARLMILLET; PENNISETUM GLAUCUM; POPULATION GENETICS.

In a study of intra-population variability in two populations (DEC 4 and DEC 5) of pearl millet [Pennisetum glaucum (L.) R. Sr.], high variability for yield and yield contributing characters was observed. Several full-sib progenies with significantly higher yield than base populations were selected for further improvement of the material. Correlation and -path analysis have revealed that in both populations tiller number played a significant role in making the yield followed by 1000 - grain weight, ear length and ear girth. It can be concluded that while making further selection tiller number should be given maximum weightage followed by grain weight, ear length and ear girth. Comparison of mass, simple recurrent and reciprocal recurrent selections have been made. It was found that maximum yield advantage was obtained in reciprocal recurrent selection.

088. Gupta, S.; Kumar, S.; Singh, B.B. (Indian Institute of Pulses, Kanpur (India)) . Relative genetic contributions of ancetral lines to Indian mungbean [Vigna radiate (L.) Wilczek] cultivars based on coefficient of parentage analysis. Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 299-302 KEYWORDS: MUNG BEANS; VIGNA RADIATA; ANCESTRY; GENETIC VARIATION.

Coefficient of parentage (COP) analysis was performed to identify the ancestor genotypes which contributed the most to Indian mung bean [Vigna radiata (L.) Wilczek] cultivars, as prediction of the width of genetic base. From the analyses it was evident that 93 mungbean cutivars could be traced back to 71 ancestors. The ancestor genotypes T 1, T 49, T 2, SR 2, G 65 and Madhira Mung were those which contributed the most to the current mungbean varieties. A total of 24 similarity groups were formed and mean COP was estimated to 0.04. T1 contributed as high as 17 percent of the genetic base of the released cultivars. Extensive and repetitive use of superior genotypes with common ancestors explained why the genetic base of released varieties is narrow. The integration of exotic and alien germplasm is paramount for broaden the genetic base of cultivated germplasm of mungbean.

089. Srivastava, R.K.; Mishra, S.K. (Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics)). Inheritance of powdery mildew resistance using near-isogenic lin es (NILs) in pea (Pisum sativum L.). Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 303-305 KEYWORDS: PEAS; PISUM SATIVUM; GENETIC INHERITANCE; DISEASE RESISTANCE; MILDEWS.

The inheritance of powdery mildew resistance was studied using seven near-isogenic lines (Nils) in pea (Pisum sativum L.). The inheritance pattern studied with X2 test confirmed the monogenic recessive nature of inheritance of powdery mildew resistance in pea.

090. Kumar, Y.; Mishra, S.K.; Tyagi, M.C.; Sharma, B. (Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics)). Detection of two linkage groups in lentil (Lens culinaris Medik.). Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 306-309 KEYWORDS: LENTILS; LENS CULINARIS; GENETIC MAPS.

Genetic mapping in lentil (Lens culinaris Medik.) has been done on a very limited scale due to nonavailabilty of sufficient number of visible markers. Therefore, about three dozen morphological traits with contrasting phenotypes were identified and several true breeding genetic stocks for each trait drawn from germ plasm collection were used to find genes that are genetically linked. Two clusters of four genes each were discovered. Gene symbols were assigned to the new genes. These are: red stem (Gs), brown leaf (S/), red pod (Rdp), and erect growth habit (Ert) in the first group; and variation in intensity of leaf colour (G/), plant height (Ph), development of pubescence (Pub), and number of leaflets per leaf (H/) in the other. Linkage studies revealed two short maps comprising these genes: 1) Gs-S/-Rdp-Ert with a total map distance of 33.9 cM in coupling phase and 41.2 cM in repulsion phase; and 2) Ph-GI-Pub-HI spanning over 37.2 cM in coupling phase.

091. Sinha, M.K.; Mitra, S.; Nandy, S.; Sengupta, D.; Dutta, P.; Das, F.; Chakrabarty, S.C. (Central Research Institute for Jute and Allied Fibre, Barrackpore (India). Div. of Crop Improvement)). Interspecific hybrid between two jute (Corchorus) species for textile quality fibre. Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 310-314 KEYWORDS: JUTE; CORCHORUS; INTERSPECIFIC HYBRIDIZATION; TEXTILE FIBRES.

Interspecific hybridization in any crop has added advantages over intraspecific cross in most of the cases. To widen genetic. base, interspecific hybridization becomes essential to improve species by transferring the desirable characters. An attempt has been made in the present investigation to obtain interspecific hybrid using mutant capsularis female parent with a cultivated variety JRO-524 C. oitorious. The mutant derived from the X-ray irradiation of JRC-212 at 400 Gy having 3.56 percent lignin in fibre with trailing nature. On the other hand JRO-524 is most popular variety. The hybrid showed intermediate values between parents for plant height, fibre weight, stick weight and fibre percentage. It also showed intermediate bending pattern in stem like female parent. The interspecific cross CMU-011 x JRO-524 has low lignin and high cellulose contents than the cultivated C. olitorious var. JRO-524. The interspecific cross has better fibre fineness but lower strength value than JRO-524. They possess identical mono-morphic gene loci for peroxidase enzyme system. The anatomy of the hybrid stem is more or less like that – of capsularis mutants with no periderm formation, distinct epidermis and prominent cortex. Regular fibre bundles forming pyramids are constituted by a few fibre cells, but the cell number per bundles is less than in JRO-524. Less cell number per bundle may be one of the parameters for selection of quality fibre containing Jow lignin. They have few crystals and tannin cells, but have large mucilage

canals and cavities. In case of CMU-011 x JRO-524, length at outer region ranges from 90.9 to 106.05 f.-l and breadth from 45.45 to 60.6 f.-l; at middle portion length is 30.3-60.6 f.-l and breadth is 30.3-45.45 f.-l and at inner portion length is 15.15-60.6 f.-l and while breadth is 22.73-60.6 f.-l. Hence, the selection in advanced generation of this interspecific cross is likely to be successful in identifying with quality fibres plants suitable for use in textile industries for blending the jute fibre with cotton as well as other natural fibres.

092. Nassar, N.M.A. (Universidade de Brasilia, Brasilia (Brazil). Dept. de Genetica)). Polyploidy, chimera and fertility of interspecific cassava (Manihot esculenta Crantz) hybrids. Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 317-318 KEYWORDS: CASSAVA; MANIHOT ESCULENTA; INTERSPECIFIC HYBRIDIZATION; POLYPLOIDY; CHIMAERAS; FERTILITY.

Four interspecific hybrids between cassava (Manihot esculenta Crantz) and wild Manihot species were polyploidized by colchicines application to buds of cuttings. Totally tetraploid types as well as sectorial and periclinal chimeras were produced. Somatic selection applied to lateral buds of sectorial chimeras induced totally tetraploids. Fertility was restored in the sterile interspecific hybrids by chromosome dupling up to 93 percent viable pollen production in the tetraploids compared to 13 percent in diploids, which could lead to the evolution of new Manihot species. Periclinal chimeras showed high vigour compared to both tetraploid and
diploid plants.

093. Sharma, S.N.; Sain, R.S.; Singh, R.; Joshi, S.K.; Sharma, Y. (Rajasthan Agricultural University, Jaipur (India). All India Coordinated Wheat and Barley Improvement Project)). Genetics of components lof heterosis for harvest index in durum wheats (Triticum durum Desf.). Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 319-320 KEYWORDS: TRITICUM DURUM; WHEATS; HETEROSIS; HARVEST INDEX.

094. Honrao, B.K.; Misrta, S.C.; Khade, V.M.; Rao, V.S. (Agharkar Research Institute, Pune (India)). Inheritance of leaf lrust resistance in Indian durum wheats (Triticum durum Desf.). Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 321-322 KEYWORDS: WHEATS; TRITICUM DURUM; GENETIC INHERITANCE; DISEASE RESISTANCE; PUCCINIA RECONDITA.

095. Devi, T.R.; Prodhan, H.S. (Bidhan Chandra Krishi Viswavidyalaya, Mohanpur (India). Dept. of Plant Breeding)). Combining ability and heterosis studies in high oil maize (Zea mays L.) genotypes. Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 323-324 KEYWORDS: MAIZE; ZEA MAYS; COMBINING ABILITY; HETEROSIS.

096. Arunkumar, B.; Biradar, B.D. (Regional Agricultural Research Station, Bijapur (India). All India Coordinated Research Project on Rabi Sorghum); Salimath, P.M. (University of Agricultural Sciences, Dharwad (India). Dept. of genetics and Plant Breeding)). Inheritance of fertility restoration on milo and maldandi sources of male sterility in rabi sorghum [Sorghum bicolor (L.) Moench]. Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 325-326 KEYWORDS: SORGHUM; SORGHUM BICOLOR; GENETIC INHERITANCE; MALE INFERTILITY.

097. Singh, N. (Indian Institute of Pulses Research, Kanpur (India). Crop Improvement Div.)). Generation of genetic variability in chickpea (Cicer arietinum L.) using biparental mating. Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 327-328 KEYWORDS: CHICKPEAS; CICER ARIETINUM; GENETIC VARIATION; COPULATION.

098. Mittal, R.K.; Sood, V.K.; Katna, G. (Chaudhary Swaran Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur (India). Dept. of Plant Breeding and Geneics); Kapila, R.K. (Chaudhary Swaran Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur (India). Advanced Centre for Hill Bioresources and Biotechnology)). Triple test cross analysis for seed yield and contributing traits in dry beans (Phaseolus vulgaris L.). Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 329-330 KEYWORDS: PHASEOLUS VULGARIS; GENETIC VARIATION; YIELD COMPONENTS.

099. Malik, R.S.; Malik, R.; Kumar, M. (Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics)). White rust (Albugo candida) infection in relation to erucic acid content in mustard [Brassica juncea (L.) Czern and Coss]. Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 331-332 KEYWORDS: MUSTARD; BRASSICA JUNCEA; FUNGAL DISEASES.; ALBUGO CONDIDA; RUSTS; ERUCIS ACID.

100. Srivastava, R.; Srivastava, G.K. (Allahabad University, Allahabad (India). Dept. of Botany)). Effect of colchicine on some qualitative and quantitative characters of sunflower [Helianthus annuus (L.) var. Morden]. Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 333-334 KEYWORDS: SUNFLOWER; HELIANTHUS ANNUS; MUTAGENS; QUANTITATIVE GENETICS.

101. Raje, R.S. (SKN College of Agriculture, Jobner (India). Dept. of Plant Breeding and Genetics)). Gene action for seed yield and its components in fenugreek (Trigonella foenum-graecum L.). Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 335-336 KEYWORDS: FENUGREEK; TRIGONELLA FOENUM GRAECUM; GENETIC VARIATION; YIELD COMPONENTS.

102. Wankhade, R.R.; Rajput, J.C.; Halakude, I.S.; Sawarkar, N.W. (Nirmal Agricultural Research and Development Foundation, Pachora (India)). Identification of fertility restorers and sterility maintainers for CGMS line in chilli [Capsicum annum (L.)]. Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 337-338 KEYWORDS: CHILLIES; CAPSICUM ANNUM; IDENTIFICATION; CYTOPLASMIC MALE STERILITY; FERTILITY.

103. Kumar, B.; Malaviya, D.R.; Roy, A.K.; Kaushal, P. (Indian Grassland and Fodder Research Institute, Jhansi (India). Crop Improvement Div.)). Morphological land biochemical characterization of exotic accessions of clover (Trifolium repens and T. pratense). Indian Journal of Genetics and Plant Breeding (India). (Nov 2004) v. 64(4) p. 339-340 KEYWORDS: CLOVER; TRIFOLIUM REPE4NS; TRIFOLIUM PRATENSE; INTRODUCED VARIETIES.

104. Sharma, S.N.; Sain, R.S. (Agricultural Research Station, Jaipur (India). Onion Research Project)). Breeding for improvement of onion (Allium cepa L.) to sustain maximum bulb yield under heat stress environments of Rajasthan. Indian Journal of Genetics and Plant Breeding

(India). (Nov 2004) v. 64(4) p. 341-342 KEYWORDS: ONIONS; ALLIUM CEPA; BREEDING METHODS; HEAT STRESS; RAJASTHAN; INDIA.

F60 Plant Physiology and Biochemistry

105. Hemalatha, K.P.J.; Prasad, D.S. (Andhra University, Visakhapatnam (India). Dept. of Biochemistry). Changes in the metabolism of lipids and carbohydrates during germination of sesame (Sesamum indicum L.) seeds. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 127-132 KEYWORDS: CARBOHYDRATES METABOLISM; LIPID METABOLISM; GERMINATION; SESAMUM INDICUM; ISOCITRATELYASE; PROTEIN SYNTHESES.

The levels of lipids, carbohydrates and enzymes concerned with their breakdown were determined in sesame (Sesamum indicum L.) seeds during an 8-days period of germination. Alkaline lipase and isocitrate lyase activities were at peak level when the lipid mobilization was highes!. The content of total soluble carbohydrates, reducing and nonreducing sugars, increased during the initialS-days period of germination followed by a reverse trend thereafter. An increase in a-amylase coincided with an increase in the content of reducing sugars in the cotyledons. Studies related to the distribution of enzymes in different organelles revealed that alkaline lipase and isocitrate lyase were restricted to the glyoxysomes. The development profiles of alkaline lipase and isocitrate lyase were followed in the sesame seedlings exposed to the inhibitors of protein synthesis. A substantial fall in enzyme activities was observed in the seedlings exposed to the inhibitors.

106. Kumar, S.; Dhingra, H.R. (Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Botany and Plant Physiology). Sexual reproduction and cadmium partitioning in two mungbean genotypes raised in soils contaminated with cadmium. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 151-157 KEYWORDS: SEXUAL REPRODUCTION; CADMIUM; GENOTYPES; MUNG BEANS; SOIL CLASSIFICATION.

Plants of two mungbean genotypes MH 85-111 and MH 98-6 were exposed to different levels of cadmium 28 days after sowing. Plants exposed to 3.0 and 4.0 mM Cd+2 did not survive and died before entering into reproductive phase. Cadmium induced reduction in the number of flowers and in vitro pollen germination but did not affect pollen viability. However, it stimulated tube growth. Cadmium although did not affect pistil length, it decreased number of ovules/ pistil. Ovules were morphologically normal and receptive. In vivo stylar studies revealed all the ovules were not penetrated by pollen tube and number of unpenetrated proximal ovules was increased by Cd+2 and cv. MH 85-111 was affected more adversely than MH 98-6. Cadmium inhibited number of pods, seeds, seed weight / plant and 100 seed weight, inhibition being more in MH 85-111 than MH 98-6. Cadmium treatment did not affect starch content but increased protein content in physiologically mature seeds. Accumulation of Cd+2 was maximum in the roots and least in the seeds. Cadmium accumulation, in general was higher in MH 85111 than MH 98-6 and stem of MH 85-111 accumulated four times Cd+2 than MH 98-6. Seed cadmium however, was comparable in both the genotypes.

