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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 → 3 → 4 → 5 → 6

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

C20 Extension

200 Nath, S.K.; Orissa University of Agriculture and Technology, Balasore (India). Krishi Vigyan Kendra. Mohapatra, B.K.; Orissa University of Agriculture and Technology, Balasore (India). Krishi Vigyan Kendra. Knowledge and adoption level of rhizobium culture among pulse cultivators of orissa. Legume Research (India). (Sep 2011) v.34(3) p.184-189 KEYWORDS: RHIZOBIUM. GRAIN LEGUMES. BIOFERTILIZERS.

Rhizobium culture was introduced as a bio-fertiliser in the pulse production programme of Orissa during pre-eighties. A study was undertaken in Balasore district during the year 2007–08 to find out the extent of adoption and knowledge level of the farmers on Rhizobium culture. It was revealed that only 4 per cent of the respondents had adopted it, whereas 41 per cent were yet to hear of it. Television was used as the source of information by the highest numbers of farmers (34%) followed by radio (28%). Nearly half of the responding farmers did not possess the knowledge of the recommended dose.

201 Borate, Amruta; Anand Agricultural University, Anand (India). Zala, Y.C.; Anand Agricultural University, Anand (India). Darji, V.B.; Anand Agricultural University, Anand (India). Analysis of marketable and marketed surplus of red gram in vadodara district of Gujarat. Legume Research (India). (Dec 2011) v.34(4) p.267-272 KEYWORDS: CAJANUS CAJAN. MARKETING. SURPLUSES. STATISTICAL METHODS.

Present investigation was undertaken to estimate the marketable and marketed surplus of red gram and to identify the factors influencing them in Vadodara district of Gujarat. Required data were collected from 120 red gram growers spread over 10 villages of Karjan taluka during 2007–08. Multiple Regression technique was used to quantify the effect of the factors influencing marketable and marketed surplus. As red gram is market oriented crop, about 86 per cent of total production on an average was the marketable surplus and 77 per cent was marketed surplus. The results showed that marketable surplus was positively and significantly related with cropped area and average productivity in all the four categories of farms. It was negatively related with family size and quantity retained for wages in kind indicating inverse relationship between extent of marketable surplus and these factors. Further, in case of marketed surplus, the examination of individual coefficients revealed that marketed surplus was positively and significantly related with total production, current prices and financial obligation for sample as a whole while the family size showed negative sign indicating inverse relationship of marketed surplus with family size in sample farms.

202 Poonia, T.C.; Junagadh Agricultural University, Junagadh (India). Pulse Research Station. Pithia, M.S.; Junagadh Agricultural University, Junagadh (India). Pulse Research Station. Impact of front line demonstrations of chickpea in Gujarat. Legume Research (India). (Dec 2011) v.34(4) p.304-307 KEYWORDS: CICER ARIETINUM. CHICKPEAS. YIELDS.

Three hundred Front Line Demonstrations on chickpea were conducted on different aspects during 2000–01 to 2009–10. The yield gap between conventional practices and improved package of practices was much higher ranging from 21 kg/ha to 349 kg/ha. There is urgent need to make stronger extension services for educating the cultivators in the implementation of improved technology. Under varietal demonstration, the technology gap was much higher i.e. 349 kg/ha followed by management of fertilizers in chickpea (191 kg/ha).

E10 Agricultural economics and policies

203 Rathore, V.S.; Central Arid Zone Research Institute, Bikaner (India). Regional Research Station. Singh, J.P.; Central Arid Zone Research Institute, Jaislmer (India). Regional Research Station. Roy, M.M.; Central Arid Zone Research Institute, Jodhpur (India). Shrubs of hot arid Rajasthan: economic and ecological imperatives–A review. Range Management and Agroforestry (India). (Dec 2011) v.32(2) p.71-78 KEYWORDS: RESOURCE CONSERVATION. ETHNOBOTANY. FORAGE. SOIL DEGRADATION. RANGELANDS. SHRUBS.

About 62 % of total hot arid zone of India lies in Rajasthan with the woody perennials particularly the rangeland shrubs as main source of sustenance and ecological significance. Destruction of natural habitats, over exploitation and increased mechanization in agriculture during last couple of decades resulted into sharp decline in number and diversity of shrubs. There is urgent need for sustainable utilization of shrub diversity through scientific conservation as well as the management. In this paper an attempt has been made to compile the available information pertaining to significance, conservation and management of rangeland shrubs for sustainable management of shrub diversity in hot arid region of Rajasthan, India.

F01 Crop husbandry

204 Gurunathan, N.; NRC for Agroforestry, Jhansi (India). Srimathi, P.; Tamil Nadu Agricultural University, Coimbatore (India). Seed Center. Influence of seed orientation at different depths of sowing in Jatropha curcas. Range Management and Agroforestry (India). (Dec 2011) v.32(2) p.100-103 KEYWORDS: JATROPHA CURCAS. SEED. ORIENTATION. SOWING DEPTH.

The studies on seed orientation based on caruncle (appendage) position and sowing depth revealed that Jatropha seeds are to be sown at a depth of two centimeter positioning the caruncle downwards for maximization of seed germination and seedling characteristics both during seed testing for evaluation of germination percentage and at nursery for production of higher percentage of plantable seedlings. However on bulk sowing irrespective of orientation, sowing of seed at 4 cm depth and irrespective of depth, downward orientation would be optimum for Jatropha seed for getting higher number of plantable seedlings.

205 Padder, M.A.; Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (India). Mir, M.A.; Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, (India). In vitro propagation of Pyrus communis cv. Bartlett. Indian Journal of Agricultural Sciences (India). (Mar 2012) v.82(3) p.225-9 KEYWORDS: FORCING. IN VITRO. PROPAGATION BY CUTTINGS. MICROPROPAGATION. PYRUS COMMUNIS.

Shoot tip explants derived from forced and unforced explants were subjected to different sterilization regimes. Satisfactory culture asepsis (61.60%) and survival (45.00%) was obtained with 0.1% mercuric chloride when forced explants were used. MS medium supplemented with BAP+IBA (1.5+0.01mg/l) resulted in maximum explant establishment (46.66%). Maximum proliferating cultures (52.66%) and shoot number/explant (8.73) was recorded in MS medium supplemented with BAP+IBA (2.00+0.01mg/l). Microcuttings (10-15mm) from the proliferated cultures were inoculated in two media supplemented with

different IBA concentrations for rooting. MS medium fortified with IBA (1.0 mg/l) resulted in maximum rooting (46.66%), root number/shoot (4.26) and root length (36.50 mm).

206 Dubay, S.C.; Indian Agricultural Research Institute, New Delhi (India). Tripathi, Aradhika; Indian Agricultural Research Institute, New Delhi (India). Singh, Birendra; Indian Agricultural Research Institute, New Delhi (India). Combination of soil application and seed treatment formulations of Trichoderma species for integrated management of wet root rot caused by Rhizoctonia solani in chickpea (Cicer arietinum). Indian Journal of Agricultural Sciences (India). (Apr 2012) v.82(4) p.356-62 KEYWORDS: FORMULATIONS. DISEASE CONTROL. SEED TREATMENT. SOIL.

The efficacy of seed dressing and soil application formulations developed from the isolates of Trichoderma viride (IARI P1; MTCC 5369), T. virens (IARI P3; MTCC 5370) and T. harzianum (IARI P4; MTCC 5371) was evaluated individually and in combinations under pot and field experiments during the winter seasons of 2005–06, 2006–07 and 2007–08 for the management of wet root rot caused by Rhizoctonia solani Kühn and improvement in the yield of chickpea. Under pot experiments, T. virens based seed dressing formulation, viz. Pusa 5SD and soil application formulations, viz Pusa Biopellet 16G (PBP 16G) and Pusa Biogranule 6 (PBG 6) were found to be superior to other formulations in reducing wet root rot incidence and increasing the seed germination, shoot and root lengths in chickpea. Under field experiments, a combination of soil application of PBP 16G (T. virens) and seed treatment with either a combination of Pusa 5SD (T. virens) and carboxin or Pusa 5SD (T. virens) alone was superior to any of these formulations individually in increasing the seed germination, shoot and root lengths and grain yield and reducing the wet root rot incidence in chickpea. Seed treatment was more effective than soil application for all the parameters. Both soil application and seed treatment formulations enhanced the growth of the plants indicating growth promoting ability of the isolates used for development of the formulations. The efficacy of the formulations evaluated for the first time against wet root rot of chickpea.

207 Arunachalam, R.; Agricultural College and Research Institute, Madurai (India). Department of Agricultural Extension and Rural Sociology. Spread and acceptance of recommended production technologies in green gram and black gram: a comparative analysis. Legume Research (India). (Mar 2011) v.34(1) p.8-13 KEYWORDS: GRAIN LEGUMES. CONSTRAINTS. MUNG BEANS. URD.

A study was conducted in green gram and black gram in the selected blocks of Madurai district with the main objectives to study the extent of adoption of recommended pulse production technologies (Rice fallow and pure crop) and also to study the constraints in the adoption of the recommended technologies. The pure crop respondents (Black gram) have fairly adopted the technologies viz., right time of sowing, optimum seed rate, recommended fertilizer, regular weeding, control of pod borer and powdery mildew and harvesting at the right time. In the practices viz., seed treatment, DAP spray at flowering, trimming and plastering of field bunds, control of sucking pests and storing the harvested produce in the polythene lined gunny bag they are not up to the expectation. At the same time, rice fallow respondents have poorly adopted almost all the recommended technologies. Almost similar trend prevailed in the green gram also. The most felt were biological constraints and socio economic constraints, followed by technological and infrastructural constraints.

F04 Fertilizing

208 Sehgal, Sandeep; Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, (India). Growth and productivity of Ocimum basilicum influenced by the application of organic manures under Leucaena leucocephala hedgerows in western Himalayan mid hills. Range Management and Agroforestry (India). (Dec 2011) v.32(2) p.83-86 KEYWORDS: AGROFORESTRY. FORAGE. ALLEY CROPPING. LEUCAENA LEUCOCEPHALA. DRUG PLANTS.

A field experiment was conducted in the western Himalayan mid hills for two consecutive years to study the hedgerow intercropping of Leucaena leucocephala with Ocimum basilicum. Leucaena hedgerows were spaced seven meters apart with three different plant spacing within the hedgerows and three different organic manures were applied to the intercrop. The results showed that closely spaced (0.50 m) Leucaena hedgerows negatively influenced various growth and yield attributes like plant height, number of inflorescence and economic yield of the associated herb as compared to its wider spacing (0.75 m and 1.50 m). The use of organic manures benefited the intercrop by improving the growth even in the presence of hedgerows as compared to control plots (without trees). Irrespective of the tree spacing the growth of O. basilicum was suppressed to a greater extent at a distance closer to the hedgerows in all the treatments.

209 Yeptho, Avitoli K.; Nagaland University, Medziphema (India). School of Agricultural Sciences and Rural Development. Singh, A.K.; Nagaland University, Medziphema (India). School of Agricultural Sciences and Rural Development. Kanaujia, S.P.; Nagaland University, Medziphema (India). School of Agricultural Sciences and Rural Development. Singh, V.B.; Nagaland University, Medziphema (India). School of Agricultural Sciences and Rural Development. Quality production of kharif onion (Allium cepa) in response to biofertilizers inoculated organic manures. Indian Journal of Agricultural Sciences (India). (Mar 2012) v. 82(3) p. 236-40 KEYWORDS: BIOFERTILIZERS. ONIONS. ORGANIC AGRICULTURE. QUALITY. PRODUCTION. ALLIUM CEPA.

