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SAMPLE ENTRY

1 ← 001 Paul, P.R.C.; Xavier, F.; Leena, A. (College of Veterinary and Animal Sciences, Trissur (India), Department, of Livestock Production Management) Dairysoft: A computer programme for dairy farms. Indian Journal of Animal Sciences (India). (Mar 2006).v. 76(3) p. 260-262 KEYWORDS: DAIRY FARMS; COMPUTER SOFTWARE

2 → author(s)

3 → title in English

4 → source

5 → keywords

6 → organisation where work was carried out

To exploit the full potential of dairy sector, a computerizd record management system dairysoft was developed. Visual Basis 6.0 was used as front end while MSAccess 97 was utilized as back end for the software. The menu base dairysoft was provided with facilities for obtaining necessary reports along with separate data entry options.

1. Entry number
2. Author(s)
3. Title in English
4. Source
5. Keywords
6. Organisation where work was carried out

A50 Agricultural research

001 Anithakumari, P.; Central Plantation Crops Research Institute,Regional Station, Kayangulam (India). anithacpcrimail.com Muralidharan, K.; Central Plantation Crops Research Institute,Kasaragod (India) Kalavathi, S.; Central Plantation Crops ResearchInstitute, Regional Station, Kayangulam (India) Remabai, S.; CentralPlantation Crops Research Institute, Regional Station, Kayangulam(India). Constraints in adoption of integrated management for root(wilt)disease affected coconut areas - An analysis of Alleppeydistrict. Journal of Plantation Crops (India). (Apr 2012) v. 40(1) p.9-15 KEYWORDS: COCONUTS. CONSTRAINTS.

Analysis of the constraints faced by the farming community inroot (wilt) affected area was done during 2010-2011 at Alleppey district, Kerala, India. It was found that irrespective of the holding size only 50 percent of the coconut trees were in bearing stage whereas around one third were seedlings and one fifth prebearing stage. Adoption of recommended practices were statistically significant with the area under coconut cultivation. The farmers identified 30 major constraints which were categorized as technical, input, economic, social and biophysical constraints in order of importance. Participation of the coconut farmers in meetings related to farming was only 18.9 percent and participation in training programmes was meager and only 10 percent of the sample respondents were members in any farmer groups. The results indicated need for coconut farmers' clusters/ societies for improving technology adoption in community basis.

E10 Agricultural economics and policies

002 Jayasekhar, S.; Central Plantation Crops Research Institute, Kasaragod (India). jaysekharsahoo.co.in Jose, C.T.; Central PlantationCrops Research Institute, Regional Station, Vittal (India) Thamban,C.; Central Plantation Crops Research Institute, Regional Station, Vittal (India) Muralidharan, K.; Central Plantation Crops Research Institute, Kasaragod (India). Economic impact of arecanut based cropping systems: A study of Dakshina Kannada district-Karnataka. Journal of Plantation Crops India). (Apr 2012) v. 40(1) p. 50-55KEYWORDS: ARECA. CROPPING SYSTEMS.

The present study was to quantify the economic impact of arecanut based cropping systems in south Karnataka region. It was observed that, farmers are predominantly following three different cropping systems such as 1) arecanut+banana 2) arecanut+cocoa and 3)arecanut+banana+pepper other than arecanut alone as monocrop. These systems were compared with the arecanut monocrop and found that the percentage increase in net returns from systems 1, 2 and 3 over monocrop were 32, 40 and 44 respectively. It was observed that, the percentage adoption of arecanut monocrop was 26, while it was 36, 11 and 27 for system 1, 2 and 3 respectively. The economic impact of different cropping systems was estimated by calculating the average cost per hectare, average yield and the net returns of each cropping system. The economic impact of each system has been worked out by combining the difference in net returns of each system from the arecanut monocrop, and percentage of adoption of each cropping system. The total economic impact in monetary terms due to adoption of cropping systems in the region was found to be Rs.819 million. The methodology used in this study for quantifying the economic impact of arecanut based cropping systems could be used in other cropping systems as well.

Moreover, the quantified economic impact figures could be used as an input for formulating policy decisions related to arecanut.

003 Jayasree, A; Coconut Developement Board, Kochi (India). Changing the face of Coconut sector. Shobha paves the way. Indian Coconut Journal (India). (Mar 2012) v. LIV(11) p. 12-14 KEYWORDS: COCONUTS.

004 Remany Gopalakrishnan; Coconut Developement Board, Kochi (India). Coconut enterprises for women empowerment. Indian Coconut Journal (India). (Mar 2012) v.LIV(11) p.7-11 KEYWORDS: ENTERPRISES. COCONUTS. WOMEN. EMPOWERMENT.

005 Thamban, C.; Central Plantation Crops Research Institute, Kasaragod (India) Jayasekhar, S.; Central Plantation Crops Research Institute, Kasaragod (India) Chandran, K.P.; Central Plantation Crops Research Institute, Kasaragod (India) Muralidharan, K.; Central Plantation Crops Research Institute, Kasaragod (India). Women empowerment through coconut based micro enterprises. Indian Coconut Journal (India). (Mar 2012) v. LIV(11) p. 15-17 KEYWORDS: COCONUTS. WOMEN. EMPOWERMENT. ENTERPRISES.

006 Sona John; Coconut Developement Board, Kochi (India). If there's a will, there's a way. Indian Coconut Journal (India). (Mar 2012) v. LIV(11) p. 18-19 KEYWORDS: COCONUTS. HANDICRAFTS. TRAINING.

007 Leena, S.; Central Plantation Crops Research Institute, Kasaragod (India) Jayasree, M.P.; Central Plantation Crops Research Institute, Kasaragod (India) Manojkumar, T.S.; Central Plantation Crops Research Institute, Kasaragod (India). Women empowerment in agriculture-a Kasaragodan model. Indian Coconut Journal (India). (Mar 2012) v. LIV(11) p. 20-21 KEYWORDS: WOMEN. EMPOWERMENT. AGRICULTURE.

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009 Dorajee Rao, A.V.D.; Dr. Y.S.R. Horticulture University, Ambajipeta (India). Horticulture Research Station. Ramakrishna, Y.; Dr. Y.S.R. Horticulture University, Ambajipeta (India). Horticulture Research Station. Kalpana, M.; Dr. Y.S.R. Horticulture University, Ambajipeta (India). Horticulture Research Station. Coconut – Beyond copra, oil and water. Indian Coconut Journal (India). (Mar 2012) v.LIV(11) p. 24-29 KEYWORDS: COCONUTS. COPRA. OILS. WATER.

010 Suja P. Devipriya; Pondicherry University (India). Dept. of Ecology and Environmental Science N. Purushothaman; Kerala Agricultural University (India). Coconut Research Station. Parthenium Weed - An Alarming Threat to Coconut. Indian Coconut Journal (India). (Mar 2012) v. LIV(11) p. 30-32 KEYWORDS: PARTHENIUM. WEEDS. COCONUTS.

011 Jose, T.K.; Coconut Developement Board, Kochi (India). Let us make our country the world leader in non-traditional, value added coconut products. Indian Coconut Journal

(India). (Apr 2012) v.LIV(12) p. 2-3 KEYWORDS: COCONUTS. PRODUCTS. VALUE ADDED. WORLD MARKETS.

012 Remany Gopalakrishnan; Coconut Developement Board, Kochi (India). Technology Mission on Coconut - in support of entrepreneurs. Indian Coconut Journal (India). (Apr 2012) v. LIV(12) p. 4-7 KEYWORDS: TECHNOLOGY. COCONUTS. ENTREPRENEURSHIP.

013 Jayashree, A.; Coconut Developement Board, Kochi (India) Muralidharan, K.; Coconut Developement Board, Kochi (India). New generation Coconut Entrepreneurs. Indian Coconut Journal (India). (Apr 2012) v. LIV(12) p. 8-15 KEYWORDS: COCONUTS. ENTREPRENEURSHIP. POWDERS. SOAPS. OIL CROPS.

014 Deepthi Nair,S; Coconut Developement Board, Kochi (India). Think different, act different and that makes a difference. Indian Coconut Journal (India). (Apr 2012) v. LIV(12) p. 16-17 KEYWORDS: COCONUTS. FOOD PROCESSING. ENTREPRENEURSHIP.

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016 Unnikrishnan Nair, G.S.; Seed Garden Complex, Munderi, Malappuram. (India). Tender coconut water, the dews from heaven. Indian Coconut Journal (India). (Apr 2012) v. LIV(12) p. 28-31 KEYWORDS: COCONUT WATER. THERAPY. DWARFS. VARIETIES.

017 Jose, T.K. IAS; Coconut Developement Board, Kochi (India). Employment opportunities for FoCTs in India and abroad. Indian Coconut Journal (India). (May 2012) v. LIV(1) p. 2-3 KEYWORDS: EMPLOYMENT. INDIA.

018 Mini Mathew; Coconut Developement Board, Kochi (India)Sreekumar Poduval; Coconut Developement Board, Kochi (India). FoCT – marching ahead towards other coconut growing states. Indian Coconut Journal (India). (May 2012) v. LIV(1) p. 4-8 KEYWORDS: COCONUTS.

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030 Dr. Joseph Mercola. Coconut Oil Benefits: When Fat is Good for you. Indian Coconut Journal (India). (Jun 2012) v. LV(2) p. 24 KEYWORDS: COCONUT OIL. FATS.

031 Rajan, P.; Central Plantation Crops Research Institute,Kayangulam (India). Regional Station.Chandrika Mohan; Central Plantation Crops Research Institute,Kayangulam (India). Regional Station.Chalapathy Rao, N.B.V.; Horticultural Research Station, Ambajipeta, Andhra Pradesh. (India)George V Thomas; Central Plantation Crops Research Institute, Kasaragod (India). Scenario of Coconut eriophyid mite infestation in Andhra Pradesh. Indian Coconut Journal (India). (Jun 2012) v. LV(2) p. 25-31 KEYWORDS: COCONUTS. ERIOPHYIDAE. INFESTATION. ANDHRA PRADESH.

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033 Mini Mathew; Coconut Developement Board, Kochi (India). Coconut Ice cream Reigns over American Ice cream Industry. Indian Coconut Journal (India). (Jul 2012) v. LV(3) p. 28-31 KEYWORDS: COCONUT MILK. COCONUTS. INNOVATION. PRODUCT DEVELOPMENT.

034 Jayashree, A.; Coconut Developement Board, Kochi (India) Muralidharan, K.; Coconut Developement Board, Kochi (India). The wonder syrup from coconut. Indian Coconut Journal (India). (Jul 2012) v. LV(3) p. 32-33 KEYWORDS: COCONUTS.

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040 Vijayakumar Hallikery; Coconut Development Board, Regional Office, Banglore.. Natural drinks in the natural way. Indian Coconut Journal (India). (Aug 2012) v. LV(4) p. 10-11 KEYWORDS: COCONUTS. COCONUT WATER. MARKETS. RETAIL MARKETING.

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043 Mridula, K.; Coconut Developement Board, Kochi (India). ILA - Coonut Soda. Indian Coconut Journal (India). (Aug 2012) v. LV(4) p. 15 KEYWORDS: COCONUT WATER. COPRA.

044 Kumaravel, S; Coconut Development Board, MDIC, DelhiSingh, G.R; Coconut Development Board, MDIC, DelhiRavi Prakash; Protection of Plant Verieties and Farmers' Rights Authority, DelhiJayakumar, S; Coconut Development Board, MDIC, Delhi. Prospects of market development for non-traditional value added coconut products in & around National Capital. Indian Coconut Journal (India). (Aug 2012) v. LV(4) p. 18-21 KEYWORDS: MARKETS. COCONUTS. COPRA. COCONUT OIL. COCONUT WATER.

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047 Baby, P. O.; Coconut Developement Board, Kochi (India). Import of Vegetable oils an outlook. Indian Coconut Journal (India). (Aug 2012) v. LV(4) p. 29 KEYWORDS: PLANT OILS. PALM OILS. SOYBEAN OIL. SUNFLOWER OIL. COCONUT OIL.

048 Girijesh, G. K.; College of Agriculture, Shimoga(India)Vageesh, T.S.; College of Agriculture, Shimoga(India)Nagaraj, R.; College of Agriculture, Shimoga(India)Kumaraswamy, A. S.; College of Agriculture, Shimoga(India)Dineshkumar, M.; College of Agriculture, Shimoga(India). Vermicompost production, from ash to cash. Indian Coconut Journal (India). (Aug 2012) v. LV(4) p. 30-32 KEYWORDS: COMPOSTING. COMPOSTS. PRODUCTION. COCONUTS. INDIA.

049 Jose, T.K. IAS; Coconut Developement Board, Kochi (India). Export of Indian coconut products soaring to greater heights. Indian Coconut Journal (India). (Sep 2012) v. LV(5) p. 2-3 KEYWORDS: COCONUTS. EXPORTS. COIR. COCONUT OIL. COCONUT WATER. CHARCOAL.

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051 Sebastian, K. S.; Coconut Developement Board, Kochi (India). Quantum jump in Coconut Product Exports. Indian Coconut Journal (India). (Sep 2012) v. LV(5) p. 10-13 KEYWORDS: COCONUTS. EXPORTS. CHARCOAL. COCONUT OIL. COPRA. COCONUT WATER.

052 Sebastian, K. S.; Coconut Developement Board, Kochi (India). You too can become an exporter. Indian Coconut Journal (India). (Sep 2012) v. LV(5) p. 19-22 KEYWORDS: GLOBALIZATION. INDUSTRY. EXPORTS.

053 Dr. Rethinam, P; Coconut Developement Board, Kochi (India). Coconut Products in American Markets on the increase. Indian Coconut Journal (India). (Sep 2012) v. LV(5) p. 23-25 KEYWORDS: COCONUTS. MARKETS. COCONUT WATER. COPRA. COCONUT OIL. INDUSTRY. COIR.

054 Muralidharan, K.; Coconut Developement Board, Kochi (India) Jayashree, A.; Coconut Developement Board, Kochi (India). Activated Carbon Emerges as the Leader. Indian Coconut Journal (India). (Sep 2012) v. LV(5) p.26-34 KEYWORDS: COCONUTS. CARBON. EUROPE. JAPAN. USA.

E12 Labour and employment

055 Sasikumar,C; Coconut Developement Board, Kochi (India). Scaling New Heights. Indian Coconut Journal (India). (Jan 2012) v. 75(09) p. 31-32 KEYWORDS: TRAINING.

056 Gopalakrishnan, Ramany; Coconut Developement Board, Kochi (India). Set for a quantum jump-Chairman,Coir Board. Indian Coconut Journal (India). (March 2012) v. 74(11) p.4-6 KEYWORDS: COIR.

E14 Development economics and policies

057 Jose, T. K.; Coconut Developement Board, Kochi (India). Let us aim at women empowerment and sustainable coconut farming. Indian Coconut Journal (India). (March 2012) v. 74(11) p.2-3 KEYWORDS: WOMEN. FEMALE LABOUR.

E16 Production economics

058 Jose, T. K.; Coconut Developement Board, Kochi (India). 12th Five Year plan: An opportunity to make India the world leader in coconut production,productivity,processing and export.. Indian Coconut Journal (India). (Jan 2012) v. 75(09) p.2-3 KEYWORDS: COCONUTS.

059 Gopalakrishnan, Ramany; Coconut Developement Board, Kochi (India). Potential of Coconut Development in 12th Plan-Sky is the Limit. Indian Coconut Journal (India). (Jan 2012) v. 75(09) p.4-13 KEYWORDS: COCONUTS.

060 Nair, Deepthi S; Coconut Developement Board, Kochi (India). What's in Store for Coconut in 12th plan. Indian Coconut Journal (India). (Jan 2012) v. 75(09) p. 14-18 KEYWORDS: COCONUTS.

061 Jnanadevan, R; Coconut Developement Board, Kochi (India). Approaches for 12th plan for reviving Coconut Cultivation in Kerala. Indian Coconut Journal (India). (Jan 2012) v. 75(09) p. 19-22 KEYWORDS: COCONUTS.

062 Muralidharan, K.; Coconut Developement Board, Kochi (India) Jayashree, A.; Coconut Developement Board, Kochi (India). The Success Story of a technocrat turned entrepreneur.. Indian Coconut Journal (India). (Jan 2012) v. 75(09) p. 23-26 KEYWORDS: COCONUT OIL.

F01 Crop husbandry

063 Al-Ghumaiz, N. S.; Qassim University. Buridah, Qassim (The Kingdom of Saudi Arabia). College of Agriculture and Veterinary Medicine, Department of Plant Production and Protection. Performance of some cool-season forage legumes growing under desert environment. Legume Research (India). (Sep 2012) v. 35(3) p.243-247 KEYWORDS: XEROPHYTES. FORAGING. SPECIES.

Pasture legume cultivars grown for forage production in the desert environment, suffers a great deal of heat stress. The study was conducted to evaluate forage yield and quality of newly introduced cool-season legumes cultivars under heat stress in the central region of Saudi Arabia for a period of two years. Eight legume cultivars belonging to five species were established during the 2008 and 2009 growing seasons. Cultivars including: two cultivars of red clover (Trifolium pretense L.) (Start and Starfire), three cultivars of white clover (Trifolium repensL.) (Kopu II, Ladino and Alice), and a single cultivars of kura clover (Trifolium ambiguum Bieb.) (Endura), Birdsfoot trefoil (BFT) (Lotus corniculatus L.) (Norcen), and Lucerne (Medicago sativa L.) (Caf 101). Cultivars were evaluated based on plant height, total dry matter yield (DMY) and forage quality. The results showed that red clover, white clover and BFT had greater adaption success and produced higher DMY in the environmental conditions of the central region of Saudi Arabia. Only one species (Kura clover) showed poor establishment during the two years of the evaluation. The two years study proved the superiority of lucerne of its total DMY, thus making it a desirable forage crop for cultivation in Saudi Arabia.

F02 Plant propagation

064 Jaglan, S.; Guru Jambheshwar University of Science and Technology, Hisar (India). Dept. of Bio and Nano Technology)Siwach, P.; Chaudhary Devi Lal University, Sirsa (India). Dept. of Biotechnology)Singh, N.; Guru Jambheshwar University of Science and Technology, Hisar (India). Dept. of Bio and Nano Technology)Yadav, O.P.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Medicinal, Aromatic and Underutilized Plants Section). Optimization of DNA extraction for RAPD studies in Plantago ovata. Annals of Biology (India). (Jun 2012) v. 28(1) p. 1-4 KEYWORDS: RAPD. PLANTAGO OVATA. DNA FINGERPRINTING. Type of sample and DNA extraction method are very important deliberations for molecular diversity analysis of Plantago ovata to get reproducible results. In the present investigation, four extraction methods and three sample types i. e. roots, leaves and seeds were evaluated for quality, quantity and suitability of genomic DNA to do fingerprinting studies of P. ovata. The DNA was purified, treated with RNase, quantified and examined for intactness using agarose gel electrophoTfsis. Good quality and yield of DNA were obtained by using Cetyl Dimethyl Ethyl Ammonium Bromide (CDAB) and S'pdium Dodecyl Sulphate (SDS) based extraction method.

065 Moudgil, V.; Kurukshetra University, Kurukshetra (India). Dept. of Biochemistry)Khaket, T.P.; Kurukshetra University, Kurukshetra (India). Dept. of Biochemistry)Singh, J.; Kurukshetra University, Kurukshetra (India). Dept. of Biochemistry). Evolutionary study of HBV in different species and human HBV genotypes. Annals of Biology (India). (Jun 2012) v. 28(1) p. 5-8 KEYWORDS: GENOTYPES. PHYLOGENY. SPECIES. HEPATITIS. VIRUSES.

Hepatitis B virus (HBV) is a hepatotropic DNA virus which belongs to the family Hepadnaviridae which includes viruses infecting birds and mammals. HBV remains an importa˜t cause of morbidity and mortality worldwide, especially in developing countries. HBV infection leads to a wide spectrum of liver conditions including acute self-limited infection, inactive carriers, fulminant hepatitis and chronic hepatitis with eventual progression to cirrhosis and hepatocellular carcinoma. The tree branching pattern representing the evolutionary divergence is referred to as phylogeny. The phylogenetic analysis of HBV was carried out by using bioinforrnatics tool 'Phylogeny.Fr'. Two types of phylogenetic analyses i.e. Interspecies and genotypic phylogenetic analyses were carried out. The maximum relatedness or similarity was between humans and orangutan with a score value of 89 and the tree showed that they emerged trom the same node. Arctic ground-squirrel is without a significant similarity witp humans. It can be concluded that orangutans are closely related to humans. The tree showed that genotypes A and B (90) shared common origin like genotypes D and E (92) with each other. The genotype H showed least similarly among other genotypes with a minimum score of 86. All the studied genotypes had well score value with genotype D.

066 Devender; Kurukshetra University, Kurukshetra (India). Dept. of Biochemistry)Attri, P.; Kurukshetra University, Kurukshetra (India). Dept. of Biochemistry)Singh, J.; Kurukshetra University, Kurukshetra (India). Dept. of Biochemistry)Puniya, A.K.; National Dairy Research Institute, Karnal (India)Dhanda, S.; Kurukshetra University, Kurukshetra (India). Dept. of Biochemistry). SDS-PAGE analysis of membrane and extracellular proteins of vanomycin resistant Pediococcus acidilactici. Annals of Biology (India). (Jun 2012) v.28(1) p. 9-11 KEYWORDS: PEDIOCOCCUS ACIDILACTICI. PROTEINS. MEMBRANES. ELECTROPHORESIS.

For past 60 years, antibiotics have been critical in fighting against infectious diseases caused by bacteria and other microbes. Misuse and overuse of antibiotics leads to antibiotic resistance among bacteria and consequent treatment complications and increased health care costs. Vancomycin is a tricyclic glycopeptide antibiotic derived from Amycolatopsis orientalis (formerly Nocardia orientalis) that functions by inhibiting the synthesis of peptidoglycan and thus has a very broad spectrum of activity. Pediococcus acidilactici is a non-pathogenic lactic acid bacteria and is used in food and dairy industry for various purposes. It is generally regarded as safe (GRAS). But, it is an opportunistic pathogen and its vancomycin resistant strains cause blood scepticemia. Recently, vancomycin resistant strains of this bacterium have been reported but no detailed study is available. We have determined the minimum inhibitory concentration (MIC). of vancomycin for P. acidilactici and vancomycin resistant (MIC). P. acidilactici was developed by growing the bacterium in presence of MIC of vancomycin for several generations. Gradient SDS-PAGE was done to evaluate membrane and extracellular proteins of MIC resistant strain. Membrane and extracellular polypeptides expression was significantly different. Different ranges of polypeptides were observed in both extracellular and membrane fractions of MIC resistant strain. Polypeptide of about 94 kDa is expressed and some other polypeptides in the range of 70 to 100 kDa are over expressed in extracellular fluid. Similarly, expression of the membrane proteins was also altered. These findings suggest that proteins confer antibiotic. resistant to antibiotic¬stressed bacteria and might be potential targets for designing the new drugs that inhibit this bacteria.

067 Siwach, R.; National Dairy Research Institute, Karnal (India). Dept. of Dairy Chemistry)Kumar, M.; Guru Jambheshwar University of Science and Technology, Hisar (India). Dept. of Food Technology). Effect of thermal treatments on pectin methyl esterase inactivation in mosambi juice. Annals of Biology (India). (Jun 2012) v. 28(1) p.12-15 KEYWORDS: PECTINS. HEAT TREATMENT. HEAT. FRUIT JUICES. Cloudness is a desirable aspect in mosambi juice and its loss is associated with consumer's unacceptance. The enzyme pectin methyl esterase, which is naturally present in citrus juices, is responsible for loss of cloudness. Extent of inactivation of pectin methyl esterase (E) in mosambi juice was studied during various thermal treatments. Fresh mosambis were procured from local m keto Extraction of juice was done using a laboratory scale juicer. Thermal treatments (HT) were carried out at three mperatures 60, 70 and 80°C irt a serological water bath for 5, 10, 15 and 20 min at each temperature. Temperature was me sured by thermometer. Treated samples were stored in a deep freezer at -18°C for PME assay. PME activity of untreated sample was also assayed and residual PME activity and per cent loss in PME activity was calculated at each time-tempiFrature combination during thermal treatments. The extent of inactivation of PME increased with increase in treatment temperature and duration. Thermal treatment given at 80°C for 20 min resulted in minimum residual activity of PME (26.6%), while similar duration thermal treatment at 60°C decreased residual activity to 80% only.

068 Goel, V.; Sugarcane Breeding Institute, Karnal (India).Regional Centre)Duhan, B.S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Soil Science). Effect of of some underutilized manures and urea-N on post harvest nutrient status of soil in a typic haplustept. Annals of Biology (India). (Jun 2012) v. 28(1) p. 16-20 KEYWORDS: POT CULTURE. NUTRIENTS. ORGANIC FERTILIZERS. MICRONUTRIENT FERTILIZERS. SOIL PH.

A pot culture experiment was conducted to study the effect of some underutilized manures and urea-N on post-harvest nutrient status of the soil after taking wheat crop in a Typic Haplustept. Organic carbon and available N increased, while available P, K, Zn, Cu, Mn and Fe decreased significantly with increasing dose of N fertilizer alone. However, the decrease in status of these nutrients was less where organic manures were applied alongwith mineral-N. Amongst organic manures, vermicompost showed best results with regards to post-harvest soil nutrient status followed or sheep manure, pig manure and FYM.

069 Kamini; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Soil Science)Singh, B.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Soil Science)Narwal, R.P.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Soil Science)Antil, R.S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Soil Science)Duhan, B.S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Soil Science). Response of adsorption and desorption behaviour of Pb and Ni to different organic C levels. Annals of Biology (India). (Jun 2012) v. 28(1) p. 21-27 KEYWORDS: ADSORPTION. DESORPTION. SOIL. LEAD. HEAVY METALS.

A laboratory experiment was conducted to study the effect of different levels of organic C on adsorption and desorption of Pb and Ni in soils. The adsorption data were fitted to Freundlich equation for adsorption and desorption and adsorption isotherms were well described. The data showed that Pb was adsorbed in higher amounts than Ni as evident by higher adsorption percentage and distribution coefficient. Adsorption of both Pb and Ni

increased with increasing levels of organic C, but it decreased with increase in metal concentrations irrespective of organic C levels. The desorption of Pb and Ni increased with increase in their concentrations and decreased with increase in organic C levels of soil.

070 Vandana; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Agronomy)Thakral, S.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Agronomy)Kumar, A.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Agronomy). Effect of organic and inorganic sources of nutrient on growth and yield of pearl millet (Pennisetum glaucum L.). Annals of Biology (India). (Jun 2012) v. 28(1) p. 28-30 KEYWORDS: PENNISETUM GLAUCUM. FERTILIZERS. NITROGEN. PHOSPHORUS. GROWTH. YIELDS.