107. Jain, V.; Khetrapal, S. (Indian Agricultural Research Institute, New Delhi (India). Div. of Plant Physiology). Relative contribution of laminae to total carbon dioxide fixation in wheat in response to nitrogen. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 182-186 KEYWORDS: CARBON DIOXIDE; LAMINAE; NITROGEN; TRITICUM AESTIVUM.

A field trial was conducted to test the bioefficacy of homobrassinolide (combine) on three year old vines of Thompson seedless grafted on Dogridge rootstock. The treatments of combine alone and in combination with N-(2 chloro- 4 pyridyl)- N -phenyl urea (CPPU) and benzyladenine (BA) alongwith gibberellic acid (GA3) were given at 2-3 mm and 5-6 mm berry size stages. Considering the favourable effects on berry quality, bunch size and storability of Thompson seedless grapes, the treatment of 2 ppm CPPU + 35 ppm GA3 at 2-3 mm berry size stage and 1 ppm combine + 50 ppm GA3 at 5-6 mm berry size stage was adjudged as the best for producing export quality table grapes.

108. Thomas, T.S.; Rajagopal, V.; Kumar, S.N. (Central Plantation Crops Research Institute, Kasargod (India). Plant Physiology and Biochemistry Section); Arunachalam, V. (Central Plantation Crops Research Institute, Kasargod (India). Crop Improvement Div.); Cherian, V.K. (Central Plantation Crops Research Institute, Kasargod (India). Plant Physiology and Biochemistry Section). Stability analysis for dry matter production and yield components of coconut in two agroclimatic regions of India. Indian Journal of Plant Physiology (India). (Jan-Mar 2005) v. 10(1) p. 1-8 KEYWORDS: AGROCLIMATIC ZONES; COCONUTS; STABILITY; YIELD; INDIA.

Environmental factors influence productivity of the coconut palms and contribute to fluctuations in nut yield. Analysis of stability parameters assumes significance as it provides information about adaptability of a cultivar to a particular agro-climatic condition. Stability in dry matter production and yield characteristics of four cultivars of coconut (ECT, WCT, LCT, COD) growing at two agro-climatic regions were analysed. In general, dry matter production and yield components were higher in palms growing at eastern costal plains-hot sub humid region (Veppankulam) than at western ghats-hot sub humid per. humid region (Kidu). At Kidu region, LCT exhibited stability in dry matter production, while WCT was stable in yield and yield components. At Veppankulam region, LCT produced relatively higher and stable dry matter and yield components indicating the adaptability of this cultivar to this agro-climatic region.

109. Murti, G.S.R.; Upreti, K.K. (Indian Institute of Horticultural Research, Bangalore (India). Div. of Plant Physiology and Biochemistry). Paclobutrazol induced growth retardation of mango seedlings. Indian Journal of Plant Physiology (India). (Jan-Mar 2005) v. 10(1) p. 9-13 KEYWORDS: MANGIFERA INDICA; GROWTH RETARDATNTS; PLANT GROWTH RETARDANTS; PACLOBUTRAZOL.

Mango seedlings of polyembryonic cv. Bappakai were given soil-drenching treatment of paclobutrazol (PBZ) at 0, 0.34, 0.85 or 1.71 mM. Observations were recorded on morphological characters at weekly interval and on leaf water potential ('P) and levels of chlorophyll, total phenols and endogenous plant growth substances [ABA, cytokinins (t-ZR and DHZR) and IAA] at a monthly interval one month after PBZ treatment. There was reduction in seedling vigour after 2 months of PBZ treatment, the effect being more prominent at 1.71 mM. The fresh weights of root, leaves and stem also showed reduction. The 'I' w was less negative and total phenols and chlorophyll content showed increase in response to PBZ application. The contents of leaf ABA and cytokinins (t-ZR and DHZR) were higher in treated seedlings. Thus it was suggested that PBZ induced growth retardation in mango seedlings is associated with increased levels of ABA and cytokinins together with higher 'I' w and phenols in leaves.

110. Paul, V.; Srivastava, G.C.; Singh, V.P. (Indian Agricultural Research Institute, New Delhi (India). Div. of Plant Physiology). Changes in electrolyte efflux pattern in detached and attached tomato fruits in slow and fast ripening varieties. Indian Journal of Plant Physiology (India). (Jan-Mar 2005) v. 10(1) p. 25-31 KEYWORDS: ELECTROLYSIS; STABILITY; RIPENING; TOMATOES.

Comparative study was} carried out to examine the differences in electrolyte efflux, which indirectly assess the membrane stability, for detached and attached fruits of tomato undergoing ripening in slow and fast ripening varieties. Slow ripening behaviour for fruits of Pusa Gaurav was not characterized by better membrane stability with age of the fruits during storage in comparison with fast ripening fruits of Pusa Ruby. Ripening of fruits attached on the plant also yielded similar results. Further, rate of electrolyte effiux was not influenced by slow or fast ripening behaviour of tomato varieties. Already proposed role of hypothetical ripening inhibitor substance" from vegetative parts to fruits could not be proved in terms of its role in providing stability to the membrane. Detached fruits (at 8 days after harvest) and attached fruits (at pink stage) of both the varieties showed drastic increase in electrolyte efflux that might be associated with climacteric behaviour. Thus, indicating climacteric pattern of ripening for detached as well as attached fruits in tomato.

111. Mathur, P.; Farooqi, A.H.A.; Sharma, S. (Central Institute of Medicinal and Aromatic Plants, Lucknow (India). Ameliorative effect of chloromequat chloride on water stressed cultivars of Japanese mint (Mentha arvensis). Indian Journal of Plant Physiology (India). (Jan-Mar 2005) v. 10(1) p. 41-47 KEYWORDS: DROUGHT STRESS; WATER; MENTHA ARVENSIS; CHLORIDE.

A comparison of responses of five cultivars of Japanese mint (Mentha arvensis L. var., Piperascens Mal.) to water stress and chlormequat chloride application has brought out considerable intervarietal variation. Relative water content, water potential, herbage and oil yield decreased under water stress, while abscisic acid, sugar content, peroxidase activity, oil and menthol content increased significantly Ameliorative effect of chlormequat chloride was observed in stressed plants of different varieties. RWC, herbage and oil concentration increased and ABA and peroxidase activity decreased in chlormequat chloride treated stressed plants, as compared with untreated stressed plants. Observations suggest that chlormequat chloride can partially alleviate the detrimental effect of water stress in Japanese mint.

F61 Plant Physiology - Nutrition

112. Sharma, H.R. (Rajasthan Agricultural University, Bikaner (India). RAU-BARC Collaborative Research Project); Gupta, A.K.; Sharma, S.K. (SKN College of Agriculture, Jobner (India). Dept. of Agronomy). Quality and nutrient uptake of arid kharif crops as affected by sulphur. Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 633-635 KEYWORDS: SULPHUR; QUALITY; NUTRIENT UPTAKE.

113. Dube, B.K.; Gopal, R.; Sinha, P.; Chatterjee, C. (Lucknow University, Lucknow (India). Dept. of Botany). Variable tolerance of two genotypes of rice to excess copper. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 191-195 KEYWORDS: PHYTOTOXINS; GENOTYPES; RICE; METABOLISM; COPPER.

A field experiment was conducted to study the effect of foliar spray of Mepiquat Chloride (MC) (25, 37.5 and 50 ppm), Chlormequat Chloride (CCC) (375 and 500 ppm) at 45 and 90 DAS and NAA (20 ppm) at 90 DAS on growth, yield, morphological, physiological and biochemical parameters of hybrid cotton (DHH-ll). Application of NAA (20 ppm) was found to be most effective in increasing plant height, dry weight, rate of photosynthesis and seed cotton yield. MC treatment (50 ppm) sprayed at 90 DAS was found to be effective than CCC in reducing plant height, leaf area and showed higher photosynthesis which resulted in higher yield and boll weight. Application of growth retardants at early stage (45 DAS) reduced seed cotton yield significantly compared to other treatments.

F62 Plant Physiology – Growth and Development

114. Kumar, M.; Sen, N.L. (Maharana Pratap University of Agriculture and Technology, Udaipur (India). Dept. of Horticulture). Effect of zinc, boron and gibberellic acid on growth and yield of okra (Abelmoschus esculentus L. Moench). Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 595-597 KEYWORDS: ZINC; BORON; GIBBERELLIC ACID; GROWTH; YIELD; OKRA; PLANT HEIGHT; MICRONUTRIENT; FERTILIZERS.

Field experiments were carried out at Horticulture Farm (Vegetable section), Udaipur during rainy season 2001 and 2002 on a clay loam soil involving 4 levels each of zinc (0, 15, 30 and 45 kg ZnSO/ "ha) and boron (0, 10, 20 and 30 kg Borax/ha) and two levels of GA3 (0 and 50 ppm seed soaking) showed that :zinc and boron application upto 30 kg ZnS04 and 20 kg Borax/ha, respectively improved nUl,J1berof fruits, fruit yield per plant and yield per hectare while, the maximum plant height was recorded 45 kg ZnS04/ha and 30 kg Borax/ha, respectively. Similarly, seed soaked with 50 ppm GA3 resulted the m~ximum seed germination per cent, plant height, number of fruits per plant, fruit yield per plant andcyield per hectare as compared to control.

115. Kumar, R.; Goyal, V.; Kuhad, M.S. (Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Botany and Plant Physiology). Influence of fertility-salinity interactions on growth, water status and yield of Indian mustard (Brassica juncea). Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 139-144 KEYWORDS: GROWTH; YIELD; DIFFUSION; MOISTURE CONTENT; SALINITY; FERTILITY; BRASSICA JUNCEA.

The present investigation was carried out with Brassica juncea cv. RH-30 to study tbe effect of salinity, on various physiological characteristics and use of phosphatic and sulphur fertilizer to mitigate the salinity effects. Under saline'irrigation, plant height and dry weight of leaves declined over non-saline control. Fertilizer applied in combined form (60 kg P hao1 + 30 kg S hao1) exhibited maximum alleviation of the adverse effects of salinity. Salt stress showed significant reduction in plant water status in terms of relative water content, water potential and osmotic potential. Application of both phosphorus and sulphur improved the water status but the higher level of sulphur (30 kg S ha-1) showed poor response. Yield and its attributes adversely affected by salinity. Both phosphorus and sulphur improved the yield under salinity up to some extent however the combination of two fertilizers proved better in reviving the yield characters.

116. Garg, R.K.; Kathju, S.; Vyas, S.P. (Central Arid Zone Research Institute, Jodhpur (India). Div. of Soil Water Plant Relationships). Salinity fertility interaction on growth, photosynthesis and nitrate4 reductase activity in sesame. Indian Journal of Plant Physiology

(India). (Apr-Jun 2005) v. 10(2) p. 162-167 KEYWORDS: NITRATE REDUCTASE; INHIBITORS; GROWTH; PHOTOSYNTHESIS; SALINITY; FERTILITY; SESAME.

Magnesium application enhanced the effect of zinc on growth and grain yield of rice in alkalilsodic soil.Ten kg MgSO lha almost doubled the biomass production under normal supply of 25 kg ZnSO l ha largely due to increased tillering. It also hastened the process of heading. Magnesium tended to reduce the chaffy grains and thereby increased the filled-grains and grain size leading to yield enhancement significantly. Further, magnesium application resulted in dark green colour of leaves due to increased chlorophylls. The activity of carbonic anhydrase also increased due to magnesium application. Interestingly, Mg application promoted the absorption and translocation of Zn, Ca, P, K and that of Mg itself whereas Na accumulation was inhibited. This study suggested that magnesium can be beneficial, in addition to zinc, in alkali soil.

117. Tiwari, G.; Shah, P.; Sonakia, V.K. (Jawaharlal Nehru Agricultural University, Jabalpur (India). Dept. of Plant Physiology). Glucoside content and its accumulation in Bach (Acorus calamus Linn.) as influenced by nitrogen and phosphorus application. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 168-170 KEYWORDS: GLUCOSIDE; ACORUS CALAMUS; NITROGEN; PHOSPHORUS.

Interactive effects of soil salinity (0, 3, 6 and 9 dSm-1 approximately) and soil fertility (LF-NoPo and IF-N6oP4o) were studied on net photosynthesis, leaf diffusive resistance, nitrate reductase activity, mineral composition and on growth and yield of sesame (Sesamum indicum L.) with a view to alleviate the adverse effects of salt stress through improvement of soil nutritional status. Although a progressive decline with increasing salinity was recorded in all the observed parameters but seed yield and dry matter production were significantly higher in plants raised at improved soil fertility (IF) as compared with low fertility (LF) plants at all levels of salinity. The magnitude of the detrimental effects of salt stress was also less in IF than LF plants. The improved nutritional status induced a higher photosynthetic efficiency coupled with higher chlorophyll concentration and more favourable concentrations of N, P and K as well as wider K:Na ratios in the fertilized plants despite salt stress. The activity of nitrate reductase was adversely affected by increased salinity but it was consistently higher in IF as compared to LF plants at all salinity levels. These changes possibly contributed to the better performance of improved fertility plants both under control as well as salinity stress conditions. The results indicate the importance of fertilizer application under salt stress for achieving sustainable yields.

118. Singh, N.B.; Singh, Y.P.; Singh, V.P.N. (Chandra Sekhar Azad University of Agriculture and Technology, Kanpur (India). Section of Economic Botanist (Rabi Cereals)). Variation in physiological traits in promising wheat varieties under late sown condition. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 171-175 KEYWORDS: SOWING DATE; MEMBRANES; TEMPERATURE RESISTANCE; GENOTYPES; WHEAT.

An experiment was conducted during 1999-2000 and 2000-2001 to assess the effects of different levels of nitrogen and phosp~orus on total glucoside accumulation in rhizomes and roots of bach (Acorus calamus. Linn.). Results revealed that application of nitrogen and phosphorus 150 kglha each led to maximum glucoside accumulation in rhizomes (3.29 percent) and roots (5.19 pewrcent), which was higher by 225 percent and 192 percent, respectively compared to control. Glucoside accumulation was more in roots as compared to rhizomes with increase in nitrogen and phosphorus doses.

119. Patil, S.G.; Karkamkar, S.P.; Deshmukh, M.R. (Agharkar Research Institute, Pune (India). Div. of Plant Sciences). Screening of grape varieties for their drought tolerance. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 176-178 KEYWORDS: DROUGHT RESISTANCE.