Onion (Allium cepa L.) is a highly nutrient responsive vegetable crop. In the light of fragmental information available on the response of kharif onion to biofertilizers enriched organic manures, a field experiment was conducted during rainy (kharif) season of 2006–08 on acidic kaolinitic Rhodustalf soil representing foothill conditions of Nagaland. Amongst different organic manures, poultry manure produced the highest response on bulb yield (21.18 tonnes/ha), followed by FYM (16.74 tonnes/ha), vermicompost (14.37 tonnes/ha)=pig manure (12.74 tonnes/ha). Incorporation of Azotobacter chroococcum into different organic manures failed to improvise any significant changes in bulb yield due to high initial microbial abundance in organic manures. Different growth-attributing characters followed the similar response. Poultry manure similarly registered highest nutrient uptake as kg/ha (26.39 N – 10.91 P – 55.96 K), followed by FYM (22.80 N – 9.10 P – 47.90 K) with Pig manure and vermicompost (15.08/16.72 N – 7.30/10.91 P – 51.02/55.96 K) displaying no significant difference. Economic analysis in terms of cost:benefit ratio supported these observations. These studies proposed that if organic manures possess enough initial microbial load, the biofortification of organic manures need not be exercised.

210 Akbari, K.N.; Junagadh Agricultural University, Targhadia (India). Dry Farming Research Station. Ramdevputra, M.V.; Agricultural Research Station, Dhari (India). Sutaria, G.S.; Junagadh Agricultural University, Targhadia (India). Dry Farming Research Station. Vora, V.D.; Junagadh Agricultural University, Targhadia (India). Dry Farming Research Station. Padmani, D.R.; Junagadh Agricultural University, Targhadia (India). Dry Farming Research Station. Effect of organics, bio and inorganic fertilizer on groundnut yield and its residue effect on succeeding wheat crop. Legume Research (India). (Mar 2011) v. 34(1) p.45-47 KEYWORDS: INORGANIC FERTILIZERS. RESIDUAL EFFECTS. YIELDS. SOIL FERTILITY. GROUNDNUTS. ARACHIS HYPOGAEA. WHEATS.

A field experiment was conducted at Agricultural Research Station, Dhari (Gujarat) during 1999–00 to 2002–03 to ascertain the effect of bio (Rhizobium and PSM) organics (FYM, castor cake) and inorganic fertilizers on groundnut yield and its residue effect on succeeding wheat crop and post harvest soil fertility. The results indicated that use of bio and organic fertilizers enhanced the yield of groundnut and wheat as well as sustained the soil fertility. It also gave higher total income and net realization.

211 Nawange, D.D.; Indian Institute of Soil Science, Bhopal (India). Phanda Agriculture Farm. Yadav, A.S.; Louisiana State University, Baton Rouge (India). LSU Ag. Centre. Biotechnology Laboratory. Singh, R.V.; Indian Institute of Soil Science, Bhopal (India). Phanda Agriculture Farm. Effect of phosphorus and sulphur application on growth, yield attributes and yield of chickpea (Cicer arietinum L.). Legume Research (India). (Mar 2011) v.34(1) p.48-50 KEYWORDS: PHOSPHORUS. SULPHUR. GROWTH. YIELDS. CHICKPEAS. CICER ARIETINUM.

A field experiment was conducted during the rabi season 2009–2010 to find out the optimum dose of phosphorus and sulphur on growth, yield attributes and yield of chickpea (Cicer arietinum L). Four levels of P2O5 (0, 20, 40 and 60 kg/ha) and three levels of sulphur (0, 20 and 40 kg/ha), applied through DAP and gypsum, respectively. Treatments were replicated three times in factorial randomized block design. Application of phosphorus from 0 to 60 kg/ha resulted in linear increase in various growth characters, yield attributing traits, seed and stalk yield of chickpea. The application of 60 kg P2O5/ha produced the highest mean seed yield of 1761 (Kg/ha) and stalk yield of 2754 (Kg/ha). Similarly the levels of sulphur up to 40 kg/ha showed linear increase the growth, yield attributes, seed and stalk yield of chickpea. The application of 40 kg Sulphur/ha produced the highest mean seed yield of 1665 (Kg/ha) and stalk yield of 2665 (Kg/ha).

212 Dekhane, S.S.; Junagadh Agricultural University, Junagadh (India). Khafi, H.R.; Junagadh Agricultural University, Junagadh (India). Raj, A.D.; Junagadh Agricultural University, Junagadh (India). Parmar, R.M.; Junagadh Agricultural University, Junagadh (India). Effect of bio fertilizer and fertility levels on yield, protein content and nutrient uptake of cowpea [Vigna unguiculata (L.) Walp.]. Legume Research (India). (Mar 2011) v.34(1) p.51-54 KEYWORDS: BIOFERTILIZERS. COWPEAS. VIGNA UNGUICULATA. PROTEIN CONTENT. NUTRIENT UPTAKE. RHIZOBIUM.

A field experiment was conducted during kharif 2008 at Junagadh on effect of bio fertilizer and fertility levels on yield, protein content and nutrient uptake of cowpea. Sixteen treatments comprising of four levels of bio fertilizer viz., without inoculation, with PSB inoculation, liquid PSB inoculation and Rhizobium inoculation and four fertility levels viz., 0, 50, 75 and 100% RDF were tried in factorial randomized block design with four replications.

The result of the experiment indicated that significantly the highest grain and stover yield of 1441 and 1716 kg/ha respectively, was recorded in seed inoculation by Rhizobium over rest of the treatments. The increased in RDF significantly increased seed and stover yield. Inoculated with Rhizobium significantly increased protein and N, P content as well as uptake of N and P by grain and stover. The 100% RDF recorded the highest protein content as well as content and uptake of N and P by grain and stover but was par with 75% RDF. Significant improvement in available N and P status in soil was also reported due to Rhizobium inoculation.

213 Sutaria, G.S.; Junagadh Agricultural University, Targhadia (India). Dry Farming Research Station. Akbari, K.N.; Junagadh Agricultural University, Targhadia (India). Dry Farming Research Station. Vora, V.D.; Junagadh Agricultural University, Targhadia (India). Dry Farming Research Station. Padmani, D.R.; Junagadh Agricultural University, Targhadia (India). Dry Farming Research Station. Residual effect of nutrient management on the soil fertility and yield of blackgram under dryland conditions. Legume Research (India). (Mar 2011) v.34(1) p.62-64 KEYWORDS: RESIDUAL EFFECTS. NUTRIENTS. SOIL FERTILITY. URD. PENNISETUM GLAUCUM. SORGHUM. MAIZE.

A field experiment was conducted to study residual effect of nutrient management (enriched compost, vermicompost and inorganic fertilizer) and crop (pearlmillet, sorghum and maize) on the soil fertility and yield of succeeding blackgram crop under dry land conditions. Effect of different crops on post harvest status of organic carbon and the availability of all the nutrients were found variable. The availability of all the nutrients was improved when crops were fertilized with enriched compost 6 t/ha as compared to other treatments. Beneficial effect of pearlmillet crop on yield attributes and yield of succeeding blackgram was recorded in comparison to sorghum and maize crops.

214 Abraham, Shalu Ann; Allahabad Agricultural Institute, Allahabad (India). Department of Agronomy. Abraham, Thomas; Allahabad Agricultural Institute, Allahabad (India). Department of Agronomy. Response of chickpea (Cicer kabulium) to different methods of P application, bio-inoculants and micronutrients. Legume Research (India). (Jun 2011) v.34(2) p.117-122 KEYWORDS: PHOSPHORUS. BAND PLACEMENT. TRICHODERMA. MOLYBDENUM. BORON. CHICKPEAS.

Field experiments were conducted during the rabi seasons of 2003–04 and 2004–05 at Allahabad, Uttar Pradesh, to evaluate the effect of different methods of P application, bio-inoculants and micronutrients (Mo+B) on growth and yield of kabuli chickpea (Cicer kabulium) var. Pragati. The experiments were laid out in split-split plot design with three replications. Main plot consisted of four different methods of P application, sub-plots consisted of bio-inoculants and sub-sub-plots comprised of micronutrients. The experimental results revealed that Band placement (basal) recorded significantly higher dry weight (30.04g plant-1), pods plant-1(47.95), pod yield (12.01g plant-1), seed weight plant-1(13.09g) and seed yield (35.03q ha-1). Among the bio-inoculants, the performance of dual inoculation of Trichoderma+PSB was the best having recorded significantly superior growth, yield attributes and yield. Increase in grain yield in Trichoderma+PSB was 10.75% and 12.79% over single inoculation of Trichoderma and PSB. Application of molybdenum+boron also significantly influenced nodulation (23.1 & 32.9 at 60 and 80 DAS), dry weight (32.0 g plant-1), yield attributes and yield (32.72 q ha-1).

215 Singh, G.P.; ICAR Research Complex for NEH Region, Umiam (India). Singh, P.L.; Nagaland University, Medziphema (Nagaland). Panwar, A.S.; ICAR Research Complex for NEH Region, Umiam (India). Response of groundnut (Arachis hypogaea) to biofertilizer, organic and inorganic sources of nutrient in North East India. Legume Research (India). (Sep 2011) v.34(3) p.196-201 KEYWORDS: RHIZOBIUM. PRODUCTIVITY. PROFITABILITY. GROUNDNUTS. ARACHIS HYPOGAEA. BIOFERTILIZERS.

A field experiment was conducted during kharif seasons of 2005 and 2006 to study the effect of biofertilizer(s), organic and inorganic sources of nutrient supply on the yield of groundnut. Treatments consisted of four biofertilizers viz. control, Rhizobium, PSM and Rhizobium+PSM in main plots and seven nutrient combinations viz. control, lime 500 kg/ha (furrow application), FYM 10 t/ha, Lime+50% NPK, FYM+50% NPK, Lime+FYM+50% NPK and recommended dose of NPK (20:60:40 kg/ha) in sub plots. Seed inoculation with Rhizobium+ PSM significantly improved growth and yield of groundnut. Highest net return (Rs.22,755) and benefit cost ratio (1.49) was estimated with Rhizobium+PSM only. Application of Rhizobium or PSM improved residual nutrient status but marked improvement was observed with combined application of these biofertilizers. Application of Lime+FYM+50% NPK increased growth, yield attributes, yield, available nutrient status, highest net returns (Rs.21,910/ha) and B:C ratio (1.23) over other nutrient levels. Integrated use of Lime+FYM+50% NPK along with Rhizobium+PSM was the best for groundnut.

216 Yadav, B.K.; Maharana Pratap University of Agriculture & Technology, Udaipur (India). Rajasthan College of Agriculture. Department of Agricultural Chemistry and Soil Science. Improvement of mung bean growth and productivity by phosphate-dissolving fungi aspergillus niger seed inoculation. Legume Research (India). (Sep 2011) v.34(3) p.217-221 KEYWORDS: MUNG BEANS. VIGNA RADIATA RADIATA. ASPERGILLUS NIGER. NUTRIENT UPTAKE.

Efficiency of Aspergillus niger was studied in a pot experiment to evaluate improvement of mung bean [Vigna radiata (L.) Wilczek] growth and productivity. A significant (p=0.05) increase in plant growth and yield parameters (plant height, number of nodules, number of branches, number of pods, seed yield and test weight) were noticed as compared to uninoculated treatments. In general there was a significant improvement in uptake of N, P, K, Fe and Zn as compared to absolute control. It was found that inoculation by A. niger increased uptake of nitrogen by 7%, phosphorus and zinc by 9%, potassium by 8% and iron by 17% as compared to uninoculated treatments. The experiment confirmed that A. niger had a significant effect on growth and nutrient uptake in the mung bean and indicated that this fungi play an important role in growth and nutrition of mung bean in sub-humid region.