An experiment was conducted during the kharif season of 2008 at Agronomy Research Farm, Chaudhary Charan Singh Haryana Agricultural University, Hisar to study the response of pearl millet hybrid (HHB-197) to organic and inorganic sources of nutrients. Among the 12 different treatments viz., Control (fertilizer), 75% RDF+FYM 5 tI ha, 100% RDF+FYM 5 t/ha,75% RDF+FYM 10 tIha, 100% RDF+FYM 10 tIha, 75% RDF+Vermicompost 2.5 t/ha, 100% RDF+Vermicompost 2.5 tIha, 75% RDF+Vermicompost 5 t/ha, 00% RDF+Vermicompost 5 t/ha, 75% RDF, 100% RDF and 125% RDF were applied to pearl millet crop, maximu growth was recorded in 125% RDF (TI2). TI2 produced significantly higher grain yield (kg/ha). Maximum stover and biological yield was recorded in T12.

071 Singh, A.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Dryland Agriculture)Rani, V.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Farm Machinery and Power Engineering)Kumar, A.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Farm Machinery and Power Engineering)Singh, G.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Agricultural Economics)Kumar, P.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Agricultural Economics). Studies in intercropping of compatible crops with castor (Ricinus communis L.) on flat bed. Annals of Biology (India). (Jun 2012) v. 28(1) p. 31-33 KEYWORDS: INTERCROPPING. RICINUS COMMUNIS. CROPS. CASTOR BEANS.

Castor (Ricinus communis L.) is a very important oil seed crop of India and has wide scope of intercropping. Thus, a field experiment was conducted during 2010-11 on sandy loam soil at the Ram Dhan Seed Farm, CCSHAU, Hisar, Haryana, India to find out the compatible crops for intercrop ing in castor. The seed yield of castor increased by 1.93 and 1.93% when greengram and mothbean were intercropped , but decreased with clusterbean by 4.5%. The income has increased over sole castor byI7.93% in castor+green m; by 10.14% in castor+mothbean and by 5.01 % in castor +c1usterbean. There was an increase in castor equivalclnt yield (1.18 qlha) with green gram (1.10 qlha) with mothbean and 1.00 q/ha with clusterbean. The benefit: cost ratio found was 2.53 for castor+greengram, 2.30 for castor +mothbean and 2.14 for castor+clusterbean.

072 Singh, P.K.; Krishi Vigyan Kendra, Khadigram (India)Kumar, B.; Krishi Vigyan Kendra, Khadigram (India)Singh, S.K.; CSISA Central Bihar Hub, Begusarai (India)Kumar, M.; Sher-e-Kashmir University of Agricultural Science and Technology, Rajouri (India). Krishi Vigyan Kendra)Singh, S.K.; Rajendra Agricultural University, Samastipur (India). Effect on yield and net returns of pea+maize intercropping on raised bed with weed management. Annals of

Biology (India). (Jun 2012) v. 28(1) p. 34-35 KEYWORDS: INTERCROPPING. YIELDS. PEAS. MAIZE. WEED CONTROL EQUIPMENT. PROFITABILITY.

An experiment was carried out during 2007-08 and 2008-09 to study the effect on inter yield and net returns of pea+maize on raised bed with weed management practices in winter season in KVK. Jamui (Bihar) operational area. The experimental area was sandy loam in texture with pH 7.5, medium in available nitrogen, phosphorus and potassium. Three treatments consisted of intercropping and five treatments consisted of weed management practices on pea+maize on raised bed. The maximum maize equivalent yield was found (84.2 q/ha) in intercrops on raised bed, whereas pea and maize sole crop on raised bed was 48.75 and 43.8 q/ha, respectively. Highest weed control efficiency (74.1%) was recorded with atrazine 0.5 kg a. i./a followed by pendimethalin 1.00 kg a. i./ha (71 %) and lowest under one hand weeding (60%).

073 Lata, K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Agronomy)Singh, K.P.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Agronomy)Nandal, D.P.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Agronomy)Hari Om; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Agronomy)Thakral, S.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Agronomy). Effect of organic and inorganic sources of fertilizer on growth parameters and productivity of wheat in rice-wheat system. Annals of Biology (India). (Jun 2012) v. 28(1) p. 36-40 KEYWORDS: FERTILIZERS. INTERCROPPING. WHEATS. RICE. NITROGEN. PRODUCTIVITY. COMPOSTING.

A field experiment was conducted during winter season of 2004-05 and 2005-06 at CCSHAU Rice Research Station, Kaul, Kaithal district of Haryana state to study the effect of organic manures and fertilizers on wheat and to work out their optimum combination in rice-wheat system. The experiment consisting of combinations of six sources of organic manures viz., no organic manure, FYM 15 t/ha, vermicompost N1oo' vermicompost N1so' vermicompost N200 and vermicompost N2so and five fertilizer levels viz., no chemical fertilizer, 25, 50, 75; recommended dose of nitrogen and 100; recommended dose of fertilizer (N-150, PPs 60, ZnS04-25 kg/ha).The results of two years' studies revealed that growth parameters were affected significantly by the application of FYM and vermicompost during both the years. Increasing the doses of vermicompost increased dry matter accumulation, LAI and LAD. All the growth parameters were recorded maximum with vermicompost N2 so followed by vermicompost N200 and vermicompost N1so and FYM. CGR was also higher under higher level of vermicompost but no definite trend was observed for the effect of organic manures on RGR. Due to logging at higher level of vermicompost i. e. at N2so and N200 and fertilizer (100; RDF), the grain yield declined significantly as compared to combinations of vermicompost N2so +75; RDN and vermicompost N2oo+75;RDN.

074 Sobti, N.; Indian Institute of Science, Jaipur (India). Dept. of Environmental Sci.)Juneja, S.K.; Indian Institute of Science, Jaipur (India). Dept. of Environmental Sci.)Yadav, P.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Genetics and Pl. Breeding)Chibbar, R.N.; University of Sasketchewan, Saskatchewans (Canada). Dept. of Pl. Sci.)Behl, R.K.; Manav Institute of Pharmacy, Hisar (India). Vermicompost application for improving grain yield and quality in cereals harnessing metagenomics and induced gene

expression changes. Annals of Biology (India). (Dec 2012) v. 28(2) p. 73-77 KEYWORDS: GRAIN. YIELDS. QUALITY. GENE EXPRESSION. COMPOSTING. METAGONIMUS. CEREALS. OLIGOCHAETA.

Vermicomposting is a simple biotechnological process of composting, in which certain species of earthworms are used to enhance the process of waste conversion and produce a better end product. Vermicompost is derived by rearing worms on organic work mixed with cattle dung. It contains plant nutrients like N, P, K, Ca, Mg, Fe, Mn and Zn which have a positive effect on the plant growth, yield, soil fertility and soil microbes. The resulting vermicompost has been shown to have several positive impacts on cereal plant growth, grain yield and quality. Metagenomics has paved the way for independent assessment and exploitation of microbial communities present in complex ecosystems like verrnicompost and recovery of novel biomolecules. The application of biotechnological tools resulted in the generation of large datasets derived from various environments such as soil. In this way, structure, functions and interactions of microbial communities were elucidated. This commentary briefly summarizes views revealing the various dynamic of the soil-plant relationship with special emphasis on vermicompost and possible gene changes in host plant for better nutrition and stress resistance, in tUJI1 impacting grain quality and yield in cereals.

075 Sharma, C.; Kurukshetra University, Kurukshetra (India). Dept. of Microbiology)Aneja, K.R.; Kurukshetra University, Kurukshetra (India). Dept. of Microbiology)Aneja, A.; Kurukshetra University, Kurukshetra (India). Dept. of Microbiology)Surain, P.; Kurukshetra University, Kurukshetra (India). Dept. of Microbiology)Dhiman, R.; Kurukshetra University, Kurukshetra (India). Dept. of Microbiology) Meashi, V.; Kurukshetra University, Kurukshetra (India). Dept. of Microbiology)Jiloha, P.; Kurukshetra University, Kurukshetra (India). Dept. of Microbiology). Evaluation of the antimicrobial activity of Delonic regia flower extracts against the pathogen causing Otitis externa. Annals of Biology (India). (Dec 2012) v. 28(2) p. 78-82 KEYWORDS: DELONIX REGIA. PATHOGENS. ANTIMICROBIAL PROPERTIES. MINIMUM TILLAGE.

Antimicrobial activity of Delonix regia flower extracts was studied by agar well diffusion method against the six ear pathogens, namely, Staphylococcus aureus, Proteus mirabilis, Escherchia coli, Pseudomonas aeruginosa, Acinetobacter sp. and Candida albicans. The antibacterial activity of D. regia flower extracts on the agar plates varied in different organic (methanol, ethanol and acetone) extracts. Organic solvent extracts of D. regia flower possessed antibacterial activity against three bacterial pathogens only, S. aureus, P. mirabilis and Acinetobacter sp. with zone of inhibition ranging between 21.6 and 15 mm, maximum against S. aureus (21.6 mm) followed by Acinetobacter sp. (19.3 mm) and P. mirabilis (18.6 mm). The MIC value for D. regia flower extracts ranged between 12.5 and 50 mg/ml. S. aureus was found to be the most sensitive pathogen with lowest MIC of 12.5 mg/ml in acetonic extracts. Of the three organic extract tested, acetonic extract of D. regia was found best among all the tested solvents. Hower extract of D. regia plants completely lacked antiyeast activity since no zone of inhibition was observed against C. albicans. Kan pip, ayurvedic ear drop showed zone of inhibition that ranged between 26.3 and 16.3 mm against the tested pathogens. Acetonic extract of D. regia flower may be used to treat Otitis externa especially caused by S. aureus. However, more detailed studies such as in vivo testing and pharmacokinetics properties are needed to determine its therapeutic potential.

076 Yadav. S.; Kurukshetra University, Kurukshetra (India). Dept. of Biotechnology Engineering)Kumar, N.; Kurukshetra University, Kurukshetra (India). Dept. of Biotechnology)Yadav, A.; Kurukshetra University, Kurukshetra (India). Dept. of Biotechnology Engineering) Gulati, S.; Kurukshetra University, Kurukshetra (India). Dept. of Biotechnology)Kanupriya; Kurukshetra University, Kurukshetra (India). Dept. of Biotechnology)Gautam, S.K.; Kurukshetra University, Kurukshetra (India). Dept. of Biotechnology)Aggarwal, N.; Kurukshetra University, Kurukshetra (India). Dept. of Microbiology)Gupta, R.; Kurukshetra University, Kurukshetra (India). Dept. of Biochemistry) Mittal, A.; Kurukshetra University, Kurukshetra (India). Dept. of Biotechnology Engineering). Protective effect of genistein against oxidative damage induced by hydrogen peroxide in cultured human peripheral blood lymphocytes. Annals of Biology (India). (Dec 2012) v. 28(2) p. 87-89 KEYWORDS: HYDROGEN PEROXIDE. BLOOD. OXIDATION.

Reactive oxygen species (ROS) have been considered to be responsible for the ageing and initiation of neoplastic processes. Hydrogen peroxide, which is generated during oxidative stress, is known to damage proteins, nucleic acids and cell membran~s and also has been implicated in cancer, ageing and several chronic neurogenerative diseases. We investigated the ptotective effect of genistein against genotoxic dose of hydrogen peroxide using sister chromatid exchanges (SCEs). The treatment with HPz (15 and 20 JlM) was showing significant increase in the frequency of SCEs. The combination of HPz with Genistein (2.5 and 5 ug/ml) was found significantly associated with decrease frequency of SCEs on cultur~d human lymphocytes. The results of the present study suggest a protective effect of Genistein against hydrogen peroxide induced genotoxic damage on cultured human lymphocytes.

077 Kumar, J.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Molecular Biology and Biotechnology)Chawla, A.; Lovely Professional University, Jalandhar (India). Dept. of Biotechnology)Kumar, P.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Molecular Biology and Biotechnology)Jain, R.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Molecular Biology and Biotechnology). Iron and zinc variability in twenty rice (Oryza sativa L.) genotypes. Annals of Biology (India). (Dec 2012) v. 28(2) p. 90-92 KEYWORDS: GENOTYPES. ORYZA SATIVA. ZINC. IRON.

More than half of the world's population, especially women and children in the developing countries suffer from micronutrient malnutrition resulting from the consumption of diets; deficient in iron, zinc and vitamin A. micronutrient malnutrition problems increased the interest of researchers to increase the mineral contents (Fe and Zn) in cereals to ensure adequate attainment of dietary minerals in all individuals. A lot of variability does exist for micronutrients (Fe, Zn, Vitamin A, etc.) content and bioavailability in many crops including rice. The first pre-requisite for initiating a breeding programme to develop mineral-rich genotypes, is to screen available germplasm and identify the source of genetic variation for the target trait. The current study was conducted to assess the variability for iron and zinc content in dehusked”rice grains and leaf tissue in 20 rice genotypes to identify mineral-rich genotypes. A large variation was observed for iron and zinc co~tents in dehusked grains and leaf tissue. In dehusked grains the iron and zinc contents ranged between 9.6-440 ug/g and 9.9-39.4 ug/g, respectively. ln leaf tissue the iron and zinc contents ranged between 127.3-659.3 ug/g and 42.1-63.4 ug/g, respectively. The grain/leaf ratio of iron and zinc content ranged between 0.03-1.56 and 0.16-0.87,

respectively. Some genotypes (HKR 95-157, Palman 579, TNG 67 and HBC 19) had good seedlleafratio for iron and zinc and these genotypes can be used for breeding to develop mineral efficient rice.

078 Kumar, S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Plant Biotechnology)Goyal, R.; Lovely Professional University, Phagwara (India). Dept. of Biotechnology)Sheorayan, A.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Plant Biotechnology)Kajla, S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Plant Biotechnology)Yadav, O.P.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Plant Breeding, Medicinal Section)Mangal, M.; Punjab Agricultural University, Ludhiana (India). Central Institute of Post Harvesting Engineering and Technology). Assessment of genetic diversity in Lepidium sativum using RAPD and ISSR markers. Annals of Biology (India). (Dec 2012) v. 28(2) p. 93-97 KEYWORDS: LEPIDIUM SATIVUM. RAPD.

Random Amplified Polymorphism DNA (RAPD) and Inter Simple Sequence Repeats (ISSR) markers were employed to assess the genetic diversity amo~g different genotypes of 1. sativum. A total of 30 RAPD decamer primers and 10 ISSR primers were screened to determine their potential for clear polymorphism and reproducibility. Out of 30 RAPD primers, only 19 primers showed good amplifications and reproducible results with a total of 124 amplicons. The total percentage of polymorphism observed was 67.7;. In case of ISSR, only five primers resulted in a total of 25 amplicons, providing a 64; polymorphism.The highest values of similarity coefficient (0.924) were detected between genotypes of 1 and 18 and the lowest values of similarity coefficient (0.523) were detected between genotypes 11 and 12.

079 Rohilla, S.K.; Chaudhary Devi Lal University, Sirsa (India). Dept. of Biotechnology)Tanwar, R.K.; Chaudhary Devi Lal University, Sirsa (India). Dept. of Biotechnology)Kumar, J.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Molecular Biology and Biotechnology)Salar, R.K.; Chaudhary Devi Lal University, Sirsa (India). Dept. of Biotechnology)Saran, A.K.; Chaudhary Devi Lal University, Sirsa (India). Dept. of Energy and Environmental Sciences). Evaluation of indigenous fungal strains for biodegradation of textile dyes. Annals of Biology (India). (Dec 2012) v. 28(2) p. 98-102 KEYWORDS: FUNGICIDES. BIODEGRADATION. DYES.

The present investigation was undertaken to isolate and evaluate the decolourization potential of fungal strains for textile dyes such as Brown ME2RL, Blue MEBL, Qrange M2R and Red RB. Out of five fungal isolates, four were identified and characterized based on their cultural haracteristics and microscopic analysis; rest one strain was not identified owing to the lack of sporulating structure and designated as mycelia sterilia. Effluent samples were also characterized for physiochemical properties. Decolou~zation efficacies of identified native fungal strains were carried out under in vitro condition both in solid and liquid culture mediums with 200 mg/l of each dye. It was observed that Alternaria brassicola, Alternaria sp., Aspergillus can1ida and A. niger were efficient in degrading the textile dyes. The study also depicted that Aspergillus niger showed qighest decolourization for Red RB (93.16:1:0.08;), Blue MEBL (80.99:1:0.30;) and Orange M2R (82.29:1:0.19;); Alternaria brassicola showed maximum decolourization for Brown ME2RL (89.73:1:0.08;). The decolourization was due to degradation of dye, as the biomass produced was white-

clear. This study reinforces the potential of indigenous fungi for the decolourization of textile effluents.

080 Rathore, S.; Kurukshetra University, Kurukshetra (India). Dept. of Botany)Yadav, K.; Kurukshetra University, Kurukshetra (India). Dept. of Botany)Kumar, S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Plant Biotechnology)Singh, N.; Kurukshetra University, Kurukshetra (India). Dept. of Botany). Biotechnological approaches to induce salt resistance in plants. Annals of Biology (India). (Dec 2012) v. 28(2) p. 103-109 KEYWORDS: GROWTH. SALINITY. SALT TOLERANCE. IN VITRO. VIGOUR. TISSUE ANALYSIS. FUNGAL MORPHOLOGY.

Salinity is one of the major environment stress factors, which limits the growth and development of plants. Approximately one third of the land being irrigated worldwide is salt affected. All plants are subjected to a different type of stress either abiotic or biotic throughout their life cycle. Growth reduction is considered as a main morphological effect of salinity. Excess of salts altered the adsorption. capacity of water and reduced the growth by effecting osmotic pressure. Salinity checks the water absorption rate of roots, and prevents roots fro performing their osmotic activity. It creates drought like conditions to plants. It seems that perennial plants can toler te salinity better than annual plants. Salinity also altered nutrient balance of plants, they required for healthy growt . Biotechnological approaches are proved successful to develop salt tolerant lines. Cell and tissue culture techniques have been used to obtain salt tolerant plants.

081 Rani, B.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Biochemistry)Jain, V.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Biochemistry)Chhabra, M.L.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Biochemistry)Dhawan, K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Biochemistry)Kumari, N.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Biochemistry)Yadav, P.; Directorate of Oilseeds Research, Hyderabad (India). Plant Biochemistry and Quality Control Lab.). Oxidative stress and antioxidative system in Brassica juncea (L.) under high temperature stress. Annals of Biology (India). (Dec 2012) v. 28(2) p. 110-115 KEYWORDS: BRASSICA JUNCEA. TEMPERATURE. CAROTENOIDS. CATALASE. LIPOXYGENASE. SUPEROXIDE DISMUTASE. OXIDOREDUCTASES. GLUTATHIONE REDUCTASE.

Indices of oxidative stress viz., HPz, MDA content and lip oxygenase activity (LOX) increased in seedlings of both thermotolerant and thermosusceptible ge~ptypes when subjectd to high temperature stress and increase was more pronounced in thermosusceptible genotype NPJ-119 as compared to tolerant genotype NRCDR-02. Activity of antioxidative enzymes i. e. Superoxide dislTIutase (SOD), catalase (CAT), peroxidase (POX), ascorbate peroxidase (APX) and glutathione reductase (GR) increased in both the genotypes under stress but increase was found significantly higher in t~lerant genotype. The basal level of POX and APX was found more in tolerant genotype and activity of SOD and GR under control was found almost same in both the genotypes but catalase activity was found more in susceptible genotype. Non-enzymatic metabolite ascorbib acid and carotenoid content were also found increased under stress in both the genotypes. However, on revival, BOX activity, MDA and HzOz content decreased as compared to stress conditions in both the genotypes.Antioxidative enzymes on revived viz., SOD and CAT started decreasing but the activity of POX and GR still continued to increase in both the genotypes, however, APX

enzyme exhibited differential behaviour which increased in tolerant genotyp but decreased in susceptible genotype. However, carotenoid decreased and ASA still continued to increase in both the genotypes on revival.

082 Jayashree, R.; Rubber Research Institute of India, Kottayam (India)Rekha, K.; Rubber Research Institute of India, Kottayam (India)Sushamakumari, S.; Rubber Research Institute of India, Kottayam (India)Sobha, S.; Rubber Research Institute of India, Kottayam (India)Kumari Jayashree, P.; Rubber Research Institute of India, Kottayam (India)Kala, R.G.; Rubber Research Institute of India, Kottayam (India)Jiji, M.; Rubber Research Institute of India, Kottayam (India)Thulaseedharan, A.; Rubber Research Institute of India, Kottayam (India). Effect of salinity stress and osmotica on embryogenesis and plant regeneration from MnSOD transgenic cell lines in Hevea brasiliensis. Journal of Plantation Crops (India). (Dec 2012) v. 40(3) p. 199-202 KEYWORDS: AGROBACTERIUM. GENETIC TRANSFORMATION. HEVEA BRASILIENSIS.

083 Suma, B.; Kerala Agricultural University, Thrissur(India),College of Horticulture. sudarsansumaahoo.comRiya Joseph; Kerala Agricultural University, Thrissur(India),College of HorticultureAlice Kurian; Kerala Agricultural University, Thrissur(India),College of HorticultureNybe, E. V.; Kerala Agricultural University, Thrissur(India),College of Horticulture. Genetic variability in long pepper(Piper longum L.). Journal of Plantation Crops (India). (Dec 2012) v. 40(3) p. 203-207 KEYWORDS: AGROBACTERIUM. GENETIC TRANSFORMATION. HEVEA BRASILIENSIS.

F03 Seed production

084 Layek, N.; Institute of Agricultural Science, Kolkata (India). Department of Seed Science and TechnologyGuha, P.; Institute of Agricultural Science, Kolkata (India). Department of Seed Science and TechnologyDe, B.K.; Institute of Agricultural Science, Kolkata (India). Department of Seed Science and TechnologyMandal, A.K.; Institute of Agricultural Science, Kolkata (India). Department of Seed Science and Technology. Pre-storage seed invigoration treatments for the maintenance of germinability and field performance of urdbean [Vigna Mungo (L.) Hepper]. Legume Research (India). (Sep 2012 v.35(3) p.220-225 KEYWORDS: SEED TREATMENT. KEEPING QUALITY. MEMBRANES. LIPID PEROXIDATION.

Pre-storage dry seed invigoration treatments of freshly harvested urdbean seeds (Vigna mungo L. Hepper, cv. Sarada) with aspirin, bleaching powder, iodinated calcium carbonate and red chilli powder showed siginificantly improved post-storage germinability, field performance and productivity of the crop over control. However, pre-storage wet treatments did not show any beneficial effect on storability and field performance over control. Physiological and biochemical studies indicated higher membrane integrity and greater enzyme activity of the dry treated seeds than untreated control. The lipid peroxide formation and volatile aldehyde production were also significantly lower in the treated seeds than in control. Thus, pre-storage dry treatments may be suggested for the improvement of storability and field performance of urdbean seeds.

F04 Fertilizing

085 Gunri, S.K.; Bidhan Chandra Krishi Viswavidyalaya, Kalyani (India). Directorate of Research, AICRP on GroundnutNath, R.; Bidhan Chandra Krishi Viswavidyalaya, Jhargram (India). Regional Research Station, All India Co-ordinated Research Project on Groundnut. Effect of organic manures, biofertilizers and biopesticides on productivity of summer groundnut (Arachis hypogeae L.) in red and laterite zone of west bengal. Legume Research (India). (Jun 2012) v. 35(2) p.144-148 KEYWORDS: GROUNDNUTS. ARACHIS HYPOGAEA. FERTILIZERS. BIOFERTILIZERS. BIOPESTICIDES. YIELDS. ECONOMICS.

A field experiment was conducted during summer season of 2006 and 2007 at All India Co-ordinated Research Project on Groundnut, Bidhan Chandra Krishi Viswavidyalaya, Regional Research Station, Jhargram, Paschim Medinipur to find out the effect of organic manures, biofertilizers and biopesticides on productivity of summer groundnut in red and laterite zone of West Bengal. The plant nodule number and nodule weight increased with the age of the crop and highest was recorded at 60 DAS when biofertilizer consortium was used with 10 t/ha of FYM (28.9 and 36.4 mg respectively). The significantly higher pod/plant and shelling out turn was recorded when recommended dose of fertilizer was applied along with 10t/ha of FYM or 5t/ha of poultry manure as compared to other treatments. The hundred kernel weight did not exhibit any significant differences among the treatments. The application of bio-fertilizer and or bio-pesticide along with organic manure to groundnut had the significant influence to increase the groundnut yield. The significantly highest pod yield (3272kg/ha) were obtained when farm yard manure 10t/ha (T9) or poultry manure 5t/ha in treatment T8 (3251 kg/ha) along with recommended dose of fertilizer was applied to groundnut. The maximum gross return (Rs.66494/ha) and net return (Rs.46356/ha) was recorded when farm yard manure0t/ha along with recommended dose of inorganic fertilizer was applied. The highest B:C ratio (3.50) was recorded in inorganic fertilizer treated control.

086 Meena, B.S.; Maharana Pratap University of Agriculture and Technology, Udaipur (India). Rajasthan College of AgricultureSharma, D.D.; Maharana Pratap University of Agriculture and Technology, Udaipur (India). Rajasthan College of Agriculture. Efficiency of sources of phosphorus and bioregulators on pigeonpea (Cajanus cajan). Legume Research (India). (Jun 2012) v. 35(2) p.149-153 KEYWORDS: PLANT GROWTH SUBSTANCES. PIGEON PEAS. CAJANUS CAJAN. ECONOMICS. ROCK PHOSPHATE. PHOSPHORUS.

A field experiment was carried out during the rainy season of 2001 and 2002 on clay loam soil of Udaipur to study relative efficiency of sources of P, phosphorus solubilizers and bioregulators on productivity and profitability of pigeonpea (Cajanus cajan (L.) Millsp). Among P sources, application of high grade rock phosphate (HGRP) + farm yard manure (FYM) in the ratio of 1:3+ elemental sulphur (ES) 25 kg/ha composted for 30 days increased seed yield by 56.6; over control and was at par with DAP. It also improved stover and protein yield, N and P uptake and available soil P at harvest of crop. The efficiency parameters viz. relative yield, agronomic efficiency, relative economics and apparent phosphorus recovery of the above sources were also comparable to DAP. Foliar application of thiourea 1000 ppm and 2, 3, 5-tri-iodobenzoic acid (TIBA) 50 ppm at pre flowering and pod formation increased the yield of pigeonpea significantly over water spray. Application of HGRP+ FYM (1:3) + ES (25 kg/ha) also had a significant positive impact on these aspects of pigeonpea.

087 Gangwar, S.; Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur (India). Department of AgronomyDubey, M.; Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur (India). Department of Agronomy. Effect on n and p uptake by chickpea (Cicer arietinum L.) as influenced by micronutrients and biofertilizers. Legume Research (India). (Jun 2012) v. 35(2) p.164-168 KEYWORDS: CHICKPEAS. CICER ARIETINUM. RHIZOBIUM. NUTRIENT UPTAKE. The influence of recommended dose of fertilizer along with Rhizobium inoculation and application of micronutrients like molybdenum and iron has affected the yield of chickpea. Different combinations were made out of which the best combination of RDF with 1 g ammonium molybdate + Rhizobium + PSB, RDF with 2 g ammonium molybdate +1 g FeSO4 + Rhizobium and PSB recorded the highest nodules/plant(33), pods/plant(30.12) and seed yield(5.52g/plant). These combinations also improved the uptake of N and P by the crop and estimated to give the highest seed yield and harvest index as compared to all other treatment combinations. Thus, the T4 combination of RDF+1.0 kg ammonium molybdate/ha as soil application + Rhizobium + PSB also increased the protein content in the chickpea seed which will influence its qualitative character.