A field experiment was conducted to study the physiological traits associated with terminal temperature tolerance. under late sown irrigated wheat. Results revealed a significant differential genotypic variation for physiological traits with respect to grain yield and its determining attributes under high post anthesis temperature i.e. :!: 4.5-6.8 °C 28°C in late sowing. Genotypes, Halna, K8962, GW 173, HD2189, HD2402 and AKW381 exhibited earliness in their flowering, higher canopy temperature depression (CTD), low membrane thermo-stability index (MTI), greater seed size (lOOO-grain weight), longer grain growth duration and higher grain yield, thereby showed a greater degree of high temperature tolerance as compared to long duration wheat genotypes. These traits are relatively simple and easily observable and can, therefore, be used to screen large number of wheat germplasm for high temperature tolerance. Based on yielding ability, these genotypes are proposed as suitable donor for crossing programme to develop ideal plant type suitable for late sown conditions.

120. Ramteke, S.D.; Somkuwar, R.G. (National Research Centre for Grapes, Pune (India). Effect of homobrassinolide on yield, quality and storage life in thompson seedless grape. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 179-181 KEYWORDS: GRAPE; YIELD; GROWTH; QUALITY; STORAGE.

Fifty four grape varieties were screened, based on chlorophyll stability index (CSI) for their drought tolerance. CSI was variable from 10.44 to 85.35 percent. Grape varieties like Athens, Buckland's Sweet Water, Foster Seedlings, Jose beli, Oval White, President and Queen Gold were significantly more tolerant to drought over the other varieties. Classification based on CSI (percent) suggests, three as tolerant, 21 as moderate tolerant, 19 as moderate susceptible and 11 as susceptible. Thus, CSI method is more reliable to confirm the drought tolerance in grape varieties. Tolerant grape varieties have significance in arid zone viticulture to improve the grape varieties.

121. Kumar, K.A.K.; Patil, B.C.; Chetti, M.B. (University of Agricultural Sciences, Dharwad (India). Dept. of Crop Physiology). Effect of plant growth regulators on physiological components of yield in hybrid cotton. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 187-190 KEYWORDS: PLANT GROWTH SUBSTANCES; YIELD; HYBRIDIZATION; COTTON.

Relative contribution of the main shoot laminae towards the total carbon dioxide fixed by the main shoot was examined in wheat cultivars Uniculm Gigas (VI) and Kalyansona (V 2). These cultivars were grown in pots at two levels of nitrogen, viz. 30 (N1, sub-optimal) and 120 (N2, optimal) kg ha-1. Photosynthetic rates (Pn) and lamina area at each insertion level were measured at weekly interval throughout the ontogeny. Sub-optimal level of nitrogen significantly reduced the area of the upper laminae, particularly penultimate and flag lamina, in both the cultivars. Pn rate of these two laminae was also reduced under sub-optimal N in the cv Kalyansona. These reductions were reflected in the grain yield. At optimal N level, the upper laminae make significant contribution to the total carbon dioxide fixed by the plant.

122. Sridhar, G. (National Research Centre for Medicinal Plants, Anand (India); Nath, V.; Srivastava, G.C.; Kumari, S. (Indian Agricultural Research Institute, New Delhi (India). Div. of Plant Physiology). Carbohydrate accumulation in developing grains of wheat genotypes. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 199-201 KEYWORDS: CARBOHYDRATES; GENOTYPES; WHEAT; TETRAPLOIDY; GRAIN; HEXAPLOIDY.

Effect of butachlor on nitrate reductase activity, nitrogen and protein content in the leaves at different stages of growth and protein content in grains was examined in rice variety RP-2421. The butachlor was applied at thret. concentrations, viz. 1.5 kg ha-1, 2.0 kg ha-1 and 2.5 kg ha-1 four days after transplanting (4 DA T) alongwith hand weeding (30 DA T and 60 DA T) and weedy check. At all the stages of development, hand weeding twice (30 DA T and 60 DA T) and butachlor 1.5 kg ha-1 being statistically at par maintained their superiority in increasing nitrate reductase activity, nitrogen content and protein content in rice leaves over all other treatments. Irrespective of the treatments nitrate reductase activity, nitrogen content and protein content in rice leaves increased up to 30 days and declined thereafter to minimal level up to 90 days. A positive correlation was observed in nitrate reductase activity and grain protein and in leaf protein and grain protein.

123. Bahadur, A.; Singh, R. (Indian Institute of Vegetable Research, Varanasi (India). Influence of seeding age on bulb production of rabi onion (Allium cepa L.). Annals of Agricultural Research (India). (Mar 2005) v. 26(1) p. 147-148 KEYWORDS: ALLIUM CEPA; YIELD; GROWTH.

124. Singh, T.; Singh, S.; Shivay, Y.S. (Indian Agricultural Research Institute, New Delhi (India). Div. of Agronomy). Growth, yield and quality of rice (Oryza sativa) as influenced by variety, date of transplanting and nitrogen levels. Annals of Agricultural Research (India). (Mar 2005) v. 26(1) p. 149-152 KEYWORDS: VARIETIES; TRANSPLANTION; GROWTH; YIELD; QUALITY; ORYZA SATIVA; NITROGEN CONTENT; FERTILIZERS.

125. Singh, R.A. (Rajendra Agricultural University, Samastipur (India). Dept. of Botany and Plant Physiology); Singh, A.P. (Rajendra Agricultural University, Samastipur (India). Dept. of Soil Science); Roy, N.K. (Rajendra Agricultural University, Samastipur (India). Dept. of Botany and Plant Physiology); Singh, A.K. (Rajenera Agricultural University, Samastipur (India). Dept. of Soil Science). Pigment concentration and activity of antioxidant enzymes in zinc tolerant and susceptible chickpea genotypes subjected to zinc stress. Indian Journal of Plant Physiology (India). (Jan-Mar 2005) v. 10(1) p. 48-53 KEYWORDS: PIGMENTS; GENOTYPES; ENZYMES; ZINC.

Physiological parameters like shoot dry weight, chlorophyll 'a', Chlorophyll 'b', total chlorophyll, carotenoids, soluble protein content, catalase, peroxidase and superoxide dismutase activities were higher in case of zinc tolerant genotypes as compared to zinc susceptible genotypes at pre and post flowering stages of plant growth. The grain yield of chickpea genotypes was positively and significantly correlated with all the physiological parameters except peroxidase and superoxide dismutase activities. At pre-flowering stage grain yield was positively correlated with catalase activity (r=0.450*) and total chlorophyll (r=0.583**), while at post flowering stage grain yield was positively and significantly correlated with .shoot dry weight (r=0.435*), total chlorophyll (r=0.470*), soluble protein (r=0.566**) and catalase activity (r=0.604**).From the above results, it can be inferred that

total chlorophyll content, catalase, carotenoids and soluble protein are important contributing parameters. towards chickpea production under zinc deficient condition. Hence, these parameters can be used as traits for screening/developing zinc stress tolerant genotypes. On the basis of per cent grain yield response, genotypes, viz. FG 897, BG1084, CSJ 128, PBG 126 and CSG 9505 were identified as tolerant, whereas BG 372, BGM 535 and BG 256 were identified as susceptible to Zn stress.

F63 Plant Physiology - Reproduction

126. Singh, S.N.; Lallu (Chandre Shekhar Azad University of Agriculture and Technology, Kanpur (India). Dept. of Soil Science and Agricultural Chemistry). Influence of different levels of nitrogen on its uptake and productive efficiency of paddy varieties. Indian Journal of Plant Physiology (India). (Jan-Mar 2005) v. 10(1) p. 94-96 KEYWORDS: PADDY; NITROGEN; YIELD.

A field experifnent was conducted tover a period of two years to assess the effect of nitrogen fertilizer on the relative uptake of riitrogen by grain, straw and total uptake by plant, productiVe efficiency and-grain yield of three paddy varieties, viz. PB-l, Sarjoo-52 and Sita at 0, 40, 80 and 120 kg levels of N/ha. Increasing levels of nitrogen increased nitrogen uptake in grain, straw and total productive efficiency and' grain, yield. Among var'eties, Sita showed its superiority in removing highest amount of nitrogen, productive efficiency and produced highest grain yield than the other two varieties.

H10 Pests of Plants

127. Goel, S.R. (Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Reaction of certain urdbean (Vigna mungo L.) genotypes to root-knot nematode, Meloidogyne javanica and Meloidogyne incognita. Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 626-627 KEYWORDS: VIGNA MUNGO; GENOTYPES; NEMATODE; MELOIDOGYNE JAVANICA; MELOIDOGYNE INCOGNITA.

128. Prasad, J.S.; Kumar, R.M.; Rao, L.V.S. (Directorate of Rice Research, Hyderabad (India)). Role of manures and fertilizers in the management of the root nematode (Hirschmanniella oryzae) in rice (Oryza sativa L.). Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 1-4 KEYWORDS: HIRSCHEMANNIELLA ORYZAE; ORGANIC FERTILIZERS; NEMATODA; FERTILIZERS; INORGANIC FERTILIZERS; ORYZA SATIVA; RICE.

Influence of some of the commouly used organic and inorganic sources of manures and fertilizers on rice root nematode, Hirschmanniella oryzae was studied under field conditions. Application of fresh leaves of Azadirachta indica, Sesbaniaaculeata, water hyacinth or water hyacinth compost at the rate of 60 kg N/ha were found useful for managing this nematode and increasing grain yields. However, the leaves of A. indica or S. aculeata when applied to the soil at the rate of 10 kg N/ha in combination with inorganic fertilizers had no effect on the nematode population.

129. Krishnamoorthy, V.; Kumar, N. (Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Fruit Crops)). Screening of banana hybrids (4X) against Pratylenchus coffeae under field conditions. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 5-8 KEYWORDS:

PRATYLENCHUS COFFEAE; TETRAPLOIDY; HYBRIDS; NEMATODA; LESION; BANANAS; FIELD EXPERIMENTATION.

Eighteen new synthetic tetraploid banana hybrids and five parental banana clones were screened against the lesion nematode, Pratylenchus coffeae under field conditions, during 2000-2002. Sixteen hybrids were found to have less root and corm lesion index than the susceptible clones Redbanana and Robusta. The lowest nematode population and multiplication rate was recorded in H-02-29 followed by H-02-26, H-02-34 and Pisang Lilin among the parents. H-02-18 (25.80 ug/g) H-02-17 (24.41 ug/g) and H-02-25 (24.00 ug/g) recorded higher content of chlorogenic acid, H-02-30 (641.23 ug/ g) and H-02-18 (976 units/minlg fresh weight) recorded higher content of bound phenol and phenylalanine ammonia lyase activity respectively.

130. Sundararaju, P. (National Research Centre for Banana (ICAR), Tiruchirapalli (India). Crop Protection Lab.)). Control of root-lesion nematode, Pratylenchus coffeae in certain cultivars of banana using different chemicals. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 9-18 KEYWORDS: PRATYLENCHUS COFFEAE; BANANAS; NEMATODA; LESION; VARIETIES; NEMATICIDES; CHEMICAL CONTROL; FIELD EXPERIMENTATION; CARBOFURAN; MONOCROTOPHOS.

An experiment was conducted in the field heavily infested with root-lesion nematode on three commercial cultivars of banana viz., Karpuravalli (ABB), Monthan (ABB) and Nendran (AAB) by using two nematicides viz., Monocrotophos and Carbofuran in different doses at different period of application along with the recommended practice of paring and pralinage of the suckers. Both the chemicals were found to be effedive in reducing the nematode population and subsequently increase the plant growth and yield when compared to untreated control. The treatment combination of suder dip with mud slurry and sprinkle with carbofuran 50 glsucker followed by two applications after planting at 3 monthly intervals was found to be very effective in reducing the nematode population and significantly increased the yield.

131. Patel, R.R.; Patel, B.A.; Thakar, N.A. (Gujarat Agricultural University, Anand (India). Dept. of Nematology)). Role of reniform nematode, Rotylenchulus reniformis in the incidence of root rot, Rhizoctonia bataticola on cotton. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 19-21 KEYWORDS: NEMATODA; ROOT ROT; COTTON; ROTYLENCHULUS RENIFORMIS; MACROPHOMINA PHASEOLINA; PATHOGENICITY; PLANT DISEASES.

Interaction study between the Rotylenchulus reniformis and Rhizoctonia bataticola (virulent and avirulent strains) revealed that avirulent strain of R. bataticola and the virulent one were equally effective in causing seedling root-rot of cotton in presence of R. reniformis. In virulent strain of fungus R. bataticola, the disease set one week earlier in different combinations of nematode and the fungus than fungus alone. Among the different combinations, nematode inoculated 15 days prior to fungus inoculation (N-F) proved highly detrimental, causing cent per cent root rot with both the strains of fungus followed by simultaneous (FN) and fungus inoculated 15 days prior to nematode (F-N).

132. John, A.; Bai, H. (College of Agriculture, Thiruvananthapuram (India). Dept. of Entomology)). Evaluation of VAM for management of root-knot nematode in brinjal. Indian

Journal of Nematology (India). (Jun 2004) v. 34(1) p. 22-25 KEYWORDS: MELOIDOGYNE; AUBERGINES; NEMATODA; VESICULAR ARBUSCULAR MYCORRHIZAL; VAM.

Different isolates of VAM fungi like Glomus fasciculatum, G. etunicatum, G. mosseae, G. constrictum, G. monosporum and A. morroweae were evaluated for their efficacy in controlling root-knot nematode infestation in brinjal. These cultures did not show any significant difference in growth parameters (height and number of leaves) at transplanting and one month after transplanting. Later, (45 and 60 days after transplanting) significant increase in height and number of leaves were observed in plants raised in soil inoculated with G. etunicatum and G. jasciculatum. Higher percentage of VA mycorrhizal colonisation was observed in plants artificially inoculated with VAM. Plants raised in G. etunicatum, G.fasciculatum and G. monosporum recorded significantly lower root-knot indices. The fecundity of the nematode was also significantly reduced in mycorrhiz treated plants. G. fasciculatum registered the lowest population per gram root while G. fasciculatum and G. constrictum significantly lowered the nematode population in the soil.

133. Swain, S.C.; Ganguly, A.K.; Umarao (Indian Agricultural Research Institute, New Delhi (India). Div. of Nematology)). Race specific biochemical responses in differential hosts against the root-knot nematode, Meloidogyne incognita. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 26-32 KEYWORDS: MELOIDOGYNE; HOST PLANTS; NEMATODA; MELOIDOGYNE INCOGNITA; LIGINS; PHENOLIC COMPOUNDS; CATECHOL OXIDASE; PHENYLALANINE AMMONIA LYASE; PHYSIOLOGICAL RACES.