217 Sharma, Rakesh; Dr. Y.S. Parmar University of Horticulture & Forestry, Kinnaur (India). Krishi Vigyan Kendra. Verma, M.L.; Dr. Y.S. Parmar University of Horticulture & Forestry, Kinnaur (India). Krishi Vigyan Kendra. Effect of rhizobium, farm yard manure and chemical fertilizers on sustainable production and profitability of rajmash (Phaseolus vulgaris L.) and soil fertility in dry temperate region of north- western Himalayas. Legume Research (India). (Dec 2011) v.34(4) p.251-258 KEYWORDS: RHIZOBIUM. FARMYARD MANURE. INORGANIC FERTILIZERS. YIELDS. SOIL FERTILITY. PHASEOLUS VULGARIS. PHASEOLUS.

Effect of using Rhizobium, farm yard manure (FYM) and inorganic fertilizers on plant growth, yield attributes, yield of rajmash and nutrient build up in soil was studied under field conditions. Rhizobium inoculation and application of FYM and chemical fertilizers had significantly increased the plant height, number of pods per plant, number of seeds per pod, yield and net returns over controls. Application of K 30 kg ha-1 along with recommended dose of fertilizers significantly increased the yield of rajmash by 34.8% and the observed response in terms of seed yield was 21.6 kg per kg of K applied. Highest growth, yield attributes and seed yield were recorded with application of 40 kg N ha-1, 60 kg P ha-1 and 30 kg K ha-1, with an increase of 58.8% in yield over recommended dose of fertilizers. Maximum net returns (Rs.78,705) was also recorded under the same treatment. The yield of 3270 kg ha-1 was observed in the interaction treatment in which Rhizobium inoculated seeds were used in conjunction with 5 t FYM and 40 kg N, 60 kg P and 30 kg K ha-1. Maximum soil organic carbon (13.5g kg-1) and the highest available N, P, K contents (380, 98, 230 kg ha-1, respectively) were observed under the combined use of Rhizobium and FYM along with chemical fertilizers (40 kg N, 60 kg P and 30kg K ha-1) after completion of the experiment, which indicated the build up of available soil nutrients over other treatments including recommended dose of fertilizers.

218 Sharma, S.K.; Directorate of Groundnut Research, Junagadh (India). Jain, N.K.; Directorate of Groundnut Research, Junagadh (India). Upadhyay, B.; M.P. University of Agri. and Technology, Udaipur (India). Response of groundnut (Arachis hypogaea L.) to balanced fertilization under sub-humid southern plain zone of rajasthan. Legume Research (India). (Dec 2011) v.34(4) p.273-277 KEYWORDS: GROUNDNUTS. ARACHIS HYPOGAEA. YIELDS. NUTRIENT UPTAKE. FERTILIZERS.

A field experiment was conducted on sandy clay loam soil during two kharif seasons of 2008 to 2009 to study the response of groundnut (Arachis hypogaea L.) to balanced fertilization. The experiment, comprised of 3 balanced fertilization treatments i.e. 100% NPK, 100% NPKS and 100% NPKSZn, was laid out in randomised block design with 9 replications. Results revealed that application of 100% NPKSZn significantly enhanced the pod and haulm yields of groundnut by 25.9 and 22.4 per cent over 100% NPK, respectively. This treatment also recorded significantly higher concentration and uptake of N, P, K, S and Zn as well as improved the soil fertility status.

219 Choudhary, S.K.; S.K.N. College of Agriculture, Jobner (India). Jat, M.K.; S.K.N. College of Agriculture, Jobner (India). Sharma, S.R.; S.K.N. College of Agriculture, Jobner (India). Singh, P.; Maharana Pratap University of Agriculture & Technology, Udaipur (India). Rajasthan College of Agriculture, Department of Agronomy. Effect of INM on soil nutrient and yield in groundnut field of semi-arid area of rajasthan.. Legume Research (India). (Dec 2011) v.34(4) p.283-287 KEYWORDS: GROUNDNUTS. ARACHIS HYPOGAEA. ORGANIC FERTILIZERS. BIOFERTILIZERS. FERTILIZERS. SEMIARID ZONES.

A field experiment was conducted during kharif 2006 at farmer's field, Ghatolia (Kalakh), Jobner. The soil was loamy sand, having pH 8.15 0.90 dS/m electrical conductivity, 0.13% organic carbon, 130.6 kg/ha available nitrogen, 20.5 kg/ha available phosphorus and 149.6 kg/ha available potassium. The application of 25 kg N+ 50 kg P2O5 + 40 kg K2O ha-1 along with Rhizobium, VAM and PSB recorded significantly higher available nitrogen 164.1 kg ha-1 and available phosphorus 26.6 kg ha-1 whereas minimum were noted with the application of RDF- NPK alone. However, this treatment also provided significantly higher

NPK uptake by the crop and crop yields (pod, kernel and haulm) over rest of the treatments. The minimum yields were noted with the application of alone RDF, poultry manure, vermicompost and their mixture.

220 Kumar, Jitendra; Chaudhary Charan Singh University, Meerut (India). Effect of phosphorus and sulphur application on performance of vegetable pea (Pisum sativum L.) cv. pant matar-2. Legume Research (India). (Dec 2011) v.34(4) p.292-295 KEYWORDS: PHOSPHORUS. SULPHUR. YIELDS. GROWTH. VEGETABLES. PISUM SATIVUM. PISUM. ROOT NODULATION.

A field experiment was conducted during the winter season of 2009–10 to find out the optimum dose of phosphorus and sulphur on growth, nodulation, yield attributes and yield of garden pea (Pisum sativum L.). Four levels of P2O5 (0, 20, 40 and 60 kg/ha) and three levels of sulphur (0, 20 and 40 kg/ha), were applied through single super phosphate and gypsum, respectively. Treatments were replicated three times in factorial randomized block design. Application of phosphorus and sulphur resulted in an increase in various growth characters, nodulation, yield attributing traits and yield of garden pea. The application of 60 kg P2O5 produced the highest mature green pod yield (73.83 q/ha). Similarly the levels of sulphur up to 40 kg/ha showed linear increased in growth, nodulation and yield of garden pea. The application of 40 kg sulphur produced the highest yield of 66.51 q/ha.

221 Yadav, B.K.; Maharana Pratap University of Agriculture & Technology, Udaipur (India). Rajasthan College of Agriculture. Rawat, U.S.; Maharana Pratap University of Agriculture & Technology, Udaipur (India). Rajasthan College of Agriculture. Meena, R.H.; Maharana Pratap University of Agriculture & Technology, Udaipur (India). Rajasthan College of Agriculture. Influence of phosphorus and sulphur on yield and micronutrient uptake by clusterbean [Cyamopsis tetragonoloba (L.) taub]. Legume Research (India). (Mar 2012) v.35(1) p.8-12 KEYWORDS: PHOSPHORUS. CYAMOPSIS PSORALIOIDES. CYAMOPSIS. SULPHUR. YIELDS. TRACE ELEMENTS.

A pot experiment was conducted with three levels of P (0, 20 and 40 kg P2O5/ha) and three levels of S (0, 10 and 20 kg S/ha). Grain and straw yield of clusterbean increased significantly (p=0.05) with increase in level of P and S individually as well as in various combinations. Phosphorus application increased the micronutrient uptake by 22.7 to 40.3% (Fe), 18.4 to 28.2% (Cu), 22.7 to 40.3% (Zn) and 19.1 to 35.7% (Mn) in grain, however 17.2 to 30.4% (Fe), 13.1 to 19.6% (Cu), 17.1 to 31.3% (Zn) and 11.4 to 23.6% (Mn) increase in uptake was recorded in straw. Almost similar observations were recorded regarding effect of S application on micronutrient uptake in both grain and straw. Micronutrient uptake increased by 14.2 to 17.0% and 11.8 to 17.3% (Fe), 9.7 to 12.6% and 9.0 to 11.4 % (Cu), 14.5 to 16.3% and 13.8 to 16.5% (Zn) and 11.7 to 15.2 and 7.6 to 14.3% (Mn) in grain and straw, respectively. Both P and S application resulted in increased in Fe by 28.7 to 65.4% (grain) and 28.3 to 54.8% (straw). Increased in Cu uptake reported by 21.0 to 54.6% (grain) and 20.6 to 42.8% (straw) with interaction of P and S. There was 28.6 to 65.0% and 29.1 to 54.8% increased in Zn uptake in grain and straw with application of P and S. The Mn uptake was in range of 26.6 to 62.9% for grain and 24.7 to 55.8% for straw.

222 Sharma, S.K.; Maharana Pratap University of Agriculture & Technology, Udaipur (India). Rajasthan College of Agriculture. Jain, N.K.; Directorate of Groundnut Research,

Junagadh (India). Effect of balanced fertilization on productivity and soil fertility status of clusterbean. Legume Research (India). (Mar 2012) v.35(1) p.32-35 KEYWORDS: CYAMOPSIS PSORALIOIDES. FERTILIZERS. YIELDS. NUTRIENT UPTAKE. SOIL FERTILITY.

A field experiment was conducted on sandy clay loam soil during two kharif seasons of 2008 to 2009 to study the effect of balanced fertilization on productivity and soil fertility status of clusterbean [Cyamopsis tetragonoloba (L.) Taubert]. The experiment, comprised of 3 treatments i.e. 100% NPK, 100% NPKS and 100% NPKSZn, laid out in randomised block design with 9 replications. Results revealed that application of 100% NPKSZn significantly enhanced the seed and straw yields of clusterbean by 29.5 and 29.6 per cent over 100% NPK, respectively. This treatment also recorded significantly higher concentrations and uptake of N, P, K, S and Zn as well as improved the soil fertility status.

223 Chesti, M.H.; SKUAST-J, Rajouri (India). Regional Agricultural Research Station. Ali, Tahir; Sher-e-Kashmir University of Agricultural Science and Technology, Srinagar (India). Bhat, M.A.; Sher-e-Kashmir University of Agricultural Science and Technology, Srinagar (India). Effect of organic and inorganic phosphorus sources on quality of green gram (Vigna radiata L.) under temperate conditions of Jammu and Kashmir. Legume Research (India). (Mar 2012) v.35(1) p.47-49 KEYWORDS: MUNG BEANS. QUALITY. ORGANIC FERTILIZERS. VIGNA RADIATA RADIATA. PHOSPHORUS.

Field experiments were conducted during two consecutive kharif seasons to assess the effect of organic and inorganic phosphorus sources on quality of green gram in temperate conditions of Jammu and Kashmir. The results revealed that application of organic manures significantly improved the total soluble sugars and protein content in grain of green gram. Among organic manures, application of FYM (10 t/ha) proved significantly superior over Dalweed (15 t/ha). Soil inoculation with P-solubilizers significantly increased the protein content in grain of green gram. Among P-solubilizers, inoculation with Pseudomonas proved significantly superior over Bacillus. Increasing levels of phosphorus up to 30 kg P2O5/ha significantly improved the total soluble sugars and protein content in grain of green gram. However, further increase in phosphorus level viz., 60 kg P2O5/ha had no beneficial influence on these quality parameters of green gram.

F06 Irrigation

224 Sharma, Vipin; Dr YS Parmar University of Horticulture and Forestry, Nauni (India). Sharma, I.P.; Dr YS Parmar University of Horticulture and Forestry, Nauni (India). Spehia, R.S.; Dr YS Parmar University of Horticulture and Forestry, Nauni (India). Kumar, Pradeep; Dr YS Parmar University of Horticulture and Forestry, Nauni (India). Influence of irrigation methods and fertilizer levels on productivity of potato (Solanum tuberosum). Indian Journal of Agricultural Sciences (India). (Feb 2012) v.82(2) p.117-21 KEYWORDS: COST BENEFIT ANALYSIS. FERTIGATION. TRICKLE IRRIGATION. SPRINKLER IRRIGATION.