088 Patra, Partha Sarathi; Uttar Banga Krishi Viswavidyalaya, Cooch Behar (India). Deptt. of Agronomy Faculty of AgricultureSinha, Ashim Chandra; Uttar Banga Krishi Viswavidyalaya, Cooch Behar (India). Deptt. of Agronomy Faculty of Agriculture. Effect of organics on yield, uptake and economics of green gram (Vigna radiata L.) production under terai region of west bengal. Legume Research (India) . (Jun 2012) v. 35(2) p.169-172 KEYWORDS: MUNG BEANS. VIGNA RADIATA RADIATA. GRAIN. YIELDS. ECONOMICS. NUTRIENT UPTAKE.

A field experiment was conducted in the experimental farm of Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal during 2009–2010 to study the effect of organics on yield, uptake and economics of green gram (Vigna radiata L.). The experiment was laid out in randomized block design with 12 treatments. Cultivar SML-668 was used in the trial. Results of the experiment revealed that average pod/picking, pod length, number of grains/pod, 100 pod weight and test weight was found to be highest under T4 (Neem cake 3.0 t ha-1) followed by T10 (NC 1.5 t ha-1+ PM 1.5 t ha-1) and T9 (VC 1.5 t ha-1+ NC 1.5 t ha-1). Based on pooled data treatment receiving neem cake 3.0 t ha-1 recorded highest grain yield of 847.50 kg ha-1 which was statistically at par with T9 (837.11 kg ha-1), however T11 (100; RDF) fetched highest B:C ratio (2.58), might be due to lower treatment cost.

089 Chaturvedi, Sumit; G. B. Pant University of Agriculture & Technology, Pantnagar (India). College of Agriculture, Department of AgronomyChandel, A. S.; G. B. Pant University of Agriculture & Technology, Pantnagar (India). College of Agriculture, Department of AgronomySingh, A. P.; G. B. Pant University of Agriculture & Technology, Pantnagar (India). College of Agriculture, Department of Agronomy. Nutrient management for enhanced yield and quality of soybean (Glycine Max.) and residual soil fertility. Legume Research (India). (Sep 2012) v. 35(3) p.175-184 KEYWORDS: GLYCINE MAX. GRAIN. LEGHAEMOGLOBIN. PLANT NUTRITION. RESIDUES. SOYBEANS.

A field experiment was conducted during rainy seasons of 2003–04 and 2004–05. Fourteen treatments consisting of two fertility levels (50; and 100; recommonded NPK) and their combination with FYM and supplementary nutrients viz. boron and iron besides control were tested in randomized block design with three replications. The results revealed that soybean yield attributed to cumulative effect of yield attributes viz., pods/plant, seeds/pod and hundred seed weight were increased significantly by the addition of

micronutrients and FYM at both the fertility levels (50; and 100; NPK). Integrated use of FYM (10.0 t/ha) and micronutrients viz., boron (2.0 kg/ha) and iron (5.0 kg/ha) with inorganic NPK can replace upto 10 kg N, 30 kg P2O5 and 20 kg K and 20 kg K2O/ha. Mean relative growth rate (RGR) and net assimilation rate (NAR) and leaf area index (LAI) were significantly affected by supplementation of inorganics (50; and 100; NPK) with FYM and/or micronutrients viz., boron and iron. Application of FYM, boron and iron along with inorganic fertilizer (50; and 100; recommended NPK) also significantly increased the root dry biomass, number of nodules, dry weight/plant and leghaemoglobin content at 60 days stage. Net returns and benefit: cost ratio was highest where boron (2.0 kg/ha) was applied with 100; NPK and lowest in control (Inoculated). Highest protein and oil content and yield were recorded with RDF + FYM. Application of FYM, Fe and B with both 50 and 100; recommended fertilizers (RDF) markedly improved the content of unsaturated fatty acids (linolenic, linoleic and oleic) and reduced the content of saturated fatty acids (palmatic and stearic). Use of organic sources and micronutrients helped in maintaining soil fertility in terms of available nutrients and fertility balance. It was concluded that application of FYM and micronutrients viz., Fe and B along with 100; NPK was essential for higher productivity and profitability of soybean as well as maintaining soil fertility.

090 Mondal, M.M.A.; Universiti Putra Malaysia, Serdang (Malaysia). Faculty of Agriculture, Departmant of Crop SciencePuteh, A. B.; Bangladesh Institute of Nuclear Agriculture, Mymensingh (Bangladesh). Plant Breeding DivisionMalek, M. A.; Bangladesh Institute of Nuclear Agriculture, Mymensingh (Bangladesh). Plant Breeding DivisionRoy, S.; Bangladesh Institute of Nuclear Agriculture, Mymensingh (Bangladesh). Plant Breeding Division. Effect of foliar application of urea on physiological characters and yield of soybean. Legume Research (India). (Sep 2012) v. 35(3) p.202-206 KEYWORDS: SOYBEANS. GLYCINE MAX. UREA. FOLIAR APPLICATION. GROWTH. YIELDS. The field experiment was conducted at the Field Laboratory of the Bangladesh Institute of Nuclear Agriculture, Mymensingh, Bangladesh during the period from July to November 2010 to investigate the effect of foliar application of urea on yield of soybean. The experiment comprised four levels of urea foliar application viz. T1 (control), T2 (application of 1.5; urea once at the beginning of flowering), T3 (application of 1.5; urea twice from the beginning of flowering with an interval of 10 days) and T4 (application of 1.5; urea thrice from the beginning of flowering to pod development stage with an interval of 10 days). Results indicated that seed yield of soybean was higher in foliar urea applied plants than control plants which was maximum in T4 treatment which showed superiority in physiological characters (leaf area index, total dry mass plant-1, absolute growth rate, chlorophyll and harvest index) and yield attributes (number of pods plant-1, number of seeds pod-1 and 100-seed weight) over other treatments. Therefore, three times foliar application of urea 1.5; at reproductive stages may be used for getting increase seed yield in soybean.

091 Modgil, Rajni; CSK Himachal Pradesh Krishi Vishwavidalaya, Palampur (India). College of Home Science, Department of Food Science and NutritionMankotia, K.; CSK Himachal Pradesh Krishi Vishwavidalaya, Palampur (India). College of Home Science, Department of Food Science and NutritionGupta, Radhna; CSK Himachal Pradesh Krishi Vishwavidalaya, Palampur (India). College of Home Science, Department of Food Science and NutritionMalhotra, S.R.; CSK Himachal Pradesh Krishi Vishwavidalaya, Palampur (India). College of Home Science, Department of Food Science and NutritionTanwar, Beenu; CSK

Himachal Pradesh Krishi Vishwavidalaya, Palampur (India). College of Home Science, Department of Food Science and Nutrition. Carbohydrates, minerals, antinutritional constituents and In vivo protein quality of domestically processed cow peas, (Vigna Ungiculata). Legume Research (India). (Sep 2012) v. 35(3) p.214-219 KEYWORDS: COWPEAS. STARCH. SUGAR. MINERALS. PHYTIC ACID. VIGNA UNGUICULATA.

Starch, sugars, dietary fiber macro and micro elements, phytic acid and trypsin inhibitors and in vivo protein quality of domestically processed cow peas were evaluated. Soaking and sprouting resulted in a significant (P¡Ü0.05) decrease in the starch, sugars, NDF, ADF and Hemicelluloses content; whereas cooking resulted in an increase in all above parameters except starch which decreased after cooking of grains. Sprouting and cooking resulted in an increase in all minerals studied except phosphorus and iron content, which decreased whereas soaking, resulted in significant (P¡Ü0.05), decrease in mineral content of cow peas. Sprouting and cooking resulted in an increase in FER and PER. Cooking resulted in an increase in biological protein quality of cow peas.

092 Venkatesh, M.S.; Indian Institute of Pulses Research, Kanpur (India). Division of Crop ProductionBasu, P.S.; Indian Institute of Pulses Research, Kanpur (India). Division of Crop ProductionVedram; Indian Institute of Pulses Research, Kanpur (India). Division of Crop Production. Foliar application of nitrogenous fertilizers for improved productivity of chickpea under rainfed conditions. Legume Research (India). (Sep 2012) v. 35(3) p.231-234 KEYWORDS: NONCEREAL FLOURS. CHICKPEAS. FOLIAR APPLICATION. UREA. NITROGEN CONTENT. A field experiment was carried out to study the response of chickpea to foliar application of nitrogenous fertilizres under rainfed conditions. The highest pods per plant (45.3) were recorded in 2; urea spray at 75 DAS which was 23.7 and 21.3; higher than control and water spray respectively. The 100 seed weight of chickpea was significantly increased with 2; urea spray at 75 DAS (16.9) being at par with other treatments except control. The highest seed yield of 2437 kg/ha was recorded with 2; urea spray at 75 DAS followed by 2; DAP spray at 75 DAS (2389 kg/ha). Highest SPAD chlorophyll meter reading (SCMR) (69.6) was recorded in urea spray at 75 DAS followed by DAP at 75 DAS (67.5).

093 Khandelwal, Rohit; S.K.N. College of Agriculture, Jobner (India).Choudhary, S.K.; S.K.N. College of Agriculture, Jobner (India).Khangarot, S.S.; S.K.N. College of Agriculture, Jobner (India).Jat, M.K.; S.K.N. College of Agriculture, Jobner (India). Singh, P.; MPUAT, Udaipur (India). Rajasthan College of Agriculture, Department of Agronomy. Effect of inorganic and bio-fertilizers on productivity and nutrients uptake in cowpea [Vigna Unguiculata (L.) Walp]. Legume Research (India). (Sep 2012) v. 35(3) p.235-238 KEYWORDS: COWPEAS. VIGNA UNGUICULATA. INORGANIC FERTILIZERS. BIOFERTILIZERS. YIELD COMPONENTS. YIELDS.

A field experiment was conducted during kharif, 2006 at Jobner (Rajasthan). The soil was loamy sand, having 8.1 pH, 1.20 dSm-1 electrical conductivity, 0.13; organic carbon, 130.2 kg ha-1 available nitrogen, 16.5 ha-1 available phosphorus and 151.9 kg ha-1 available potassium. The application of 75; of recommended dose of fertilizer i.e. 15 kg N and 30 kg P2O5 ha-1 along with seed inoculation by Rhizobium + PSB proved significantly superior over rest of treatment combinations and provided significantly higher pods per plant (8.23), seeds per pod (7.83), seed yield (8.85qha-1), straw yield (19.20q ha-1), nitrogen uptake (68.78kg ha-1), phosphorus ptake (8.85kg ha-1) and protein content (25.56;) and increase in these characters was by 27.99, 27.94, 20.08, 22.06, 41.99, 42.37 & 16.71; respectively over the control. Similarly, in seed inoculation combined i.e. Rhizobium + PSB treatment provided

significantly higher pods per plant (8.52), seeds per pod (8.11), seed yield (9.20q ha-1), straw yield (20.12q ha-1), nitrogen uptake (75.29 kg ha-1), phosphorus uptake (9.32 kg/ha) and protein content (26.81 ;) over rest of the treatments. The increase in their parameters was to the tune of 28.70, 28.93, 24.32, 23.51, 59.78, 37.46 & 32.85;respectively over control.

094 Gupta, S.C.; RAK College of Agriculture, Sehore (India). AICRP On Chickpea, Department of Soil Science and Agricultural Chemistry Sahu, Seema; RAK College of Agriculture, Sehore (India). AICRP On Chickpea, Department of Soil Science and Agricultural Chemistry. Response of chickpea to micronutrients and biofertilizers in vertisol . Legume Research (India). (Sep 2012) v. 35(3) p.248-251 KEYWORDS: TRACE ELEMENTS. BIOFERTILIZERS. CHICKPEAS. VEGETABLES. CICER ARIETINUM.

Field experiment conducted during 2004–05 and 2005–06 to study the effect of micronutrientsviz., iron (FeSO4 10 kg ha-1), boron (borax0 kg ha-1), Zinc (ZnSO4 25 kg ha-1), molybdenum (ammonium molybdate 1 kg ha-1) and joint application of all micronutrients viz., Fe+B+Zn+Mo, alone and in combination with Rhizobium+PSB inoculation on symbiotic traits, grain yield and uptake of N, P, K, S, Zn, Fe and B by chickpea crop grown with one irrigation in Vertisol having 74.8 mg kg-1 Fe, 0.02 mg kg-1 B, 2.15 mg kg-1 Zn and 0.016 mg/kg-1 Mo in soil. Application of allmicronutrients as well as inoculation significantly increased the nodule and total plant dry weight at 45 days of sowing. Grain yield was significantly increased by the application of molybdenum throughammonium molybdate 1 kg ha-1 which was 42.9; higher over the recommended dose of fertilizeralone. Combination of all micronutrients viz., Fe+B+Zn+Mo could increase the grain yield significantlyto the tune of 25.3; over RDF alone. Microbial population viz., Rhizobium, PSB and uptake of nutrients viz., N, P, K, S & Zn, Fe and B was also higher under the treatment of RDF+ ammonium molybdate kg ha-1 and the values were 43 and 26 X103 per gram of soil and 58.84, 3.54, 41.37, 3.22 kg ha-1 and 48, 820 and 60 g/ha-1 respectively. Microbial inoculation could significantly increase the Rhizobium and PSB population and also the grain yield of chickpea (12.2;) over no inoculation.The study indicated the necessity of application of molybdenum wherever deficient in Vertisol under intensive (Soybean-Chickpea) cultivation of legumes as it is directly involved in biological nitrogenfixation through nitrogenase enzyme activity.

095 Yadav, L.R.; S.K.N. College of Agriculture, Jobner (India). Choudhary, G. L.; S.K.N. College of Agriculture, Jobner (India).. Effect of fertility levels and foliar nutrition on profitability, nutrient content and uptake of cowpea [Vigna Unguiculata (L.) walp]. Legume Research (India). (Sep 2012) v. 35(3) p.258-260 KEYWORDS: PRAYS. NUTRIENT UPTAKE. COWPEAS. VIGNA UNGUICULATA. A field experiment was conducted during kharif season of 2009 on loamy sand soil to study the effect of fertility levels and foliar nutrition on cowpea. The experiment consisted of four treatments of fertility levels (control, 50, 75 and 100; RDF) and four treatments of foliar spray (water spray, 2; urea, 2; DAP and 2; KCl spray at branching and flowering) thereby making sixteen treatment combinations tested in factorial randomized block design with four replications. Results indicated that application of 100; RDF significantly increased the seed yield, net returns and total uptake of nitrogen, phosphorus and potassium over preceding levels of fertility. Whereas, protein content in seed, nitrogen, phosphorus and potassium content in seed and straw and potassium content in straw increased significantly upto 75; RDF and remained at par with 100; RDF. Results further indicated that foliar sprays of 2; DAP, 2; urea and 2; KCl remained at par and

resulted in higher seed yield, net returns, protein content, nitrogen, phosphorus and potassium content in seed and straw and total uptake of nitrogen, phosphorus and potassium over water sprayed control.

096 Goud, V.V.; Dr. Panjabrao Deshmukh Agricultural University, Akola (India). Pulses Research UnitKale, H.B.; Dr. Panjabrao Deshmukh Agricultural University, Akola (India). Pulses Research UnitKonde, N.M.; Dr. Panjabrao Deshmukh Agricultural University, Akola (India). Pulses Research UnitMohod, P.V.; Dr. Panjabrao Deshmukh Agricultural University, Akola (India). Pulses Research Unit. Optimization of agronomic requirement for medium duration pigeonpea hybrid under rainfed condition in vertisol. Legume Research (India). (Sep 2012) v. 35(3) p.261-264 KEYWORDS: ECONOMICS. NITROGEN. PHOSPHORUS. PIGEON PEAS. CAJANUS CAJAN. POTASSIUM. SPACING. SULPHUR. ZINC SULPHATE.

Investigation was carried out to study the effect of spacing and fertilizer on growth, yield and soil health in pigeonpea hybrid during 2007–08 and 2008–09. The results obtained showed significantly highest grain yield with row spacing of 90 cm (1371 kg/ha) followed by 75 cm (1329 kg/ha) over 60 cm (1193 kg/ha) and plant to plant spacing of 30 cm found superior over 20 cm, however, similar trend was obtained with net return. Application of different fertility levels recorded significantly higher grain yield and net return over control, however, difference between them remained at par, therefore, application of 20:45:20:20:15 kg NPKSZnSO4/ha was found economical. Soil fertility status after harvest of pigeonpea hybrid was significantly influenced due to spacing and fertility levels over initial status. Interaction effect due to different levels of fertilizer, FYM and biofertilizer were found to be non significant. The results show that sowing at 75 x 30 cm with application of 20:45:20:20:15 kg NPKSZnSO4/ha are essential for obtaining high grain yield as well as net return of pigeonpea hybrid.

097 Kang, J.S.; Punjab Agricultural University, Ludhiana (India). Department of AgronomySingh, Avtar; Punjab Agricultural University, Ludhiana (India). Department of AgronomyKaur, Maninder; Punjab Agricultural University, Ludhiana (India). Department of Agronomy. Studies on growth and yield of soybean (Glycine Max L. Merrill) under different planting methods and fertility levels. Legume Research (India). (Sep 2012) v. 35(3) p.265-267 KEYWORDS: PLANTING. SOYBEANS. GLYCINE MAX. YIELDS. GROWTH.

A field experiment was conducted on soybean (Glycine max L. Merrill) during kharif season of 2007–08 to study the response to nitrogen and phosphorus fertilizer under different methods of planting. Bed planted soybean with or without mulch recorded higher growth and yield attributes, seed and straw yield as compared to conventional and zero tillage planting method. There was no significant affect of fertility levels on growth and yield attributes and seed yield of soybean.

098 Subramanian, P.; Central Plantation Crops Research Institute, Kasaragod (India). subramanian.omshanthimail.comDhanapal, R.; Central Plantation Crops Research Institute, Kasaragod (India)Mathew, A.C.; Central Plantation Crops Research Institute, Kasaragod (India) Palaniswami, C.; Central Plantation Crops Research Institute, Kasaragod (India)Upadhyaya, A. K.; Central Plantation Crops Research Institute, Kasaragod (India)Naresh Kumar, S; Central Plantation Crops Research Institute, Kasaragod (India)Reddy, D. V. S; Central Plantation Crops Research Institute, Kasaragod (India). Effect of fertilizer application through micro-irrigation technique on nutrient availability and

coconut productivity. Journal of Plantation Crops (India). (Dec 2012) v. 40(3) p. 168-173 KEYWORDS: COCONUTS. TRICKLE IRRIGATION. GROWTH. PHOTOSYNTHESIS. SOIL FERTILITY. TRANSPIRATION. YIELDS.

An investigation was conducted to study the response of drip fcrtigation in West Coast Tall variety of coconut for growth, nutrition, physiological parameters and yield at Central Plantation Crops Research Institute, Kasaragod during 1996·2008. The application of fertilizers either through drip fertigation or soil application resulted in significantly higher trunk height and girth at base than control (no fertilizer). However, no significant difference was observed among different dose offertigation and soil application treatments. The number ofleaves on the crown was significantly higher (32.6) under 75 per cent of NPK through drip fertigation which was on par with 50 per cent and 100 per cent NPK through drip fertigation and 100 per cent NPK through soil application and significantly differed from 25 percent NPK through drip fertigation and control. Fertigation to coconut resulted in a marked increase in available nitrogen, phosphorus and potassium status in soil. Different levels of fertigation did influence significantly physiological parameters like net photosynthesis (PN)' transpiration (E) and stomatal conductance (gJ The treatment, 100 per cent NPK applied through fertigation resulted significantly higher PN' E and g, and which was on par with 50 per cent and 75 per cent thrpugh drip fertigation and significantly differed from 100 per cent NPK though soil application and control. Among the fertigation levels, coconut yield was significantly higher in 100 per cent NPK fertigation (131 nuts/palm/year) which was on par with 75 and 50 per cent NPK applied through drip irrigation and significantly differed from 100 per cent NPK through soil application, 25 per cent NPK through fertigation and control. The study indicated that adoption of fertigation increases the productivity with 50 per cent saving of chemical fertili zers which ensure the higher efficiency of nutrients in crop production.

F06 Irrigation

099 Soni, M.; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (India)Upadhyay, V.B.; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (India)Vishwakarma, S.K.; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (India)Singh, P.; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (India). Productivity and sustainability of rice (Oryza sativa) based cropping systems in Kymore plateau and Satpura hills zone of Madhya Pradesh. Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 8-13 KEYWORDS: PRODUCTIVITY. ORYZA SATIVA. MADHYA PRADESH. GROWTH. YIELDS. SUSTAINABILITY.

A field experiment was conducted during 2007-08 and 2008-09 on a sandy clay loam soil, to indentify sustainable rice (Oryza sativa L.) based cropping systems with higher productivity, economics and efficient use of water in Kymore Plateau and Satpura hills zone of Madhya Pradesh. In these 12 cropping systems, rice was sequenced with feasible rabi viz., wheat [Triticum aestivum (L.) emend. Paol & Fiori], chickpea (Gicer arietinum L.), onion (Allium sepa L.), berseem (Trifolium alexandrinum L.), potato (Solanum tuberosum L.), gobhi sarson (Brassica napus var. napus), vegetable pea, (Pisum sativum L.), garlic (Allium sativum L.), marigold (Tagetes erecta L.) and sum¬mer crops viz., maize (Zea mays L.), green gram (Vigna radiata L. Wilczek), sunflower (Helianthus annuus L.), groundnut (Arachis hypogaea L.), okra (Abelmoschus esculentus L. Moench) and cowpea (Vigna unguiculata (L.) Walp.). Hybrid rice 'JRH-5'-garlic-maize+cowpea cropping system recorded the highest productivity (27.35t/ha/ year) in terms of rice equivalent yields (REY) with net monetary returns of Rs 1

,75,980/ha/year, A.47 benefitcost ra-tio and water productivity of 137.9kg/ha/cm. Both the existing cropping systems viz., rice-wheat and rice-chickpea recorded the least productivity, net monetary returns, benefit cost ratio and water productivity. The highest total uptake of N, P and K nutrients was under rice-gobhi sarson-okra cropping system. After completion of 2 crop cycles, there was a slight improvement in organic carbon and total N content of soil due to inclusion of legumes.

100 Mishra, J.S.; Directorate of Weed Science Research, Jabalpur (India)Singh, V.P.; Directorate of Weed Science Research, Jabalpur (India). Effect of tillage sequence and weed management on weed dynamics and productivity of dry seeded rice (Oryza sativa) – wheat (Triticum aestivum) system. Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 14-19 KEYWORDS: TILLAGE. PRODUCTIVITY. ORYZA SATIVA. TRITICUM AESTIVUM. ECONOMICS. HERBICIDES. WEEDS.

A field experiment was conducted during 2006-07 to 2008-09 at Jabalpur to study the effect of four tillage se-quences [zero-till planting of both the crops (ZT-ZT), conventional planting in both the crops (CT-CT), and two ro-tational tillage sequences that altered between zero-till and conventional tillage (ZT-CT and CT-ZT)] and three weed control treatments (weedy check, herbicide alone, and herbicide + 1 hana weeding at 35 days after sowing) on weed dynamics, tillage economy and productivity of dry-seeded rice (Oryza sativa L.) wheat [(Triticum aestivum (L.) emend Fiori & Paol)] system on a clay-loam soil. Results revealed that continuous zero tillage in-creased the population density of Echinoch/oa c;na (L.) Link Gungle rice) and Cyperus iria L. (rice flat sedge), the most dominant weeds of rice. In subsequent wheat crop, zero tillage reduced the population of Avena /udoviciana (L.) Our. (wild oats) and Chenopodium a/bum L. (common lambsquarters) but increased the density of Medicago hispida Gaertn. (burclover) as compared to other tillage systems. Rotational tillage systems had variable effects on weed density in rice and wheat. Pendimethalin (1.0 kg/ha) fb 2, 4-0 (0.50 kg/ha) significantly reduced the population density of E. c;na, C. iria and A/ternanthera sessilis (L.) D.C. (sessile joyweed) but failed to control Caesu/ia axillaris Roxb. (pink node flower) in rice. In subsequent wheat, clodinafop propargyl alone significantly reduced the population of A. /udoviciana, but M. hispida was unaffected even with integration of herbicide with 1 hand weeding. Continuous zero tillage yielded 25.1 and 15.4; higher grain yields of rice and wheat re¬spectively, than that of conventional tillage regardless to weed control methods. Continuous zero tillage with rec¬ommended herbicide + 1 hand weeding recorded the maximum net returns (~73.87 x 103/ha) and B: C ratio (3.81) in direct-seeded rice-wheat system.

101 Mukundam, B.; Acharya N.G. Ranga Agriculture University; Hyderabad (India). All India Coordinated Research Project on STCR) Yakadri, M.; Acharya N.G. Ranga Agriculture University; Hyderabad (India). Dept. of Agronomy)Raja, V.; Acharya N.G. Ranga Agriculture University; Hyderabad (India). All India Coordinated Research Project -IFS)Srividya, S.; Central Research Institute for Dryland Agriculture, Hyderabad (India). Diversification of rice (Oryza sativa) based cropping system for improving productivity and income in Telangana region of Andhra Pradesh. Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 20-23 KEYWORDS: DIVERSIFICATION. ORYZA SATIVA. PRODUCTIVITY. ECONOMICS. CROPPING SYSTEMS. SOIL. FERTILITY.

Field experiments were conducted on a sandy clay loam soil during kharif and rabi 2006-07 and 2007-08 at Agriculture College Farm, Rajendranagar, Hyderabad to evaluate diversified rice (Otyza sativa L.) based cropping system with rice varieties and legume crops. The experiment was laid out in split plot design with three rice varieties of different durations, viz., 'Samba Mahsuri' (BPT-5204), 'Early Samba' (M-7) and 'Tellahamsa' as main plot treatments in kharif and sub-plot treatments of maize (Zea mays L.) with and without herbicides, greengram (Vigna mungo L.) and blackgram [Vigna radiata (L.) Wilczek] were super imposed on the rice varieties during rabi season in three replicates. 'Samba Mahsuri' long duration rice produced 0.9 and 1.9 t/ha higher yield and Rs. 7,891 and 16,074/ha higher net return over 'Early Samba' and 'Tellahamsa'. The performance of rabi crops was not in-fluenced by the rice varieties of kharif season. In terms of rice equivalent yield and net returns, rice-zero tillage maize, irrespective of herbicides supplementation, was 103-197 percent superior over existing rice-pulse se-quence. Soil fertility status and microbial population of the rice - maize system was lower than rice legume system.