Investigations on sequential development of phenylalanine ammonia lyase (PAL), polyphenol oxidase (PPO), phenol and lignin-like polymers, were undertaken in differential host plants (cotton cv. Deltapine-16 and tobacco cv. NC-95) along with snsceptible hosts (cotton cv. H-777 and tobacco cv. FCV-Special) after inoculation with different host races of Meloidogyne incognita. All the races induced a faster and early accumulation of these defense parameters upon inriculation to host differentials than their healthy controls, whereas race-inoculated susceptible tobacco cv. FCV Special and cotton cv. H-777 showed a gradual and delayed accumulation in their defense reactions, but the per cent increase over their uninoculated controls, was of less magnitude than that observed in host differentials at different time intervals. Further, gel electrophoretic study showed de novo appearance of isozyme only in race-inoculated host differentials. It was evident that virulent and avirulent races were able to induce defense mechanisms with different speed in host differentials. On the basis of interactions observed between races and host differentials at 7 DAI, a biochemical model has been hypothesized for differentiating the four races of M. incognita with respect to
phenylalanine ammonia lyase activity.

134. Bishnoi, S.P. (Agricultural Research Station, jaipur (India); Singh, S.; Mehta, S.; Bajaj, H.K. (Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Isozyme patterns of Heterodera avenae and H. filipjevi populations of India. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 33-36 KEYWORDS: ISOENZYMES; NEMATODA; INDIA; ENZYMES; HETERODERA; HETERODERA AVENAE.

Isozyme patterns of catalase (CAT), b-esterase (EST) and malate dehydrogenase (MDH) of white females of three populations of Heterodera filipjevi (pathotype Hf 31 and Hf 41) and five populations of H. avenae (pathotype ha 21) were tudied using polyacrylamide gel electrophoresis. The two species could easily be differentiated on the basis of single band

osition of malate dehydrogenase that was at Rf 0.34 for H. filipjevi as compared to Rf 0.40 for H. avenae. Isozyme profiles of atalase and esterase, however, were not found useful for the separation of two species. A single band of catalase with Rf alue of 0.26 was present in all the tested populations. Number of b-esterase bands were either three or two in these opulations of cereal cyst nematode.

135. Patel, A.D.; Patel, D.J.; Patel, N.B. (Gujarat Agricultural University, Anand (India). Dept. of Nematology)). Effect of aqueous leaf extracts of botanicals on egg hatching and larval penetration of Meloidogyne incognita in banana. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 37-39 KEYWORDS: MELOIDOGYNE INCOGNITA; MUSA PARADISICA; NEMATODA; BANANAS; LEAVES; HATCHING; LARVAE; PLANT EXTRACTS.

A Study on effect of various aqueous leaf extracts on egg hatching and subsequent larval penetration of Meloidogyne incognita in banana cv. Basrai roots, indicated that aqueous leaf extracts of argemone (Arge;'lOne maxicana, L.) and lantana (Lantana. camera, L.) and neem seed kernel suspension NSKS (Azadirachta indica Juss.) proved to be the most effective in almost complete inhibition of nematode egg hatching at 48, 96 and 144 hrs, indicating ovicidal effect. Ipomea (Ipomoea fistulosa) and castor (Ricinus communis) leaf extracts were the least effective. There was no larval penetration from egg masses previously treated with argemone and lantana leaf extracts and NSKS treatment. Significantly more nematode larval penetration was recorded from egg masses treated with castor and Ipomea leaf extracts, indicating their ovistatic effect.

136. Sarvanapriya, B.; Sivakumar, M.; Rajendran, G.; Kuttalam, S. (Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology)). Effect of different plant products on the hatching of Meloidogyne incognita eggs. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 40-43 KEYWORDS: MELOIDOGYNE INCOGNITA; NEMATODA; HATCHING; PLANT PRODUCTS; OVA.

The nematicidal properties of fifteen plant products viz., leaves of Albizzia amara, Aristalochia bractiata, Tagetes erecta, T. patula, Origanum majorana, Azadirachta indica, Butea monosperma and Calotropis gigantea, roots of Acorus calamus, bulbs of Allium sativum, seeds of Citrullus lanatus, Areca catechu and Anona reticulata, latex of C. gigantea and Carica papaya were screened against root-knot nematode, Meloidogyne incognita for egg hatch. The seed extract of Areca catechu recorded the highest inhibition rate at 0.1 percent concentration. Latex of Carica papaya caused 98.22 and cent per cent inhibition of hatching at 1.0 and 10.0 percent concentrations respectively. Latex of C. gigantea also caused cent per cent inhibition at 10.0 percent concentration.

137. Tyagi, S.; Ajaz, S. (Aligarh Muslim University, Aligarh (India). Dept. of Botany)). Biological control of plant parasitic nematodes associated with chickpea using oil cakes and Paecilomyces lilacinus. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 44-48 KEYWORDS: PLANT NEMATODES; NEMATODE CONTROL; OILSEED CAKES; BIOLOGICAL CONTROL; CHICKPEAS; PAECILOMYCES; NEMATODA; POPULATION GROWTH; FIELD EXPERIMENTATION.

The addition of organic matter to soil has been explored as an alterantive means of nematode control. Oil-seed cakes of neem (Azadirachta indica), castor (Ricinus communis), groundnut (Arachis hypogaea), linseed (Linum usitatissimum), sunflower (Helianthus annuus) and soybean (Glycine max) were found to. be highly effective in reducing the

multiplication of soil nematodes and subsequently plant growth increased significantly. The multiplication rate of nematodes was less in the presence of Paecilomyces lilacinus as compared to the absence of P. lilacinus. Damage caused by the nematodes was further reduced when P. lilacinus was added along with oil-seed cakes. Most effective combination of P. lilacinus was with neem cake, under field conditions.

138. Senthilkumar, T.; Rajendra, G. (Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology)). Biological agents for the management of disease complex involving root-knot nematode, Meloidogyne incognita and Fusarium moniliforme on grapevine (Vitis vinifera). Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 49-51 KEYWORDS: MELOIDOGYNE INCOGNITA; VITIS VINEFERA; GIBBERELLA FUJUKUROI; GRAPEVINES; BIOLOGICAL CONTROL AGENTS; DISEASE CONTROL; PSEUDOMONAS FLUORESCENS; TRICHODERMA VIRIDE.

Field trials were conducted for the management of disease complex involving Meloidogyne incognita and Fusarium moniliforme, on grapevine cv. Muscat Hamburg. The vines were treated with commercial foumulatinns of biocontrol agents viz., Pseudomonas fluorescens (100 g/vine) and Trichoderma viride (100 g/vine) alone and in combination at half dosage, along with farmyard manure (20 kg/vine) and carbofuran 3G (60 g/vine). All the treatments significantly reduced the final soil nematode populaiton and wilt disease incideoce. The highest reduction .in final soil nematode population (56.9 percent), teast root gall index (1.8) and least wilt disease incidence (24.8 percent) were observed in FYM (20 kg) + P. fluorescens (100 g/vine) treated vines. The bunch weight of grapevine increased by 155.4 percent in FYM (20 kg) + P. fluorescens (100 glvine) treated vines compared to untreated control.

139. Krishnamoorthy, V.; Kumar, N.; Poornima, K. (Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Fruit Crops)). Evaluation of diploid banana hybrids against burrowing nematode, Radopholus similis. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 52-55 KEYWORDS: DIPLOIDY; NEMATODA; BANANAS; RADOPHOLUS SIMILIS; HYBRIDS; FIELD EXPERIMENTATION.

A field study was conducted to know the reaction of fifteen new diploid banana hybrids against burrowing nematode, Radopholus similis. Three hybrids namely H-02-08, H-02-09 and H-02-10 recorded the lowest root and corm lesion index followed by H-02-14 and H-02-15 and Pisang Lilin. The nematode population in the soil and root of these hybrids were minimum. H-02-10 among the hybrids and Pisang Lilin recorded higher amount of total phenol (711.38 and 1622.10 ug/g respectivey) and ortho-dihydric phenol (34.10 and 133.60 ug/g respectivey) and polyphenol oxidase activity (971.51 units /min/g fresh weight) in roots.

140. Bhosle, B.B. (Cotton Research Station, Nanded (India); Sehgal, M. (National Centre for Integrated Pest Management, New Delhi (India); Puri, S.N. (Mahatma Phule Krishi Vidyapeeth, Rahuri (India); Das, S. (Guru Govind Singh Indraprastha University, Delhi (India). School of Environment Management). Prevalance of phytophagous nematodes in rhizosphere of okra (Abelmoschus esculentus L.) Moench) in Parbhani district, Maharashtra, India. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 56-59 KEYWORDS: PLANT NEMATODES; NEMATODA; RHIZOSPHERE; OKARAS; MAHARASHTRA; ABELMOSCHUS

ESCULENTUS; ROTYLENCHULUS RENIFORMIS; MELOIDOGYNE INCOGNITA; HELIOCOTYLENCHUS.

A survey was conducted in Parbhani district to know the prevalence of plant parasitic nematodes in okra field. Six phytophagous nematodes viz. Meloidogyne incognita, Rotylenchulus reniformis, Helicotylenchus sp., Tylenchorhynchus sp., Hoplolaimus indicus and Aphelenchus avenae were encountered in rhizosphere of okra on farmer's fields of Parbhani District. The Meloidogyne incognita was found to be the most predominant nematode species and which might be associated with stunted growth, yellowing of leaves and temporary wilting in okra.

141. Mojumder, V.; Pankaj; Chawla, G.; Singh, J. (Indian Agricultural Research Institute, New Delhi (India). Div. of Nematology)). Effect of urea coated with neem formulations on root-knot and reniform nematodes in okra. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 60-63 KEYWORDS: OKARAS; ABELMOSCHUS ESCULENTUS; NEEM EXTRACTS; MELOIDOGYNE INCOGNITA; UREA; ROTYLENCHULUS RENIFORMIS.

The investigations were carried out to know the effect of three commercially available neem-based formulations viz. Nimin V-Coatand Modified-neem-oilas urea coatings (500 g/50kg urea) on the root-knot (Meloidogyne incognita) and reniform (Rotylenchulus reniformis) nematodes in okra. Two glasshouse experiments and a field trial were conducted in three successive years. Application of recommended doses of urea coated with Niminand V-Coatsignificantly reduced root-knot index as well as soil population of M. incognita and R. reniformis and increased plant growth parameters. In field trial, all the three treatments reduced the root-knot index (3.0-3.6 compared to 4.8 in check), soil populations of mot-knot (17-23 percent) and reniform (14-25percent) nematodes compared to the check, and increased the yield/plot. Niminand V-Coaturea treatments were at par and effective while increase with Modified-neem-vilwas not significantly different from the check.

142. Praveen; Ahuja, S.P. (Punjab Agricultural University, Ludhiana (India). Dept. of Biochemistry)). Role of cuticular surface carbohydrates of J2 larvae of Anguina tritici in specific recognition of the host. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 64-69 KEYWORDS: ANGUINA TRITICI; NEMATODA; CARBOHYDRATES; HOSTS; LECTINS; ANIMAL CUTICLE.

Different extracts of J2 larvae of Anguina trittpi were analyzed to understand the mechanism of location and recognition of the host seedlings: Glycoproteins extracted by dimethylsulfoxide were maximally glycosylated and might represent the surface. coat glycoproteins of second stage juvenile (J2) whereas those extracted by sodium dodacylsulfate and deoxycholate (DOC) might be deeply embedded in the cuticle. Surface carbohydrates of J2 with wheat germ agglutinin (WGA), concanavalin A (Con A) and antisera to blood group substances showed the presence of sialic acid, N-acetyl glucosamine. The SDS as well as DOC extractable cuticular proteins showed the absence of galactose and N-acetylgalactosomine. It is indicated that J2 of A. tritici lack the ability to glycosylate their proteins with galactose and N-acetyl galactosamine, but. they utilize the cuticular sialic acid and N-acetylglucosamine for locating the host containing WGA.

143. Singh, B. (National Research Centre for Citrus, Nagpur (India)). Control of citrus nematode, Tylenchulus semipenetrans in Nagpur mandarin orchard. Indian Journal of

Nematology (India). (Jun 2004) v. 34(1) p. 70-74 KEYWORDS: TYLENCHULUS SEMIPENETRANS; NEMATODA; MANDARIN; CITRUS RETICULATA; CONTROL METHODS; ORCHARDS; CITRUS JAMBHIRI; MAHARASHTRA; CARBOFURAN; PHORATE.

A field trial for the control of the citrus nematode, Tylenchulus semipenetrans in a ten year old Nagpur mandarin orchard on rough lemon rootstock showed that the application of carbofuran 3G and phorate lOG, each at 1, J and 5kg a.if ha reduced the nematode (Tylenchulus semipenetrans) populations in soil and on roots significantly within one month of nematicide application. The repeated application of the nematicides after one year kept the namatode populations significantly lower as compared to non-repeated and check treatments. Increase in canopy volume was also significant in treatments where carbofuran and phorate were applied at 5kg a.iJha during first year and in repeated treatments during second year. In second year, the fruit yield was increased by 32.4 and 29.7 percent over check in the repeated treatments where carbofuran and phorate were applied each at 5 kg a.i./ha.

144. Ashraf, M.S.; Khan, T.A. (Aligarh Muslim University, Aligarh (India). Dept. of Botany, Section of Plant Pathology and Nematology)). Response of chickpea varieties/lines against reniform nematode Rotylenchulus reniformis. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 75-79 KEYWORDS: CHICKPEAS; VARIETIES; NEMATODE CONTROL; CICER ARIETINUM; ROTYLENCHULUS RENIFORMIS; PEST RESISTANCE.

A pot experiment was conducted to evaluate fifty six chickpea (Cicer arietinum) varieties against their reaction to reniform nematode (Rotylenchulus reniformis). Out of fifty six varieties, only 3 varieties (BG- 1086, KPG-59 and Pusa-372) were found resistant and 4 varieties (BG-I072, BG-ll08, ICC-88506 and Pusa-l003) as moderately resistant to R. reniformis. Six varieties viz. BG-276, BG-llOO, BGI0863, BGD-1l2, BGD-1l7 and CIYTSL-2 showed tolerant response to R. reniformis. Nineteen varieties (BG-376, BG-I032, BG-I087, BG-I095, BGD-72, BGD-98, BGD-ll04, Biogreen, C-235, CSG-9505, EC-442507, GPF-2, ICC-88503, ICCV-5, L-550, Pusa-212, RSG-143, RTY-411, and SAKI-9303) were found susceptible, while the remaining varieties showed highly susceptible reaction to R. reniformis.

145. Dabur, K.R. (Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology); Taya, A.S. (Chaudhary Charan Singh Haryana Agricultural University, Karnal (India). Regional Research Stn.); Bajaj, H.K. (Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology)). Life cycle of Meloidogyne graminicola on paddy and its host range studies. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 80-84 KEYWORDS: MELOIDOGYNE GRAMINICOLA; HOSTS; RICE; NEMATODA.