A experiment was laid in split-plot design and the treatments comprised sprinkler, drip and furrow irrigation as main plot along with three doses of fertilizers, viz F1 (NPK 150:150:125 kg/ha), F24 (NPK 125:125:100 kg/ha) and F (NPK 100:100:75 kg/ha) as sub-plot treatments. Results of the study indicated that irrigation methods manipulated the hydrothermal regimes of the soil comprehensively and mean maximum monthly temperature was lowered by about 1.2^0C under sprinkler irrigation. Under drip irrigation, moisture was near to the field capacity throughout the growth period, whereas, in

conventional furrow irrigation, the moisture status curve travelled from above field capacity to 50% moisture depletion conditions. The yield of tubers was appreciably higher under sprinkler and drip, compared to furrow irrigation method. F1 and F exhibited non-significant differences among themselves, in respect of tuber yield, but were significantly higher than F32. Economic analysis indicated that sprinkler irrigation and F2 resulted in optimum benefit: cost ratio.

225 Raja, R.; Central Agricultural Research Institute, Port Blair (India). Ravisankar, N.; Central Agricultural Research Institute, Port Blair (India). Chaudhari, S. Ghoshal; Central Agricultural Research Institute, Port Blair (India). Ambast, S.K.; Central Agricultural Research Institute, Port Blair (India). Subhash Chand; Central Agricultural Research Institute, Port Blair (India). Din, M.; Central Agricultural Research Institute, Port Blair (India). Meena, Babulal; Central Agricultural Research Institute, Port Blair (India). Subramani, T.; Central Agricultural Research Institute, Port Blair (India). Ahmed, Zakir; Central Agricultural Research Institute, Port Blair (India). Effect of supplemental irrigation on yield and water productivity of dry season crops in Andaman and Nicobar Islands. Indian Journal of Agricultural Sciences (India). (Feb 2012) v.82(2) p.122-6 KEYWORDS: CHILLIES. DRY SEASON. CROPS. MUNG BEANS. MAIZE. OKRAS. SESAME. SUPPLEMENTAL IRRIGATION.

Field experiments were conducted with different supplemental irrigation levels for growing maize, greengram, sesame, okra and chilies during the dry season of 2006–07 and 2007–08 in A&N Islands. The results indicated that though the yields achieved with supplemental irrigation has not achieved at par with that of farmers, practice (I) of irrigating the crop as and when required (4160 and 10398 kg/ha during 2006–07 and 2007–08 respectively. It has increased the yield significantly in both the years vis-à-vis I i.e., no irrigation (1355 and 5640 kg/ha during 2006–07 and 2007–08 respectively). The percent yield increase over I 0 0 when supplemental irrigation was provided one (I 1), two (I 2 5), three (I) times due to supplemental irrigation was 48, 95, 133 and 178 in I 1 , I 2 , I 3 and I 4 3 9) and four (I during 2006–07 and 13, 27, 53, 62 in I and I during 2007–08 respectively. Thus by providing supplemental irrigation at different critical crop growth stages, higher yield and economic returns were achieved with lesser irrigation water usage, an important consideration for raising dry season crops in the rice fallows from the harvested rainwater of rainy season under Island conditions. However, the results also underlined the fact that cultivation of vegetables like okra and chillies on residual soil moisture alone without irrigation during dry season in the islands may be riskier and result in economic loss if the rainf all during the cropping period is very low.

226 Kumar, P. Suresh; ICAR Research Complex for NEH Region, Basar (India). Choudharry, V.K.; ICAR Research Complex for NEH Region, Basar (India). Bhagwati, R.; ICAR Research Complex for NEH Region, Basar (India). Influence of mulching and irrigation level on water-use efficiency, plant growth and quality of strawberry (Fragaria ananassa). Indian Journal of Agricultural Sciences (India). (Feb 2012) v.82(2) p.127-33 KEYWORDS: FRUIT. IRRIGATION. MULCHING. QUALITY. ARBUTUS. FRAGARIA ANANASSA.

Strawberry (Fragaria × ananassa Duch) cv. Chandler was grown in the field to investigate the effectiveness of different mulches and irrigation level on plant growth, fruit growth, yield and other quality parameters. I favoured plant growth, enhanced flowering (67.5 days), resulted in production of significantly larger fruit and higher yield (175.15 g/ plant), higher TSS, and ascorbic acid content with lesser incidence of albinism (17.9%) and

botrytis rot than other irrigation levels. Plants mulched with BPM have significantly better growth, flowered and fruited early, produced larger fruit and higher yield, with slightly higher incidence of albinism (19.8%), but with lower incidence of botrytis rot (14.9%) than those mulched with other materials. Irrigation level×mulching interaction has significantly influenced growth parameters like, crown height, plant spread and leaf area with I 1 × M 1interaction. Strawberry produced larger fruit (13.1 g) and higher yield (185.8 g/plant), higher TSS, and higher ascorbic acid content with a slightly higher incidence of albinism, but comparatively lower incidence of botrytis rot under irrigation regime of I 1 mulched with black polyethylene.

227 Sripunitha, A.; Agricultural College and Research Institute, Madurai (India). Department of Seed Science and Technology. Sivasubramaniam, K.; Agricultural College and Research Institute, Madurai (India). Department of Seed Science and Technology. Manikandan, S.; Agricultural College and Research Institute, Madurai (India). Department of Seed Science and Technology. Selvarani, K.; Agricultural College and Research Institute, Madurai (India). Department of Seed Science and Technology. Shyla, K. Krishna; Agricultural College and Research Institute, Madurai (India). Department of Seed Science and Technology. Sub surface drip irrigation studies on seed and field quality of groundnut cv. vri2. Legume Research (India). (Dec 2011) v.34(4) p.311-313 KEYWORDS: GROUNDNUTS. ARACHIS HYPOGAEA. QUALITY. SEED. FERTIGATION. SUBSURFACE IRRIGATION.

A study was conducted to evaluate the surface and subsurface fertigation application effects on groundnut seed crop performance, under two methods of sowing (conventional method and ridges and furrows) and at two levels of potential evapo-transpiration (SSDI at 75% and 100%). The experimental results indicated that the sowing in ridges and furrows with subsurface drip irrigation at 100% potential evapo-transpiration led to a greater seed yield with higher seed quality.

228 Mehta, R.S.; National Research Centre on Seed Spices, Ajmer (India). Tabiji Farm. Anwer, M.M.; National Research Centre on Seed Spices, Ajmer (India). Tabiji Farm. Kakani, R.K.; National Research Centre on Seed Spices, Ajmer (India). Tabiji Farm. Yield and profitability of fenugreek (Trigonella foenum-graecum) as influenced by irrigation and nutrient levels with varying crop geometry. Legume Research (India). (Mar 2012) v. 35(1) p.28-31 KEYWORDS: TRIGONELLA FOENUM GRAECUM. IRRIGATION. CROPS. FERTILITY. NUTRIENTS.

An experiment was conducted during rabi season of 2003–06 to study growth, profitability and productivity of fenugreek as influenced by irrigation and nutrients levels with varying crop geometry. Three irrigation levels (8, 12 and 15 days interval) in main plot, nutrient levels (N and P2O5 each of 20+10,30 +20 and 40+25 kg/ha, respectively) in sub plot and crop geometry (20 cm x 10 cm, 25 cm x 10 cm and 30 cm x 10 cm) in sub-sub plot were studied in split-split plot design with three replications. The maximum plant height and dry matter accumulation per plant at all the growth stages as well as number of branches per plant at harvest (3.84) and yield attributes, seed yield (1120 kg/ha), net return (35086) and BCR(1.68) in fenugreek was obtained highest with application of irrigation at 12 days interval. Application of 30 +20 kg N and P2O5 per ha gave higher yield attributes, seed yield (1121 kg/ha) net return (Rs 34465/ha) and BCR (1.62) being at par with 40 + 25 kg N and P2O5. The Crop geometry of 25 x 10 cm resulted in 10 per cent higher seed yield over 20 x 10 cm crop geometry. Thus, application of irrigation at 12 days interval with combined

application of 30 kg N and 20 kg P2O5/ha at 25 cm x 10 cm crop geometry is better for realizing higher yield, productivity and net return in fenugreek.

F07 Soil cultivation

229 Maji, B.; Central Research Institute for Jute and Allied Fibres, Kolkata (India). Sahu, N.C.; Central Research Institute for Jute and Allied Fibres, Kolkata (India).Das, I.; Central Research Institute for Jute and Allied Fibres, Kolkata (India).Saha, S.; Central Research Institute for Jute and Allied Fibres, Kolkata (India).Sarkar, S.; Central Research Institute for Jute and Allied Fibres, Kolkata (India).Saha, Suprakash; Central Research Institute for Jute and Allied Fibres, Kolkata (India).. Soil fertility management for productivity enhancement of jute under some constrained acidic soils of West Bengal. Indian Journal of Agricultural Sciences (India). (Apr 2012) v. 82(4) p. 345-50 KEYWORDS: ACIDIFICATION. SOIL. SOIL PH. JUTE. PRODUCTIVITY. RESOURCE MANAGEMENT. SOIL FERTILITY.

Jute crop plays a pivotal role in the farming economy of number of eastern Indian states like West Bengal (Paschimbanga), Asom, Bihar and Odisha. In spite of available sound production technology, the main concern in jute fibre production system in India is the non-uniform productivity over 87 jute-growing districts located in varying agroclimatic regions of the country including 17 jute-growing districts of West Bengal having relatively higher productivity in South Bengal than in North Bengal. The major reasons of technical nature for low productivity in North Bengal are initially identified as soil acidity. The participatory farmers' field experiments were conducted at Balurghat (pH 5.06, EC 0.024 dS/m, OC 0.59%, available N, P, K= 246, 29, 90 kg/ha) and Kumarganj (pH 4.45, EC 0.002 dSm-1, OC 0.51%, available N, P, K= 314, 15, 98 kg/ha) blocks of Dakshin Dinajpur district of North Bengal with an aim to enhance the productivity of jute through proper soil fertility management. The results of the field experiment revealed that application of lime (based on LR value) coupled with soil test-based balanced fertilization enhanced the productivity of olitorius jute [over farmers' practice Balurghat [(2.42 tonnes/ha) and Kumarganj (1.52 tonnes/ha)] by 29.1% and 45.7% in the constrained acidic block of Balurghat and Kumarganj (of Dakshin Dinajpur district) respectively. The same treatments also improves the B:C ratio and reduced insect pests and disease incidence.

F08 Cropping patterns and systems

230 Singh, K.A.; ICAR Research Complex for NEH Region, Umiam (India). Rai, Arvind K.; ICAR Research Complex for NEH Region, Umiam (India). Nutrient accumulation, distribution and use efficiency in different bamboo plant species in north-eastern hills region of India. Indian Journal of Agricultural Sciences (India). (Feb 2012) v.82(2) p.134-45 KEYWORDS: BAMBOOS. CYCLING. NUTRIENT AVAILABILITY. PLANT NUTRITION. EFFICIENCY.

Nutrient accumulation, distribution and use efficiency in 30 bamboo plant species were studied in a 14 years old bamboosetum at ICAR Research Complex for NEH Region, Arunachal Pradesh Centre. Per cent concentration of N, P, Ca, Mn and Z n in different component of biomass had similar pattern in all the species. It was in the order of leaves branches stems and the concentration of K, Mg and Fe was in leaves stems branches. The N: P: K ratios of above ground biomass varied in different bamboo plant species (76–706:1:66–930). They showed that P was most limiting nutrient. Bamboo plant species had inherently different response to low P. Recycling of the nutrients through litters showed

variability in the range of 2.7–40.9, 0.6–31.4, 1.5–21.1, 3.0–35.4, 1.0–35.4, 2.0–26.3, 0.5–8.0, 1.2–15.0 and 5.0– 39.3% of the annual uptake of N, P, K, Ca, Mg, Cu, Fe, Mn and Zn respectively, in different bamboo species. The pattern of nutrient-use efficiency was also different in 30 bamboo plant species.