102 Bana, R.S.; Indian Agricultural Research Institute, New Delhi (India)Shivay, Y.S.; Indian Agricultural Research Institute, New Delhi (India). Div. of Agronomy). Productivity of summer forage crops and their effect on succeeding basmati rice (Oryza sativa) in conjunction with phosphogypsum-enriched urea. Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 24-31 KEYWORDS: PRODUCTIVITY. ORYZA SATIVA. YIELDS. NUTRIENT UPTAKE.

A field experiment was conducted during summer and rainy seasons of 2007 and 2008 at New Delhi to study the productivity of summer forage crops viz. sole pearlmillet (Pennisetum glaucum L. R. Br. Emend Stuntz), sole cowpea {Vigna unguiculata (L.)Walp}, pearlmillet + cowpea mixture and their effect in conjunction with phosphogypsum-enriched urea (PGEU) viz. absolute control, 0, 2.5, 5 and 7.5; PGEU on yield attributes, yields and total N, P, K and S uptake in basmati rice (Otyza sativa L.). Among the three forage crops grown during sum¬mer, pearlmillet + cowpea mixture recorded significantly higher green and dry fodder yields compared to sole pearlmillet and sole cowpea during both the year of experimentation. Percentage increase in fresh yield of pearlmillet + cowpea was 15.3 and 43.4 over sole pearlmillet and sole cowpea respectively during 2007 and simi¬lar trend was also recorded during 2008. Micronutrient uptake viz. zinc, manganese, copper and iron also followed the same pattern to that of dry forage yield of summer fodder crops. In case of basmati rice yield attributes viz. ef¬fective tillers, panicle length, panicle weight and grain weight/panicle were influenced significantly due to preced¬ing forage crops. Application of variable concentrations of PGEU had significant effect on all the yield attributes of basmati rice. Significantly higher grain, biological yield as well as harvest index of basmati rice was recorded when it was grown after the harvest of proceeding summer forage cowpea as compared to other treatments. Similarly, significantly higher grain and biological yields were recorded with 7.5; PGEU. Various preceding summer forage I crops had significant effect on nutrients uptake viz. N, P, K and S total uptake in basmati rice (grain + straw). The significantly higher total (grain + straw) N, P, K and S uptake were recorded with 7.5; PGEU compared to lower levels of PGEU.

103 Avasthe, R.K.; Central Soil and Water Conseervation Research and Training Institute, Dehradun (India). Div. of Human Resource Department)Verma, S.; Central Soil and Water Conseervation Research and Training Institute, Dehradun (India). Senior Technical Officer)

Kumar, A.; Central Soil and Water Conseervation Research and Training Institute, Dehradun (India). Scientist Senior Scale)Rahman, H.; Indian Council of Agricultural Research Research Complex for North Eastern Hill Region, Tadong (India). Sikkim Centre). Performance of rice (Oryza sativa) varieties at different spacing under system of rice intensification (SRI) in mid hill acid soils of Sikkim Himalayas . Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 32-37 KEYWORDS: ORYZA SATIVA. NUTRIENT UPTAKE. YIELDS. GROWTH. HIMALAYAN REGION. ACID SOILS. EFFICIENCY. WATER USE.

Field experiments were conducted at the ICAR Sikkim Research Farm, Tadong located at an altitude of 1450 m amsl in the per-humid mid hill acidic soils during kharif (rainy season) of 2008 and 2009 to evaluate the perfor-mance of four rice (Oryza sativa L.) varieties viz., 'RCPL 1-87-8' (medium-duration, 125 days), 'Pusa Sugandh-2' (medium-daration, 130 days), 'RC Maniphou-7' (long-duration, 150 days) and one local cultivar 'Thulo Atley' (long duration, 155 days) under different spacing in system of rice intensification (SRI) compared with conventional rice cultivation. 'RC Maniphou-7' recorded the highest grain yield (6.73 t/ha), N uptake (124.8 kg/ha), P uptake (40.5 kg/ha) , K uptake (84.3 kg/ha) , water use efficiency (2.879 kg/ha-mm), net return (Rs. 72,750) and benefit: cost (2.09) at 20 cm x 20 cm spacing under SRI. Total N, P and K uptake was the highest in SRI with a spacing of 20 cm x 20 cm in 'RCLP 1-87-8', 'RC Maniphou-7' and local cv 'Thulo Atley' over conventional rice cultivation. The optimum spacing under system of rice intensification for 'RCPL 1-87-8', 'RC Maniphbu-7' and tocal cv 'Thulo Atley' was 20 cm x 20 cm. 'Pusa Sugandh-2' recorded a 2.0; yield decrease at 20 cm x 20 cm and 23.0; yield de¬crease at SRI 10 cm x 10 cm, as compared to conventional rice cultivation and did not respond to SRI.

104 Singh, M.; National Bureau of Plant Genetic Resources, New Delhi (India)Sairam, C.V.; Indian Council of Agricultural Research Zonal Project Directorate, Bangalore (India)Hanji, M.B.; Indian Council of Agricultural Research Zonal Project Directorate, Bangalore (India)Prabhukumar, S.; Indian Council of Agricultural Research Zonal Project Directorate, Bangalore (India)Kishor, N.; Ministry of Agriculture, Government of India, New Delhi (India). Directorate of Extension). Crop weed competition and weed management studies in direct seeded rice (Oryza sativa). Indian Journal of Agronomy (India) . (Mar 2012) v. 57(1) p. 38-42 KEYWORDS: WEEDS. MANAGEMENT. ORYZA SATIVA. SEED.

Field experiments were conducted during 2006-07 and 2007-08 at Krishi Vigyan Kendra, Madurai, Tamil Nadu under the Zonal Project Directorate, Bangalore to study the critical period of crop weed competition and develop an integrated and effective weed control practices, combining chemical, manual and mechanical methods, for direct seeded rice (Oryza sativa L.). It was found that first 40 days after sowing was the most critical period for crop weed competition. The crop grown under weed free condition for 40 days after sowing gave the maximum grain yield (2.93 t/ha). Hand-weeding followed by foliar application of urea was significantly superior to rest of the treatments and gave maximum grain (4.33 t/ha) and straw yields (8.17 t/ha). Post-emergence application of propanil 3.8 kg/ha at 20 days after sowing and soil application of urea was most effective in increasing the crop yield and minimizing the crop weed competition. Highest weed control efficiency of 88.1 ; was recorded in crop given propanil 3.8 kg/ha + hand weeding within rows and hoeing at 40 DAS and it closely followed by the application of butachlor 2.5 kg/ha + hand weeding within rows and hoeing at 40 DAS. In the integrated approach, post emergence application of propanil 3.8 kg/ha at 20 days after sowing followed by hoeing between the rows and hand weeding

within rows at 40 days after sowing minimized crop'weed competition, increased uptake of N, P and K by crop and maximized grain yield and
economical returns significantly.

105 Singh, U.; Sher-e-Kashmir University of Agricultural Science and Technology, Kashmir (India). Faculty of Agriculture)Saad, A.A.; Sher-e-Kashmir University of Agricultural Science and Technology, Kashmir (India). Faculty of Agriculture)Ram, T.; Sher-e-Kashmir University of Agricultural Science and Technology, Kashmir (India). Faculty of Agriculture)Chand, L.; Sher-e-Kashmir University of Agricultural Science and Technology, Kashmir (India). Faculty of Agriculture)Mir, S.A.; Sher-e-Kashmir University of Agricultural Science and Technology, Kashmir (India). Faculty of Agriculture)Aga, F.A.; Sher-e-Kashmir University of Agricultural Science and Technology, Kashmir (India). Faculty of Agriculture). Productivity, economics and nitrogen-use efficiency of sweet corn (Zea mays saccharata) as influenced by planting geometry and nitrogen fertilization. Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 43-48 KEYWORDS: ECONOMICS. PRODUCTIVITY. ZEA MAYS. NITROGEN. FERTILIZERS. PLANTING.

A field experiment was conducted during rainy season of 2007 and 2008 at Wadura, Sopore, to study the effect of crop geometry (60 cm x 15 cm, 60 cm x 20 cm, 60 cm x 25 cm, 60 cm x 30 cm) and nitrogen levels (0, 30, 60, 90,120 and 150 kg N/ha) on yield, yield attributes, nitrogen use efficiency, crop productivity, economics and nitrogen balance of sweet corn (Zea mays saccharata Sturt). Plant height, weight of green cobs, number of kernel/cob, 1,000-kernel weight and kernel recovery increased as the inter-plant spacing was increased from 15 to 30 cm, while the number of cobs/ha, plant dry weight and bareness increased with a decrease inter-plant spacing from 30 cm to 15 cm. The maximum cob yield was recorded at 60 cm x 20 cm spacing which was higher than 60 cm x 25 cm planting geometry. A decrease in planting spacing from 60 cm x 20 cm to 60 cm x 15 cm caused 33.2; reduction in cob yield. The kernel yield and crop productivity, crop profitability, net returns, nitrogen uptake and nitrogen use efficiency were also higher at 60 cm x 20 cm planting spacing. Increasing nitrogen. levels upto 120 kg/ha showed marked improvement in plant height, plant dry weight, number of cobs/ha, number of kernels/cob, 1000 kernel weight, green cob weight and kernel recovery, which consequently improved the yield and return. While Barrenness in cobs also declined with increasing nitrogen levels. Highest nitrogen uptake, total availability and actual residual soil nitrogen contents were observed at 150 kg N/ha. Increasing nitrogen levels progressively reduced agronomic and physiological nitrogen use efficiency. A level of 125.7 kg N/ha was found to be economic optimum with green cob yield of 14.21 tlha and a response of 7.55 tlha. The response to optimum level of N was found to be 60.09 kg green cob/kg N applied. Hence, crop geometry of 60 cm x 20 cm with nitrogen level of 120 kg/ha should be adopted to obtain the maximum green cob yield and net profit from sweet corn in Kashmir valley.

106 Miri, K.; Indian Agricultural Research Institute, New Delhi (India)Rana, D.S.; Indian Agricultural Research Institute, New Delhi (India). Div. of Agronomy)Rana, K.S.; Indian Agricultural Research Institute, New Delhi (India). Div. of Agronomy)Kumar, A.; Indian Agricultural Research Institute, New Delhi (India). Div. of Agronomy) . Productivity, nitrogen-use efficiency and economics of sweet sorghum (Sorghum bicolour) genotypes as influenced by different levels of nitrogen. Indian Journal of Agronomy (India). (Mar 2012) v 57(1) p. 49-

54 KEYWORDS: GENOTYPES. NITROGEN. PRODUCTIVITY. ECONOMICS. SORGHUM BICOLOR. YIELDS.

A field experiment was conducted at New Delhi, during rainy seasons of 2009 and 2010 to evaluate 3 sweet sorghum {Sorghum bicolour (L.) Monech} genotypes ('RSSV 9', 'SSV 84' and hybrid 'CSH 22 SS') under four ni-trogen levels (0, 50, 100 and 150 kg N/ha) for productivity of ethanol, grain and fodder, nitrogen-use efficiency and economics of production. Results pooled over two years indicated that stalk yield (75.3 t/ha) and fodder yield (16.0 t/ha) recorded significant increase only up to 100 kg N/ha, while fermentable sugar (4.34 t/ha), estimated ethanol (2.46 KUha) and grain yields (2.6 t/ha) responded up to 150 kg N/ha. Hybrid 'CSH 22 SS' recorded 28, 40, 34,. 34, 33 and 26; higher stalks (85.6 t/ha), juice (30 KU ha), fermentable sugar (4.6 t/ha), estimated ethanol (2.6 KLi ha), grain (2.4 t/ha and fodder (16.8 t/ha) yields than genotype 'RSSV 9' and 57, 110, 112, 112,41 and 46; than genotype 'SSV 84'. Sorghum grain equivalent (11.1 t/ha) based on ethanol, grain and fodder yields recorded with 150 kg N/ha was significantly higher over 100 kg N/ha. Hybrid 'CSH 22 SS' recorded significantly higher sorghum grain equivalent yield (11.35 t/ha), when compared to 'SSV 84' (6.15 t/ha) and 'RSSV 9' (8.53 t/ha). Nitrogen-use efficiencies like partial factor productivity, agronomic nitrogen-use efficiency and crop recovery efficiency de-creased with increasing dose of nitrogen. 'CSH 22 SS' had the highest agronomic nitrogen-use efficiency (14.5 kg grain/kg N applied) and partial factor productivity (30.7 kg/kg N applied) followed by 'RSSV 9'. Maximum gross re-turns (f1 01,410), net returns (f55,670) and net B:C ratio (1.17) were recorded with application of 150 kg N/ ha. 'CSH 22 SS' produced the highest net returns (f55,900), which was (105 and 39; higherover 'SSV 84' and 'RSSV 9', respectively. Application of 150 kg N with 'CSH 22 SS' produced the highest values of juice yield (40KU ha), estimated ethanol yield (3.47 KUha) and grain yield (3.3 t/ha).

107 Sarawgi, S.K.; Indira Gandhi Krishi Vishwavidyalaya, Raipur (India). Dept. of Agronomy)Chitale, S.; Indira Gandhi Krishi Vishwavidyalaya, Raipur (India). Dept. of Agronomy)Tiwari, A.; Indira Gandhi Krishi Vishwavidyalaya, Raipur (India). Dept. of Soil Science and Agricultural Chemistry)Bhoi, S.; Indira Gandhi Krishi Vishwavidyalaya, Raipur (India). Dept. of Agronomy). Effect of phosphorus application alongwith PSB, rhizobium and VAM on P fractionation and productivity of soybean (Glycine max). Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 55-60 KEYWORDS: PHOSPHORUS. RHIZOBIUM. GLYCINE MAX. PRODUCTIVITY.

A field experiments was carried out at Raipur, during 2005 to 2007 to find out the best source and level of phosphorus with and without phosphorus solubilizing microbial seed treatment for higher growth and yield of soybean [Glycine max (L.) Merr.] and soil P fraction were studied in soil after the harvest of the crop. The soil of experimental area belongs to the sub-group chromustert of the order Vertisol and was neutral to slightly alkaline in reaction, medium in organic carbon, low in available N and available P and high in available K. Application of 30 kg P2O5/ha through rock phosphate (RP) + phosphate solubilizing bacteria (PSB) + Rhizobium inoculation (RI) + vesicular arbuscular mycorrhizae (V AM) registered significantly higher seed yield, net return and return/rupee invested in P compared to application of 60 kg P P2O5/ha through rock phosphate without bio-fertilizers. The P supplied through rock phosphate and inoculated with PSB, RI and V AM increased the Nand P content of soil. PSB and V AM application over respective level of P enhanced the availability of different fraction of inorganic-P in soybean crop. Seed treatment with

biofertilizers had their significant effect on microbial population in conjunction with P application. Saloid-P, Ca-P and organic-P and AI-P at 0-15 cm depth and Ca-P and organic-P at 15-30 cm depth contributed significantly for total-P after soybean.

108 Singh, G.; Kurukshetra University, Kurukshetra (India). Dept. of Microbiology)Mittal, A.; Kurukshetra University, Kurukshetra (India). Dept. of Microbiology)Kumari, A.; Kurukshetra University, Kurukshetra (India). Dept. of Microbiology)Goel, V.; Kurukshetra University, Kurukshetra (India). Dept. of Microbiology)Aggarwal, N.K.; Kurukshetra University, Kurukshetra (India). Dept. of Microbiology)Yadav, A.; Kurukshetra University, Kurukshetra (India). Dept. of Biotechnology). Isolation and cultural conditions optimization for poly a-hydroxybutyrate producing Bacillus specis. Annals of Biology (India). (Dec 2012) v. 28(2) p. 116-120 KEYWORDS: ISOLATION TECHNIQUES. NITROGEN. TEMPERATURE. BACILLUS. SPECIES. PLASTICS.

The amount of plastic waste increases every year and exact time for its degradation is unknown. Out of a total of 300 isolated strains, one strain was selected for PHB production in different conditions like carbon source, nitrogen source, and incubation temperature and time. When PHB production conditions were optimized with different carbon and nitrogen sources, the highest PHB production was observed with maltose and ammonium sulphate. Regarding incubation time and temperature and pH, optimum PHB production conditions were 72 h, 40°C and 7.0, respectively. The isolate was characterised biochemically as Bacillus species. The present study provide the useful data about the optimized conditions for PHB production by Bacillus species that can be utilized for industrial production of PHB, a fast emerging alternative of non-biodegradable plastics.

109 Verma, R.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Haryana Kisan Ayog)Yadav, P.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Genetics and Plant Breeding)Gahlawat, S.K.; Chaudhary Devi Lal University, Sirsa (India). Dept. of Biotechnology). Detection and identification of genetic diversity among fish pathogens using 16X-rRNA primers. Annals of Biology (India). (Dec 2012) v. 28(2) p. 121-124 KEYWORDS: IDENTIFICATION. PATHOGENS. FISH. PCR. BIODIVERSITY.

Many bacterial pathogens can now be detected in samples of various kinds without the need to first culture the organism and phylogenetic relationships by using PCR-based methods. PCR-based genotyping technologies are simple and fast. Under the present investigation, the amplified gel electrophorized product (approx. 500 bp), stained with Ethidium bromide was visualized under U.V. light in gel documentation system. The amplified 16S rDNA was digested with two restriction enzymes SauIIIA and Hinfl at 37°C for 2 h to generate amplified ribosomal DNA restriction analysis (ARDRA) profiles, both the restriction enzymes generated 2-3 fragments in bacterial isolates; these fragments were scored by comparison to a low molecular DNA Ladder (50 bp) and analyzed by 1/0 clustering method of the NT¬SYSpc2.0 programme then a dendrogram displaying hierarchical associations among all isolates was generated. On the basis of similarity coefficient the isolates were divided in five major groups (A, B, C, D and E). Group A and E were found most divergent which have genotypes S. aureus and Streptococcus grp. Ql, respectively. The genotypes KI. oxytoca and A. hydrophila has 83; similarity in group B, whereas P. flourescens and P. aeruginosa have 99; similarity in group D.

110 Sharma, S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Horticulture)Sharma, R.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Horticulture)Siddique, S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Pl. Physiology and Botany)Goyal, R.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Horticulture). Chemical changes during growth and development of ber (Ziziphus mauritiana Lamk) fruits. Annals of Biology (India). (Dec 2012) v. 28(2) p. 125-129 KEYWORDS: GROWTH. PROTEINS. ENZYMES. POLYPHENOLS. FRUITS. ZIZIPHUS. GROWTH DISORDERS. RESEARCH.

Chemical changes occuITed during growth and development of ber fruit cultivars Urman and Kathaphal were. studied at Post-harvest Laboratory, Department of Horticulture at CCSHAU, Hisar. Starch content decreased progressively during the. initial stages of fruit development, but. thereafter no remarkable reduc.tion in starch content was found in both the cultIvars. Total phenols and total protems decreased progressIvely wIth the subsequent development of fruits of botlp the cultivars. Protein banding pattern at different stages of fruit development i. e. after fi-uit set, before ripening an4 ripening did not show any specific differences in polypeptide pattern in both the cultivars Urman and Kathaphal except band D having high intensity. The activity of enzymes amylase and protease increased progressively with the advip1cement of ripening in both the culTivars except at last stage of maturity. However, polyphenol oxidase activity increased upto 5th of April after fruit set and then decreased at later stage of ripening in ber.

111 Beniwal, R.S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Forestry)Chauhan, R.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Forestry)Kumar, S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Forestry). Evaluation of genetic variability in Pongamia pinnata (L.) Pierre germplasm for pod and seed traits. Annals of Biology (India). (Dec 2012) v. 28(2) p. 130-135 KEYWORDS: GERMPLASM. SEEDS. QUALITY. PONGAMIA PINNATA. GENETIC VARIATION.

Fifty-two seed sources of Pongamia pinnata were collected from different geographical regions of Haryana, Rajasthan and Uttar Pradesh. Morphological data on pods and seeds were taken to assess he genetic variability. Significant genetic variability between seed raits (length, breadth, thickness, 100-seed weight and oil content) and pod traits (length, breadth, thickness and IOO-pod weight) was recorded. Oil content in the seed ranged from 28.67; in RJ-lI to 47.02; in RJ-2. Higher magnitude of phenotypic coefficients of variation (PCY) than the corresponding genotypic coefficients of variation (GCY) for all the characters indicated the impact of environmental changes on the expression of traits. High heritability coupled with high genetic gain was recorded for IOO-pod weight indicating the importance of additive gene effects.

112 Kumar, D.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Entomology)Singh, S.P.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Forestry). Role of bio-chemical paramaters for resistance to mustard aphid;Lipaphis erysimi (Kaltenbach) incidence. Annals of Biology (India). (Dec 2012) v. 28(2) p. 136-139 KEYWORDS: MUSTARD. BIOCHEMICAL PATHWAYS. APHIDOIDEA. LIPAPHIS ERYSIMI.

Selected 10 genotypes of five Brassica species were evaluated for their bio-chemical analysis to mustard aphid on the basis of pooled mean of aphid infestation index. Higher

glucosinolate content was obtained in genotype T-27 (105.66 Jl mole/g DM) and lower in BSH-l (47.04 Jl mole/g DM). A highly significant and negative correlation was observed between glucosinolate content and aphid infestation. Pheno1 content varied ITom 1.46; (BSH-l) to 2.71; (T-27). The correlation coefficient between phenol content and aphi infestation index was negative and significant. The amount of waxes in leaves of Brassica genotypes varied from .91; (BSH-l) to 5.72; (T-27). The correlation coefficient between waxes content in leaves of plant and mustard' aphid infestation was negative and non-significant. Total nitrogen varied ITom 3.54; (HNS 9605) to 4.75; (BSH-l) had positive significant correlation with aphid infestation. Total sugar varied ITom 6.87; (T-27) to 10.50; (BSH-l) and presented positive significant correlation with aphid infestation.

113 Singh, Y.; Sant Longowal Institute of Engineering and Technology, Longowal (India). Dept. of Food Engineering and Technology)Prasad, K.; Sant Longowal Institute of Engineering and Technology, Longowal (India). Dept. of Food Engineering and Technology). Variation in engineering characteristics of Moringa oleifera leaf to controlled isothermal exposure. Annals of Biology (India). (Dec 2012) v. 28(2) p. 140-143 KEYWORDS: DEHYDRATION. MORINGA OLEIFERA. TECHNICAL PROPERTIES.

Moringa oleifera is multipurpose usage plant, considered as nutritionally rich vegetative resource to be used as food in combating the protein energy malnutrition problem in most of the developing and under developed countries. The leaf of M. oleifera is good source of proteins, vitamins and minerals. To combat the perishability problem associated with the fresh plant resources reduction in water activity is tried as a noble technique. The selected fresh leaf was treated at different isothermal conditions from 50 to 80°C, with an equal interval of 10°C till attaining constant weight. The dehydrated leaves were powdered. This developed shelf-stable leaf powder can be used in place as ready to use nutritionally improved biomaterial. Considering this in vi'ew, the objective of this study was considered to determine the effect of heat treatment on dimensional, gravimetric, frictional and associated nutritional changes in M. oleifera. The results indicated that M. oleifera leaf powder obtained at dehydration temperature of 70°C maintained the optimal physico-chemical and nutritional characteristics.

114 Kumar, S.; Mahareshi Dayanand University, Rohtak (India). Dept. of Environmental Sciences)Dhankhar, R.; Mahareshi Dayanand University, Rohtak (India). Dept. of Environmental Sciences). Trophic state index and assessment of water quality for domestic and agriculture purpose of Bhindawas wetland, jhajjar, Haryana (India). Annals of Biology (India). (Dec 2012) v. 28(2) p. 144-151 KEYWORDS: WATER QUALITY. HARYANA. AGRICULTURE. WETLANDS.

Bhindawas wetland is the largest wetland in state of Haryana with an area of around 1064 acres. Present study was carried out to understand the water quality alongwith Trophic State Index and its suitability for domestic and agriculture use in different months, namely, July (pre-monsoon), September (monsoon) and November and January (post-monsoon). Nine samples were collected from the study area, seven from wetland area and two from drain No.8 adjacent to wetland for four times at the interval of two months. Calculation based on Carlson Trophic State Index revealed that wetland came under the hypereutrophic category. Chemical analysis data of Bhindawas wetland water was evaluated for its suitability for domestic purpose. The electric conductivity and concentration of total dissolved solid were more than the desirable limit of 750 Ilmho/cm (WHO) and 500 mg/l

(BIS), respectively, in 18; of the total wetland samples. Total hardness increased in the monsoon because in this season lake received flooded water. Highest permissible limit of total hardness given by WHO is 200 mg/l. Concentration of turbidity was higher than 5 NTU (max. desirable) in most of the samples it might be due to the surface water. Turbidity can be removed by sedimentation process and water after treatment is safe for domestic purpose. Suitability of water irrigation purpose is mainly based upon the estimation of parameters like sodium absorption ratio, per cent sodium, residual sodium carbonate, total sodium concentration and electric conductivity are important factors in classification. In the present study, it was found that samples fen in excellent and good categories. Sodium adsorption ratio ranged from 0.69835 in September at Sl site to maximum 3.272241 milliequivalents per litre in January at S3 site satisfying irrigation water. Range of per cent sodium varied from 22 to 58; in study area. Residual sodium carbonate ranged from -2.95547 in November at Ss to 0.49296 epm in July Ss. Based on the base-exchange indices (rl), about 78; Bhindawas water samples are classified as Na+-SOt type (rll) and rest are Na+-HC03- type (rlI).

115 Yadav, S.; Mahareshi Dayanand University, Rohtak (India). Dept. of Genetics) Arya, V.; Mahareshi Dayanand University, Rohtak (India). Dept. of Genetics)Kumar, S.; Mahareshi Dayanand University, Rohtak India). Dept. of Genetics)Yadav, M.; Mahareshi Dayanand University, Rohtak (India). Dept. of Genetics)Yadav, J.P.; Mahareshi Dayanand University, Rohtak (India). Dept. of Genetics). Ethnomedicinal flora and dosi hills of Mahendergarh district (Haryana), India. Annals of Biology (India). (Dec 2012) v. 28(2) p. 152-157 KEYWORDS: ETHNOBOTANY. HARYANA. FLORA.

The present study was carried out to document the ethnomedicinal flora of Dosi hills in Mahendergarh district of south Haryana. The information was collected from the local medicine men, Vaidyas, traditional healers and elderly people of nearby villages. A total of 52 plants belonging to 25 families with ethnomedicinal as well as other benefits have been reported. Out of 52 surveyed plants, 38; were herbs, 31; shrubs, 19; trees and 6; climbers and grasses. Some plants are confined to this area e. g. Actiniopteris radiate, Adiantum capillus veneris, Euphorbia neriifolia, Barleria prionitis, Boswellia serrata and Commiphora wighti. But, now few of them are at the verge of extinction from this area. Proper documentation will be helpful for conservation of these threat plants.