Screening of eight crops of Kharif season and three of Rabi season against a Haryana population of Meloidogyne graminicola revealed that rice, sorghum, pearl millet, wheat and oats, were good hosts of this nematode. Brinjal, tomato, okra, green gram and barley did not support the multiplication of this nematode. Few galls but with egg masses were formed on Sesbania and the use of this crop in the management of rice root-knot nematode management has been discussed. Cyperus rotundus, C. iria, Dicanthium annulatum, Echinocloa colonum, E. crusgalli, Eclipta alba, Melilotus alba and Trigonella polycerate were found to be very good hosts of this nematode. M. graminicola completed its life cycle in 24 days in the months of July-August.

146. Pathak, K.N.; Keshari, N. (Rajendra Agricultural University, Samastipur (India). Dept. of Nematology)). Interaction of Meloidogyne incognita with Fusarium oxysporum f. congulatinans on cauliflower. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 85-87 KEYWORDS: MELOIDOGYNE INCOGNITA; CAULIFLOWERS; BRASSICA OLERACEA BOTRITIS; WILTS; FUSARIUM OXYSPORUM; HOST PATHOGEN RELATIONS.

147. Sharma, G.C.; Kashyap, A.S. (University of Horticulture and Forestry, Kandaghat, Solan (India). Horticultural Research Stn.)). Studies on the population dynamics of phytoparasitic nematodes in Kiwi fruit. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 87-88 KEYWORDS: PLANT NEMATODES; KIWI FRUITS; NEMATODA; ACTINIDIA DELICIOSA; POPULATION DYNAMICS.

148. Sundarababu, R.; Ramakrishnan, S.; Jothi, G.; Rajendran , G. (Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology)). Optimization of commercial formulation of VAM (Glomus mosseae) against Pratylenchus delattrei in Crossandra. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 89-90 KEYWORDS: PLANT NAMATODES; NEMATODA; MELOIDOGYNE INCOGNITA; PRATYLENCHUS; GLOMUS MOSSEAE; VESICULAR ARBUSCULAR MYCORRHIZAE; CROPS; ORNAMENTAL PLANTS.

149. Sharma, G.C.; Bhatia, M. (University of Horticulture and Forestry, Solan (India). Dept. of Entomology)). Impact of sowing time on the nematode populations of french bean and assessment of avoidable yield losses to the crop due to their infestation. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 90-92 KEYWORDS: NEMATODA; POPULATION DYNAMICS; PHASEOLUS VULGARIS; MELOIDOGYNE INCOGNITA; SOWING DATE; PRATYLENCHUS PRATENSIS; HELICOTYLENCHUS DIHYSTERA; INFESTATION; YIELDS; QUINISULCICUS INDICUS.

150. Sharma, H.K.; Pankaj; Siyanand; Pachauri, D.C.; Singh, G. (Indian Agricultural Research Institute, New Delhi (India). Div. of Nematology)). Reaction of tomato (Lycopersicon esculentum) varieteis/lines to Meloidogyne incognita Race-1. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 93 KEYWORDS: TOMATOES; VARIETIES; MELOIDOGYNE INCOGNITA; LYCOPERSICON ESCULENTUM; PEST RESISTANCE.

151. Wanshi, R.K.S.; Khan, A.; Srivastava, A.S. (Chandra Shekar Azad University of Agriculture and Technology, Kanpur (India). Dept. of Plant Pathology)). Reaction of tomato germplasm against root-know nematode, Meloidogyne incognita. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 94 KEYWORDS: TOMATOES; LYCOPERSICON ESCULENTUM; MELOIDOGYNE INCOGNITA; GERMPLASM; PEST RESISTANCE.

152. Wanshi, R.S.K. (Chandra Shekar Azad University of Agriculture and Technology, Kanpur (India). Dept. of Plant Pathology); Kumar, S. (Horticulture Research and Training Centre, Ranikhet (India). Occurrence of root feeder nematodes in rice at Kanpur. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 95-96 KEYWORDS: PLANT NEMATODES; ROOT HAIRS; RICE; VARIETIES; ROOTS; UTTAR PRADESH; INFECTION.

153. Haidar, M.G.; Dutta, K. (Rajendra Agricultural University, Samastipur (India). Dept. of Nematology)). Estimation of avoidable yield losses to sugarcane due to nematodes in field

condition. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 96-97 KEYWORDS: PLANT NEMATODES; YIELDS; NEMATODA; FIELD EXPERIMENTATION; SUGARCANE; POPULATION DYNAMICS.

154. Dhawan, S.C. (Indian Agricultural Research Institute, New Delhi (India). Div. of Nematology); Kaur, S.; Singh, A. (Indian Agricultural Research Institute, New Delhi (India). National Research Centre on Biotechnology)). Effect of Bacillus thuringiensis on the mortality of root knot nematode, Meloidogyne incognita. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 98-99 KEYWORDS: PLANT NEMATODES; MORTALITY; MELOIDOGYNE INCOGNITA; BACILLUS THURINGIENSIS.

155. John, A.; Sivaprasad, P.; Bai, H. (College of Agriculture, Thiruvananthapuram (India). Dept. of Entomology)). Influence of VAM on the biomass production and root-knot nematode infestation in Amaranthus. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 99-102 KEYWORDS: PLANT NEMATODES; AMARANTHUS; INFESTATION; BIOMASS; PRODUCTION; VESICULAR ARBUSCULAR MYCORRHIZAL.

156. Joymati, L.; Romoni, H.; Dhanachand, Ch. (Manipur University, Canchipur (India). Dept. of Life Sciences)). Effect of Parkia javanica Merr. against root-knot nematodes Meloidogyne incognita on Vicia faba Linn.. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 102-104 KEYWORDS: PLANT NEMATODES; MELOIDOGYNE INCOGNITA; PARKIA; VICIA FABA.

157. Patel, R.R.; Patel, B.A.; Thakar, N.A. (Gujarat Agricultural University, Anand (India). Dept. of Nematology)). Effect of granular nematicides on penetration of Reniform nematode, Rotylenchulus reniformis in cotton. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 104-105 KEYWORDS: ROTYLENCHULUS RENIFORMIS; COTTON; NEMATICIDES; GRANULES.

158. Patel, R.R.; Patel, B.A.; Thakar, N.A. (Gujarat Agricultural University, Anand (India). Dept. of Nematology)). Pathogenicity of reniform nematode, Rotylenchulus reniformis on cotton. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 106-107 KEYWORDS: ROTYLENCHULUS RENIFORMIS; COTTON; PLANT NEMATODES; PATHOGENICITY.

159. Rajashekhar, A.V.; Reddy, Y.N. (Osmania University, Hyderabad (India). Dept. of Zoology)). Effect of abiotic factors on the egg hatching of Romanomermis manijerensis (Nematoda : Mermithidae) from Anopheles sp mosquito larvae. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 111-113 KEYWORDS: ROMANOMERMIS; HATCHING; ANOPHELES; NEMATODA; EGG; CULICIDAE; MERMITHIDAE; LARVAE; STRESS.

160. Ravichandra, N.G.; Krishnappa, K. (University of Agricultural Sciences, Bangalore (India). Dept. of Plant Pathology)). Prevalance and distribution of phytoparasitic nematodes associated with major vegetable crops in Mandya district, Karnataka. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 113-116 KEYWORDS: PLANT NEMATODES; KARNATAKA; VEGETABLE CROPS.

161. Arjunlal, R.; Khetarpal, R.K. (National Bureau of Plant Genetic Resources, New Delhi (India). Plant Quarantine Div.)). Quarantine namatodes vis-a-vis convention on biological

diversity. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 116-117 KEYWORDS: QUARANTINE; CONTROL METHODS; DIVERSITY; NEMATODA.

162. Dhawan, S.C.; Kaushal, K.K.; Ganguly, S.; Singh, K. (Indian Agricultural Research Institute, New Delhi (India). Div. of Nematology)). Occurrence of Pasteuria sp. in free living nematodes, Cephalobus and Discoloimium sp.. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 107-109 KEYWORDS: PLANT NEMATODES; PASTEURIA; FREE LIVING NEMATODES; CEPHALOBUS; DISCOLAMIUM.

163. Praveen, H.M.; Gowda, D.N. (University of Agricultural Sciences, Bangalore (India). Dept. of Plant Pathology)). Screening of gherkin (Cucumis anguria L.) cultivars against root-knot nematode, Meloidogyne incognita. Indian Journal of Nematology (India). (Jun 2004) v. 34(1) p. 109-111 KEYWORDS: DISEASE RESISTANCE; PLANT NEMATODES; GHERKINS; VARIETIES; MELOIDOGYNE INCOGNITA; INFESTATION; CUCUMIS ANGURIA.

H60 Weeds and Weed Control

164. Singh, D.; Tomar, P.K.; Singh, A.K. (Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Agronomy). Performance of promising herbicides on weed population and grain yield of rainfed wheat (Triticum aestivum). Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 624-625 KEYWORDS: HERBICIDES; WEED; YIELD; TRITICUM AESTIVUM.

165. Singh, U. (Indian Agricultural Research Institute, New Delhi (India). Div. of Agronomy); Singh, U.P.; Sutaliya, R. (Banaras Hindu University, Varanasi (India). Dept. of Agronomy). Effect of weed management under varying levels of N, P, K and Zn on growth and yield of boro rice (Oryza sativa L.). Annals of Agricultural Research (India). (Mar 2005) v. 26(1) p. 153-156 KEYWORDS: WEED CONTROL; GROWTH; YIELD; ORYZA SATIVA; FYM.

166. Singh, G.; Singh, R.G.; Singh, O.P.; Kumar, T.; Mehta, R.K.; Kumar, V.; Singh, P.P. (Narendra Deva University of Agriculture and Technology, Bahraich (India). Crop Research Stn.). Effect of weed management practices on direct seeded rice (Oryza sativa) under puddled lowlands. Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 35-37 KEYWORDS: WEED CONTROL; PUDDLING; DIRECT SOWING; LOWLAND; RICE; ORYZA SATIVA; CONTROL METHODS.

A field experiment was conducted during the rainy season of 2001 and 2002 at the Crop Research Station, Ghaghraghat (Bahraich), to find out the most effective weed-control method in controlling weeds in directseeded rice (Otyza sativa L.) under puddled condition. Pre-emergence application of anilophos + 2, 4-0 (0.3+0.5 kg a.i./ha) supplemented by 1 hand-weeding 40 days after sowing (OAS) provided a broad-spectrum weed control throughout the crop season. The highest weed-control efficiency (85.2percentage) was also recorded under this treatment. The grain yield and nutrient uptake of the crop were highest in 2 hand-weeding treatments which was comparable with treatment of anilophos + 2,4-0 (0.3+0.5 kg a.i./ha)+ 1 hand-weeding 40 days after sowing (OAS). Both formulations of fenoxaprop-P-ethyl and almix + 0.2percentage surfactant as post-emergence resulted in the poorest control of weeds, lower grain yield and higher phytotoxicity to rice crop.

167. Saini, J.P. (Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur (India). Dept. of Agronomy). Efficacy of cyhalofop-butyl alone and in combination with 2,4-D against mixed weed flora in direct seeded upland rice (Oryza sativa). Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 38-40 KEYWORDS: WEED CONTROL; CONTROL METHODS; WEEDS; HERBICIDES; DIRECT SOWING; RICE; ORYZA SATIVA; HIGHLANDS.

A field experiment was conducted during the rainy seasons of 1998 and 1999 at Agronomy Research Farm of the CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, to find out the best combination of cyhalofop-butyl and 2,4-0 in controlling mixed weed flora in direct-seeded upland rice (Otyza sativa L.). Cyhalofop-butyl 90 and 120 g/ha when tank mixed with 2,4~0 1.0 kg/ha lost its herbicidal property completely and did not control any of the grass weeds. However, 2, 4-0 in mixture controlled broad-leaf weeds completely, When these herbicides were applied in sequence both grass and broad-leaf weeds were controlled effectively. Cyhalofop-butyl 120 g/ha (15 OAS) followed by 2,4-01.0 kg/ha (20 OAS) and 2,4-01.0 kg/ha (15 OAS) followed by cyhalofop-butyl120 g/ha (20 OAS) being at par with each other and also with hand-weeding twice resulted in significantly lower weed dry weight and hence higher yield attributes and yield of rice over all other treatments.

168. Saini, J.P.; Angiras, N.N. (Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur (India). Dept. of Agronomy). Standardization of dose of sulfosulforun (MON 37503) in controlling weeds of rainfed wheat (Triticum aestivum) under mill hill conditions of Himachal Pradesh. Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 41-43 KEYWORDS: WEED CONTROL; HIGHLANDS; WEEDS; CONTROL METHODS; HERBICIDES; RAINFED FARMING; WHEATS; TRITICUM AESTIVUM; HIMACHAL PRADESH.

A field experiment was conducted during the winter (rabl) seasons of 1998-99 and 1999-2000 at Palampur, Himachal Pradesh, to find out the optimum dose of sulfosulfuron for controlling weeds in rainfed wheat (Triticum aestivum L. emend. Fiori & Paol.). Sulfosulfouron 30.0 g a.i.Iha being at par with sulfosulfuron 30.0 g a.i.Iha + sur-factant and sulfosulfuron 37.5 g a.i.lha with and without surfactant resulted in significantly lower weed dry weight and higher yield attributes and yield of wheat when compared with the lower doses during both the years. How-ever, during the first year diclofopmethyl 0.75 kg/ha being at par with isoproturon 1.0 kg ai/ha + surfactant resulted in significantly higher grain yield over other treatments, whereas during the second year dichlofop-methyl per-formed comparatively poor probably because of poor control of Phalaris minor Retz. which was thedominating weed this year. Isoproturon 1.0 kg/ha + surfactant was as effective as sulfosulfuron 37.5 g ai/ha + surfactant and hand-weeding twice during both the years, and also with sulfosulfuron 37.5 g/ha without surfactant and sulfosulfuron 30.0 g ai/ha with and without surfactant during the second year of study.

169. Yadav, S.S.; Sharma, O.P.; Yadav, R.D. (Rajasthan Agricultural University, Jobner (India). Dept. of Agronomy). Comparative efficacy of herbicidal and manual weed control in cumin (Cuminum cyminum) at different levels of nitrogen. Indian Journal of Agronomy (India). (Mar 2005) v. 50(1) p. 77-79 KEYWORDS: WEED CONTROL; CONTROL METHODS; HERBICIDES; HAND WEEDING; WEEDS; CUMIN; CUMINUM CYMINUM; EFFICIENCY; NITROGEN; YIELDS.