231 Singh, Devvart; Directorate of Soybean Research, Indore (India). Ramteke, Rajkumar; Directorate of Soybean Research, Indore (India). Vyas, A.K.; Directorate of Soybean Research, Indore (India). Khan, I.R.; Directorate of Soybean Research, Indore (India). Sweep seed drill for intercultural operation along with sowing of soybean (Glycine max) crop. Indian Journal of Agricultural Sciences (India). (Feb 2012) v.82(2) p.158-60 KEYWORDS: SOYBEANS. SEED. DRILLING EQUIPMENT. WEEDING.

A field experiment was conducted to study the effect of planting by tractor-drawn sweep seed drill, on growth and yield performance of soybean, weed population and economics. A Tractor drawn sweep seed drill, attachable on 30 PTO hp tractor was conceived, fabricated and validated for facilitating weeding along with sowing operations on the field prepared for soybean crop. The use of developed seed drill leads to saving of one pass tillage and one weeding operation in the initial growth period. In this way, approximately 3000/ha/season could be saved from the total expenditure. The simultaneous tillage and sowing operation by the machine helps to maintain higher plant population (25.22–34.55%). This also leads to reduction of weeds (59.91– 68.37%) as compared to flat sowing method. Thus, the use of sweep seed drill curtails the cost on post sowing weedicides along with seed bed preparation as one operation of cultivator. Result of the study indicated that crop planted by the sweep seed drill showed yield increase from 7.78 to 16.46% as compared to normal seed drill. It is suggested to get tractor-operated sweep seed drill manufactured with an adjustable frame which could hold sweeps at the rear end of the frame of the seed drill and the tines for dropping seeds on the front of the seed drill frame to ensure better field operation.

232 Kaur, Harsimaran; Punjab Agricultural University, Ludhiana (India).Jalota, S.K.; Punjab Agricultural University, Ludhiana (India).Kanwar, Ramesh; Punjab Agricultural University, Ludhiana (India).Vashisht, Bharat Bhushan; Punjab Agricultural University, Ludhiana (India).. Climate change impacts on yield, evapotranspiration and nitrogen uptake in irrigated maize (Zea mays)–wheat (Triticum aestivum) cropping system: a simulation analysis. Indian Journal of Agricultural Sciences (India). (Mar 2012) v. 82(3) p. 213-9 KEYWORDS: CLIMATIC CHANGE. CARBON DIOXIDE. TEMPERATURE. CROPPING SYSTEMS. SIMULATION. EVAPOTRANSPIRATION. MAIZE. WHEATS. YIELDS.

Considering the present trends of global climate change, atmospheric CO and temperature levels are likely to increase in future, which will affect yields, water and nitrogen requirements of the crops in a given region. The present study concerns quantification of direct and interactive effects of the elevated CO22 (from 350 to 700ppm) and temperature (from existing to 3^0C higher) on yield, nitrogen uptake and evapotranspiration (ET) of optimally irrigated (IW/Pan E ratio=0.9) and fertilized (120 kg/ha) maize–wheat cropping system on texturally variable soils. IW and Pan E are amounts of irrigation water and open pan evaporation, respectively. Averaged over 30 years simulations with the already calibrated and validated CropSyst model showed that by increasing CO concentration from 350 to 700ppm in maize and wheat, yields were increased by 17 and 57%, ET decreased by 14 and 3 mm; and nitrogen uptake increased by 12 and 44 kg/ha

respectively. The effect of increased CO2 was more in wheat (C23 plant) than that in maize (C4). At 350ppm CO with temperature 3°C higher than the existing in maize and wheat crops, crop durations of maize and wheat were shortened by 12 and 23 days, ET decreased by 30 and 50 mm, nitrogen uptake decreased by 31 and 27 kg/ha and subsequently yields were reduced by 37 and 15%, respectively. The interaction of CO2 and temperature indicates that even 700ppm level of CO was not able to maintain the existing maize yield beyond one degree increase in temperature. In case of wheat, yield levels were well maintained at 700ppm level of CO even at higher level of temperature (3°C). Increased levels of irrigation (IW/Pan E ratio=1.25) and nitrogen (150 and 180 kg/ha) were not able to outweigh the negative effect due to increased temperature than the existing in this cropping system.

233 Moirangthem, Sanju Singh; Assam Agricultural University, Jorhat (India). Gogoi, Sailen; Assam Agricultural University, Jorhat (India). Fiyaz, R. Abdul; Assam Agricultural University, Jorhat (India). Ramaya, K.T.; Assam Agricultural University, Jorhat (India). Thongbam, Premila Devi; Assam Agricultural University, Jorhat (India). Effect of planting time and spacing on growth characteristics of yellow lantern chilli (Capsicum chinense). Indian Journal of Agricultural Sciences (India). (Apr 2012) v. 82(4) p. 328-33 KEYWORDS: CHILLIES. CAPSICUM CHINENSE. PLANTING DATE. SPACING.

Yellow lantern chilli [(Capsicum chinense (Jacq.)], the world's hottest chilli is mostly grown in the north eastern part of India. The crop is cultivated by traditional ways since time immemorial. However, very little research towards scientific cultivation has been conducted in the past and until now scientific package of practices is not available. In the present investigation, the effect of various planting time and spacing on the growth characteristics of the hottest chilli, yellow rantern chilli (bhoot jolokia) was studied in north-eastern hill region of India. Seeds of the variety local cultivar, bor Bhoot of bhoot jolokia were planted in four different dates i e September 15 (P1), October 15 (P2), January 15 (P3) and February 15 (P4) with three spacings viz. 75cm×75cm (S1), 90cm×90cm (S2) and 105cm×105cm (S3). The results revealed that the growth parameters and yield attributing characters were significantly influenced by different planting dates and spacings. Sowing in September 15 (P1) and with a spacing 105cm×105cm (S3) were recorded the highest plant height, number of primary branches, number of fruits/plant, fruit weight and fruit yield/plant. In case of phyllochron index September 15 sowing showed maximum days to phyllochron but closest spacing 75cm×75cm showed maximum phyllochron. Among all the treatments, the crop sown in September with a spacing of 105cm×105cm showed better performance for all the parameters studied and can be considered basis for studying the effects of other agronomic practices.

234 Khobragade, Rajesh kumar; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (India). Bisen, Sharad; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (India).Thakur, Rajendra Singh; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (India). Effect of planting distance and pinching on growth, flowering and yield of China aster (Callistephus chinensis.) cv. Poornima. Indian Journal of Agricultural Sciences (India). (Apr 2012) v.82(4) p.334-9 KEYWORDS: ASTER. INTERNODES. PINCHING. KEEPING QUALITY.

An experiment was conducted to study the effect of planting distance and pinching on growth, flowering and yield of China aster (Callistephus chinensis L. Nees.) cv. Poornima. The experiment consisted of six spacing (20 × 10, 30 × 10, 40 × 10, 30 × 20, 30 × 30, 40 × 20)

and with unpinched and pinched and laid out in factorial randomized block design with two replications. The closer spacing 20 cm × 10 cm produced taller plants (86.74 cm) and flower production was higher/unit area then wider spacing. Pinching reduced the plant height and delayed flowering. Pinched plant yield more than unpinched plant. The interaction of spacing and pinching was found that closer spacing with pinching gave higher yield (56.75 kg/plot) and economically best than wider spacing with unpinched plants. Wider spacing with pinched plants given more number (60.90), weight (381.05 g/plot) and diameter (5.90 cm) of flowers.

235 Singh, Ravi K.; CSK Himachal Pradesh Agricultural University, Palampur (India). Department of Crop Improvement. Sood, B.C.; CSK Himachal Pradesh Agricultural University, Palampur (India). Department of Crop Improvement. Kumar, Naresh; CSK Himachal Pradesh Agricultural University, Palampur (India). Department of Crop Improvement. Identification of potential lentil (Lens culinarismedik) genotypes for monocropping and lentil-linseed cropping system based on genetic divergence. Legume Research (India). (Jun 2011) v.34(2) p.79-89 KEYWORDS: GENOTYPES. LENTILS. LENS CULINARIS. HYBRIDIZATION.

Genetic diversity was studied in 44 lentil genotypes including one check (Vipasha) procured from different agencies using Mohalanobis D2 statistics. Quantitative classification serves as sound basis of grouping any two or more genotypes based on minimum divergence or resemblance between them. D2-statistic provides quantitative measurement of divergence among genotypes besides defining the relative contribution of different characters to differentiate among genotypes. Study of genetic divergence revealed that selection of parents for hybridization should be on genetic diversity rather than on their geographical distribution. As clustering pattern changed with the different cropping system which indicates that genotypic performance is highly influenced by the environment. Seeds per plant and seed yield per plant, pods per plant and pod cluster per plant being the potential contributor to the divergence at both genotypic and inter-cluster level. Divergence study suggested crosses should be involved using L 1–27, Vipasha, HPCL-2104, HPCL-2116, HPCL-2119, L 1–3, L 1–26, HPCL-2127, HPCL-2129, HPCL-2136, HPCL-2142, HPCL-2144, HPCL-2153, HPCL-2157, HPCL-2167, HPCL-2170 and HPCL-2174 with Precoz, L 1–24 and L-90-57 to get desirable recombinants for both the cropping systems in future lentil improvement programme.

236 Reddy, A. Malliswara; Agricultural Research Station, Anantapur (India). Reddy, B. Sahadeva; Agricultural Research Station, Anantapur (India). Effect of planting geometry and fertility level on growth and seed yield of cluster bean [Cyamopsis tetragonoloba (L)] under scarce rainfall zone of andhra pradesh. Legume Research (India). (Jun 2011) v. 34(2) p.143-145 KEYWORDS: CYAMOPSIS PSORALIOIDES. GAURS. YIELDS.

A field experiment was conducted during kharif, 2007 to find out the effect of planting geometry and fertility level on seed yield of clusterbean. From the study it was found that, planting pattern of 45 x 10 cm recorded higher plant height and number of branches per plant, however, it was comparable with 30 x 10 cm planting pattern and significantly superior to 30 x 5 cm planting geometry. However, number of branches per plant, test weight and seed yield did not differ significantly with planting geometry. Fertility level affected plant height significantly. 150% RDF level recorded higher plant height. However, it was at par with RDF and significantly superior to 50% RDF and control. However, fertility level did not affect number of pods/plant and test weight significantly. Higher seed

yield of 164 kg/ha recorded with 150% RDF, which was statistically comparable with RDF and 50% RDF and significantly superior to control. Thus, it can be concluded that in cluster bean, adoption of 30x10 cm spacing with 50% RDF is recommended for scarce rainfall Zone of Andhra Pradesh.

237 Rathore, R.S.; Rafi Ahmad Kidwai College Of Agriculture, Sehore (India). Department of Agronomy. Nawange, D.D.; Rafi Ahmad Kidwai College of Agriculture, Sehore (India). Department of Agronomy. Solanki, R.S.; Rafi Ahmad Kidwai College of Agriculture, Sehore (India). Department of Agronomy. Singh, R.P.; Rafi Ahmad Kidwai College Of Agriculture, Sehore (India). Department of Agronomy. Identification of suitable ideotypes of blackgram (Vigna mungo L. hepper) for intercropping with sorghum (Sorghum bicolar L. moench). Legume Research (India). (Mar 2012) v. 35(1) p.72-74 KEYWORDS: IDENTIFICATION. URD. VIGNA MUNGO. INTERCROPPING. SORGHUM. SORGHUM BICOLOR.