116 Bhyan, B.; Manav Institute of Pharmacy, Hisar (India). Dept. of Pharmaceutics)Jangra, S.; Markandeshwar Institute of Science and Technology, Kurukshetra (India). Dept. of Pharmaceutical Sciences) Berwal, R.; Manav Institute of Pharmacy, Hisar (India). Dept. of Pharmaceutics)Khurana, G.; Manav Institute of Pharmacy, Hisar (India). Dept. of Pharmaceutics)Nagpal, U.; Manav Institute of Pharmacy, Hisar (India). Dept. of Pharmaceutics)Sindhwani, G.; Markandeshwar Institute of Science and Technology, Kurukshetra (India). Dept. of Pharmaceutical Sciences). Formulation and evaluation of Buccoadhesive core in cup tablet of diclofenae potassium and tizanidine hydrochloride. Annals of Biology (India). (Dec 2012) v. 28(2) p. 158-163 KEYWORDS: POTASSIUM. EVALUATION. ADHESIVES. CONTROLLED RELEASE.

Novel muccoadhsive buccal tablets (NMBT) of diclofenac potassium (DP) and tizanidine hydrochloride (TH) were prepared as core in cup fashion to release and permeate the drugs unidirectionally towards the buccal mucosa to reach systemic circulation directly. Special punches were designed and fabricated to prepare buccoadhsive core in cup tablets by

making protrusion in the 11 mm upper flat-faced punch. The buccoadhsive cups were prepared by direct compression method using polymers like ethylcellulose, sodium carboxymethyl cellulose, chitosan, carbopol 934P, hydroxyl propyl methylcellulose (HPMCK4M) on single station tabletting machine. NMBT were evaluated for weight uniformity, thickness, hardness, friability, diameter, thickness, percentage drug content, swelling, mucoadhesive strength, surface pH, in vitro drug release. In vitro permeability studies of NMBTs were conducted in 200 ml phosphate buffer pH 6.8 (37:J:2°C) as dissolution media using type I (basket) apparatus and stirred at ~O rpm/min. Tablet was attached outside basket with the help of cyanoacrylate from backing membrane cup side as the mucoadhesive side was exposedto mucus membrane in the oral cavity. Formula F7 containing the polymer carbop61 and HPMC K4M in ratio 1 : 1 was . selected as the best formulation because it satisfies all the evaluation parameters. The formulation showe.d unidirectional drug release through the b~ccal mucosa in a controlled fashion with a promising adhesion strength.

117 Berwal, R.; Manav Institute of Pharmacy, Hisar (India). Dept. of Pharmacology)Bhyan, B.; Manav Institute of Pharmacy, Hisar (India). Dept. of Pharmacology)Gulshan; Manav Institute of Pharmacy, Hisar (India). Dept. of Pharmacology)Berwal, N.; Manav Institute of Pharmacy, Hisar (India). Dept. of Pharmacology). A review on process of drug discovery and development. Annals of Biology (India). (Dec 2012) v. 28(2) p. 164-167 KEYWORDS: DRUGS. DEBT. RESEARCH. Drug discovery is a process of searching new therapeutically useful entities. The process of bringing a new drug to the market consists of four main stages-drug discovery, preclinical testing, clinical trials and FDA review. Drug discovery involves the searching of a new compound by lead search, combinatorial chemistry and HTS. After getting a new compound, preclinical testing and preformulation are done. INDA is required for continuing, the process in phases of clinical trials. Final step is submission of NDA to FDA, and a drug comes in the market after approval of FDA. This process continues here also with post-market surveillance, long term effect of a drug is studied. Drug discotery is a challenging process requiring a huge amount of money, time and man power.

F08 Cropping patterns and systems

118 Kumari, P.; Chaudhary Charan Singh Haryana Agricultural University, Kaithal (India). College of Agriculture)Ahuja, U.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Genetics and Plant Breeding)Maheswaran, M.; Tamil Nadu Agricultural University, Coimbatore (India). Center for Plant and Molecular Biology)Chawla, V.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Genetics and Plant Breeding)Battan, K.R.; Chaudhary Charan Singh Haryana Agricultural University, Kaithal (India). College of Agriculture). Variability pattern of intact and split grains in RILs' of cross Bas 370 x ASD 16 . Annals of Biology (India). (Jun 2012) v. 28(1) p. 41-44 KEYWORDS: RICE. GRAIN. KERNELS. WATER EROSION.

Intact cooked kernel is characteristic of Basmati and good cooking rices. No scale has been developed to classity it at intemationallevel though scales have been developed for various grain quality parameters. Cooked kernel appearances have not been subjected to inheritance studies. Till now only method of getting intact lines is selection. In the present study 307 RILS (F9) of cross Bas 370 and ASD 16 developed through SDS (single descent selection) were subjected to henotyping for grain and cooking quality traits and cooked

grain appearance. Both the parents had nearly intact c, oked grains, while the F9 population showed various types of split grains and transgressive variation. The data g~nerated during this study indicate that the population differs in the extent of split kernels and this criterion may prove useful in identifying markers for intactness which can be used for genotyping the RILs for mapping of QTLs' for this important quality trait.

119 Datt, I.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Plant Breeding and Genetics) Mehla, B.S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Plant Breeding and Genetics)Goyat, B.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Plant Breeding and Genetics)Kaliramana, R.S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Plant Breeding and Genetics). Variability and correlation coefficient analysis of plant height, yield and yield components in rice (Oryza sativa L.). Annals of Biology (India). (Jun 2012) v. 26(1) p. 45-52 KEYWORDS: YIELDS. ORYZA SATIVA. PLANTS. STATISTICAL METHODS.

The present study investigated the variability and correlations in rice. In present investigation, 50 genotypes of rice were grown in randomized block design with three replications accommodating each genotype in 4 m long single row plot spaced 30 cm apart. Observations on five competitive plants for 17 traits were recorded. The grain yield per plant showed positive and significant correlation with harvest index (;), hulling (;), number of effective tillers per plant and panicle length in E-I and harvest index, biological yield per plant, milling (;) and IOO-seed weight in E-ll. The path coefficient analyses revealed that harvest index and biological yield per plant were the most important traits contributing towards grain yield per plant in rice. Practical utility of the findings in improving grain yield of rice h.as also been discussed.

120 Lal, M.; Sahib Seeds Limited, Karnal (India). Research and Development Unit)Singh, D.P.; Sahib Seeds Limited, Karnal (India). Research and Development Unit). Genotype x environment interaction in rice (Oryza sativa L.). Annals of Biology (India). (Jun 2012) v. 26(1) p. 53-55 KEYWORDS: GENOTYPES. ORYZA SATIVA. ENVIRONMENTAL IMPACT.

Genotype x environment interaction was studied for grain yield and its component characters in IS genotypes of rice under six environments during kharif 2005 and 2006. Pooled analysis also indicated highly significant differences among the genotypes and environments for all the characters under study. The environment+(genotype x environment) was significant for all the characters indicating distinct nature of environments and genotype x environment interactions in phenotypic expression. Based on stability parameters and overall mean, performance genotypes Pusa Basmati-l, PR-1l4 and Sahib-140 were found promising with stable performance for plant height, effective tillers/plant and grain yield/plot.

121 jattan, M.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Genetics and Plant Breeding) Chawla, V.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Genetics and Plant Breeding)Yadav, N.R.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Biotechnology and Molecular Biology)Sharma, I.; Punjab Agricultural University, Ludhiana (India). Dept. of Plant Breeding)Gupta. M.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Genetics and Plant Breeding). Pathogen variability in Indian isolates of Neovossia

indica based on hoswt pathogen interactions. Annals of Biology (India). (Jun 2012) v. 26(1) p. 56-61 KEYWORDS: HOST PLANTS. SMUTS. TILLETIA INDICA. PATHOGENS.

Karnal bunt (KB) caused by fungus (Neovossia indica) is viewed as a serious disease of wheat due to quarantine restrictions imposed by several countries. It urgently requires 'F adequate understanding of pathogen that can be utilized in control of disease. The study examined level of pathogenic variability in 28 N. indica isolates (from Haryana, Punjab and Himachal Pradesh) which were firstly subjected to inter-simple sequence repeat analysis and grouped into seven major clusters. These seven groups of isolates were usbd against 25 wheat genotypes for host-pathogen interaction studies. The infection potential of these seven groups on a set of 25 wheat genotypes was different. The wheat genotypes were also demarcated into four groups based on infection. The investigation strongly provides useful clues for harnessing genetic variation in wheat as well as Karnal bunt pathogen to identify most suitable combination of wheat genotype (resistant) and Karnal bunt isolate (avirulent).

122 Saini, S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Entomology)Malik, V.S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Entomology)Singh, R.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Entomology). Impact of Bt and BGII cotton hybrids on ovipositional preference of Spodoptera litura (Fabricius). Annals of Biology (India). (Jun 2012) v. 26(1) p. 64-65 KEYWORDS: COTTON. SPODOPTERA LITURA. HYBRIDS.

Bt cotton hybrids viz., Ankur Jai BOIL Ankur Jai Bt, Ankur Jai non-Bt, RCH 134 BGll, RCH 134 Bt and RCH 134 non-Bt were used for valuation of their effect on ovipositional preference of Spodoptera litura (Fabricius) adults at CCS Haryana Agricultural University, Hisar under laboratory conditions. Observations were recorded at 90 and 120 days after sowing (DAS). Twigs of cotton hybrids were brought to the laboratory and kept in ovipositional chamber for oviposition by four pairs of adults. Eggs were counted after 48 h of release. The studies revealed that S. litura adults showed no specific preference for egg laying on any of the hybrids at 90 and 120 DAS. However, leaves were preferred over flowers and bracts.

123 Prakash, O.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Pl. Pathology)Kumar, A.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Pl. Pathology)Khirbat, S.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Pl. Pathology). Biochemical basis of resistance to fruit rot (Colletotrichum capsici) in chilli. Annals of Biology (India). (Jun 2012) v. 26(1) p. 62-63 KEYWORDS: ASCORBIC ACID. SUGAR. INDICATOR ORGANISMS. COLLETOTRICHUM CAPSICI. CHILLIES.

The level of total sugar and ascorbic acid content of two resistant varieties (Pusa Sadabahar and Kiran) and two susceptible varieties (Pusa Jawala and PKC-8) was determined at three different stages (green, turning red and red) of fruits. Biochemical studies indicated that the resistant varieties of chilli had more ascorbic acid and lesser total sugar contents. While comparing the different stages of fruits, red fruits of resistant varieties had much higher ascorbric acid and less sugar content as compared to other two stages (green and turning red) of fruits.

124 Gupta, P.; Indira Gandhi Krishi Vishwavidyalaya, Raipur (India). Dept. of Horticulture)Kumari, S.; Indira Gandhi Krishi Vishwavidyalaya, Raipur (India). Dept. of

Horticulture)Dikshit, S.N.; Indira Gandhi Krishi Vishwavidyalaya, Raipur (India). Dept. of Horticulture). Response of African marigold (Tagetes erecta L.) to integrated nutrient management. Annals of Biology (India). (Jun 2012) v. 26(1) p. 66-67 KEYWORDS: NUTRIENTS. MANAGEMENT. TAGETES.

Response of Afiican marigold (Tagetes erecta L.) cv. Giant African Double Orange to integrated nutrient management was studied at the Horticulture Research Farm, Department of Horticulture, IGKV, Raipur (Chhattisgarh) during the years 2007-08 and 2008-09 employing randomized block design having 10 treatments replicated thrice. Different integrated nutrient treatments were applied as basal and during vegetative stage of plant growth and development. Marigold cv. Giant African Double Orange when~own under the treatment 100; RDF (T,) produced maximum fresh weight (265.78 g) and dry weight (55.49 g), while maximum chlorophyll content (52.12 SPAD) ofleaves was recorded on 50; RDF+50; N FYM (T7). Applicati°fi' of 50; RDF+50; N VC (Ts) recorded maximum plant height (68.23 em), number of branches (29.99), earliest 50; flowering (41.91 days), flower size (6.55 cm), number of flowers (22.23) and flower yield (27.00 kg! plot and 215.26 kglha).

125 Goyal, S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Foods and Nutrition)Boora, P.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Foods and Nutrition). Effect of domestic processing treatments on proximate composition and in vitro protein and starch digestibility of urd varieties. Annals of Biology (India). (Jun 2012) v. 26(1) p. 68-72 KEYWORDS: PROTEINS. DIGESTIBILITY. URD. PROCESSING. PROXIMATE COMPOSITION.

Four varieties of blackgram viz., UH 04-04. UH 04-06. T-9 and Uttra were evaluated for nutrient composition and subjected to various domestic processing treatments like soaking. soaking and dehulling and fermentation. The crude protein. fat. ash and crude fiber content ranged from 19.98-22.06;. 1.20-1.35;.3.48-3.82; and 2.60-3.03;. respectively. Protein digestibility (in vi O) and starch digestibility (in vitro) of different varieties varied from 54.26-61.60; and 36.80-43.27 mg maltose eleasedlg. respectively. All the processing treatments resulted in improving the in vitro digestibility of protein an, starch of all the varieties. Fermentation was found to be the best method of domestic processing. Such simple processing treatments can be adopted for improving the nutritional quality of the legumes.

126 Kumar, P.; M.N. Institute of Applied Sciences, Bikaner (India). Dept. of Biotechnology)Mathur, K.; M.N. Institute of Applied Sciences, Bikaner (India). Dept. of Biotechnology)Kumar, J.; Chaudhary Charan Singh Hisar Agricultural University, Hisar (India). Dept. of Molecular Biology and Biotechnology)Kumar, S.; Chaudhary Charan Singh Hisar Agricultural University, Hisar (India). Dept. of Genetics and Plant Breeding)Kumar, P.; Chaudhary Charan Singh Hisar Agricultural University, Hisar (India). Dept. of Genetics and Plant Breeding)Kumar, S.; Chaudhary Devi Lal University, Sirsa (India). ept. of Biotechnology)Sharma, N.; M.N. Institute of Applied Sciences, Bikaner (India). Dept. of Biotechnology). Antimicrobial potential of leaf and callus tissue extracts of Ocimum sanctum. Annals of Biology (India). (Dec 2012) v. 28(2) p. 83-86 KEYWORDS: ANTIMICROBIALS. CALLUS. TISSUE EXTRACTS. OCIMUM.

The present study was undertaken to investigate antimicrobial potential of Oscimum sanctum. Leaf and callus derived from leaf were extracted in two organic solvents i. e. Petroleum ether and Diethyl ether. Antimicrobial activity was tested against four bacterial strains, Lactobacillus, Staphylococcus epidermidis, Citrobacter and Proteus species by agar

well diffusion method. All the extracts of leaf and callus of O. sanctum showed considerable antimicrobial activity against almost all the micro-organisms tested. Among the different extracts tested, petroleum ether extract of callus tissue was found to be most effective. Petroleum ether extract of callus tissue showed maximum activity against Lactobacillus (i. e. 4.5 cm inhibition zone). Diethyl ether extract ofleaves showed maximum activity against Lactobacillus. Diethyl ether extract of leaf was found active against Citrobacter. Petroleum ether extract of leaf showed minimum inhibition zone (1.8 em) against Citrobacter.

127 Kalyani, D. Lakshmi; ANGRAU, Tirupati (India). S.V. Agricultural College, Department of Agronomy. Performance of cluster bean genotypes under varied time of sowing. Legume Research (India). (Jun 2012) v. 35(2) p.154-158 KEYWORDS: CYAMOPSIS PSORALIOIDES. SOWING. VARIETIES. YIELDS. QUALITY.

A field experiment was conducted at S.V. Agricultural College, Tirupati, to study the effect of different sowing dates on the seed yield and quality of different varieties of guar. The experiment was laid out in a factorial randomized block design replicated thrice. Four dates of sowing viz., first and second fortnight of July and first and second fortnight of August. Genotypes are RGC 1003, HG 563, RGM 112 and GAUG 9703. The results were revealed that growth parameters, yield attributes, yield and quality parameters were highest with RGM 112 sown during first fortnight of July, which was at par with HG 563 sown at the same time.

128 Song, Ri; Jilin Agricultural University, Changchun (China). College of Agronomy. Growth promotion of maize by soybean root exudates. Legume Research (India). (Sep 2012) v. 35(3) p.226-230 KEYWORDS: SOYBEANS. GLYCINE MAX. MAIZE. ROOTS. EXUDATES. ALLELOPATHY. ALLOMONES.

Soybean [Glycine max (L.) Merrill] rotation with maize (Zea mays L.) can increase maize yield, but its mechanism has not been fully understood. The effects of soybean root exudates at trefoil stage (prior to nitrogen fixation ability) on maize seedling growth were studied under laboratory and field conditions in this study. Results showed that soybean root exudates at trefoil stage clearly promoted maize growth. Further HPLC analysis showed that soybean root exudates contained substances that promote plant growth, such as triacontanol. Maize growth exhibited significant differences when soybean root exudates were applied at different concentrations. Altogether this indicated that allelopathy, in addition to an increase in soil nitrogen, was an important mechanism of soybean promotion of maize yield during crop rotation.

129 Sebastian, K, S.; Coconut Developement Board, Kochi (India). Awesome farming in migrated land. Indian Coconut Journal (India). (Feb 2012) v. 74(10) p.11-12 KEYWORDS: INTERCROPPING.

130 Resmi,D.S; Coconut Developement Board, Kochi (India). Cashing in on Coconut:a success Story. Indian Coconut Journal (India). (Feb 2012) v. 74(10) p.13-14 KEYWORDS: INTERCROPPING.

F30 Plant genetics and breeding

131 Boraiah, K.M.; Directorate of Seed Research, Mau (India)Goud, Shanker; University of Agricultural Sciences, Raichur (India). Department of Genetics and Plant BreedingGejli,

Kotreshi; University of Agricultural Sciences, Raichur (India). Department of Genetics and Plant BreedingKonda, C.R; University of Agricultural Sciences, Raichur (India). Department of Genetics and Plant BreedingBabu, H. Prashauth; Indian Agril. Res. Intt., Regional Station, Karnal (India) . Heterosis for yield and yield attributing traits in groundnut (Arachis hypogaea L.)*. Legume Research (India). (Jun 2012) v. 35(2) p.119-125 KEYWORDS: GENES. GROUNDNUTS. ARACHIS HYPOGAEA. HETEROSIS.

Three lines and seven testers were crossed in a line x tester fashion to estimate heterosis over mid parent, better parent for yield and its attributing characters in groundnut. The prevailence of heterosis over both mid parent and better parent in majority of crosses indicated the influence of both additive and non-additive gene action. The cross R-2001-2 x GPBD-5 exhibited higher and significant heterosis for most of the characters like number of flowers, number of mature pods, total number of pods, pod yield and kernel yield per plant followed by ICGV-00451 x SEL-1 for immature pods, shelling per cent and 100 kernel weight and ICGV-00350 x ICGV-00451 for sound mature kernels and oil content.

132 John, K.; S. V. Agricultural College Campus, Tirupati (India). Regional Agricultural Research StationReddy, R. Raghava; A.N.G. Ranga Agricultural Unversity, Hydrabad (India).Reddy, K. Haripraad; S. V. Agricultural College Campus, Tirupati (India). Regional Agricultural Research StationSudhakar, P.; S. V. Agricultural College Campus, Tirupati (India). Regional Agricultural Research StationReddy, N.P. Eswar; S. V. Agricultural College Campus, Tirupati (India). Regional Agricultural Research Station. Estimation of heterosis for certain orphological, yield and yield attributes in groundnut (Arachis Hypogaea L.). Legume Research (India). (Sep 2012) v. 35(3) p.194-201 KEYWORDS: HETEROSIS. GROUNDNUTS. ARACHIS HYPOGAEA. YIELDS.

Twenty eight F1 crosses along with eight parents were studied to get information on the extent of heterosis over mid parent, better parent and standard parent for morphological, yield and yield attributes. The maximum relative herterosis for pod yield per plant 101.52;, better parent heterosis 92.73; and standard heterosis 108.54 respectively. The crosses viz., TIR-25 x ICGV-99029 for kernel yield per plant, ICGV-91114 x TCGS-647 for pod yield per plant, Tirupati-4 x JL-220 for number of well filled and mature pods per plant, JL-220 x ICGV-99029 for 100 kernel weight, K-1375 x TCGS-647 for sound mature kernel per cent and TPT-4 x K-1375 for shelling per cent were the best heterotic crosses over the better parent. These hybrids were identified as promising for many desirable traits and they may be useful in exploiting hybrid vigour in groundnut.

133 Devi, S. Rama; Acharya N.G. Ranga Agricultural University, Tirupati (India). S.V. Agricultural College, Department of Genetics and Plant BreedingPrasanthi, L.; Acharya N.G. Ranga Agricultural University, Tirupati (India). S.V. Agricultural College, Department of Genetics and Plant BreedingReddy, K. Hari Prasad; Acharya N.G. Ranga Agricultural University, Tirupati (India). S.V. Agricultural College, Department of Genetics and Plant BreedingReddy, B.V. Baskara; Acharya N.G. Ranga Agricultural University, Tirupati (India). S.V. Agricultural College, Department of Genetics and Plant Breeding. Studies on interrelationships of yield and its attributes and path analysis in pigeonpea [Cajanus Cajan (L.) Millsp.]. Legume Research (India). (Sep 2012) v. 35(3) p.207-213 KEYWORDS: STATISTICAL METHODS. YIELDS. CAJANUS CAJAN. PIGEON PEAS. CAJANUS. Five lines, three testers and their fifteen crosses were evaluated to study the genetic relationship among yield components through association and path analysis. The association studies

indicated significant positive correlation of seed yield with pods per plant in parents and plant height, pods per plant and harvest index in crosses. Path coefficient analysis showed that out of fourteen characters, pods per plant, days to flowering, plant height and pod length in parents, while pods per plant in crosses showed high positive direct effects on seed yield, indicating that these characters should be given due importance while making selection for increased seed yield in pigeonpea.

134 Kumar, Sanjeev; Indian Institute of Sugarcane Research, Lucknow (India).Srivastava, S.B.L.; C.S. Azad University of Agriculture and Technology, Kanpur (India). Department of Genetics and Plant Breeding Malik, I.P.S.; C.S. Azad University of Agriculture and Technology, Kanpur (India). Department of Genetics and Plant BreedingKumar, Rajesh; C.S. Azad University of Agriculture and Technology, Kanpur (India). Department of Genetics and Plant Breeding. Grouping of lentil (Lens Culinaris Medik.) genotypes using non-hierarchical cluster analysis. Legume Research (India). (Sep 2012) v. 35(3) p.239-242 KEYWORDS: GENETIC DISTANCE. LENTILS. LENS CULINARIS.

Twenty three genotypes of lentil (Lens culinaris Medik.) were evaluated for grain yield, protein content and some other metric traits during 2005–06. Twelve characters were recorded in each genotype to compare the variability among them. Analysis of variance exhibited significant differences for days to maturity, clusters per plant, pods per clusters, pods per plant, harvest index and protein content indicated presence of genetic variability for these traits. Based on the different characteristics, genotypes were grouped into four clusters having 6 (K 75, KLS 221, L 4076, DPL 62, DPL 58, PL 406), 9 (IPL 306, NDL 2–3, IPL 304, KLB 148, HUL 57, KLB 2001, KLS 218, DPL 15, KLB 97-3), 1 (Precoz) and 7 (PL 639, KLS 219, KLS 133, KLB 86–11, FLIP 56–61, KLB 97-5, KLS 86–13) genotypes. Cluster I was characterized by better grain yield, protein content and most of the yield related traits except 1000 seed weight and branches per plant, while cluster III was represented by genotype (Precoz) having extra early maturity and extra bold seeded group. The genetic divergence was igh between cluster I and III and low between cluster II and IV indicating their close relationship. The genotypes of divergent clusters such as cluster I and cluster III can be utilized in the crossing programme to produce better recombinants for development of varieties.

135 Jayanthi, M; Directorate of Oil Palm Research, Pedavegi, Andhra Pradesh. jayman21mail.comKamala, A. V. R; Directorate of Oil Palm Research, Pedavegi, Andhra PradeshTamil Selvan, C; Directorate of Oil Palm Research, Pedavegi, Andhra PradeshMandal, P. K; National Research entre for Plant Biotechnology,New Delhi(India). DNA markers for identification of oil palm varieties. Journal of Plantation Crops India). (Dec 2012) v. 40(3) p. 208-211 KEYWORDS: OIL PALMS. RAPD.

136 Anju, C; College of Agriculture, Thiruvananthapuram(India). anjuantoneymail.com Suharban, M; College of Agriculture, Thiruvananthapuram(India) Joseph, P. J.; College of Agriculture,Thiruvananthapuram(India). Foliar fungal pathogens associated with middle whorl yellowing symptoms of coconut in southern Kerala. Journal of Plantation Crops (India). (Dec 2012) v. 40(3) p. 212-214 KEYWORDS: OIL PALMS. RAPD.

F40 Plant ecology

137 Molly Thomas; Rubber Research Institute of India, Kottayam (India). mollyubberboard.org.inSathik, M. B. M; Rubber Research Institute of India, Kottayam (India)Luke, L. P; Rubber Research Institute of India, Kottayam (India)Sumesh, K. V; Rubber Research Institute of India, Kottayam (India)Satheesh, P. R; Rubber Research Institute of India, Kottayam (India)Annamalainathan; Rubber Research Institute of India, Kottayam (India)James Jacob; Rubber Research Institute of India, Kottayam (India). Stress responsive transcripts and their association with drought tolerance in Hevea brasiliensis. Journal of Plantation Crops (India). (Dec 2012) v. 40(3) p. 180-187 KEYWORDS: DROUGHT. GENE EXPRESSION. HEVEA BRASILIENSIS.

Increasing global demand for natural rubber necessitates extending rubber cultivation to marginally suitable non-traditional areas which are known for their climatic constraints. Soil moisture deficit and atmospheric drought are the major causes of crop loss in uch regions. Hence, it is essential to develop/identify suitable drought tolerant Hevea clones having inherent capacity to cope with the adverse environment. The present study deals with expressions often stress responsive genes analyzed in four Hevea brasiliensis clones viz., RRII 105, RRIM 600, RRlI 208 and RRII 430 using quantitative PCR (qPCR). Photosynthetic adaptability under drought conditions was better in the field grown plants of the clone RRII 430 followed by RRIM 600 and RRlM 208. Water use efficiency under water deficit conditions was the highest in RRIM 600 and the least in RRII 105. From the quantitative gene expression analysis, it is evident that there was differential gene regulation in tolerant and susceptible clones under drought conditions. Among the ten genes studied, peroxidase and WRKY transcription factor were found to be strongly associated with drought tolerance in H.brasiliensis.

138 Reju, M. J.; Rubber Research Institute of India, Kottayam (India)Thapliyal, A. P.; RRII,Meghalaya(India), Regional Research StationNazeer, M. A.; Rubber Research Institute of India, Kottayam (India)Soman, T. A.; Hevea Breading Substation,Kanyakumari(India) Deka, H. K; RRII,Guwahati(India), Regional Research Station. Growth and yield performance of rubber clones in Meghalaya. Journal of Plantation Crops (India). (Dec 2012) v. 40(3) p. 220-223 KEYWORDS: GROWTH. HEVEA. MEGHALAYA. YIELDS.