A field study was conducted during the winter seasons of rabi 2000-2001 and 2001-2002 to investigate the comparative efficacy of herbicidal and manual weed control in cumin

(Cumimum cyminum L.) at different levels of nitrogen. All the weed-control treatments significantly reduced the density and dry weight of weeds and nutrient depletion as compared to weedy check. Two hand-weedings at 25 and 50 days after sowing was'found to be the best treatment in reducing the above weed parameters. It attained the maximum weed-control efficiency (87.9percentage) and seed yield of cumin (5.50 q/ha). Among herbicides, the lowest density and dry weight of weeds and the maximum weed-control efficiency (84.3percentage) was obtained with pre-plant Trifluralin at 2.16 kg/ha. For seed yield (4.94 q/ha) and weed-competition index (10.2percentage), Trifluralin at 1.08 kg/ha was found the best herbicidial treatment. Pendimethalin at 1.0 kg/ha (pre-emergence) also controlled the weeds more effectively (79.3percentage) than lower doses of Trifluralin and Fluchloralin at 1.125 kg/ha and resulted 242.9percentage higher seed yield than the control. Application of 30 kg N/ha was the most remunerative dose for cumin with respect to seed yield.

J10 Handling, Transport, Storage and Protecion of Agricultural Products

170. Sharma, R.K. (Indian Agricultural Research Institute, New Delhi (India). Directorate of Maize Res.); Paudel, L.R. (Ministry of Agriculture, HMG (Nepal). Agriculture Development Officer); Sharma, K. (Indian Agricultural Research Institute, New Delhi (India). Div. of Entomology). Quantitative losses in the various kernel fractions due to khapra beetle, Trogoderma granarium Everts in stored maize. Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 590-594 KEYWORDS: STORAGE LOSSES; KERNEL; PERICARP; INSECTA; MAIZE.

Irrespective of the varieties maximum per cent loss was in embryo fraction followed by pericarpand endosperm except Basi local due to the feeding by khapra beetle, T. granarium. Madhuri had the highest per cent loss in all fractions. Preferential feeding of khaprai beetle is dependent to some extent on the varieties. Losses in entire seed on dry weight basis were maximum in Madhuri followed by Basi local and NLD composite, hence, placed in most susceptible group. The average per cent loss ranged from 10.31 to 78.07 in embryo, 2.84 to 67.32 in endosperm and 1.27 to 62.14 in pericarp. This indicated that khapra beetle is primarily a germ feeder, thus causing great loss to nutritional value of stored maize.#e.

P01 Nature Conservation and Land Resources

171. Sharma, P.D. (Indian Council of Agricultural Research, New Delhi (India). Managing natural resources in the Indian Himalayas. Journal of the Indian Society of Soil Science (India). (Dec 2004) v. 52(4) p. 314-331 KEYWORDS: NATURAL RESOURCES MANAGEMENT; INDIAN HIMALAYAS; SOIL DEGRADATION.

P30 Soil Science and Management

172. Verma, M.L. (Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Shimla (India). Regional Horticultural Research Station); Acharya, C.L. (Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur (India). Dept. of Soil Science). Soil moisture conservation, hydrothermal regime, nitrogen uptake and yield of rainfed wheat as affected by soil management practices and nitrogen levels. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 69-73 KEYWORDS: SOIL MANAGEMENT;

SOIL WATER CONTENT; RAINFED FARMING; SOIL TEMPERATURE; MULCHING; YIELDS; TRITICUM AESTIVUM; NUTRIENT UPTAKE; NITROGEN.

Field experiment was conducted to study the effect on soil managemet practices such as, presowing irrigation and conventional tillage (PSICT), tillage after harvest (T AH), conventional tillage -with Lantana camara incorporation (CTLNi), minimum tillage with'mulch of lantana (MTLNM) 'and conventional tillage with mulch of lantana (CTLNM) and nitrogen levels(O, 60, 120 kg N ha-1) on. carry-over of seed-zone moisture, dynamic changes in hydrothermal regime during crop growth, yield and nitrogen uptake of wheat crop during the years 1990-91 and 1991-92. The MULCH (mulch application after harvest of rice) treatments retained more soil moisture in all the depths as compared to TAH (tillage after harvest of rice) treatment, commonly followed by the farmers for wheat crop. The MULCH treatment conserved 7.2 and 4.7 mm more moisture per 0.30 m soil depth than TAH treatment, during the years 1990-91 and 1991-92, respectively at the time of sowing of wheat crop. The soil moisture storage and upward increase in hydraulic gradients were maximum up to 0.45 m depth in CTLNM and MTLNM (mulched) treatments and were minimum in CTLNi, T AH and PSICT (unmulched) treatments. Soil temperature was favourably moderated in mulch treatments (CTLNM and MTLNM) as compared to unmulched treatments. Nitrogen uptake and yield of grain and straw increased with nitrogen and mulch application during both the years of study.

173. Misra, U.K. (Orissa Universisty of Agriculture and Technology, Bhubaneshwar (India). Dept. of Soil Science and Agricultural Chemistry). Acid soil and its management. Journal of the Indian Society of Soil Science (India). (Dec 2004) v. 52(4) p. 332-343 KEYWORDS: ACID SOILS; SOIL MANAGEMENT; SOIL CHEMISTRY; SOIL CLASSIFICATION.

P32 Soil Classification and Genesis

174. Kumari, S.R.; Murthy, J.S.V.S.; Chamundeswari, N. (Regional Agricultural Research Station, Guntur (India). Species suitability in cotton to different agro-ecological situations in Andhra Pradesh. Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 583-586 KEYWORDS: GENOTYPES; SPECIES; AGRONOMY; HIRSATELLA; HERBACEOUS PLANTS; HYBRIEDS; SOIL FERTILITY.

Field investigations were conducted at six agro-ecological situations in Andhra Pradesh to identify the suitable cotton species/ genotypes viz., arboreums, herbaceums, hirsutums, intra hirsutum and inter specific hybrids, In deep soil + high rainfall (51) and medium soil + high rainfall (53) situations arboreums; in medium soil + low rainfall (54) and shallow soil + high rainfall (55) situations hirsutums and in deep soil + low rainfall (52) and shallow soil + low rainfall (56) situations intra hirsutum hybrids performed well. When compared over species, irrespective of rainfall, highest seed cotton yield was produced in deep soil (18.16 q/ha), followed by medium and shallow soils (6.73 and 6.79 q/ha, respectively). Irrespective of soil type under high rainfall situation, arboreums recorded highest seed cotton yield of 21.62 q/ha whereas in low rainfall situation intra hirsutum hybrids performed well (5.92 q/ha).

175. Singh, H.P. (Narendra Deva University of Agriculture and Technology, Faizabad (India). Directorate of Research); Singh, T.N. (Crop Research Station, Faizabad (India). Associate Director of Research). Enhancement in zinc response of rice by magnesium in alkali soil.

Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 158-161 KEYWORDS: CARBONATE DEHYDRATASE; SOIL PH; MAGNESIUM; ZINC; CHLOROPHYLL.

Plants of two mtmgbean genotypes MH 85-111 and Mli 98-6 were exposed to different levels of cadmium 28 days after sowing. Plants exposed to 3.0 and 4.0 mM Cd+2 did not survive and died before entering into reproductive phase. Cadmium induced reduction in the number of flowers and in vitro pollen germination but did not affect pollen viability. However, it stimulated tube growth. Cadmium although did not affect pistil length, it decreased number of ovules/ pistil. Ovules were morphologically normal and receptive. In vivo stylar studies revealed all the ovules were not penetrated by pollen tube and number of unpenetrated proximal ovules was increased by Cd+2 and cv. MH 85-111 was affected more adversely than MH 98-6. Cadmium inhibited number of pods, seeds, seed weight / plant and 100 seed weight, inhibition being more in MH 85-111 than MH 98-6. Cadmium treatment did not affect starch content but increased protein content in physiologically mature seeds. Accumulation of Cd+2 was maximum in the roots and least in the seeds. Cadmium accumulation, in general was higher in MH 85111 than MH 98-6 and stem of MH 85-111 accumulated four times Cd+2 than MH 98-6. Seed cadmium however, was comparable in both the genotypes.

176. Dutta, D.; Sarkar, D.; Banerjee, S.K. (National Bureau of Soil Survey and Land Use Planning (ICAR), Kolkatta (India). Regional Centre); Banerjee, S.K. (Tropical Forest Research Centre, Jabalpur (India). Investigations on non-functioning of podzolisation in Darjeeling region of Himalayas. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 56-62 KEYWORDS: SOIL GENESIS; GENETIC SOIL TYPES; SOIL CHEMICOPHYSICAL PROPERTIES; UTTAR PRADESH; HIMALAYAN REGION; SOIL MORPHOLOGICAL FEATURES.

The soils of Darjeeling Himalayan region occurring in the high altitude zones under different coniferous vegetations were studied for their pedogenesis through study of the physico-chemical characteristics, the translocation and deposition of Fe, Al and humus in the B-illuvial horizons. The soils were extremely acid' (pH-3.7) to very' strongly 'acid (pH-5.0) in reaction with the organic carbon varying from 26.7 to 58.8 g kg-l in surface mineral horizon and 3.9 to 44.2 g kg-l in deeper horizons. ' The total N of soils varied from 0.01 to 0.41 percent and the C/N ratio narrowed down with depth. Exchangeable cations were present in the order Ca++ Mg++ K+ Na+ reflecting the decreasing energy of adsorption by the complex and increasing mobility of ions. The distribution of dithionite and pyrophosphate extractable Fe and Al showed no zone of marked accumulation of these constituents in any of the six pedons. 'The same was true in case of humus also. There was limited migration of Fe and Al bound with humus as evidenced by pyrophosphate extraction. However, the ratio of per cent Fep and Alp to per cent clay was less than 0.2 or percent (Fep + Alp) to percent (Fed + AId) slightly less than 0.5, thereby confirming the absence of spodic horizon. The study revealed that pedons showed limited downward migration of Fe and Al along with humus and the process of podzolisation was in juvenile stage. The soils were podzolic in nature on account of limited migration of Fe-AI and humus. The soils were classified as Humic Dystrudepts, Humic Pachic Dystrudepts and Typic Haplohumults.

177. Sharma, V.K. (Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur (India). Dept. of Soil Science); Sharma, P.D. (Indian Council of Agricultural Research, New Delhi (India); Sharma, S.P. (Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur (India). Dept. of Soil Sciece); Acharya, C.L. (Chaudhary

Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur (India). Directorate of Extension Edn.); Sood, R.K. (Himachal Pradesh Remote Sensing Cell, Shimla (India). Characterization of cultivated soils of neogal watershed in North-West Himalayas and their suitability for major crops. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 63-68 KEYWORDS: SOIL CLASSIFICATION; SOIL CHEMICOPHYSICAL PROPERTIES; ARABLE SOILS; SOIL MORPHOLOGICAL FEATURES; SOIL TYPES; WATERSHEDS; HIMALAYAN REGIONS; HIMACHAL PRADESH; SOIL FERTILITY.

Six typical pedons representing cultivated soils of Neogal watershed in North-West Himalayas occurring on river terraces and hill slopes viz. Baun, Talinu, Phata, Gopalpur, Bhattu and Mahadev were studied for their morphological characteristics and physico-chemical properties and suitability for locally preferred crops. The soils are acidic in reaction, non-calcareous, coarse to fine loamy in particle size class, mixed in mineralogy and medium to very deep and have thermic soil temperature and udic soil moisture regimes. The soil texture, pH (I:2.5), organic carbon, CEC, base saturation, water retention at 33 and 1500 kPa ranged from loamy s,and to clay loam, 5.2 to 6.2, 3.2 to 9.5 g kg-I, 4.9 to 14.3 cmol (p+) kg.I, 46 to 77 percent , 4.2 to. 3L2 percent and 2.6 to 16.8 percent, respectively. Taxonomically, the soils .on moderately sloping hill slopes and gently sloping streams/ side (Baun and Phata) belong to Typic Udorthents and Typic Udipsamments and those on gently to moderately sloping river terraces (Talinu, Gopalpur, Bhattu and Mahadev) are classified as Typic Dystrudepts and Typic Hapludalfs subgroups, respectively. The agricultural land of the watershed qualifies for land capability class III and land irrigability classes 3 and 4. Mahadev soils are highly suitable for locally preferred crops viz. paddy, maize, wheat and potato but Bhattu soils for maize, potato and wheat and Talinu soils for maize and wheat only. The remaining soils are suitable to marginaHy suitable for these crops. Mahadev, Bhattu and Gopalpur soils are highly suitable to suitable, while other soils are moderately to marginally suitable for tea gardening. The coefficient of improvement of soils varied from 1.7 to 3.2 for agricultural crops and 1.5 to 5.2 for plantation crops (tea) and suggests for adopting judicious soil and water management practices to sustain crop productivity on thdse soils.

P33 Soil Chemistry and Physics

178. De, B.K.; Mandal, A.K.; Basu, R.N. (Calcutta University, Calcutta (India). Dept. of Seed Science and Technology). Pre-sowing aerated and non-aerated hydration treatments for improved field performance of wheat. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 133-138 KEYWORDS: SOWING DATE; TRITICUM AESTIVUM; AERATION; HYDRATION; GERMINABILITY.

Pre-sowing hydration of wheat (Triticum aestivum L.) seeds (high-medium vigour) fOr 6-8h with or without aeration significantly improved field emergence and yield of the crop per unit area over untreated control. Prolonged soaking showed adverse effect on germinability, field performance and productivity. A marginal beneficial effect on yield and yield attributes was noted in the aerated hydration treatment for 6-8b over the non-aerated hydration treatment (6-8h). Among the aerated hydration treatment, 8.12h proved more effective in improving field performance and productivity. The efficacy of aeration (oxygen) on field emergence and yield was more prominent in the long-term soaking duration (24-72h) but never surpassed the value of short-term (6-8h) non-aerated hydration. It may be pointed out that if the storage conditions are reasonably good then short-term pre-sowing hydration

for 6-8h with or without aeration.followed by light air-drying to facilitate sowing in the field may be suggested for the improvement of crop performances.

179. Das, M. (Water Technology Centre for Eastern Region, Bhubaneswar (India)). Alliance among hydro-physical and physico-chemical properties of soil. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 1-5 KEYWORDS: SOIL CHEMICOPHYSICAL PROPERTIES; SOIL HYDRALIC PROPERTIES; SOIL WATER RETENTION; SOIL ANALYSIS.