The treatment comprised 10 varieties of blackgram intercropped with sorghum at 1:1 ratio sown. The grain yield of blackgram and sorghum was influenced significantly due to different intercropping treatments. RBU-38 blackgram intercropped with sorghum proved the most remunerative for this region. The growth parameters, yield attributes and productivity parameters indicated that intercropping of blackgram variety RBU-38 with sorghum was most remunerative. It gave the maximum yield of sorghum (4639.23 kg/ha) and blackgram (551.44 kg/ha) as well as blackgram-equivalent yield (1943.17 kg/ha) and net return upto Rs. 51399/ha along with 1:7.45 B:C ratio.

F30 Plant genetics and breeding

238 Aparajita, Subbashree; College of Agriculture, Bhubaneshwar (India). Department of Agricultural Biotechnology. Rout, Gyana Ranjan; College of Agriculture, Bhubaneshwar (India). Department of Agricultural Biotechnology. Molecular analysis of albizia species using AFLP markers for conservation strategies. Journal of Genetics (India). (Apr 2010) v. 89(1) p.95-99 KEYWORDS: STATISTICAL METHODS. GENETIC RESOURCES. BIODIVERSITY. GENETIC VARIATION. MOLECULAR CLONING.

239 Kumar, Sushil; National Institute of Plant Genomic Research, New Delhi (India). Chaudhary, Swati; National Institute of Plant Genomic Research, New Delhi (India). Sharma, Vishakha; National Institute of Plant Genomic Research, New Delhi (India). Renu Kumari; National Institute of Plant Genomic Research, New Delhi (India). Mishra, Raghvendra Kumar; National Institute of Plant Genomic Research, New Delhi (India). Kumar, Arvind; National Institute of Plant Genomic Research, New Delhi (India). Choudhury, Debjani Roy; National Institute of Plant Genomic Research, New Delhi (India). Jha, Ruchi; National Institute of Plant Genomic Research, New Delhi (India). Priyadarshini, Anupama; National Institute of Plant Genomic Research, New Delhi (India). Kumar, Arun; National Institute of Plant Genomic Research, New Delhi (India). Genetic control of leaf-blade morphogenesis by the INSECATUS gene in Pisum sativum. Journal of Genetics (India). (Aug 2010) v.89(2) p.201-211 KEYWORDS: PEAS. TENDRILS. PISUM SATIVUM. MORPHOGENESIS. INSECT CONTROL.

To understand the role of INSECATUS (INS) gene in pea, the leaf blades of wild-type, ins mutant and seven other genotypes, constructed by recombining ins with uni-tac, af, tl and mfp gene mutations, were quantitatively compared. The ins was inherited as a recessive mutant allele and expressed its phenotype in proximal ins leaflets of full size leaf blades. In

ins leaflets, the midvein development was arrested in distal domain and a cleft was formed in lamina above this point. There was change in the identity of leaflets such that the intercalary interrupted midvein bore a leaf blade. Such adventitious blades in ins, ins tl and ins tl mfp were like the distal segment of respective main leaf blade. The ins phenotype was not seen in ins af and ins af uni-tac genotypes. There was epistasis of uni-tac over ins. The ins, tl and mfp mutations interacted synergistically to produce highly pronounced ins phenotype in the ins tl mfp triple mutant. The role(s) of INS in leaf-blade organogenesis are: positive regulation of vascular patterning in leaflets, repression of UNI activity in leaflet primordia for ectopic growth and in leaf-blade primordium for indeterminate growth of rachis, delimitation of proximal leaflet domain and together with TL and MFP homeostasis for meristematic activity in leaflet primordia. The variant apically bifid shape of the affected ins leaflets demonstrated that the leaflet shape is dependent on the venation pattern.

240 Gurudatta, B.V.; Cenre for Cellular and Molecular Biology, Hyderabad (India). Shashidhara, L. S.; Indian Institute of Science Education and Research, Pune (India). Parnaik, Veena K.; Centre for Cellular and Molecular Biology, Hyderabad (India). Lamin C and chromatin organization in drosophila. Journal of Genetics (INDIA). (Apr 2010) v.89(1) p.37-49 KEYWORDS: HETEROCHROMATIN. DROSOPHILA.

Drosophila lamin C (LamC) is a developmentally regulated component of the nuclear lamina. The lamC gene is situated in the fifth intron of the essential gene tout velu (ttv). We carried out genetic analysis of lamC during development. Phenotypic analyses of RNAi-mediated downregulation of lamC expression as well as targeted misexpression of lamin C suggest a role for lamC in cell survival. Of particular interest in the context of laminopathies is the caspase-dependent apoptosis induced by the overexpression of lamin C. Interestingly, misexpression of lamin C in the central nervous system, where it is not normally expressed, did not affect organization of the nuclear lamina.lamC mutant alleles suppressed position effect variegation normally displayed at near-centromeric and telomeric regions. Further, both downregulation and misexpression of lamin C affected the distribution of heterochromatin protein1. Our results suggest that Drosophila lamC has a tissue-specific role during development and is required for chromatin organization.

241 Bajpai, Neelam; University of Allahabad, Allahabad (India) Department of Zoology. Tewari, Raghav Ram; University of Allahabad, Allahabad (India) Department of Zoology. Mitochondrial DNA sequence-based phylogenetic relationship among flesh flies of the genus sarcophaga (Sarcophagidae: Diptera). Journal of Genetics (India). (Apr 2010) v. 89(1) p.51-54 KEYWORDS: PHYLOGENY. GENETIC DISTANCE. DNA. MOLECULAR CLONING. SARCOPHAGA. CYTOCHROME C OXIDASE.

The phylogenetic relationships among flesh flies of the family Sarcophagidae has been based mainly on the morphology of male genitalia. However, the male genitalic character-based relationships are far from satisfactory. Therefore, in the present study mitochondrial DNA has been used as marker to unravel genetic relatedness and to construct phylogeny among five sympatric species of the genus Sarcophaga. Two mitochondrial genes viz., cytochrome oxidase subunit 1 (COI) and NAD dehydrogenase subunit 5 (ND5) were sequenced and genetic distance values were calculated on the basis of sequence differences in both the mitochondrial genes. The data revealed very few genetic differences among the five species for the COI and ND5 gene sequences.

242 Panwar, Preety; G B. Pant University of Agriculture and Technology, Pantnagar (India). College of Basic Science and Humanities, Department of Molecular Biology and genetic Engineering. Nath, Manoj; G.B. Pant University of Agriculture and Technology, Pantnagar (India). College of Basic Science and Humanities, Department of Molecular Biology and genetic Engineering. Yadav, Vijay Kumar; G.B. Pant University of Agriculture and Technology, Pantnagar (India). College of Basic Science and Humanities, Department of Molecular Biology and genetic Engineering. Kumar, Anil; G.B. Pant University of Agriculture and Technology, Pantnagar (India). College of Basic Science and Humanities, Department of Molecular Biology and genetic Engineering. Comparative Evaluation of Genetic Diversity Using RAPD, SSR and Cytochrome P450 Gene Based Markers with Respect to Calcium Content in Finger Millet (Eleusine coracana L. Gaertn.). Journal of Genetics (INDIA). (Aug 2010) v. 89(2) p.121-133 KEYWORDS: GENETIC RESOURCES. BIODIVERSITY. RAPD. CYTOCHROME P450. FINGER MILLET. ELEUSINE CORACANA.

Genetic relationships among 52 Eleusine coracana (finger millet) genotypes collected from different districts of Uttarakhand were investigated by using randomly amplified polymorphic DNA (RAPD), simple sequence repeat (SSR) and cytochrome P450 gene based markers. A total of 18 RAPD primers, 10 SSR primers, and 10 pairs of cytochrome P450 gene based markers, respectively, revealed 49.4%, 50.2% and 58.7% polymorphism in 52 genotypes of E. coracana. Mean polymorphic information content (PIC) for each of these marker systems (0.351 for RAPD, 0.505 for SSR and 0.406 for cyt P450 gene based markers) suggested that all the marker systems were effective in determining polymorphisms. Pair-wise similarity index values ranged from 0.011 to 0.999 (RAPD), 0.010 to 0.999 (SSR) and 0.001 to 0.998 (cyt P450 gene based markers) and mean similarity index value of 0.505, 0.504 and 0.499, respectively. The dendrogram developed by RAPD, SSR and cytochrome P450 gene based primers analyses revealed that the genotypes are grouped in different clusters according to high calcium (300-450 mg/100 g), medium calcium (200-300 mg/100 g) and low calcium (100-200 mg/100 g). Mantel test employed for detection of goodness of fit established cophenetic correlation values above 0.95 for all the three marker systems. The dendrograms and principal coordinate analysis (PCA) plots derived from the binary data matrices of the three marker systems are highly concordant. High bootstrap values were obtained at major nodes of phenograms through WINBOOT software. Comparison of RAPD, SSR and cytochrome P450 gene based markers, in terms of the quality of data output, indicated that SSRs and cyt P450 gene based markers are particularly promising for the analysis of plant genome diversity. The genotypes of finger millet collected from different districts of Uttarakhand constitute a wide genetic base and clustered according to calcium contents. The identified genotypes could be used in breeding programmes and amajor input into conservation biology of cereal crops.

243 Rakshit, Arunita; National Research Centre on Plant Biotechnology, New Delhi (India). Rakshit, S.; Directorate of Sorghum Research, hyderabad (India). Singh, J.; Indian Agricultural Research Institute, New Delhi (India). Division of Genetics. Chopra, S.K.; Indian Agricultural Research Institute, New Delhi (India). Nuclear Research Laboratory. Balyan, H.S.; Ch. Charan Singh University, Meerut (India). Department of Genetics and Plant Breeding, Molecular Biology Laboratory. Gupta, P.K.; National Research Centre on Plant Biotechnology, New Delhi (India). Bhat, Shripad R.; National Research Centre on Plant Biotechnology, New Delhi (India). Association of AFLP and SSR markers with agronomic and

fibre quality traits in gossypium hirsutum L.. Journal of Genetics (India). (Aug 2010) v. 89(2) p.155-162 KEYWORDS: QUANTITATIVE TRAIT LOCI. STATISTICAL METHODS. GOSSYPIUM.

Molecular markers linked to QTL contributing to agronomic and fibre quality traits would be useful for cotton improvement. We have attempted to tag yield and fibre quality traits with AFLP and SSR markers using F2 and F3 populations of a cross between two Gossypium hirsutum varieties, PS56-4 and RS2013. Out of 50 AFLP primer combinations and 177 SSR primer pairs tested, 32 AFLP and four SSR primers were chosen for genotyping F2 individuals. Marker-trait associations were studied for eight agronomic and five fibre quality traits through simple and multiple regression analysis (MRA) using a set of 92 AFLP polymorphic loci and four SSR markers. Simple linear regression analysis (SLRA) identified 23 markers for eight different traits whereas multiple regression analysis identified 30 markers for at least one of the 13 traits. SSR marker BNL 3502 was consistently identified to be associated with fibre strength. While all the markers identified in SLRA were also detected in MRA, as many as 16 of the 30 markers were identified to be associated with respective traits in both F2 and F3 generations. The markers explained up to 41 per cent of phenotypic variation for individual traits. A number of markers were found to be associated with multiple traits suggesting clustering of QTLs for fibre quality traits in cotton.

244 Singh, B.K.; ICAR Research Complex for NEH Region, Mizoram (India). Sharma, S.R.; Indian Agricultural Research Institute, Kullu (India). Singh, B.; ICAR Research Complex for NEH Region, Mizoram (India). Heterosis for superoxide dismutase, peroxidase and catalase enzymes in the head of single cross-hybrids of cabbage (Brassica oleracea Var. capitata). Journal of Genetics (India). (Aug 2010) v. 89(2)p.217-221 KEYWORDS: HETEROSIS. ANTIOXIDANTS. SUPEROXIDE DISMUTASE. PEROXIDASES. CATALASE. CABBAGES. BRASSICA OLERACEA.