F50 Plant structure

139 Vijaylaxmi; Indian Institute of Pulses Research, Kanpur (India). Biochemistry and Microbiology, Division of Physiology. Effect of late seeding on phenology, morpho-physiological traits and dry matter distribution on urdbean. Legume Research (India). (Jun 2012) v. 35(2) p.104-111 KEYWORDS: SOWING DATE. SEEDS. YIELDS. VIGNA RADIATA. PHENOLOGY.

In order to ascertain the effect of phenology, morpho-physiological traits, and dry matter distribution in different plant parts on seed yield of urdbean under late seeding condition, sixteen urdbean genotypes were planted during 2nd week of September of 2007 and 2008 and phenology, morpho-physiological traits, dry matter buildup and its distribution amongst plant parts were studied. With correlation studies followed by path analysis it was concluded that urdbean seed yield under late seeding condition is highly influenced by seed filling period and dry matter allocation in leaves during flowering. And at maturity it is

moderately and positively affected by plant height at flowering and other traits viz., leaf area at flowering and at maturity, total dry matter accumulation at flowering and at maturity and SPAD values had very negligible effect. However, residual correlations were estimated to be of higher magnitude. More in depth study, involving more morphological and/or physiological parameters, to have a clear understanding of urdbean yield structure under late seeding condition.

F60 Plant physiology and biochemistry

140 Reddy, K.N.; United States Department of Agriculture, Stoneville (United States of America). Crop Production System Research Unit)Nandula, V.K.; United States Department of Agriculture, Stoneville (United States of America). Crop Production System Research Unit). Herbicide resistant crops : History, development and current technologies. Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 1-7 KEYWORDS: WEEDS. HERBICIDES. BIOTECHNOLOGY. TRANSGENICS.

Advances in biotechnology have led to the development and commercialisation of several herbicide-resistant crops (HRCs) in the mid-1990s. HRCs survive herbicide treatment that previously would have killed the crop along with targeted weeds. Both transgenic (created through stable integration of a foreign gene) and non-transgenic - (developed through traditional plant-breeding) HRCs are commercially available to farmers. Although several HRCs are available, only transgenic HRCs, such as, glyphosate- and glufosinate-resistant crops appear to have the greatest impact and dominate the market. HRCs are readily accepted in North and South America and are slowly making inroads into other parts of the world. Farmers who have chosen HRCs must have seen some eco-nomic and weed control benefits; otherwise, the rapid increase in area planted to HRCs in recent years would not have occurred. There are benefits and risks associated with the use of HRCs as a weed management tool. The benefits of HRCs for weed management outweigh the risks based on current knowledge. HRCs should not be relied on solely to the exclusion of other weed control measures and should be used within integrated weed management programmes.

141 Kumari, A.; Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Soil Science)Singh, R.P.; Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Soil Science)Yeshpal; Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Soil Science). Productivity, nutrient uptake and economics of mustard hybrid (Brassica juncea) under different planting time and row spacing. Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 61-67 KEYWORDS: BRASSICA JUNCEA. PRODUCTIVITY. NUTRIENT UPTAKE. ECONOMICS. YIELDS. SOWING DATE.

A field experiment was conducted at Pantnagar during 2007-08 and 2008-09 to evaluate the effect of 3 dates of sowing (October 10, 20 and 30), 3 spacings (30 x 10 cm, 45 x 10 cm and 60 x 10 cm, and 3 mustard [Brassica juncea (L.) Czernj & Cosson] hybrids/varieties ('Kranti', 'NRCHB-506' and 'DMH-1 '). Yield attributes and seed yield were significantly higher in October 10 sowing compared to delayed sowings. The decrease in seed yield due to sowing on October 20 and October 30 over October 10 was to the tune of 8.7 and 29.2 ; during first year and 10.1 and 29.3 ; during second year, respectively. The hybrids 'DMH-1' and 'NRCHB-506' recorded 36, 35; and 24,28; higher seed yield respectively, over 'Kranti'. Spacing 45 x 10 cm had significant effect over 60 x 10 em on seed yield during both the

years. Hybrid 'DMH-1' recorded the highest economic returns when sown on Oc¬tober 10 at spacing of 45 x 10 cm. Nutrient uptake followed same trend as seed yield.

142 Kumar, N.; Rajendra Agricultural University, Samastipur (India). Sugarcane Research Institute). Productivity, quality and nutrient balance in spring sugarcane (Saccharum spp. hybrid complex) under organic and inorganic nutrition. Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 68-73 KEYWORDS: PRODUCTIVITY. QUALITY. NUTRIENT UPTAKE. SACCHARUM. SUGARCANE. ORGANIC FERTILIZERS.

An experiment was conducted during spring season of 2008-09 and 2009-10 on sandy loam soil at Pusa to as-sess the effect of farmyard manure and fertilizer levels on sugarcane (Saccharum spp. Hybrid complex). The ex-periment was laid out in factorial randomized block design and replicated thrice with two FYM viz., 0 and 20 tonnes/ha and our fertilizer levels viz., F1' 150 + 37.1 + 49.8, RDF; F2' 150 + 43.6 + 66.4; Fa' 200 + 43.6 + 83.0 and F4' 200 + 54.6 + 99.6 ~g N + P + K/ha. Application of 20 tonnes FYM/ha to sugarcane recorded significantly higher mean growth (tillers, 1, 70,200/ha; cane height, 208.9 cm; drymatter accumulation, 33.3 t/ha), yield at¬tributes (millable canes, 1,13, 600/ha; cane diameter, 2.18 em) and cane yield (87.5 t/ha) over no FYM. An in¬crease of 16.2; in cane yield, 26.31; in net return, 8.5; in benefit: cost ratio and 15.6; in sugar yield was no¬ticed with FYM over its control. FYM 20 tonnes/ha registered an increase of 20.9; in N uptake, 20.3; in P up¬take, 20.2; in K uptake, 10.0; in available N, 23.3; in available P and 6.4; in available K ove.r no FYM. Net gain of N (65 kg), P (6.1 kg) and K (31 kg) were also highest in FYM added plots. Crop receiving 200 + 54.6 + 99.6 kg N + P + K/ha gave significantly higher tillers (1,83,800/ha), cane height (213.8 cm), drymatter (34.5 t/ha), cane diameter (2.22 cm) and number of millable cane (1,20,800/ha) though, it was statistically at par with 200 + 43.6 + 83.0 kg N + P + K/ha. There was an increase in cane and sugar yield with each successive increase in N + P + K level from 150 + 37.1 + 49.8 kg/ha to 200 + 43.6 + 83.0 kg/ha. Increasing N + P + K levels from F, to Fa significantly increased the net returns. However, further increase to F4 level did not proved profitable option. Fertilizer application increased the N uptake from 164 to 238 kg/ha, P uptake from 14.9 to 21.9 kg/ha and K uptake from 191.3 to 277.6 kg/ha. Significant increase in available N status was recorded with an application of 200 + 43.6 + 83.0 kg N + P + K/ha. However, available P status in post harvest soil increased significantly with each successive increase in fertilizer up to highest levels i.e. 200 + 54.6 + 99.6 kg N + P + K/ha. Available K status was the highest (121 kg K/ha) at 200 + 54.6 + 99.6 kg N + P + K/ha though it was on par with 200 + 43.6 + 83.0 kg N + P + K/ha. Net gain of N, P and K were progressively increased with increase in N + P + K levels from 150 + 37.1 + 49.8 to 200 + 54.6 + 99.6 kg/ha.

143 Kumar, R.; CSIR-Institute of Himalayan Bioresource Technology, Palampur (India) Sharma, S.; CSIR-Institute of Himalayan Bioresource Technology, Palampur (India) Ramesh, K.; CSIR-Institute of Himalayan Bioresource Technology, Palampur (India) Prasad, R.; CSIR-Institute of Himalayan Bioresource Technology, Palampur (India) Pathania, V.L.; CSIR-Institute of Himalayan Bioresource Technology, Palampur (India) Singh, B.; CSIR-Institute of Himalayan Bioresource Technology, Palampur (India) Singh, R.D.; CSIR-Institute of Himalayan Bioresource Technology, Palampur (India). Effect of agro-techniques on the performance of natural sweetener plant-stevia (Stevia rebaudiana) under western Himalayan conditions. Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 74-81 KEYWORDS: FERTILIZERS. STEVIA REBAUDIANA. YIELDS. QUALITY. ECONOMICS.

Two separate field experiments were conducted during 2007, 2008 and 2009 to evaluate the effect of agro-techniques on the performance of natural sweetener plant-stevia (Stevia rebaudiana Bertoni) under western Hi-malayan conditions. In the first experiment during 2007 and 2008 two doses of farm yard manure (FYM) and seven inorganic fertilizers were compared with untreated plot (control). Application of 50:60:50 kg NPKlha recorded significantly higher plant height, stem, flower and total weight/plant (dry) and consequently recorded higher dry leaf yield as compared to other treatments. However, stevioside and rebaudioside contents were found to reduce due to the application of manures/fertilizers. FYM application recorded higher marker compounds than inorganic fertilizers. Owing to higher dry leaf yield, 50:60:50 kg NPKlha recorded highest steviol glycoside (stevioside and rebaudioside A) yield/ha than other treatments. In second experiment during 2008 and 2009, effect of land configuration nd harvesting time on growth, yield and steviol glycosides of stevia was evaluated. Planting stevia in broad bed and furrow (BBF) recorded 31 and 23; higher leaf biomass over flat and camber bed methods, re-spectively. Steviol glycosides (stevioside and rebaudioside-A) oncentration was higher when stevia was planted in camber bed as compared to flat and BBF. Significantly higher leaf biomass was obtained from stevia plants which were harvested once at 50; flower bud stage compared with those harvested once at the 60 and 90 days after transplanting (DAT). Rebaudioside -A content was higher when leaves were harvested at 50; flower bud stage. Owing to higher dry leaf yield, stevia planted in BBF and harvested at 50; flower bud stage recorded high-est net return and B:C ratio than other treatments.

144 Ratnam, M.; Acharya N.G. Ranga Agricultural University, Guntur (India). Regional Agricultural Res. Stn.)Rao, A.S.; Acharya N.G. Ranga Agricultural University, Guntur (India).Reddy, T.Y.; Acharya N.G. Ranga Agricultural University, Hyderabad (India). Integrated weed management in turmeric (Curcuma longa). Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p.82-84 KEYWORDS: TURMERIC. WEEDS. MANAGEMENT.

A field experiment was .conducted on clay soils of Regional Agricultural Research Station, Lam, Guntur during kahif 2006-07, 2007-08,and 2008-09 resp'actively to find out suitable weed mana'gement package for turmeric (Curcuma longa L.) in coa.:;tal districts of Andhra Pradesh. Pre-emergence application of oxyflourfen :25 kg/ha followed by post-emergence application of quizalofop ethyl 0.05 kg/ha and two hand weeding at 60 and 90 days after sowing (DAS) with WCE of 92 ; significantly recorded the highest fresh rhizome yield (6.6 t/ha) with B:C ratio of 0.61 and was on par with hand weeding at 30, 60 and 90 DAS, which recorded the highest fresh rhi-zome yield (8.5,t/ha). UncontrolLed weed growth reduced rhizome yield by 80;.

145 Mahdi, S.S.; Sher-e-Kashmir University of Agricultural Science and Technology, Srinagar (India)Hasan, B.; Sher-e-Kashmir University of Agricultural Science and Technology, Srinagar (India)Singh, L.; Sher-e-Kashmir University of Agricultural Science and Technology, Srinagar (India). Influence of seed rate, nitrogen and zinc on fodder maize (Zea mays) in temperate conditions of western Himalayas. Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 85-88 KEYWORDS: NITROGEN. ZINC. SEED. ZEA MAYS. YIELDS. QUALITY. PROTEINS.

A field experiment was conducted at Shalimar, Srinagar during 2009 and 2010, to study the effect of seed rate and nitrogen and zinc fertilization on yield and quality of fodder maize (Zea mays L.) var. 'J-1006'. Application of N 120 kg/ha has resulted significantly higher plant height, leaf area index, green fodder yield, nitrogen content and its uptake, zinc

content and its uptake, Ca content and crude protein content. Seed rate of 60 and 80 kg/ha being at par, recorded significantly higher plant height, leaf area index and green fodder yield over 40 kg/ha. Zinc application 10 kg/ha, significantly increased plant height, leaf area index and green fodder yield. Nand Zn con-tent and their uptake while Ca and crude protein content remain unaffected. Net returns and B:C ratio were re-corded highest with 120 kg N/ha, 80 kg seed/ha and 10 kg Zn/ha.

146 Prajapat, K.; Indian Agricultural Research Institute, New Delhi (India). Div. of Agronomy)Shivram, A.C.; SKN College of Agriculture, Jobner (India)Choudhary, G.L.; Indian Agricultural Research Institute, New Delhi (India). Div. of Agronomy)Choudhary, H.R.; SKN College of Agriculture, Jobner (India). Influence of planting pattern and sulphur on mungbean (Vigna radiata) and sesame (Sesamum indicum)intercropping under semi arid region of Rajasthan. Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 89-91 KEYWORDS: SULPHUR. VIGNA RADIATA. SESAMUM INDICUM. INTERCROPPING. PLANTING.

The study was carried out during kharif season of 2009 to study the effect of different intercropping systems and sulphur levels on mungbean [Vigna radiata (L.) Wilczek] and sesame (Sesamum indicum L.). mong the dif¬ferent row ratios, sole planting of both the crops gave significantly maximum seed yield and uptake of nutrients. The highest productivity in terms of mungbean equivalent yield (1.21 t/ha) was obtained under sole mungbean, which remained on par with mungbean + sesame grown in 4:1 ratio. Mungbean + sesame grown in 4:1 ratio also gave significantly highest land equivalent ratio. Application of increasing levels of sulphur up to 30 kg S/ha recorded significantly highest seed yield of mungbean. However, significant improvement in seed yield of sesame, total uptake of nitrogen and sulphur by mungbean and sesame, protein content in seed of mungbean, oil content in seed of sesame, mungbean equivalent yield and land equivalent ratio were observed up to 45 kg S/ha.

147 Ram, A.; Indian Agricultural Research Institute, New Delhi (India). Div. of Agronomy)Pannu, R.K.; Choudhary Charan Singh Haryana Agricultural University, Hisar (India)Prasad, D.; Indian Agricultural Research Institute, New Delhi (India). Div. of Agronomy). Effect of management practices on growth, yield and quality of late sown wheast (Triticum aestivum). Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 92-95 KEYWORDS: GROWTH. YIELDS. QUALITY. WHEATS. TRITICUM AESTIVUM. SEED. SOWING DATE. MANAGEMENT.

A field experiment was conducted at Hisar during rabi season of 2007-08 to study the effect of different agro-nomic management practices on growth, yield and quality of late sown wheat(Triticum aestivum L. emend. Fiori & Paol.). Dry seeding with overnight soaked seed on 15 December with 25; higher seed rate followed by irrigation produced higher grain and biological yield followed by dry seeding with 25; higher seed rate on 15 December followed by irrigation. Crop germination was earlier by 2 days when sowing with soaked seeds was adopted.

148 Barod, N.K.; Indian Agricultural Research Institute, New Delhi (India). Div. of Agronomy)Dhar, S.; Indian Agricultural Research Institute, New Delhi (India). Div. of Agronomy)Kumar, A.; Indian Agricultural Research Institute, New Delhi (India). Directorate of Maize Research). Effect of nutrient sources and weed control methods on yield and

economics of baby corn (Zea mays). Indian Journal of Agronomy (India). (Mar 2012) v. 57(1) p. 96-99 KEYWORDS: ZEA MAYS. WEEDS. YIELDS. NUTRIENT UPTAKE.

Results of the field experiment conducted at New Delhi during kharif season of 2008 showed that baby corn can be grown profitably with application of 120 kg N through vermicompost and two hand weeding at 20 and 40 DAS or pre-emergence tank mix application of atrazine 0.5 kg + pendimethalin 0.75 kg/ha.

149 Upreti, K.K.; Indian Institute of Horticultural Research, Bangalore (India). Div. of Pl. Physiology and Biochemistry) Varalakshmi, L.R.; Indian Institute of Horticultural Research, Bangalore (India). Div. of Soil Science and Agricultural Chemistry) Jayaram, H.L.; Indian Institute of Horticultural Research, Bangalore (India). Div. of Pl. Physiology and Biochemistry). Role of rootstocks for salinity tolerance in grapevine:changes in biomass, photosynthesis, abscisic acid and Glycine betaine. Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p. 128-136 KEYWORDS: ROOTSTOCKS. SALINITY. TOLERANCE. PHOTOSYNTHESIS. ABA.

Physiological response of four grape varieties, Cabernet Sauvignon, Sauvignon Blanc, Flame Seedless and Sharad Seedless grafted on rootstocks, Dogridge and 110-R was studied after 30 days of (100 and 250 mM) NaCI salinity stress. NaCI salinity increased Na+ and decreased K+ content significantly in the varieties raised on Dogridge rootstock, and in Sharad Seedless. Flame Seedless raised on 110-R, recorded high K+ and low Na+: K+ ratio under salinity stress. The leaf and stem dry mass were negatively influenced by the salinity treatment and Flame Seedless and Cabernet Sauvignon raised on 100-R, showed less reduction in mass under NaCI salinity. Root dry mass of Cabernet Sauvignon and Flame Seedless was higher at 100 mM but declined at 250 mM NaCl treatment, while those on 110-R rootstock contained higher root dry mass. The root: shoot dry mass ratio consistently increased under salinity, and the varieties raised on 110-R rootstock showed high root: shoot dry mass ratio. The leaf water potential ('II), osmotic potential ('1'0)' specific leaf weight, photosynthesis rate (PO and chlorophyll content were high in lants raised on 110-R rootstock, and in Flame Seedless variety at both the salinity levels. Abscisic acid (ABA) and glycine betaine (GB) contents were high in Cabernet Sauvignon and Flame Seedless raised on 110-R rootstock under NaCI salinity. Abscisic acid contentwith Na+/K+ ratio (R2 = 0.811, p5.0.05) and GB content with leaf water potential (R2 = 0.782, p5.0.05) showed high negativerelationship due to the salinity. Thus, induction in ABA and GB accumulation under salinity in grafted plants was associated with the rootstock induced salinity tolerance in grapevines. The Flame Seedless vines raised on 110-R accumulated higher ABA and GB under salinity and witnessed low Na+ content and Na+: K+ ratio, and maintained high leaf water potential and osmotic potential and root: shoot dry mass ratio.

150 Ravichandran, G.; Central Potato Research Station, The Nilgiris (India)Natarajan, N.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Seed Science and Technology and Crop Physiology) Vanangamudi, K.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Seed Science and Technology and Crop Physiology) Pathmanabhan, G.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Seed Science and Technology and Crop Physiology) Manorama, K.; Central Potato Research Station, The Nilgiris (India). Changes in potato tuber skin histology, behaviour with the application of growth regulators in storage and its performance under field. Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p.137-144 KEYWORDS: POTATOES.

BEHAVIOUR. GROWTH. STORAGE. SEEDS. YIELDS. REGULATIONS. TRANSFORMING GROWTH FACTOR.

Prolonging the shelf life of seed tubers under normal conditions helps the farmers to store their own produce as seed for the subsequent seasons, which in turn reduces the cost of production. Though, many chemicals such as methyl ester of naphthalene acetic acid. maleic hydrazide (MH) and CIPC can be used as sprout suppressants, which kill the sprouts, but as such they are not suitable for use in seed potatoes. Storag behaviour of seed tubers with treatments of chemicals like maleic hydrazide, zeatin, salicylic acid, chlorocholine chloride (CCC), tri-iodQ benzoic acid (TffiA) was studied on standing crop and resultant tubers were stored under normal open rack storage condition. CCC followed by MH performed well in controlling the sprout length. The histological studies of transverse section of tuber skin showed differences in thickness of ph ell em and arrangement of starch granules between control, MH and CCC treatments.

151 Arunkumar, R.; Indian Agricultural Research Institute, New Delhi (India). Div. of Pl. Physiology)Sairam, R.K.; Indian Agricultural Research Institute, New Delhi (India). Div. of Pl. Physiology)Deshmukh, P.S.; Indian Agricultural Research Institute, New Delhi (India). Div. of Pl. Physiology)Pal, M.; Indian Agricultural Research Institute, New Delhi (India). Div. of Pl. Physiology)Khetarpal, S.; Indian Agricultural Research Institute, New Delhi (India). Div. of Pl. Physiology)Pandey, S.K.; Indian Agricultural Research Institute, New Delhi (India). Div. of Pl. Physiology)Kushwaha, S.R.; Indian Agricultural Research Institute, New elhi (India). Div. of Pl. Physiology)Singh, T.P.; National Bureau of Plant Genetic Resources, New Delhi (India). High temperature stress and accumulation of compatible solutes in chickpea (Cicer arietinum L.). Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p. 145-150 KEYWORDS: TEMPERATURE. STRESS. CICER ARIETINUM. GENOTYPES. PROLINE. YIELDS. SUGAR.

Four chickpea genotypes differing in sensitivity to high temperature (HT) stress were analysed for the role of sugars and proline accumulation at reproductive stage. Significant increase in membrane injury index, reducing sugars and proline content and decrease in non reducing sugars and total sugars under HT stress was observed in all the chickpea genotypes. Under HT stress, the tolerant Pusa 1103 and BGD 72 genotypes showed significantly greater accumulation of reducing sugars and proline along with lower membrane injury index (higher membrane stability). The percent reduction in total sugars and non reducing sugars was less in Pusa 1103 and BGD 72 compared to the susceptible genotypes viz. Pusa 256 and Pusa 261. There was less reduction in yield under temperature stress in both tolerant genotypes, which may possibly be due to the higher accumulation of proline and reducing sugars. Thus, it was concluded that the higher osmolyte accumulation and lower membrane injury could be one of the reason for the high temperature tolerance of Pusa 1103 and BGD 72.

152 Malaikozhundan, B.; Alagappa Govt. Arts College, Karaikudi (India). Department of ZoologyRaj, S. Thiravia; Alagappa Govt. Arts College, Karaikudi (India). Department of Zoology. A study on the developmental biology of Callosobruchus maculatus (Fabricius) in different pulses. Legume Research (India). (Jun 2012) v. 35(2) p.159-63 KEYWORDS: LONGEVITY. GRAIN LEGUMES. CALLOSOBRUCHUS MACULATUS. CALLOSOBRUCHUS.

The development of Callosobruchus maculatus on five different varieties of pulses were studied. The cowpea variety CoCp-7 recorded significantly highest number of eggs oviposited and percentage adult emergence, the shortest developmental period, highest

susceptibility indices and the highest weight loss. Dobie's susceptibility index showed that the cowpea variety CoCp-7 and Co-6 were found to be highly susceptible to C.maculatus, whereas greengram varieties Km-2 and VBN2 were found to be moderately resistant to C.maculatus. The blackgram varieties VBN3 and VBN4 were resistant and regarded as non-suitable hosts for the development of C.maculatus.

153 Nair, D. B.; Rubber Research Institute of India, Kottayam (India). bhuvanendranubberboard.org.inJames Jacob; Rubber Research Institute of India, Kottayam (India)Nair, N. R.; Rubber Research Institute of India, Kottayam (India). A simple method for rapid determination of residual water content in rubber cup lumps. Journal of Plantation Crops (India). (Apr 2012) v. 40(1) p. 35-39 KEYWORDS: HEVEA. RUBBER. MOISTURE CONTENT.

Estimation of yield of rubber trees based on the dry rubber content of cup lumps is a common practice in field experiments. This leads to large errors due to the presence of moisture trapped inside the lump even after prolonged drying. The amount of water trapped inside the cup lumps can vary with the size of the lump. An experiment as conducted using cup lumps of varying sizes coagulated from fresh field latex for determination of the actual water content in them. Fresh weight of the cup lump was recorded gravimetrically immediately after coagulation. An equal amount of latex was taken in aluminium pan for acid coagulation to make rubber sheet. The dry weight of cup lumps and sheets were recorded after drying and smoking. Dry sheets always recorded less dry weight than dry cup lumps as the latter always contained some amount of moisture trapped inside. Residual moisture content of the lump was calculated from the differences in the weights of dried rubber sheets and lumps. The moisture content of the dry cup lump was not constant across their sizes; the larger the cup lump, the more the residual moisture content in lump. In dry cup lumps, the water content varied from 3-13; by dry weight. In fresh cup lumps this varied from 47-53; on fresh weight basis. Regression equations were derived between per cent residual moisture content and weight of dry cup lumps. The regression equation is suitable for determination of actual rubber content in large number of lumps. Differences in estimation of ruber content using the conventional method and the equations derived from this study and possible errors in determining the rubber yield using the conventional method are discussed.

154 Shamina Azeez; Indian Institute of Spices Research, Calicut(India), Division of Crop Production and Post Harvest Technology. shaminapices.res.inKrishnamurthy , KS.; Indian Institute of Spices Research, Calicut(India), Division of Crop Production and Post Harvest TechnologyVani Chitra, V.; Bharathidasan University,Tiruchirapalli(India), Department of Biochemistry. Effect of temperature on the antioxidant activity of fresh turmeric shizome(Curcuma longa L.). Journal of Plantation Crops (India). (Dec 2012) v. 40(3) p. 163-167 KEYWORDS: CURCUMA LONGA.

Spices are important sources of natural antioxidants and used in alternate systems of Indian and Chinese medicine for ages. The study compares the antioxidant potential of 23 accessions of fresh tunneric, in hot and cold extracts of water and ethanol, by I, I-Diphenyl-2-picryl hydrazyl (DPPH) radical scavenging activity and total antioxidant potential by phosphomolybdenum method. DPPH radical scavenging activity was positively correlated with the curcumin content in hot and cold ethanol extracts. Ethanolic extracts had three times higher DPPH radical scavenging activity (84;) compared to water extracts

(28;). Curcumin content (which ranged between 0.39 and 5.83;) was positively correlated with total antioxidant potcntial in hot ethanol (r = 0.3; P = 0.05) and cold water extracts (r = 0.31; p = 0.05); the cold extracts of water and ethanol had twice the values of hot extracts. The tunneric accessions with high DPPH radical scavenging activity and total' antioxidant activity, with a correlation to their curcumin content is indicated. The study indicates that antioxidant potential is reduced when tunneric is subjected to heat.

F61 Plant physiology - Nutrition

155 Patel, P.K.; Banaras Hindu Unviersity, Varanasi (India). Dept. of Pl. Physiology)Hemantranjan, A.; Banaras Hindu Unviersity, Varanasi (India). Dept. of Pl. Physiology)Sarma, B.K.; Banaras Hindu Unviersity, Varanasi (India). Dept. of Mycology and Pl. Pathology). Effect of salicylic acid on growth and metabolism of chickpea (Cicer arietinum L.) under drought stress. Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p. 151-157 KEYWORDS: METABOLISM. GROWTH. CICER ARIETINUM. DROUGHT STRESS. SALICYLIC ACIDS.