Estimation of water retention characteristics, penetrability, weighted mean diffusivity and cation exchange capacity (CEC) of soil is difficult though imperative to characterize any soil and study the soil water relation. Threfore, with the measured values of clay, organic and humus carbon, pore space, coarse sand, soil volume expansion, pH, saturated hydraulic conductivity and absolute specific gravity of twelve different soils, l}near, quadratic and logarithmic regressions were evaluated separately in different relevant combinations for determining the above properties. Validation of relations reveals that linear and quadratic regressions with known values of clay, organic carbon and pore space / soil volume expansion determine the wilting point successfully, while quadratic relation was only found suitable to determine the field capacity of soil. Quadratic equation develope4 from clay and pore space per cent with organic / humus carbon can be used to determine available water capacity and penetrability of soil. However, the CEC of soil, derived from all regression functions developed on clay content, organic carbon, and soil volume expansion / pH, was found in good agreement with the actual value. The study thus provides some easy alternatives to be utilized. Appropriately for precise evaluation of important hydro-physical and physiCo-chemicarsoil properties.

180. Lama, T.D. (Indian Council of Agricultural Research, Research Complex for North Eastern Hill Region, Umiam (India); Mallick, S.; Sanyal, S.K. (Bidhan Chandra Krishi Viswavidyalaya, Mohanpur (India). Dept. of Agricultural Chemistry and Soil Science)). Solute transport and retention in some soils of West Bengal. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 5-11 KEYWORDS: SOIL HYDRAULIC PROPERTIES; SOIL TYPES; PERMEABILITY; SOLUTES; WEST BENGAL; SOIL WATER RETENTION; SOIL TRANSPORT PROCESSES.

Solute transport involving passage of aqueous electrolytes, namely KCI, K2S04 and MgCl2 in vertical columns of soils from four locations, namely Baruipur, Gayeshpur, Kalimpong and Matimahal at two different compaction levels has been studied. The experimental data were analysed to obtain the hydraulic conductivity, solute accumulation and breakthrough curves for the aqueous electrolytes in the given soils. The hydraulic conductivity of .the aqueous electrolytes through the soils decreased with the increase in compaction. Baruipur soil having high clay and organic matter contents gave distinctly lower values of hydraulic conductivity for K2S04 than those for KCl. The values of solute accumulation parameter 'r' for Baruipur and Gayeshpur soils were greater than those for other soils for each solute over the entire permeation period. This may be due to the presence of smectitic and illitic clay minerals having high specific surface area. The value of 'r' in all the soils was greater for the passage of aqueous potassium salts as compared to aqueous MgCI2. This may have arisen from the presence in these soils of considerable amounts of illitic minerals having a high degree of specificity for retaining K+ ions. The sigmoid shape of the breakthrough curves (BTCs) for the electrolytes indicated hydrodynamic dispersion. The shifting of the BTCs to the left of the inflexion point suggested the preferential flow of solute in the large pores.

The shift was minimum for the Matimahal soil having lowest clay and organic matter contents. On the other hand, the shifting was greater for Kalimpong soil than for Baruipur soil despite the fact that the former had lower clay and organic matter contents, possibly due to greater size of aggregates in the former. The present study also revealed that the increase in compaction level resulted in a greater degree of the aforesaid shifting of the inflexion point of the breakthrough curves.

181. Dhillon, N.S.; Dhesi, T.S.; Brar, B.S. (Punjab Agricultural University, Ludhiana (India). Dept. of Soils)). Phosphate sorption-desorption characteristics of some ustifluvents of Punjab. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 17-22 KEYWORDS: PHOSPHATES; SORPTION; DESORPTION; SOIL PROPERTIES; SOIL TYPES; PUNJAB; FLOOD PLAINS.

A laboratory study conducted on 19 soils collected from flood plain areas of Punjab showed that the amount of phosphate sorption and desorption increased with increase in amount of P added and it varied with various soil properties viz. clay, CaC03, Fe and Al oxides etc. Most of these' soils were adsorbing more than 150 mg P kg-l soil. Sorption parameters such as sorption maxinia, buffering capacity and bonding energy constant related mainly to CaCO~, free Fe oxides, silt, clay 'and exchangeable Mg. The values of mobility constant (Kd) correlated significantly with clay (r = 0.467*), exchangeable Ca (r = 0.503*) and exchangeable Mg (r =0.648**). Organic carbon (r = 0.870**) and exchangeable Fe (r = 0.680**) showed highly significant relationship with maximum phosphate-desorption (Om). Supply parameter, maximum buffering capacity and bonding energy constant are important sorption parameters which control P availability to berseem in these soils.

182. Thakur, S.K.; Tomar, N.K.; Pandeya, S.B. (Rajendra Agricultural University, Samastipur (India). Dept. of Soil Science, Sugarcane Reasearch Institute)). Sorption of phosphatre on pure and cadmium-enriched calcium carbonate and clay. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 23-28 KEYWORDS: PHOSPHATES; SOIL PROPERTIES; CADIUM; SORPTION; SOIL TYPES; CALCIUM CARBONATE; CLAY.

Laboratory investigation was carried out to study the effect of cadmium pretreatment of pure calcium carbonate and clay isolate of a Typic Haplustept on their phosphate sorbing ability' to elucidate the mechanism of phosphoms mobility and avaiiability in the cadmium-contaminated soils. For cadmium enrichment CaC03 and clay were treated with CdClz solution 'containing 10-4 and 10-3 , mol Cdz+ L-I and incubated for 48 h. The cadmium untreated and treated CaC03 and clay were used as P sorbents. Distribution coefficient (Kd) and the percentage of added phosphate sorbed (XAd) decreased with increasing solution P concentration and Cd enrichment. The Kd decreased with increasing phosphate sorption (x/m). Phosphate sorption by CaC03 and clay was satisfactorily described by two-surface Langmuir and Freundlich adsorption isotherm equations. The adsorption maxima and bonding energy constants were calculated in accordance with two surface-Langmuir equation of Syers et al. (1973). The values of P sorption maxima (bl and bz) decreased and bonding energy (kJ and kz) increased with increasing Cd levels but the effect was more pronounced on bz and kz rather than bl and kJ. The enrichment of CaC03 and clay with 10-4 mol Cdz+ decreased bJ by 20.62 and 22.94 and bz by 72.65 and 24.80 percent, while at 10-3 mol Cdz+ level bl decreased by 43.26 and 33.76 percent and bz by 91.97 and 44.02 percent over corresponding bJ and bz by original CaC03 and clay. Freundlich constant K decreased and then increased with increasing Cd levels.

183. Das, P.K. (Orissa University of Agriculture and Technology, Sambalpur, (India). College of Agriculture); Sahu, S.K.; Acharya, N. (Orissa University of Agriculture and Technology, Bhubaneswar (India). Dept. of Soil Science and Agricultural Chemistry)). Sulphate adsorption characteristics of some alfisols of Orissa. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 34-42 KEYWORDS: SOIL TYPES; LUVISOLS; SOIL CHEMICOPHYSICAL PROPERTIES; SULPHATES; ADSORPTION.

Sulphate adsorption characteristics of the surface soils and sub-soils of five Alfisols of the state were studied. Adsorption of SOl was higher in the sub-soils than in the surface soils which was attributed to higher clay, free Fez03, exchangeable Caz+ + Mgz+ and lower organic matter contents In the former than in the latter~ Free Fez03 had the dominant role in SO/- adsorption, followed by clay' and exchangeable Caz+ + Mgz+. These three factors along with free Alz03, pHw and organic carbon jointly contributed 99.2 to 99.9 per cent of variations in SOl adsorption at different levels of S04Z-S added, Equilibrium buffering capacity and maximum buffering capacity for SO/--S increased, whereas supply parameter of SOl-S decr'eased from surface to the sub-soils.

184. Sidhu, A.S. (Punjab Agricultural University, Bathinda (India). Regional Research Stn.); Narwal, R.P. (Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Soil Science); Brar, J.S. (Punjab Agricultural University, Bathinda (India). Regional Research Stn.)). Adsorption-desorption behaviour of lead in soils amended with different organic materials. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 43-49 KEYWORDS: ADSORPTION; SOIL TYPES; ORGANIC AMENDMENTS; DESORPTION; LEAD; SOIL AMENDMENTS; SOIL CHEMICOPHYSICAL PROPERTIES.

A laboratory experiment was conducted to study the adsorption-desorption behaviour of lead in sandy loam Typic Haplustept and sandy Typic Ustipsamment amended with different organic materials. The resu1ts indicated that the Pb adsorption was concentration-dependent in both the soils. Relatively higher amounts of added Pb were adsorbed (4.70-4.75 mg 100g'l) in sandy loam than in sandy soil (3.65-4.05 mg 100g-1), amended with different organic materials at lower concentration of the former in the equilibrium solution. The highest amount of 4.75 mg Pb 100g-1 was adsorbed in the FYM-amended soil. The desorption of Pb increased with increased concentration of Pb in equilibrium solution. Higher amount of Pb was desorbed by CaCl2 from the samples where more Pb was retained in soil. More desorption was observed from sandy soil than that from sandy loam soil. However, complete desorption did not take place by 0.002 M CaCl2 in any case. Thus amendment of a soil with any type of organic material reduces the desorbability of Pb from the soil which suggests less Pb availability.

185. Bandyopadhyay, B.K.; Sarkar, P. (Central Soil Salinity Research Institute, Canning Town (India). Regional Research Stn.); Sen, H.S. (Central Research Institute for Jute and Allied Fibres, Barrackpore (India); Sanyal, S.K. (Bidhan Chandra Krishi Viswavidyalaya, Nadia (India). Influence of soil properties on arsenic availability in soil. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 50-55 KEYWORDS: SOIL CHEMICOPHYSICAL PROPERTIES; ARSENIC; NUTRIENT AVAILABILITY; SOIL TYPES; WEST BENGAL.

The effect of soil properties, namely, texture, soil moisture regime, salinity, available P, Fe, Zn and organic matter content on available arsenic content in soil was investigated in the laboratory' incubation studies. The soils used were those from Baruipur and Canning in the

district of South 24-Parganas, West Bengal, representing coastal soils (Typic Haplaquept) of the Indo-Gangetic alluvial plains. The Baruipur soil was loam in texture while the Canning soil was a silty clay. Results indicated that the increase in the arsenic availability in soil with rates of added arsenic was more in coarse textured soil than in the fine textured one. The available arsenic (extracted with 0.05 M NaHC03, pH 8.5) content of soil increased in presence of added phosphatic fertilizer, organic manure, salinity and under waterlogging, while it decreased with application of Fe and Zn fertilizers as well as on drying of soil. Application of Fe fertilizer appeared to be relatively more effective in reducing arsenic availability in soil. Application of high doses of P fertilizer and organic manure to arsenic contaminated soils should be restricted to avoid enhanced availability of soil arsenic. It appeared that inappropriate management of arsenic affected soils or those irrigated with arsenic contaminated water might increase the arsenic availability in soil, which, in turn, might aggravate the arsenic contamination of crops grown.

186. Laxminarayana, K. (ICAR Research Complex for North Eastern Hill Region, Umiam (India); Rajagopal, V. (Acharya N.G. Ranga Agricultural University, Hyderabad (India). Dept. of Soil Science and Agricultural Chemistry)). Estimation of critical levels of available P for predicting response of paddy to applied P in submerged soils. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 74-79 KEYWORDS: SOIL ANALYSIS; SOIL TYPES; REDOX POTENTIAL; SOIL CHEMICOPHYSICAL PROPERTIES; PHOSPHORUS; RICE; FRACTIONATION.

The available P status of intensively rice growing soils of Andhra Pradesh was evaluated by different methods both in air-dry and submerged soils. The redox potential became negative (-37 mY) at 28 days of submergence, attained the lowest value (-165 mY) at 49 days of submergence and remained almost constant thereafter. It was observed that the submergence of the soils increased the available P status due to an increase in iron phosphate, occluded phosphate and calcium bound phosphate. The- Fe-P and AI-P significantly" contributed to the available P pool in submerged soils and Fe-P was the major contributing P fraction to the P nutrition of rice. The traditional Olsen's method was found to be much superior to the other methods as it showed highest significant relationship with all the plant growth parameters with a critical level of 33.5 kg PPs ha-1. Since Olsen's method extracted Fe-P and AI-P at peak submergence, which are also the main sources for P uptake by rice, the determination of available P at submergence by this method may be a better index for computing fertilizer P recommendations for rice.

187. Jena, D.; Jena, M.K.; Pattanayak, S.K.; Sahu, D.; Mitra, G.N. (Orissa University of Agriculture and Technology, Bhubaneswar (India). Dept. of Soil Science and Agricultural Chemistry)). Evaluation of compacted phosphoate rocks for maize-mustard cropping sequence in a typic haplaquept of North Eastern ghat zone. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 80-84 KEYWORDS: ROCK PHOSPHATES; SOIL ANALYSIS; YIELDS; SEQUENTIAL CROPPING; MAIZE; MUSTARD; EFFICIENCY; AGRONOMIC CHARACTERS; ACID SOILS; NUTRIENT UPTAKE.

A field experiment was conducted under maize-mustard cropping sequence grown on moderately acidic soil to evaluate the efficiency of Jhamarkota phosphate rock (JPR) compacted with mono-ammonium phosphate (MAP), MAP + Sulphur (S) and single super phosphate (SSP) along with granular MAP and granular SSP. The highest grain and stover yields of maize were recorded in granular MAP treatment closely followed by compacted

fertilizer treatments. However, in mustard crop, MAP + S and SSP compacted sources out yielded water soluble P sources. Considering both the crops in sequence, MAP + S and SSP compacted P sources were found to give higher crop yields and better agronomic efficiency compared to other P sources. Both compacted and water soluble P sources significantly influenced the P, Sand Ca uptake by crops over lone phosphate rock sources. The apparent phosphorus recovery (APR) from granular MAP was highest followed by granular SSP and compacted P sources with SSP, MAP+S and MAP.

188. Patel, K.P.; Pandya, R.R.; Maliwal, G.L.; Patel, K.C.; Ramani, V.P.; George, V. (Gujarat Agricultural University, Anand (India). Micronutrient Project)). Heavy metla content of different effluents and their relative availability in soil irrigated with effluent waters around major industrial cities of Gujarat. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 89-94 KEYWORDS: SOIL ANALYSIS; WASTE WATER; SOIL; HEAVY METALS; TRACE ELEMENTS; IRRIGATION; GUJARAT; NUTRIENT AVILABILITY.

The discharge of effluents from the industries situated around the major cities of Gujarat to nearby rivers or open land is of great concern with respect to soil-plant-water pollution as the farmers around these areas are using effluents or contaminated river I well water for irrigation purpose. Since these effluents contain high amount of trace elements and other pollutant heavy metals, a study was conducted to characterize and assess their suitability for irrigation. The soil, plant, effluent and well-water samples collected were analysed for the relevant parameters. The COD value of effluents from Ankleshwar site 'was extremely high, while the BOD values were within the safe limit in all the cases. - The effluents from Ankleshwar site were the most polluted with respect to different elements viz., Fe, Cu, Mn, Cd, Ni, Co and Cr. The dis:solved oxygen was observed only in well-water and not in effluents. The results of relative availability of trace and heavy metals indicated that Cu, Pb, Zn and Cd were the most available elements in different soils. However, the soils continuously irrigated with effluents showed the highest Cu availability and Mn, Cu, Cd and Ni moderately available, while Fe and Cr indicated low availability. The relative availability of Pb was highest in soils near Ahmedabad and Ankleshwar irrigated with sewage mixed with industrial effluent. The availability of Zn was found to be more in soils having acidic soil reaction. Among different soil properties, organic carbon showed significant positive correlation with most of the trace and heavy metals and was found to be the most influential parameter on availability of these elements followed by soil pH and EC. The content of Cr in different crops grown on polluted soils was very high in spite of its low level in all the soils.