245 Pathak, Rakesh; Central Arid Zone Research Institute, Jodhpur (India). Singh, S.K.; Directorate of Mushroom Research, Solan (India). Singh, Manjit; Central Arid Zone Research Institute, Jodhpur (India). Henry, A.; Central Arid Zone Research Institute, Jodhpur (India). Molecular assessment of genetic diversity in cluster bean (Cyamopsis tetragonoloba) benotypes. Journal of Genetics (India). (Aug 2010) v. 89(2) p.243-246 KEYWORDS: BIODIVERSITY. RAPD. CYAMOPSIS PSORALIOIDES.

246 Sengupta, Mainak; Indian Institute of Chemical Biology, Kolkata (India). Molecular and Human Genetics DivisionChakraborty, Amrita; Institute of Genomics and Integrative Biology, New Delhi (India). Nodal LaboratoryRay, Kunal; Indian Institute of Chemical Biology, Kolkata (India). Molecular and Human Genetics Division. Analysis of single nucleotide polymorphisms of PRNP gene in twenty-four ethnic groups of India. Journal of Genetics (India). (Aug 2010) v. 89(2) p.247-251 KEYWORDS: PRIONS. GENES. NUCLEOTIDES. ETHNIC GROUPS.

247 Sukhchain; Punjab Agricultural University, Ludhiana (India). Department of Plant Breeding and Genetics. Singh, Pritpal; Punjab Agricultural University, Ludhiana (India). Department of Plant Breeding and Genetics. Singh, Karnail; Punjab Agricultural University, Ludhiana (India). Department of Plant Breeding and Genetics. Analysis of association among different morphological traits in fodder barley. Range Management and Agroforestry (India).

(Dec 2011) v.32(2) p.92-95 KEYWORDS: HORDEUM VULGARE. FORAGE. BARLEY. DRY MATTER CONTENT. YIELDS.

Barley (Hordeum vulgare L.) is a drought tolerant crop. Farmers use its first cut for fodder purpose during the scarcity period in semi-arid tracts and then the crop is left for grain purpose. Keeping this in view, first cut of twenty-two dual purpose barley varieties were evaluated for different morphological traits related to fodder. Dry matter yield was significantly correlated with green fodder yield (P 0.01) and also with number of leaves/ plant (P 0.05). Further, leaf breadth was significantly (P 0.05) correlated with culm thickness. Leaf-stem ratio, a parameter of fodder quality, was negatively correlated (P 0.05) with internode length. Interestingly, green fodder yield and culm thickness were negatively correlated (P 0.05) with tiller number. Plant height, number of leaves/ plant, leaf-stem ratio, leaf length and leaf breadth had moderate positive direct effects while tiller number/ m row length and culm thickness had high negative direct effects on green fodder yield. Only green fodder yield had high direct effect on dry matter yield. Hence selection for plants with thick stems, broad leaves, more number of leaves/ plant and shorter internodes may enhance green fodder yield and dry matter yield along with forage quality.

248 Ahmed, S.; Indian Grassland and Fodder Research Institute, Jhansi (India). Roy, A.K.; Indian Grassland and Fodder Research Institute, Jhansi (India). Majumdar, A.B.; Indian Grassland and Fodder Research Institute, Jhansi (India). Genetic diversity and variability analysis in oat (Avena sativa L.). Range Management and Agroforestry (India). (Dec 2011) v.32(2) p.96-99 KEYWORDS: AVENA SATIVA. FORAGE. GRAIN. GENETIC VARIATION.

Genetic diversity, variability and clustering pattern were studied in seventy five germplasm lines of oat for yield and contributing traits using D2 analysis. Clustering pattern grouped the germplasm lines into nine different clusters. Cluster IV consisted of 21 lines, cluster I & II had 20 lines each, cluster V had 9 lines. Highest intra cluster distance was observed for cluster IV followed by cluster II, I and V. The maximum inter cluster distance was observed between cluster VI & IX, followed by cluster IV & IX, cluster III & IX suggesting diversity among lines of these clusters. Cluster IV is characterized by lines having prominent traits like high green fodder yield, high grain yield, and tall plants, long and broad leaves. Contribution towards genetic divergence was more from days to 50% flowering, grain yield, leaf-stem ratio and green fodder yield, so the direct selection for these traits would be helpful.

249 Sivaraj, N.; National Bureau of Plant Genetic Resources, Hyderabad (India). Regional Station. Sunil, N.; National Bureau of Plant Genetic Resources, Hyderabad (India). Regional Station. Pandravada, S.R.; National Bureau of Plant Genetic Resources, Hyderabad (India). Regional Station. Kamala, V.; National Bureau of Plant Genetic Resources, Hyderabad (India). Regional Station. Abraham, Babu; National Bureau of Plant Genetic Resources, Hyderabad (India). Regional Station. Kumar, Vinod; National Bureau of Plant Genetic Resources, Hyderabad (India). Regional Station. Rao, B.V.S.K.; National Bureau of Plant Genetic Resources, Hyderabad (India). Regional Station. Prasad, R.B.N.; National Bureau of Plant Genetic Resources, Hyderabad (India). Regional Station. Varaprasad, K.S.; National Bureau of Plant Genetic Resources, Hyderabad (India). Regional Station. Variability in linseed (Linum usitatissimum) germplasm collections from peninsular India with special reference to seed traits and fatty acid composition. Indian Journal of Agricultural Sciences (India). (Feb 2012)

v. 82(2) p. 102-5 KEYWORDS: FATTY ACIDS. GERMPLASM. LINSEED. LINUM USITATISSIMUM.

Eighty-four accessions of linseed (Linum usitatissimum L.) collected from Andhra Pradesh and Maharashtra, were analyzed for seed traits, oil content and fatty acid composition. Field observations on floral and other morphological traits were recorded. Variability was observed in all the agro-morphological and biochemical traits studied. DIVA-GIS software was used to assess the diversity of linseed fatty acid composition for the first time in India. The oil content of the linseed germplasm ranged between 29.4% and 42.6%. IC564681 recorded the highest oil content (42.6%), while the accession IC564591 recorded the least (29.4%). With respect to linolenic acid (omega-3 fatty acid), IC 564631 possessed the maximum (57.1%) and IC564687 the minimum (39.5%). Linseed germplasm with high oleic acid content was identified with IC564627 recording the maximum of 32%. Based on DIVA-GIS diversity analysis for omega-3 profile and test weight of seed, it was inferred that Kohir, Jarasangham, Nayalkal, Shankarampet and Zaheerabad which are sub-units (mandals) of Medak district and Jainoor, Koutala and Bhimni mandals of Adilabad district are potential areas for collection of diverse accessions.

250 Gupta, Y.C.; Dr YS Parmar University of Horticulture and Forestry, Solan (India). Gupta, R.K.; Dr YS Parmar University of Horticulture and Forestry, Solan (India). Moona; Dr YS Parmar University of Horticulture and Forestry, Solan (India). Dhiman, S.R.; Dr YS Parmar University of Horticulture and Forestry, Solan (India). Stability analysis of different biostimulant applications to flowering characters of rose (Rosa hybrida) cultivar First Red. Indian Journal of Agricultural Sciences (India). (Feb 2012) v. 82(2) p. 106-11 KEYWORDS: STABILITY. ROSA. SEASONS.

Stability parameters were estimated for four quantitative flowering characters of rose cultivar First Red under 22 biostimulant applications during two years and two seasons in each year, i e 2006–07 and 2007–08 by using Eberhart and Russel's model (1966). All analysis of variance showed that biostimulants had significant responses towards different environment changes. Significant biostimulant × Environment interactions were detected for all the four characters, i e number of flowering shoots/plant, flower bud length, days taken from bud appearance to harvesting of rose and flower size. Winter season were found to be suitable for days taken from bud appearance to harvesting of last flower and flower size as compared to summer season. Treatment 16 (i e 50% recommended dose of NPK+5% Panchagavya + 5 % Manchurian mushroom tea) were found to be stable biostimulant for two characters, i e number of flowering shoot/plant and flower size.

251 Miri, Khaled; Indian Agricultural Research Institute, New Delhi (India). Rana, D.S.; Indian Agricultural Research Institute, New Delhi (India). Evaluation of sweet sorghum (Sorghum bicolor) genotypes for biomass, sugar and ethanol production under different levels of nitrogen. Indian Journal of Agricultural Sciences (India). (Mar 2012) v. 82(3) p. 195-200 KEYWORDS: BIOMASS. YIELDS. ETHANOL. SORGHUM BICOLOR. GENOTYPES. NITROGEN.

Sweet sorghum [Sorghum bicolor (L.).Moench] stalks contain high fermentable sugar and thus have potential to produce bio-ethanol along with grains and crushed dry matter. Its cultivars differ in production potential, adaptation, duration and response to nitrogen level under different agro-climatic conditions. A field experiment was conducted at New Delhi, during kharif season of 2009 and 2010 to evaluate three sweet sorghum genotypes

(varieties: RSSV 9, SSV 84, and hybrid: CSH 22 SS) under four nitrogen levels (0, 50, 100 and 150 kg N/ha for growth, biomass, fermentable sugar and potential ethanol yield. In the first year, except green biomass, juice yield, fermentable sugar yield and expected ethanol yield recorded significant increase up to 100 kg N/ha, while green biomass yield responded up to 150 kg N/ha. In the second year, all yield parameters except brix (%) showed marked improvement up to 150 kg N/ha. Expected ethanol yield recorded 83.4% and 77.7% increase due to application of 150 kg N/ha over control in 2009 and 2010 respectivelyAmong the genotypes, hybrid CSH 22 SS showed it's significant superiority in the above mentioned yield parameters over varieties, except brix (%), which was the highest in RSSV 9. Hybrid CSH 22 SS recorded 112% and 34% increase in ethanol yield over SSV 84 and RSSV 9, respectively. Interaction effect of nitrogen × genotypes for all above characters, except brix (%) was significant. Hybrid CSH 22 SS responded significantly up to 150 kg N/ha, while in case of varieties response to N application was significant only up to 100 kg N/ha. Net return with 150 kg N/ha fertilizer application recorded 116.9 and 116.3% increase over control in 2009 and 2010 respectively. On an average hybrid CSH 22 SS produced net returns of ` 41 540 which was 135 and 41% higher than SSV 84 and RSSV 9 respectively.

252 Shrama , Akhilesh; Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur (India). Kapoor, Puja; Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur (India). Katoch, Vivek; Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur (India). Generation mean analysis to estimate genetic parameters for desirable horticultural traits in garden pea (Pisum sativum). Indian Journal of Agricultural Sciences (India). (Mar 2012) v. 82(3) p. 201-6 KEYWORDS: GENE INTERACTION. PEAS. MILDEWS. PISUM SATIVUM.

Generation means analysis was carried out to estimate the nature and magnitude of gene action in order to formulate breeding strategy for identifying the segregants with desirable horticultural traits and resistance to powdery mildew disease. Two commercially grown powdery mildew susceptible varieties Azad P-I and Green Pearl and three resistant lines DPP 9411, DPP 9418-06 and Sugar Giant were used to develop three crosses, viz. Green Pearl × Sugar Giant, DPP 9411 × DPP 9418-06, and Azad P-I × Sugar Giant to achieve the objectives. The presence of epistatic interaction for majority of the traits in all three crosses was observed as reflected by the significance of simple additive-dominance model. The results revealed that the nature and magnitude of gene effects differed in different crosses and showed the importance of additive as well as non-additive gene effects in the inheritance of different characters with preponderance of the latter. In view of the parallel role of additive and non-additive gene effects, selection in the segregating generations should be delayed to later generations to diminish the dominance gene effects. Duplicate type of epistasis was also found for some of the traits in certain cross combinations whose effect can be eliminated by following sophisticated selection procedure such as reciprocal recurrent selection and/or biparental mating in early segregating generations for the development of highyielding garden pea varieties with desirable horticultural traits.