Four chickpea genotypes (Tyson, ICC 4958, JG 315 and DCP 92-3) were treated with 1.0 mM and 1.5 mM salicylic acid (SA) and subjected to pre- and post flowering drought stress to analyse its influence on nitrate reductase (NR) activity, relative water content (RWC), proline and antioxidant enzymes activity (superoxide dismutase and peroxidase). Leaf RWC significantly reduced during stress at both the growth stages and ranged between 71.67-74.43; (unstressed) and 67.96-71.67; (stressed), whereas in 1.5 mM SA treated plants leaf RWC increased comparable to the control (unstressed plant). NR activity significantly reduced under stress at the post anthesis stage of growth but was maintained higher in 1.5 mM SA treated plants in all the four genotypes studied. On the other hand, activities of antioxidant enzymes superoxide dismutase (SOD) and peroxidase (POX) were up regulated by drought stress and interestingly further enhanced by 1.5 mM SA treatment. The response of SA (1.5 mM) was relatively more in ICC 4958 and Tyson cultivars of chickpea. Hence, results signify the role of SA in protecting metabolic activity along with regulating the drought response of plants.

156 Srivastava, N.; Gobind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Pl. Physiology)Singh, D.; Gobind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Pl. Physiology)Shukla, A.; Gobind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Pl. Physiology)Guru, S.K.; Gobind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Pl. Physiology)Singh, M.; Gobind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Pl. Physiology)Rana, D.S.; Gobind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Pl. Physiology). Effect of high temperature stress at post anthesis stage on photo system II, senescence, yield and yield attributes of wheat genotypes. Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p. 158-165 KEYWORDS: SOWING DATE. SENESCENCE. TEMPERATURE. YIELDS. WHEATS. GENOTYPES. FLOWERING.

Wheat [Triticum aestivum (L.) emend Fiori & Paol.], a major cereal of north India experiences high temperature during anthesis and grain development stages coupled with sharp irradiance, low humidity and moisture deficit, resulting in adverse effect on different vital activities and finally the yield and yield attributes of the crop. Wheat genotypes may

have variable response to these stresses, so a field experiment was conducted, where six wheat cultivars (UP-2338, PBW-343, UP-2113, PBW-175, VL¬616 and VL-421) were subjected to variable temperature conditions by sowing them timely and delayed by 20 days. Results revealed that delayed sowing negatively affected growth attributes viz. plant height and leaf area as compare to timely sown crops. The photosynthetic pigments (chI a+b) along with chI at b ratio also recorded reduction under delayed sowing as compared to timely sown cultivars. Chlorophyll fluorescence variable yield (FvIFm), which indicates the functionality of PSII also got impaired under delayed sowing. The higher temperature under delayed sowing enhanced plant growth and hastened both flowering and maturity, resulting in marked reduction in number of days to booting, heading, anthesis and maturity of wheat. Significant interaction was recorded between the genotypes and time of sowing. The yield and yield attributes in terms of spike length plant-” 1000-grain weight, harvest index and finally seed yield ha-1 recorded marked reduction under delayed sowing. UP-2338 recorded the highest grain yield both under timely and late sown conditions closely followed by VL-616. Percent reduction in grain yield due to delayed sowing was lowest in UP-2113 and the highest in VL-421. In case of test weight, PBW-343 and VL-616 maintained its significant superiority. In overall, among all the genotypes, UP-2338 was found to be best performer, while VL-421 was the worst in coping with high temperature stress.

157 Almeselmani, M.; General Commission for Scientific Agricultural Research, Damascus (Syria). Molecular Biology Lab. Dept. of Biotechnology)Saud, A.AL R.; Ezra Research Station, Daraa (Syria) Hareri, F.; Daraa Agricultural Research Center, Daraa (Syria) AL- asan, M.; Daraa Agricultural Research Center, Daraa (Syria)Ammar, M.A.; Daraa Agricultural Research Center, Daraa (Syria)Kanbar, O.Z.; Daraa Agricultural Research Center, Daraa (Syria)AL-Naseef, H.; Daraa Agricultural Research Center, Daraa (Syria). Physiological traits associated with drought tolerance of Syrian durum wheat varieties under rainfed condition. Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p. 166-169 KEYWORDS: TOLERANCE. DROUGHT. WHEATS. STABILITY. WATER. MEMBRANES. HARD WHEAT. FUNCTIONAL DISORDERS. CHLOROPHYLLS.

A field experiment was conducted under rainfed condition using drought tolerant and susceptible durum wheat varieties to determine the effect of water deficit on various physiological traits. Data revealed significant differences between the three groups of}heat varieties under study (tolerant, moderately tolerant and susceptible). Drought tolerant group was superior in term of membrane stability index, relative water content, chlorophyll content and chlorophyll fluorescence. This group also showed higher yield, total biomass, tillers number m-2, 1000 grain weight and grain number ear-I. The current investigation indicated that the physiological adaptability of this wheat group as a reason to perform reasonably well under water stressed environment.

158 Das, S.; Assam Agricultural University, Jorhat (India). Dept. of Crop Physiology)Hatibarua, P.; Assam Agricultural University, Azara (India). Horticultural Research Stn.)Das, R.; Assam Agricultural University, Jorhat (India). Dept. of Crop Physiology). Studies on post harvest life of cut anthurium flowers. Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p. 170-174 KEYWORDS: ANTHURIUM. COLD ZONES. KEEPING QUALITY.

An experiment was conducted to study the post harvest life of two anthurium cultivars viz. Sunset Orange and Agnihotri. Studies involved pulsing of anthurium cut flowers with 10

chemicals, out of which maximum vase life in terms of spadix drying, spathe blueing and loss of. spathe glossiness was observed in 100 ppm BA. All the pulsing treatments showed improved water uptake over control, maximum uptake was observed in 4; sucrose, followed by 500 ppm AgN03. In the holding solution experiment, 100 ppm citric acid + 5; sucrose showed significantly higher vase life in terms of spadix drying, spathe blueing and loss of spathe glossiness. Maximum water uptake was observed in flowers held in 5; sucrose. In the cold treatment experiment, precooling treatment at 15°C for 4 hours resulted in maximum vase life in terms of spadix drying, spathe blueing and loss of glossiness.

159 Rao, D.N.; Directorate of Rice Research, Hyderabad (India) Voleti, S.R.; Directorate of Rice Research, Hyderabad (India) Subrahmanyam, D.; Directorate of Rice Research, Hyderabad (India)Rao, P.R.; Directorate of Rice Research, Hyderabad (India)Ramesha, M.S.; Directorate of Rice Research, Hyderabad (India). Heterosis for antioxidant enzymes in rice hybrid under abiotic stress conditions. Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p.175-178 KEYWORDS: ORYZA SATIVA. HETEROSIS. ANTIOXIDANTS. ENZYMES. HYBRIDS. GLUTATHIONE REDUCTASE. STRESS. CATABOLISM.

Activities of superoxide dismutase (SOD), glutathione reductase (GR), catalase (CAT) were analyzed in rice hybrid DRRH-2 and its respective male (DR 714-1-2R) and female (IR 68897A) parents under water, salinity and low temperature stresses. The superoxide dismutase (SOD) activity was significantly increased in all the three stresses and in all the three genotypes, while highest increase was observed under water stress condition. In case of glutathione reductase (GR) activity the hybrid did not show significant change with the type of stress, where as male parent exhibited decrease and female parent exhibited increase in the enzyme activity under water stress and salt stresses. The catalase activity decreased in all the three types of stresses in hybrid and both parents, while the reduction was relatively higher in male parent followed by hybrid. The hybrid DRRH-2 showed distinct heterosis under all the stresses for the activities of SOD and GR as indicated by their heterosis over the better of parents (HOBP) and heterosis over the mean of parents (HOMP) values, while for CAT activity these heterosis values were non-significant. From the study, we conclude that heterotic vigor for the antioxidant enzymes (SOD, GR) played a role in improvement of stress tolerance in hybrid than the parental lines, which could be an important biochemical basis towards understanding the heterosis under abiotic stress conditions.

160 Srivastava, V.; Banaras Hindu University, Varanasi (India). Dept. of Horticulture)Singh, A.K.; Banaras Hindu University, Varanasi (India). Dept. of Horticulture)Singh, S.P.; Banaras Hindu University, aranasi (India). Dept. of Horticulture). Optimization of BAP and IAA concentration on shoot induction proliferation and rooting in shoot - tip culture of banana CV. dwarf cavendish. Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p. 179-184 KEYWORDS: MICROPROPAGATION. BANANAS. ROOTING. CELL CULTURE.

The effect of BAP (6-benzylaminopurine) and IAA (indole-3-acetic acid) alone and in combination was investigated on shoot initiation, multiplication and root induction for Dwarf Cavendish banana. Shoot¬tips (1-1.2 cm) were isolated from field collected suckers to initiate the culture. Concentration of BAP ranged from 0-6 mg VI for shoot induction and from 0-8 mg VI for shoot multiplication. The concentration of IAA in both initiation media and multiplication media ranged from 0-2 mg VI. The explants responded best on shoot induction media containing MS media supplemented with BAP (6 mg VI) and IAA (1 mg VI).

Highest multiplication rate was observed on the same medium. Best root induction and proliferation. was observed on half strength MS media supplemented with 1 mg VI IAA.

161 Sudhakar, P.; Regional Agricultural Research Station, Tirupati (India). Institute of Frontier Technology)Latha, P.; Regional Agricultural Research Station, Tirupati (India). Institute of Frontier echnology)Babu, P.R.; Agricultural Research Station, Nellore (India)Sujatha, K.; Regional Agricultural Research Station, Tirupati (India). Institute of Frontier Technology)Reddy, K.R.; Regional Agricultural Research Station, Tirupati (India). Institute of Frontier Technology). Identification of thermotolerant rice genotypes at seedling stage using tir technique in pursuit of global warming. Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p. 185-188 KEYWORDS: SEEDLINGS. IDENTIFICATION. ORYZA SATIVA. GENOTYPES. TEMPERATURE. TOLERANCE. CLIMATIC CHANGE.

Global warming predicted to affect food security, especially rice, which is stable food crop as it is vulnerable to high temperature. In the present study, a novel temperature induction response (TIR) technique was adapted for identifying highly thermotolerant rice genotypes. This approach of TIR involves, first the identification of challenging temperature and induction temperature and later standardizing them before being used for screening the material for intrinsic stress tolerance. A lethal temperature of 55°C for 2 hours and induction treatment from 36°C-52°C for 5 hours ~as standardized in the laboratory. Using this standardized TIR protocol, highly thermotolerant rice genotypes were screened from 72 rice germplasm. Sufficient genotypic variability was noticed from zero level to 100; level of tolerance. Among the genotypes, NLR-145 showed highest thermotolerance in terms of 100 per cent seedlings survival and no reduction in root and shoot growth. NLR-40066, NLR-40070 and NLR-40050 also showed higher thermotolerance in terms of 90; seedlings survival and no reduction in root and shoot growth. This study revealed that TIR technique can be used for identification of thermotolerant rice genotypes. The identified rice varieties can be used as donor source for developing high temperature tolerant rice genotypes to withstand future temperature rise.

162 Beena, R.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Crop Physiology)Thandapani, V.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Crop Physiology)Chandrababu, R.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Crop Physiology). Physio-morphological and biochemical characterization of selected recombinant inbreed lines of rice for drought resistance. Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p. 189-193 KEYWORDS: CELL MEMBRANES. STABILITY. CHLOROPHYLLS. DROUGHT. ORYZA SATIVA.

The effect of water deficit on various physio-morhological and biochemical traits were studied during panicle initiation stage using selected recombinant inbred lines (RIL's) of IR20 x Nootripathu and their parents under glasshouse conditions. A pot culture experiment was conducted using tolerant and susceptible RIL's (Ten each). Significant variation was observed for leaf rolling, leaf drying, stress recovery, canopy temperature, relative water content, cell membrane stability, chlorophyll stability index, soluble protein content, proline content, lipid peroxidation and plant production traits such as plant height, number of tillers and biomass under water tress and irrigated conditions between the parents and among the RIL's. The tolerant lines maintained high leaf water status under drought condition. Significant positive correlations were found between proline content, soluble protein content, membrane stability index, chlorophyll stability index, stress recovery and relative

water content with biomass under water stress. Negative correlations were found between leaf rolling, leaf drying and lipid peroxidation with biomass under water stress.

163 Yadukumar, N.; Directorate of Cashew Research, Puttur (India) Rejani, R.; Directorate of Cashew Research, Puttur (India)Nandan, S. L.; Directorate of Cashew Research, Puttur (India). Effect of organic and inorganic nutrition in cashew. Journal of Plantation Crops (India). (Apr 2012) v. 40(1) p. 1-8 KEYWORDS: BIOFERTILIZERS. CASHEWS. INORGANIC FERTILIZERS. ORGANIC FERTILIZERS.

A study was conducted to find the effect of integration of different nutrient sources viz., organic, inorganic and biofertilizers on cashew yield and soil. The cashew yield in different nutrition treatments to meet 100; N requirement of cashew were on par (1.1 to 1.2 tonnes/ha/year) and was lowest (0.88 t/ha/year) in control without manure. An increase in yield over the years was observed in treatments T9(50; N through recommended dose of fertilizer (RDF) and remaining through poultry manure) followed by T4 (biofertilizer Azetobacter with 100; N through organically recyclable biomass compost (ORBC)) and T8 (25; N through RDF and remaining through poultry manure) respectively. The higher nut weight of 10.12 g was observed in treatment T8 and was low in control (8.9 g). After manure application, the N content(296.8 kg/ha) of the soil was more in treatment T5 with 25; N through RDF and remaining through ORBC. The available P2O5 content was more in treatment T8 (59.0 kg/ha)and available K2O content was on par in many treatments. The nutrient content of the soil was less in control treatment (N – 98.3 kg/ha, P2O5– 33.9 kg/ha and K2 O – 85.7 kg/ha). The net profit was worked out and the yield trend over the years showed that treatments T9 with 50; N through RDF and remaining through poultry manure is more suitable for cashew garden. The study also revealed that sustainable yield and profit can be achieved by the application of different fertilizers and manures or their combinations to meet 100; N requirement of cashew.

164 Rejani, R.; Directorate of Cashew Research, Puttur (India). rrejani10mail.com Yadukumar, N.; Directorate of Cashew Research, Puttur (India). A nutrient decision support system for rainfed cashew . Journal of Plantation Crops (India). (Apr 2012) v. 40(1) p. 40-49 KEYWORDS: PLANT NUTRITION. RAINFED FARMING. CASHEWS.

In cashew, the recommended dose of fertilizers/manure per plant is effectively applicable up to 80-100 percent canopy coverage depending upon the age of the plant, plant density, soil fertility level and varieties used. After 6-8 years, a cut down of recommended doses of fertilizers or manures per plant is necessary depending on the nutrient build up in cashew garden due to the addition of nutrients from the increased cashew biomass deposit. For the judicious use of fertilizers and manures, prior soil testing is required for getting the nutrient status in the soil from time to time. A nutrient decision support system (NDSS) was developed for cashew using Visual Basic package for determining the site specific fertilizer and or manure requirement. The optimal fertilizer and manure requirement is based on the nutrient budgeting and nutrient balance approach and it depends on plant density, age of the plant, canopy biomass fallout, canopy wash nutrients, optimal yield of cashew, initial soil NPK, removal of NPK by plants and post soil NPK. The developed decision support system which was validated using field data is having the flexibility of giving the optimal quantity of inorganic fertilizers and or organic manures as selected by the user. The regression analysis of the measured optimal values against the predicted values of the inorganic fertilizers and organic manures showed a reasonable fit between two data sets (R2 = 0.95 for inorganic

fertilizers and R2 = 0.94 for organic manures). The quantity of nutrient application to rainfed cashew can substantially be reduced using the estimated quantity obtained from NDSS.

165 Padhi, S. K.; Orissa University of Agriculture and Technology, Semiliguda(India). Regional Research and Technology Transfer Station. Swain, S. C.; Orissa University of Agriculture and Technology, Bhawanipatna (India). College of Agriculture.. subashswain.hortmail.comRath, S.; Orissa University of Agriculture and echnology, Bhubaneswar (India). College of Agriculture.. Effect of coal ash on physio-morphological and bio-chemical parameters of cashew (Anacardium occidentale L.). Journal of Plantation Crops (India). (Apr 2012) v. 40(1) p. 56-60 KEYWORDS: CASHEWS. COAL BYPRODUCTS. GERMINATION. GROWTH.

F62 Plant physiology - Growth and development

166 Sairam, R.K.; Indian Agricultural Research Institute, New Delhi (India). Div. of Pl. Physiology) Chinnusamy, V.; Indian Agricultural Research Institute, New Delhi (India). Div. of Pl. Physiology) Arora, A.; Indian Agricultural Research Institute, New Delhi (India). Div. of Pl. Physiology) Bhattacharya, P.; Indian Agricultural Research Institute, New Delhi (India). Div. of Pl. Physiology) Joshi, R.; Indian Agricultural Research Institute, New Delhi (India). Div. of Pl. Physiology) Trivedi, S.; Government M.V. Mahavidyalaya, Bhopal (India). Non-symbiotic hemoglobin and nitrate reductase constitute an alternative to fermentation in waterlogging tolerance of mung bean (Vigna radiata (L.) Wilczek). Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p. 93-102 KEYWORDS: NITRIC ACID. VIGNA RADIATA. ACIDS. WATERLOGGING. GROWTH. OXYGEN. REGENERATION. FERMENTATION.

The objective of this study was to examine the role of nitrate reductase, nitric oxide and non-symbiotic hemoglobin in imparting waterlogging tolerance in mung bean genotypes. Experiment was conducted with five cultivated mung bean [Vigna radiata (L.) Wilczek] genotypes viz., T 44, MH 96-1 (relatively tolerant), and Pusa Baisakhi, MH lK-24 and PS 10 (susceptible) under pot-culture condition. Waterlogging induced reduction in relative water content, chlorophyll content and membrane stability index was comparatively less in tolerant genotypes T 44, MH 96-1 than in Pusa Baisakhi, MH lK-24 and PS 10. The nitric oxide (NO) production activity increased up to 6 days of waterlogging treatment in all the genotypes, however T 44, MH 96-1 maintained more than double NO content than Pusa Baisakhi, MH lK-24 and PS 10. Increase in nitrate reductase (NR) activity under waterlogging was observed up to 6-days of treatment in all the genotypes, and T 44, MH 96-1 maintained significantly higher NR activity than Pusa Baisakhi, MH lK-24 and PS 10. Non-symbiotic hemoglobin (NSHb) and cNR mRNA expressions were studied only in the roots of control and waterlogging treated plants of T 44, MH 96-1, and PS 10. Waterlogging induced increase in expression was observed only in tolerant genotypes T 44 and MH 96-1, while little expression was observed in PS 10. In this study we have reported the involvement of non-symbiotic hemoglobin-nitric oxide homeostasis in the waterlogging tolerance of mung bean.

167 Singh, I.; Indian Agricultural Research Institute, New Delhi (India). Directorate of Maize Res.) Shono, M.; Japan International Research Centre for Agricultural Sciences, Okinawa (Japan). Tropical Agriculture Res. Front). Heat - stress effects on dry matter partitioning pollen viability and fruit yield in tomato genotypes. Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p.103-112 KEYWORDS: YIELDS. POLLEN. GERMINATION. FRUITS. PROTEINS. GENOTYPES. HEAT STRESS.

Heat-stress is one of the most important limiting factors for crop productivity under sub-tropical conditions, mainly because of its adverse effects on photosynthetic efficiency and pollen fertility. However, induction of heat shock proteins during heat-stress helps the plant to tolerate high temperature. In the present study, we evaluated four tomato genotypes viz. CLN 2026E, UC 204A, Suncherry extra and Ailsa Craig for their heat-stress response at different growth stages. The mitochondrial small heat shock proteins (MT-sHSPs) were expressed in leaves of. all the four genotypes when the plants were exposed to 38°C for 4 hours. The flowers of CLN 2026E and Suncherry extra started accumulating MT-sHSP within one hour of exposure to 38°C, however, we observed expression of MT-sHSP in CLN 2026E flowers under heat-stress (35/27°C, day/night temperatures) conditions. The genotypes CLN 2026E and Ailsa Craig had significantly higher cell membrane thermostability at high temperature. These genotypes also showed comparatively less reduction in fruit yield at 35/27°C day-night temperatures. Significant reduction in pollen fertility of genotypes UC204A and Suncherry extra was observed during heat-stress. These genotypes did not show in vitro pollen germination at 35°C, indicating their sensitivity to high temperature. On the other hand pollen of genotypes CLN 2026E and Ailsa Craig germinated well at 35°C and also even at 40°C little germination was observed, providing the evidence of thermotolerance.

168 Singh, D.; Indian Agricultural Research Institute, New Delhi (India). Div. of Pl. Physiology) Shamim, M.; Project Directorate for Farming Systems Research, Modipuram (India) Pandey, R.; Indian Agricultural Research Institute, New Delhi (India). Div. of Pl. Physiology) Kumar, V.; Project Directorate for Farming Systems Research, Modipuram (India). Growth and yield of wheat genotypes in relation to environmental constraints under timely sown irrigation condition. Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p. 113-120 KEYWORDS: GROWTH. YIELDS. WHEATS. PHOTOSYNTHESIS. RADIATION. CONSTRAINTS. IRRIGATION. ENVIRONMENTAL
FACTORS. ADAPTATION.

Evaluation of morpho-physiological and yield traits of twenty timely sown irrigated wheat genotypes was done during two seasons (2008-2010). Under the prevailing environmental conditions, the genotypes attained flowering and physiological maturity in about 88-105 and 129-137 days after sowing, respectively. Photosynthesis rate (Pn, J!mol m-z S-l) was significantly higher in UP 2565 (24.17), while higher rate of transpiration (E, mmol HzO m-z S-l) was observed in UP 2338 (6.17), PBW 226 (6.68) and PBW 509 (6.78). Photosynthesis rate, photosynthetic radiation use efficiency (mol COz mol-1 photon) and apparent carboxylation efficiency (Pn/Ci, umol m-z S-l umol”l) declined wit,. temperature above 26°C. An optimum PAR of 1270 umol m-z S-l was observed. A positive association (r = 0.84**) was observed between total biomass and seasonal radiation use efficiency. Yield performance was significantly higher (5.5-5.7 t A50

169 Anithakumari, P.; Central Plantation Crops Research Institute, Regional Station, Kayangulam (India). anithacpcrimail.com Muralidharan, K.; Central Plantation Crops Research Institute, Kasaragod (India)Kalavathi, S.; Central Plantation Crops Research Institute, Regional Station, Kayangulam (India)Remabai, S.; Central Plantation Crops Research Institute, Regional Station, Kayangulam (India). Constraints in adoption of integrated management for root (wilt)disease affected coconut areas - An analysis of

Alleppey district. Journal of Plantation Crops (India). (Apr 2012) v. 40(1) p. 9-15 KEYWORDS: COCONUTS. CONSTRAINTS. A50

170 Anithakumari, P.; Central Plantation Crops Research Institute, Regional Station, Kayangulam (India). anithacpcrimail.com Muralidharan, K.; Central Plantation Crops Research Institute, Kasaragod (India)Kalavathi, S.; Central Plantation Crops Research Institute, Regional Station, Kayangulam (India)Remabai, S.; Central Plantation Crops Research Institute, Regional Station, Kayangulam (India). Constraints in adoption of integrated management for root (wilt)disease affected coconut areas - An analysis of Alleppey district. Journal of Plantation Crops (India). (Apr 2012) v. 40(1) p. 9-15 KEYWORDS: COCONUTS. CONSTRAINTS. A50

171 Anithakumari, P.; Central Plantation Crops Research Institute, Regional Station, Kayangulam (India). anithacpcrimail.com Muralidharan, K.; Central Plantation Crops Research Institute, Kasaragod (India)Kalavathi, S.; Central Plantation Crops Research Institute, Regional Station, Kayangulam (India)Remabai, S.; Central Plantation Crops Research Institute, Regional Station, Kayangulam (India). Constraints in adoption of integrated management for root (wilt)disease affected coconut areas - An analysis of Alleppey district. Journal of Plantation Crops (India). (Apr 2012) v. 40(1) p. 9-15 KEYWORDS: COCONUTS. CONSTRAINTS.ha-1) in DBW 17, HD 2687, HD 2894, PBW 343, PBW 550 and UP 2338,

…….while it was lower (4.6-4.9 t ha-1) in UP 2425, PBW 509, HI 1544 and DBW 16. Grain yield was positively correlated with heat use efficiency and stomatal conductance. Further, the environmental constraints like moderately higher temperatures (above 26°C) affected photosynthesis even under timely sown irrigated conditions in the main wheat producing belt (north western plain zone) of India.

172 Kumar, A.; Indian Agricultural Research Institute, New Delhi (India). Div. of Biochemistry)Kumari, S.; Indian Agricultural Research Institute, New Delhi (India). Div. of Biochemistry)Jolly, M.; Indian Agricultural Research Institute, New Delhi (India). Div. of Biochemistry)Rai, R.D.; Indian Agricultural Research Institute, New Delhi (India). Div. of Biochemistry)Sachdev, A.; Indian Agricultural Research Institute, New Delhi (India). Div. of Biochemistry). Cloning and characterization of myo-inositol-1-phosphate synthase (MIPSI) gene in developing seeds of Glycine max. Indian Journal of Plant Physiology (India). (Apr-Jun 2012) v. 17(2) p. 121-127 KEYWORDS: CLONING. GENE EXPRESSION. PHYTATES. ACIDS. GLYCINE MAX. SEEDS.

Phytic acid (myo-inositol 1, 2, 3, 4, 5, 6 hexakisphosphate) is a phoshphorylated derivative of myoinositol, which functions as a major storage form of phosphorous in plant seeds. MIPS (myo- inositol-1¬phosphate synthase) catalyzes the first and rate limiting step in phytic acid biosynthesis. In the present study, a genomic sequence of MIPS from soybean (Glycine maxvar. Pusa16) was amplified using long PCR. Cloning and characterization of the genomic sequence revealed a total length of 2608 bp containing 9 introns interrupting 10 exons. The transcribed sequence of the gene had an expected open reading frame of 1533 bp encompassing MIPSla variant of the MIPS1 isoform of MIPS gene. Strong homology with the previously reported MIPS gDNA as revealed in the BlastN search also indicated a high degree sequence similarity to Phaseolus vulgaris, Vigna radiata, Cicer arietinum, Lotus japonica and Medicago truncatula. The maximum level of phytate content observed in mature soybean

seeds was 1.9;. MIPS expression by RT -PCR and Northern analysis revealed increased transcript levels during early stages of seed development reaching a maximum at 6-8 mm seed size. At least four copies of the MIPS were detected during Southern analysis of the genomic DNA.