189. Moafpouryan, G.R. (Agriculture Research Centre, Shiraz (Iran); Shukla, L.M. (Indian Agricultural Research Institte, New Delhi (India). Div. of Soil Science and Agricultural Chemistry)). Forms of boron in inceptisols of Delhi and their relationships with soil characteristics and sunflower plant parameters. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 109-111 KEYWORDS: SOIL CHEMICOPHYSICAL PROPERTIES; SOIL ANALYSIS; BORON; SOIL TYPES; HELIANTHUS ANNUUS; PLANT NUTRIENT; SUNFLOWERS.

190. Ghafoor, A.; Qadir, M.; Sadiq, M.; Murtaza, G. (University of Agriculture, Faisalabad (Pakistan); Brar, M.S. (Punjab Agricultural University, Ludhiana (India). Dept. of Soils)). Lead, copper, zinc and iron concentrations in soils and vegetables irrigated with city effluent on

urban agricultural lands. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 114-117 KEYWORDS: SOIL ANALYSIS; URBAN WASTES; IRRIGATION; LEAD; COPPER; ZINC; SOIL TYPES; VEGETABLES; FARM LAND; URGAN AGRICULTURE.

P34 Soil Biology

191. Dhakad, A.; Rajput, R.S.; Mishra, P.K.; Sarawagi, S.K.; Joshi, B.S. (Indira Gandhi Agricultural University, Raipur (India). Dept. of Agronomy). Effect of crop geometry and nitrogen management on yield and yield attributes of wheat + chickpea intercropping system. Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 567-570 KEYWORDS: INTERCROPPING; YIELD; NITROGEN; MANAGEMENT; GROWTH.

Field experiInent was conducted at Research farm ofIGAU, Raipur during rabi 2002-03 to find out the crop geometry and nitrogen management on yield and yield attributes of wheat + chickpea cropping system. Result revealed that-yield and yield attributing character viz., ear plant-I, grain ear-I, ear weight and 1QO,grain weighrwere higher under sole crop sown at 20 cm spacing as compared to cross sowing. In case ofirtercropping 4:2 row ratio with 80 kg N ha-Iperformed well among the yield and yield attributing character of wheat. In case o(chickpea, sole crop sown at 30 cm spacing with 80 kg N ha-I gave better result over 20 cm spacing but in intercropping 2:2 row ratio, with 80 kg N ha-I gavehigfier yield and yield attributing character as compared to 2:1 and 4:2 row ratio.

192. Sharma, V.; Kanwar, K.; Dev, S.P. (Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Sirmour (India). Regional Research Stn.)). Efficient recycling of obnoxious weed plants (Lantana camara L.) and congress grass (Parthenium hysterophorus L.) as organic manure through vermicomposting. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 112-114 KEYWORDS: COMPOSTING; RECYCLING; LANTANA CAMARA; OLIGOCHAETA; WEEDS; ORGANIC MATTER; ORGANIC WASTES; EUDRILUS; ORGANIC FERTILIZERS.

P35 Soil Fertility

193. Sairam, A. (Horticulture Polytechnic, Adilabad (India); Reddy, A.S. (College of Agriculture, Hyderabad (India). Dept. of Agronomy). Influence of integrated nutrient management of nutrient uptake and soil fertility of rice-mustard cropping system on a vertisol. Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 587-589 KEYWORDS: NUTRIENT MANAGEMENT; NUTRIENT UPTAKE; SOIL FERTILITY; VERTISOLS.

A field study was conducted for three consequent years on a clayey soil to study the effect of integrated nutrient management on nutrient uptake and soil properties in rice-mustard cropping system. Among the different organic sources of N for rice, glyricidia and FYM in conjunction with inorganic fertilizers proved significant in enhancing the nutrient uptake. Rice straw was proved to be inferior. Buildup of organic carbon, available Nand P were observed in manurial plots. K depletion was observed in all the treatments.

194. Azmi, N.Y.; Singh, A.P.; Sakal, R.; Ismail, M. (Rajendra Agricultural University, Samastipur (India). Dept. of Soil Science)). Long-term influence of intensive cropping and fertility levels on the build up of sulphur and its influence on crop performance. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 85-88 KEYWORDS:

INTENSIVE FARMING; SULPHUR; SOIL FERTILITY; CROP PERFORMANCE; CROP ROTATION; NUTRIENT UPTAKE; YIELDS.

The studies on long-term influence of four fertility levels and management practices under rice-wheat-sorghum and rice-mustard-mungbean rotations on soil fertility build-up and the yield of crops are being carried out in a Calciorthent. Increasing fertility levels significantly increased the crop yield and S uptake under both rotations. Depth-wise distribution of available S was also studied from the same experiment and the results revealed that high fertility level increased the available S at all the soil depths investigated. However, at medium and high fertility, available S was almost equal beyond 30-45 cm depth under rice-wheat-sorghum rotation. Higher fertility reduced leaching losses to some extent. Accumulation of available Sunder rice-wheat-sorghum rotation was higher at all the depths as compared to rice-mustard-mungbean rotation due to higher amount of S added under the former rotation. However, S movement down the depth was more in case of rice-wheat-sorghum rotation. Rice-mustard-mungbean rotation removed more S from surface soil but at the same time it restricted the downward movement up to only 45 cm. Under dummy situation at higher fertility levels, though the available S was higher at almost all the depths but there was slow movement of available S down the depth.

195. Sharma, D.R.; Minhas, P.S. (Central Soil Salinity Research Institute, Karnal (India)). Soil properties and yields of upland crops as influenced by the long term use of waters having variable residual alkalinity, salinity and sodicity. Journal of the Indian Society of Soil Science (India). (Mar 2004) v. 52(1) p. 100-104 KEYWORDS: UPLAND CROPS; COTTON; PEARL MILLET; SALINITY; BRACKISH WATER; SOIL CHEMICOPHYSICAL PROPERTIES; CROP ROTATION; WHEAT; ALKALINITY; SALINE WATER.

Long term effects of irrigation with waters varying in residual alkalinity (RSC 5 and 10 me L-I), salinity (5Ciw 2 and 4 dS mol), sodicity (SARiw 10,20 and 30 mmol L-1I2) and anionic composition (HC03 vs Cl-S04) were evaluated in lysimeters filled with a silt loam soil (Typic Haplustalf). The crop rotation was cotton-wheat for initial 4 years (1991-95), followed by pearl-millet (fodder)-wheat for another 7 years (1995-2002). The rainfall varied from 7-23 and 39-107 cm during rabi and kharif seasons, respectively. Build-up of sodicity (SARe) in soil in general was more where waters of higher salinity but of similar SAR were used. Similarly, for the same adj. RNa of water, sodication was morewith HC03-type water as compared with Cl-S04 ones. Increase in soil pH was related to RSC rather than to SAR. Progressive build-up in salts (ECe 1.2-5.8 dS m-I), sodicity (SARe 5.6-38.5) and ,goil pHs (8.10-8.66) monitored during cotton-wheat rotation were either curtailed or even got reduced as a consequence of shifting to pearl millet-wheat rotation. Sodicity build-up was also related to duration of irrigation both in cotton (R2 = 0.64*) and wheat (R2 = 0.81 **) but was negated by the quantum of rainfall received during kharif (R2 = 0.67*). Similarly, increase in leaching fraction (LF) and rainfall during kharif reduced SARe build-up during wheat (R2 = 0.68). Decline in yield of kharif crops (cotton/pearl millet) ranged from 9 to 36 percent when referenced to good quality water. Reductions in yields of pearl millet were comparatively more than those of cotton while no effect was observed in case of wheat. In general, the yields of wheat could be sustained (90 percent) with waters of ECiw4 dS m-I, SAR30 and RSC10 and of cotton/ pearl millet (80 percent) with water of ECiw4 dS m-l, SAR20 and RSC5.

P36 Soil Erosion, Conservation and Reclamation

196. Upreti, K.K.; Murti, G.S.R. (Indian Institute of Horticultural Research, Bangalore (India). Plant Hormones Lab.). Water stress induced changes in common polyamines and abscisic acid in french bean. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 145-150 KEYWORDS: POLYAMINES; FRENCH BEAN; ELECTROLYTES; DROUGHT STRESS; ABA.

The effects of water stress imposed at flowering stage on the leaf relative water content (RWC), electrolytic conductivity and levels of polyamines and abscisic acid (ABA) in three cultivars of french bean differing in drought tolerance were studied. Amongst the cultivars, tolerant cv. Contender showed lesser decline in RWC and maintained stable electrolyte leakage than the suiceptible cv. Arka Suvidha. The effect of stress on polyamines content depended upon cultivars and stress severity. Putrescine content increased under 3 and 6 days stress condition but declined under 9 days. Increase in putrescine was more prominent in susceptible cv. Arka Suvidha under 3 days stress and in the tolerant cv. Contender under 6 days stress. In the 9 days stressed plants, the decline in this polyamine was marked in the tolerant cultivar. The spermidine content showed a declining trend in all the cultivars following increased duration of stress, with tolerant cv. Contender showing lesser changes. In contrast, the spermine content increased progressively with stress in all the cultivars, and the tolerant cv. Contender maintained high levels in the stressed plants. The abscisic acid (ABA) content that increased gradually with increasing durations of stress showed a pattern similar to spermine. Putrescine and spermidine contents in stressed plants did not show any relationship with electrolyte leakagelRWC while spermine content was positively related to ABA content. The possible role of spermine in wafer stress tolerance has been, discussed.

U40 Surveying Methods

197. Ansari, M.D.S. (Indian Institute of Pulses Research, Kanpur (India). Agric. Extn.); Mahey, R.K. (Punjab Agricultural University, Ludhiana (India). Dept. of Agronomy). Relationship between spectral reflectances and agronomic parameters of cotton (Gossypium species). Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 603-608 KEYWORDS: SPECTROMETRY; REFLECTANCE; GOSSYPIUM SPECIES; GROWTH; LEAF AREA; REMOTE SENSING.

Remote Sensing (RS) is a tool to monitor crop growth and its condition assessment. To study the spectral reflectance characteristics of cotton crop throughout its crop growth developmen~cle and understand the relationship between agronomic parameters and spectral reflectances of cotton crop, a field experiment was conducted on American cotton (Gossypium hirsutum) cv. F 864 and Desi cotton (G. arboreum) cv. LD 327 during 1997-98 kharif season on a sandy loam soil at the Punjab Agricultural University, Ludhiana (punjab). Results showed that the leaf area index (LAI) and leaf dry matter follow the same 'curve trend with the Infra Red (IR) reflectance and just opposite trend with Red reflectance throughout growth period. The plant height, total dry matter, stem, root and reproductive dry matter follow the curve of IR and opposite with Red reflectance upto 110 DAS in American cotton species (25 per cent boll opening) as well as in Desi cotton species (initiation of boll opening). Leaf dry matter tends to follow the curve more than any other dry matter partitioning in both spectral reflectances throughout crop growth cycle. Hence, agronomic parameters like LI, leaf biomass, plant height, total dry matter and dry matter-partitioning needs to be monitored during crop growth cycle with red and IR reflectances.

198. Chakraborty, D. (Indian Agricultural Research Institute, New Delhi (India). Div. of Agric. Physics); Dutta, D. (Central Arid Zone Research Institute, Jodhpur (India). RRSSC(ISRO/DOS); Singh, A.; Chandresekharan, H. (Indian Agricultural Research Institute, New Delhi (India). Water Technology Centre). Satellite remote sensing approach for the health of an arid watershed in Western Rajasthan. Annals of Agricultural Research (India). (Dec 2004) v. 25(4) p. 609-614 KEYWORDS: SATELLITE; WATERSHEDS; HEALTH; VEGETATION; LAND USE.

The utility of remote sensing data pertaining to pre-treatment (1988) and post-treatment (1996) periods for assessing the health of Birantya Kalan, an arid Watershed in Western Rajasthan, India, is presented in this paper. T~ has beel}l by interpreting different land use/land cover and vegetation vigour status and assignytg due weightages for them in the study area. Results indicated that the indices for land use in cover and vegetation vigour declined from 1 to 0.95 and 0.85, respectively, showing non-perce tible change in watershed health. The selected indicators of land use/land cover and vegetati vigour showed that the watershed management programme (NWDPRA) seemed to have marginal impact on checking the degradation of natural resource base in the watershed. The study provided potentialities of satellite remote sensing data in defining the health of a watershed, especially in regions of large size and with limited accessibility.

199. Panwar, P. (Uttar Banga Krishi Viswavidyalaya, Coochbehar (India). Dept. of Forestry); Bhardwaj, S.D. (University of Horticulture and Forestry, Nauni (India). Dept. of Silviculture Agroforestry). Variation in stomatal count and size due to cement dust on the leaves of Shorea robusta. Indian Journal of Plant Physiology (India). (Apr-Jun 2005) v. 10(2) p. 120-126 KEYWORDS: STOMATA; LEAF CONDUCTANCE; SHOREA ROBUSTA.

Number of stomata and their size were observed in the leaves of Shorea robusta trees growing in the vicinity of the cement factory. It was observed that number of stomata increased as the distance from the factory increased. It varied from 663.3/ mm2 (at 400m) to 821.7 / mm2 (at 10 km distance). The direction also played a role in variation of stomatal count. Stomata varied from 655.4 / mm2 (in southwest direction) to 786.6/ mm2 (in west direction). Stomatal pore area was maximum (46.80 flm2) in leaves collected from west direction of the factory and minimum (37.63 flm2) in east direction of factory. As the distance from factory increased the stomatal pore area increased from 35.41 flm2 to 47.65 flm2.

200. KOMARNENI, S. (The Pennsylvania State University, PA (USA). Dept. of Crop and Soil Science). Synthetic and modified clays for environmental cleanup: soil and water. Journal of the Indian Society of Soil Science (India). (Dec 2004) v.52(4) p. 304-313 KEYWORDS: ENVIRONMENTAL PROTECTION; ENVIRONMENTAL CONTROL; ENVIRONMENTAL MANAGEMENT; ENVIRONMENTAL POLICIES(SOIL WATER BALANCE.