173 Sadeghi, Hossein; Shiraz University, Shiraz (Iran). College of Agriculturekhaef, Nazila; Shiraz University, Shiraz (Iran). College of Agriculture. Germination of three annual medics (Medicago roman.) as affected by seed-coat dormancy breaking techniques. Legume Research (India). (Jun 2012) v. 35(2) p.112-118 KEYWORDS: MEDICAGO SCUTELLATA. MEDICAGO. MEDICAGO POLYMORPHA. DORMANCY.

Medicago scuteUata, Medicago rigidula and Medicago polymorpha are all lucem species. These are annual forage legumes of specific interest to agriculture in Mediterranean pasture. As with other legumes these have a state of seed dormancy, which delays and reduces germination. This research studied germination of these plants in response to mechanical, physical and chemical scarification to break dormancy. The rapid germination in almost all the seeds in the test was achieved from hand scarification with sandpaper, and this demonstrated that dormancy was exclusively imposed by the seed coat (hardseededness). Soaking in hot water partially removed coat-imposed dormancy in these species, but in M. scutellata even after 2 min at 100°C 97.9; of seeds still remained hard. Low temperature by keeping in refrigerator was also effective in stimulating final germination and a good rate of germination in seeds of M. scuteUata and M. polymorpha. After 10 days freezing the germination rate increased by 90;. There was also a good result from keeping seeds on surface run off, after 7 days there was 90; germination rate in seeds of M. scutellata. Chemical scarification with sodium hypochlorite was also used effectively to reduce hardseededness at the lowest concentration (2;) and the shortest time (2 min) in seeds of M. rigidula.

174 Mondal, M.M.A.; Bangladesh Institute of Nuclear Agriculture, Mymensingh (Bangladesh). Crop Physiology DivisionPuteh, A.B.; University Putra Malaysia, Selangor (Malaysia). Department of Crop Science, Faculty of AgricultureMalek, M.A.; University Putra Malaysia, Selangor (Malaysia.). Institute of Tropical Agriculture Ismail, M.R.; Universiti Putra Malaysia, Selangor (Malaysia). Institute of Tropical Agriculture. Determination of optimum seed rate for mungbean based on morpho-physiological criteria. Legume Research (India). (Jun 2012) v. 35(2) p.126-131 KEYWORDS: MUNG BEANS. VARIETIES. YIELDS.

The experiment was conducted at the experimental field of Bangladesh Institute of Nuclear Agriculture, Mymensingh, Bangladesh from the month of March to May 2011 to investigate the effect of cultivars and seed rates on morpho-physiological characters, yield components and yield of summer mungbean [Vigna radiata (L.) Wilczek]. The experiment comprised three types of varieties viz., BINAmung-6 (bold seeded), BINAmung-7 (small seeded) and BINAmung-8 (medium seeded) and three seed rates viz., 30, 40 and 50 kg ha-1. The experiment was laid out in a two factor randomized complete block design with three replications. Number of branches plant-1, leaf area plant-1, total dry mass plant-1, relative growth rate, pod number plant-1, seed and biological yield plant-1 and harvest index decreased with increasing seed rate while reverse trend was observed in plant height and leaf area index. Results revealed that optimum seed rate of a mungbean variety depended on seed size. The variety having smaller size seeds require lower seed ate and vice versa. On an average over the varieties, the seed rate 40 kg ha-1 resulted in the highest seed yield in

mungbean. The optimum seed rate for maximizing seed yield of bold seeded variety, BINAmung-6 was 50 kg ha-1. Similarly, the optimum seed rate for small seeded variety, BINAmung-7 and medium seeded variety, BINAmung-8 was 30 and 40 kg ha-1, respectively. The dry matter partitioning to economic yield was also higher at above optimum seed rates of the varieties. Among the varieties, BINAmung-8 produced the highest seed yield both per plant and per hectare due to its favourable dry matter partitioning to economic yield.

175 Mohajer, S.; University of Malaya, Kuala Lumpur (Malaysia). Institute of Biological Sciences, Faculty of ScienceJafari, A.A.; Research Institute of Forests and Rangelands, Tehran (Iran)Taha, R.M.; University of Malaya, Kuala Lumpur (Malaysia). Institute of Biological Sciences, Faculty of ScienceAhmed, A Bakrudeen Ali; University of Malaya, Kuala Lumpur (Malaysia). Institute of Biological Sciences, Faculty of Science. Evaluation of yield and morphology traits in 72 genotypes of sainfoin (Onobrychis viciifoua scop) through factor analysis. Legume Research (India). (Jun 2012) v. 35(2) p.132-137 KEYWORDS: STATISTICAL METHODS. YIELDS. ONOBRYCHIS VICIIFOLIA. ONOBRYCHIS.

Seventy two genotypes of sainfoin (Onobrychis viciifolia Scop) were sown using lattice design under irrigation condition in Alborz, station Karaj, Iran during 2009–10. Forage dry matter (DM) yield, leaf to stem ratio, growth condition, stem density, plant height, flowering time and resistance to sainfoin powder mildew were studied over 2 years. The analysis of variance showed significant differences for all traits (PO.01). The correlation coefficient between DM yield and growth condition, plant height and stem density was positive and significant. Resistance to disease had negative significant relationship with late-growing, plant height, stem density and forage yield. In addition, Ward cluster analysis was done and divided into 4 genotype groups. In coordinate axis, 1st and 2nd factors demonstrated a good agreement between cluster and factor analysis.

176 Malek, M.A.; Bangladesh Institute of Nuclear Agriculture, Mymensingh (Bangladesh)Shafiquzzaman, M.; Bangladesh Agricultural University (BAU), Mymensingh (Bangladesh). Dept. of Crop Botany Rahman, M.S.; Bangladesh Agricultural University (BAU), Mymensingh (Bangladesh). Dept. of Crop BotanyIsmail, M. Razi; Universiti Putra Malaysia, Selangor (Malaysia). Institute of Tropical Agriculture Mondal, M.M.A.; Universiti Putra Malaysia, Selangor (Malaysia). Dept. of Crop Science. Standardization of soybean row spacing based on morpho-physiological characters. Legume Research (India). (Jun 2012) v. 35(2) p.138-143 KEYWORDS: SOYBEANS. YIELDS. GLYCINE MAX. GENOTYPES.

A field experiment was conducted during December 2008 to April 2009 to investigate the effect of genotypes and row spacing on morpho- hysiological characters, yield attributes and yield of soybean with three row spacing of 25, 30 and 35 cm. The experiment was laid out in two factor randomized complete block design with four replications. Branch number plant-1, leaf area plant-1, total dry mass plant-1, absolute growth rate, relative growth rate, pod number plant-1, seed yield plant-1 and harvest index were increased with increasing row spacing while reverse trend was observed in plant height and leaf area index. Results revealed that narrow spacing performed better in seed yield than wider spacing in soybean. The genotype having lower leaf area requires narrows row spacing and vice versa. On an average over the genotypes, the row spacing of 30 cm showed the highest seed yield in soybean under Bangladesh conditions. The optimum row spacing for higher seed yield of genotype BAU-21 and Shohag was 25 cm while optimum row spacing for genotype BAU-70

was 30 cm. Among the different genotypes, BAU-70 produced the highest seed yield both plant-1 and ha-1 due to its larger photosynthetic area.

177 She, Yuehui; Sichuan Agricultural University, Chengdu (China). Agronomy CollegeZhang, Lifeng; Sichuan Agricultural University, Chengdu (China). Agronomy CollegeWu, Xingwen; Sichuan Agricultural University, Chengdu (China). Agronomy College. Anatomy of seed development of Amphicarpaea Edgeworthii benth. Legume Research (India). (Sep 2012) v. 35(3) p.252-257 KEYWORDS: EDGEWORTHIA. SEED. LEGUMES.

Amphicarpaea edgeworthii Benth. is a wild legume species, with important value in the soybean breeding and research of plant developmental biology. The seed development of Amphicarpaea edgeworthii Benth. was observed using paraffin sectioning method by Nikon TE2000 light microscope. The ovule got fertilized and formed the zygote after flowering about 12 hours. The zygote was transversely divided into a terminal cell and a basal cell in two days after flowering. The proembryo continued cell division in directions forming globular embryo and then heart-shaped embryo, in which the cotyledons primordium began to occur. In 24 days after flowering, the embryo differentiated into matured embryo through Torpedo embryo (in 16 days after flowering).The endosperm cell formation began when the globular proembryo was formed,and the development of the endosperm was nuclear type. The mature seed of Amphicarpaea edgeworthii Benth is devoid of endosperm. The outer integument developed into the seed coat, and the seed coat cells were the fence cells with corneum, that may be one of the important reasons of hard seeds for Amphicarpaea edgeworthii Benth.

H01 Protection of plants - General aspects

178 Anithakumari, P.; Central Plantation Crops Research Institute,Kayangulam (India). Regional Station.. anithacpcrimail.com Muralidharan, K.; Central Plantation Crops Research Institute, Kasaragod (India)Kalavathi, S.; Central Plantation Crops Research Institute,Kayangulam (India). Regional Station.. Technology utilization among coconut farmers of root(wilt) disease affected areas. Journal of Plantation Crops (India). (Dec 2012) v. 40(3) p. 174-179 KEYWORDS: KNOWLEDGE MANAGEMENT. MANAGEMENT. PLANT PROTECTION.

The study was conducted in Alappuzha district, Kerala during 2010-11 among 150 coconut fanners randomly selected from 30 panchayaths. The adoption and knowledge of the fanners were studied in respect of seedling and adult palm management.In case of coconut seedlings application of chemical fertilizers, organic manure and prophylactic measure against rhinoceros beetle attack (leaf axil filling) were adopted by majority offanners. The management of adult palms recorded fairly good adoption level regarding basin opening, basin managemeht with green manures and organic manure/ lime/salt/chemical fertilizer application. Kuttanad region of Alappuzha district recorded significant level of knowledge and adoption of coconut fam1ing technologies compared to other regions of the district. Fanners' knowledge and adoption indicated statistically significant relationship with area under cultivation, training part icipation, membership in groups, frequent attendance in group meetings and enterprise diversification. The knowledge and adoption of plant protection aspects including bio-control measures, soil and water conservation were far below optimum which needs participatory community based extension interventions. Compared to the adoption and knowledge level during

200 l, this study recorded improvement in both knowledge and adoption of recommended technologies except plant protection and soil/ moisture conservation technologies .

H10 Pests of plants

179 Unnikrishnan Nair,G.S; Coconut Developement Board, Kochi (India). Sacred war against a sturdy beetle.. Indian Coconut Journal (India). (Jan 2012) v. 75(09) p. 29-30 KEYWORDS: PESTS OF PLANTS.

180 Ajanta Birah; Central Agricultural Research Institute, Port Blair, Andaman and Nicobar Islands. ajantabirahediffmail.comArun Kumar, S.; Central Agricultural Research Institute, Port Blair, Andaman and Nicobar IslandsTripathi, R.S.; Central Arid Zone Research Institute,Jodhpur(India),AINP on Rodent Control. Status of rodent damage to coconut in Andaman and Nicobar Islands. Journal of Plantation Crops (India). (Dec 2012) v. 40(3) p. 188-192 KEYWORDS: ANDAMAN AND NICOBAR ISLANDS. COCONUTS. DAMAGE. INFESTATION. RODENTS.

The Andaman and Nicobar group of islands forms an arched string of 572 islands and islets stretching from Union of Myanmar in the north to Sumatra in the south. Coconut is the major plantation crop in the Bay islands in about 20927 ha land in India. Rodents cause severe losses to coconut in nurseries as well as in orchards world over, however, such information from Andaman and Nicobar islands is lacking. Therefore, studies on status of rodent problem (infestation rate and nut damage) in coconut were undertaken at thirty-nine locations ofAndaman including nearby islands of south, north and middle Andaman districts. Nineteen rodent species exist in these islands belonging to genera Rattus,Mus and FUllambulus, three species have been reported to be associated with losses in coconuts. Among various rodent species,the black rat (Rat/us rat/us) is primarily responsible for tender nut damage and is cons idered to be the major pest. All the orchards were infested with rodent pests ranging from 2.5 per cent (Dollygunj) to 74.5 per cent (Adajik) in Andaman and from 5.6 to 65.2 per cent in other islands (Little Andaman, Neil and Havelock Islands). Similarly, the nut damage ranged from 4.2 to 6.3 percent (Andaman) and 4.1 to 5.9 per cent (other islands). The overall average rodent infestation and nut damage in the study areas was 26.1 and 5.1 per cent, respectively. The present maiden and extensive finding therefore indicates the need to evolve effective rodent management strategies for enhancing coconut production in these Islands.

J11 Handling, transport, storage and protection of plant products

181 Mathew,Mini; Coconut Developement Board, Kochi (India). A man with exquisite skills in coconut shell carving.. Indian Coconut Journal (India). (Jan 2012) v. 75(09) p. 27-28 KEYWORDS: COCONUTS.

N02 Farm layout

182 Jose, T. K.; Coconut Developement Board, Kochi (India). Let us salute the innovative coconut farmers. Indian Coconut Journal (India) . (Feb 2012) v. 74(10) p. 2-3 KEYWORDS: COCONUTS.

183 Nisha,G; Coconut Developement Board, Kochi (India). Reaching Heights in the midst of dwarfs. Indian Coconut Journal (India). (Feb 2012) v. 74(10) p.7-8 KEYWORDS: DWARFS.

184 Leenamol,MA; Coconut Developement Board, Kochi (India). Innovation brings in sustainability. Indian Coconut Journal (India). (Feb 2012) v. 74(10) p.9-10 KEYWORDS: INTERCROPPING.

185 Deepthi Nair,S; Coconut Developement Board, Kochi (India). A Technocrat who opted for a different path. Indian Coconut Journal (India). (Feb 2012) v. 74(10) p.15,17 KEYWORDS: INTERCROPPING.

186 Jayanath,R; Coconut Developement Board, Kochi (India) Thomas,Elizabeth; Coconut Developement Board, Kochi (India). Hard Work:the key to success. Indian Coconut Journal (India). (Feb 2012) v. 74(10) p.16-17 KEYWORDS: INTERCROPPING.

187 Sasikumar,C; Coconut Developement Board, Kochi (India). With an indepth passion for farming. Indian Coconut Journal (India). (Feb 2012) v. 74(10) p.18-19 KEYWORDS: FARMING SYSTEMS.

188 Deepthi,R; Coconut Developement Board, Kochi (India). In the path of Organic farming. Indian Coconut Journal (India). (Feb 2012) v. 74(10) p.20-21 KEYWORDS: ORGANIC AGRICULTURE.

189 Vijayan, K.M; Coconut Developement Board, Kochi (India). A Golden investment from hard earned money. Indian Coconut Journal (India). (Feb 2012) v. 74(10) p.22-23 KEYWORDS: AGRICULTURE.

190 Mridula, K.; Coconut Developement Board, Kochi (India). A self made Farmer. Indian Coconut Journal (India). (Feb 2012) v. 74(10) p.24-25 KEYWORDS: INTERCROPPING.

191 Chandrashekaran,V.G; Coconut Developement Board, Kochi (India). A Kasaragoden Success story in coconut farming. Indian Coconut Journal (India). (Feb 2012) v. 74(10) p.26 KEYWORDS: COCONUTS.

192 George Peter; Coconut Developement Board, Kochi (India). Mohanraj,moves forward with determination. Indian Coconut Journal (India). (Feb 2012) v. 74(10) p.27 KEYWORDS: INTERCROPPING.

193 Jnanadevan, R; Coconut Developement Board, Kochi (India). A Civil Engineer turned Coconut Farmer. Indian Coconut Journal (India). (Feb 2012) v. 74(10) p.28-29 KEYWORDS: INTERCROPPING.

N20 Agricultural machinery and equipment

194 Balasubramanian, D.; Directorate of Cashew Research, Puttur (India). bavika13mail.comSandeep,T. N.; Directorate of Cashew Research, Puttur (India).

Performance evaluation of dual mode dryer for in-shell cashew nuts. Journal of Plantation Crops (India). (Apr 2012) v. 40(1) p. 28-34 KEYWORDS: DRYERS. MOISTURE CONTENT.

Performance of a dual mode dryer developed to reduce the moisture content of in-shell cashew nut to improve its shelf life was evaluated. Dual mode dryer consisted of three major components viz., drying chamber, aspirator and heat exchanger. Its performance was evaluated by exposing in-shell cashew nuts at an average drying chamber temperature of 65 ºC for safe drying. Preliminary study on infusion of moisture into in-shell cashew nuts indicated that the moisture content of whole nuts and fractions viz., shell and kernel increased with increase in soaking period. Moisture reduction took place at faster rate in the case of electrical than thermal power which was used for the generation of heating media for drying moistened nuts. Average time required to reduce the moisture content of in-shell cashew nuts of small,medium and large size to safer level was worked out to be 4.41, 4.37 and 3.16 hrs in the case of electric power and 4.38,4.28 and 4.11 hrs for thermal power respectively, indicating that the time taken for drying large size nuts was lesser than smaller size nuts. Drying rate among the size of the nuts varied mainly due to lesser nut count in a given mass for large size than small size nuts. Differential rate of drying was recorded for the nuts placed in different positions viz., top, middle and bottom of the drying chamber and it became non-significant after 4 hrs of drying. Drying of in-shell nuts followed falling rate period of drying and time required to reduce its moisture level from initial moisture content of 20.44 per cent to safer level of 8.00 per cent d.b was in the range of 2.84 to 4.51 hrs irrespective of source of power, size of the nuts and position of the tray. Energy required for desired moisture reduction was found to be in the range of 26.06 to 39.79 MJ for electrical system and 173.24 to 230.18 MJ in the case of cashew shell cake as biofuel.

195 Annamalai, S. J. K; Indian Council of Agricultural Research,Coimbatore(India), Central Institute of Agricultural Engineering, Regional CentreRavindra Naik; Indian Council of Agricultural Research, Coimbatore(India), Central Institute of Agricultural Engineering, Regional Centre. naikravindramail.com. Performance of power tiller mounted turmeric harvester at optimized crop and operational parameters. Journal of Plantation Crops (India). (Dec 2012) v. 40(1) p. 193-198 KEYWORDS: RHIZOMES. TURMERIC.

India is a major turmeric (Curcuma longo L.) growing country and Tamil Nadu is one among the major turnleric growing states.Of the many problems identified in turmeric cultivation, harvesting is a major operation which needs to be mechanized. A power tiller (9kW) mounted harvester with chisel type single digger blade for digging single row of turmeric crop with a rubber conveyor with vibrator to convey the dug tunneric rhizome was evaluated at optimized crop and operational parameters. The rake angle (20°) of the digging blade and conveying speed (4.5 km h-') of the rubber type conveyer were optimized by experimentation. The mechanical harvester performed better with rhizome harvesting efficiency of 98 per cent at soil moisture of 15.5 per cent (d.b) with damage of2 per cent with an effective field capacity of 0.08 ha h-1. The conventional method of manual digging had the average(harvesting efficiency of 90.5 per cent and the damage caused to rhizome was 7.1 per cent.The saving in cost was 59.82 per cent by harvesting with mechanical harvester over manual harvesting. The breakeven point was 16 per cent of annual utility and the payback period was 0.5 year for the power tiller mountcd turmeric harvester. The better harvesting efficiency by mechanical harvesting would enable the farmer to realize additional 6-7 per cent of the yield with less damage to the produce.

196 Dushyant Singh; CIAE,Bhopal(India)Kushwaha, H. L.; CIAE,Bhopal(India)Mathew, A.C.; Central Plantation Crops Research Institute, Kasaragod (India)Manojkumar, T.S.; Central Plantation Crops Research Institute, Kasaragod(India), Krishi Vigyan Kendra Hebbar, K. B.; Central Plantation Crops Research Institute, Kasaragod (India). kb_hebbarmail.comMadhavan, K.; CIAE,Bhopal(India)George V Thomas.; Central Plantation Crops Research Institute, Kasaragod (India)Bhargav, V. K.; CIAE,Bhopal(India). Performance evaluation of paddle type and push up type coconut climbing devices. Journal of Plantation Crops (India). (Dec 2012) v. 40(3) p. 224-226 KEYWORDS: COCONUTS. EVALUATION.

P01 Nature conservation and land resources

197 viswan,T.S; Coconut Developement Board, Kochi (India) Antony,Tina; Coconut Developement Board, Kochi (India). A resort to restore the lost glory of Coconut. Indian Coconut Journal (India). (Jan 2012) v. 75(09) p. 34-35 KEYWORDS: NATURE RESERVES.

P30 Soil science and management

198 Ponmurugan , P.; K.S.Rangasamy College of Technology,Tiruchengode(India), Department of Biotechnology. drponmuruganmail.comHemalatha, K.; K.S.Rangasamy College of Technology,Tiruchengode(India),Department of BiotechnologyMarimuthu, S.; Parry Agro Tea Industry, Coimbatore(India), R&D Centre. Studies on silicon solubizing bacteria in south Indian tea soils for biocontrol activity. Journal of Plantation Crops (India). (Dec 2012) v. 40(3) p. 215-219 KEYWORDS: TEA.

P34 Soil biology

199 Dudeja, Surjit Singh; CCS Haryana Agricultural University, Hisar (India). Department of MicrobiologySheokand, Sunita; CCS Haryana Agricultural University, Hisar (India). Department of MicrobiologyKumari, Swaraj; CCS Haryana Agricultural University, Hisar (India). Department of Microbiology. Legume root nodule development and functioning under tropics and subtropics: perspectives and challenges. Legume Research (India). (Jun 2012) v.35(2) p.85-103 KEYWORDS: LEGUMES. ROOT NODULATION. MICROORGANISMS. RHIZOBIUM.

The article has been written in view of the importance attached to symbiotic N2-fixation taking place in unique organs called legume root nodules under tropics and subtropics. Nodules on legume roots are formed in interaction with soil bacteria a and b rhizobia. Symbiotic interactions between compatible legume host plant and rhizobia involve a fine tuned, molecular communication between the two partners. Calcium has been reported to play a crucial role in symbiotic signaling. Nod factors are central to the initial establishment of legume - rhizobial symbiosis. Production of these signaling molecules is activated by the release of plant phenolics, mainly flavonoids, in the rhizosphere, where they induce a set of nod genes in the appropriate rhizobial strain, leading to synthesis of Nod factors. The nature of both flavonoid signal from plant and Nod factor from the microbial partner are central to the maintenance of specificity in this symbiosis, ensuring that plant accommodates only the useful bacterium. Generally the invasion of plant root occurs through an invagination of root hair cell, called infection thread, at the primary site of interaction. The infection thread spans through the entire root cortex allowing rhizobial invasion into dividing cells of nodule

primordium. Rhizobia are released from infection thread into membrane enclosed compartments, where they convert from free living form to N2-fixing form named the bacteroids. Development of functional nodules requires differentiation of both plant and microbial cells. Transcriptomics and proteomics reveal truly great extent of plant and microbial differentiation. Symbiotic N2-fixation is a finely regulated process that involves carbon and energy metabolism of the host plant significantly. The process is also under regulation by N-feedback and O2 supply within the nodules. Redox balance and antioxidant defense system play important roles in establishment of legume-rhizobial symbiosis as well as nodule functioning. Longevity and N2-fixing efficiency of nodules are hugely dependent on environmental conditions prevailing in tropical and subtropical conditions.

P35 Soil fertility

200 Ramana, G. V.; GITAM University, Visakhapatnam (India). GITAM Institute of Technology, Department of BiotechnologyPadhy, Sweta Padma; GITAM University, Visakhapatnam (India). GITAM Institute of Technology, Department of BiotechnologyChaitanya, K. V.; GITAM University, Visakhapatnam (India). GITAM Institute of Technology, Department of Biotechnology. Differential responses of four soybean (Glycine max. L) cultivars to salinity stress. Legume Research (India). (Sep 2012) v. 35(3) p.185-193 KEYWORDS: SALINITY. SOYBEANS. GLYCINE MAX. GLYCOSIDASES.

Salinity stress-induced morphological, physiological and biochemical responses of four soybean cultivars (MAU-61, LSB-1, NRC-37 and MACS-57) were studied in 30 days old plants by treating them with 100 mM, 200 mM and 300 mM concentrations of NaCl respectively. The effect of salinity on plant growth was studied by measuring the growth of the plant, branch length, leaf area. The water relations of soybean cultivars under salinity were estimated by studying the relative water contents and water uptake capacity. The response of the soybean plants to salinity stress was analysed by estimating the levels of carbohydrates, total free amino acids, proline, glycine betaine along with the enzymatic activities of superoxide dismutase and sucrose phosphate synthase. Carbohydrates and SPS activity were decreased in the soybean plants under salinity stress whereas the contents of proline, glycine betaine and total free amino acids were increased along with superoxide dismutase activity. Native polyacrylamide gel electrophoresis showed the accumulation of two SOD isoenzymes Mn-SOD and Cu/Zn SOD under salinity stress. Differential expression of these enzymes showed that the expression of these enzymes under salinity stress was high in roots. This study reveals that the varieties NRC-37 and MACS-57 showed a better performance under salinity stress, when compared to that of MAU-61 and LSB-1 which was very well correlated with their biomass contents.

S20 Physiology of human nutrition

201 Shamina Azeez; Central Plantation Crops Research Institute, Kasaragod (India). shaminapices.res.inRajagopal Vellamoor; Central Plantation Crops Research Institute, Kasaragod (India)Jayarama Pai, T.; K G Heart Surgery Centre, KG Hospital, Coimbatore (India) Arunachalam, V.; ICAR Research Complex for Goa (India). A comparison between the effects of coconut oil and other vegetable oils on human health, with emphasis on heart disease. Journal of Plantation Crops (India). (Apr 2012) v. 40(1) p. 16-22 KEYWORDS:

CARDIOVASCULAR DISEASES. COCONUT OIL. CHOLESTEROL. GROUNDNUT OIL. SUNFLOWER OIL.

Medical records of 550 subjects (394 men and 156 women), from an age group of 18-83 years were collated using a standard proforma exploring personal details, their habits, dietary pattern including the dietary oils used such as coconut oil, gingelly oil, sunflower oil and groundnut oil, physiological and clinical status, blood biochemical profile, medications,socio-psychological status, etc. Biochemical data of blood samples were related to the type and quantity of oil consumed. Gingelly oil correlated well with low serum cholesterol levels, followed by sunflower oil, coconut oil and groundnut oil.Irrespective of the type of oil used, quantity of oil consumed played a major role in the serum cholesterol, HDL and triglyceride levels directly. However, all the four vegetable oils studied, appeared safe for human health. This study also challenges the belief that coconut oil is hypercholesteremic in nature.

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- If your librarian is unable to find the document you want, you could send us the document delivery coupon which is included in each copy of this journal. This coupon enables you to ask the AGRIS National Input Centre of India, Directorate of Knowledge Management in Agriculture, ICAR, Room No.703, Krishi Anusandhan Bhawan-I, Pusa Campus, New Delhi-110012 to supply one or two items for your personal interest. We make no charge for this limited service, but the coupons should be used only as a last resort.
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