253 Kumar, Vishnu; Maharana Pratap University of Agriculture and Technology, Udaipur (India). Maloo, S.R.; Maharana Pratap University of Agriculture and Technology, Udaipur (India). Parental molecular diversity and its concurrence to heterosis in bread wheat (Triticum aestivum). Indian Journal of Agricultural Sciences (India). (Mar 2012) v. 82(3) p. 207-12 KEYWORDS: HETEROSIS. INBREEDING DEPRESSION. RAPD. SOFT WHEAT.

A half diallel set of 10 parents,45 F 1 s and 45 F 2 s was analyzed for grain yield and its components and parental entries were also assessed with RAPD marker for the concurrence of genetic diversity analysis with heterosis and combining ability. Out of 45 crosses, thirteen-thirty one crosses manifested heterotic response for different characters in desired direction. An overall appraisal of GCA effects identified parents DBW 16 and UP 2338 as good general combiners for grain yield and its contributing traits and crosses DBW 16 × UP 2338, DBW 17 × UP 2338 and PBW 373 × Raj 4083, as having high significant positive SCA effects for grain yield as well as for its components. RAPD analysis discemed 352 fragments of which 95 scorable alleles were obtained with 16 primers with an average of 5.93 alleles/primer.

254 Dhillon, M.K.; International Crops Research Institute for the Semi-Arid Tropics, Patancheru (India). Pampapathy, G.; International Crops Research Institute for the Semi-Arid Tropics, Patancheru (India). Wadaskar, R.M.; International Crops Research Institute for the Semi-Arid Tropics, Patancheru (India). Sharma, H.C.; International Crops Research Institute for the Semi-Arid Tropics, Patancheru (India). Impact of Bt transgenic cottons and insecticides on target and non-target insect pests, natural enemies and seedcotton yield in India. Indian Journal of Agricultural Sciences (India). (Mar 2012) v. 82(3) p. 248-54 KEYWORDS: BACILLUS THURINGIENSIS. PESTICIDE CROPS. INSECTICIDES. COTTON. GOSSYPIUM. PREDATORS. TRANSGENIC PLANTS. TRANSGENICS. INSECT CONTROL. INSECTICIDES. INSECTA. SUCKING INSECTS.

Genetically engineered cottons expressing ä-endotoxins from Bacillus thuringiensis have been adopted on a largescale worldwide. Therefore, we studied the efficacy of Bt cottons for the management of bollworms, their effects on nontarget insects, and seedcotton yield under insecticide protected and unprotected conditions. Helicoverpa armigera and Earias vittella damage was significantly lower in Bt than in non-Bt cottons, while no significant differences were observed in egg-laying by H. armigera. The populations of major non-target sucking insect pests such as Amrasca biguttula biguttula, Bemisia tabaci, Aphis gossypii, Oxycarenus laetus, Dysdercus koenigii and Nezara viridula and the generalist predators, viz Cheilomenes sexmaculatus, Chrysopa spp., and spiders did not differ significantly between Bt and non-Bt cottons. Insecticide application resulted in resurgence of cotton aphid and whitefly, possibly because of elimination of natural enemies or better growth of plants under protected conditions. Abundance of bollworms, non-target pests, and generalist predators was significantly greater before insecticide sprays than after insecticide application, except in a few cases. Bollworm damage was lower and seedcotton yields higher in Bt than in non-Bt cottons. The present studies indicated that Bt cotton hybrids are effective for the management of bollworms and yield more, and do not have any adverse effects on the abundance of generalist predators.

255 Roy, S.K.; Bidhan Chandra Krishi Viswavidyalaya, Nadia (India). Senapati, B.K.; Bidhan Chandra Krishi Viswavidyalaya, Nadia (India). Combining ability analysis for grain yield and quality characters in rice (Oryza sativa). Indian Journal of Agricultural Sciences (India). (Apr 2012) v. 82(4) p. 293-303 KEYWORDS: ORYZA SATIVA. FORECASTING. GRAIN CROPS. YIELDS. QUALITY.

Genetic variances were estimated for grain yield and quality characters in rice (Oryza sativa L.) by full-sib and halfsib analysis in 20 F1 hybrids produced from crosses between five high yielding genotypes namely IR 50, IR 62, IET 5656, IET 8002 and IET 6441 as lines and

four quality rice genotypes namely Basmati 385, Dudheswar, Kalonunia and Sambamahsuri as testers. The lines were significantly varying for the characters, whereas variances due to testers were significant for all the characters except panicle weight. Line × tester interaction was highly significant for all the characters. Combining ability analysis revealed predominance of non-additive gene action for days to flowering, total tillers/plant, productive tillers/plant, 1000 grain weight, grain yield/plant and kernel elongation ratio; additive gene action for plant height, panicle length, panicle weight, spikelet/panicle, filled grains/panicle, spikelet fertility, grain length, grain breadth, grain length/breadth ratio, grain weight/panicle, ker nel length, kernel breadth and kernel length/breadth ratio and both additive and non-additive gene actions for cooked kernel breadth. Among the lines IET 5656 was found to be the best general combiner for grain yield as well as its components and quality characters, while IET 8002 and IET 6441 were superior general combiners for quality characters only. Among the testers Kalonunia was the best general combiner for yield and its components followed by Basmati 385, whereas, for the quality characters Dudheswar was the best general combiner, followed by Basmati 385. The three crosses namely IET5656×Kalonunia, IR50×Basmati 385 and IR62×Sambamahsuri were superior over their superior grain quality parents like Kalonunia, Dudheswar and Sambamahsuri for most of the yield and quality characters. When all the 23 yield and quality characters were considered together in an overall ranking on the basis of specific combining ability for grain yield per plant and kernel elongation ratio as the base characters and the actual field performance of their attributing characters, the cross IET 8002×Dudheswar was the best performer, closely followed by IR50×Basmati 385 and IET 6441×Dudheswar in this regard.

256 0145. Mir, M.A.; Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar (India). Bhat, K.M.; Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar (India). Rather, Z.A.; Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar (India). Peer, F.A.; Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar (India). Pandit, A.H.; Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar (India). Hussain, G.; Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar (India). In vitro propagation of almond (Prunus dulcis) cv. Merced. Indian Journal of Agricultural Sciences (India). (Apr 2012) v. 82(4) p. 312-7 KEYWORDS: IN VITRO. ALMONDS. GROWTH CONTROL. CUTTINGS. MICROPROPAGATION. TISSUE PROLIFERATION. CUTTINGS. ROOTING.

Forced and unforced shoot tips were surface sterilized with different sterilant regimes and incubated under normal culture room conditions. Surface sterilization of explants with mercuric chloride 0.1% (w/v) for 10 min. was found effective in improving culture asepsis (51.66%) and explant survival (55.00%). Higher values for both these parameters were recorded with forced explants in comparison to unforced ones. Main effect of growth regulators and media was significant on explant establishment which was maximum (66.66%) on ½ MS media containing BAP + IBA (0.50+0.01 mg/l). Callusing at the base of initiating cultures was minimum (24.58%) with BAP+IBA (0.25+0.01 mg/l). Microshoots from the established cultures were subcultured on the MS media supplemented with BAP and NAA alone or in combination for axillary shoot proliferation. Maximum proliferated cultures (86.66%) with maximum shoot number/explant (15.61) and proliferation grade (4.00) was obtained with BAP+NAA (0.40 + 0.01 mg/l). BAP was found superior to NAA during axillary shoot proliferation. Microshoots (10–15 mm) from

proliferated cultures were subcultured in root induction medium (MS medium supplemented with IBA) and incubated under darkness for 10 days at 24±1 degree Celsius and then transferred to root development medium (hormone-free MS medium) and incubated under normal culture room conditions. Highest rooting of microshoots (93.33%) with maximum root number/shoot (5.90) and root length (43.00 mm) was obtained with IBA (1.0 mg/l).

257 Chatterjee, Ranjit; Uttar Banga Krishi Viswavidyalaya, Cooch Behar (India). Jana, J.C.; Uttar Banga Krishi Viswavidyalaya, Cooch Behar (India). Paul, P.K.; Uttar Banga Krishi Viswavidyalaya, Cooch Behar (India). Enhancement of head yield and quality of cabbage (Brassica oleracea) by combining different sources of nutrients. Indian Journal of Agricultural Sciences (India). (Apr 2012) v. 82(4) p. 323-7 KEYWORDS: BIOFERTILIZERS. CABBAGES. YIELDS. QUALITY. FARMYARD MANURE. INORGANIC FERTILIZERS. COMPOSTING. OLIGOCHAETA.

The present study was aimed to study on influence of different nutrient sources on important quality attributes of cabbage cv. Golden Acre. The field experiment was conducted during 2005–06 and 2006–07 with 14 different treatments by combining inorganic and different organic sources of plant nutrients. The marketable cabbage heads from different treatments were studied for yield and different quality attributes. The pooled result revealed that cabbage head yield and its shelf life, TSS, vitamin A and vitamin C contents were significantly influenced by the application of different sources of nutrients. Vermicompost emerged as better organic nutrient source over farmyard manure. Inoculation with Azophos, a commercial biofertilizer preparation containing the Azotobacter and phosphate-solubilizing bacteria exerted more positive result over uninoculated treatments and benefits of biofertilizer application were more in presence of vermicompost as compared to farmyard manure. The maximum head yield (27.86 tonnes/ha), shelf-life (12 days), head firmness (93.32 kg/cm2) as well as TSS (4.18° Brix), vitamin A (126.76 ìg/100g), vitamin C (44.62 mg/100g) and lowest nitrate content of head (217.17 mg/kg) were realized for the plants grown with the application of 75% of recommended inorganic fertilizers along with vermicompost (5 tonnes/ha) in presence of biofertilizers. Substitution of 25% recommended inorganic nitrogen with higher levels of organic manure and biofertilizer prolonged shelf-life as well as improved nutritional qualities of cabbage heads.

258 Singh, R.K.; Indian Institute of Sugarcane Research, Lucknow (India). Archna Suman; Indian Institute of Sugarcane Research, Lucknow (India). Singh, J.; Indian Institute of Sugarcane Research, Lucknow (India). Singh, A.K.; Indian Institute of Sugarcane Research, Lucknow (India). Kumar, Sanjeev; Indian Institute of Sugarcane Research, Lucknow (India). Singh, P.K.; Indian Institute of Sugarcane Research, Lucknow (India). Singh, R.K.; Indian Institute of Sugarcane Research, Lucknow (India). Effects of Gluconacetobacter diazotrophicus on seed cane produced through micro-propagated plantlets in sugarcane (Saccharum spp hybrid complex) under sub-tropics. Indian Journal of Agricultural Sciences (India). (Apr 2012) v.82(4) p.340-44 KEYWORDS: NITROGEN FIXATION. PSEUDOMONACEAE. NITROGEN FIXING BACTERIA. MICROPROPAGATION. SEEDS. SUGARCANE.

Field experiment was conducted to evaluate the performance of micropropagated plantlets inoculated in vitro with Gluconacetobacter diazotrophicus on the population counts of diazotroph, plant growth, yield, quality and ultimately planting material of sugarcane cultivar CoS 96268. Maximum cell counts (5.8 × 105 cells/g fresh weight) was

obtained in the in vitro, treated micropropagated plantlets-followed by untreated micropropagated plantlets (4.7 × 104 cells/g fresh weight) while it was only 3.7 x104 cells/g fresh weight in conventionally grown plants. The highest cell counts of Gluconacetobacter diazotrophicus was recorded at grand growth stage which decreased at maturity. Inoculation with diazotroph improved dry matter accumulation specially in roots accompanied by higher uptake of nitrogen and potassium in micropropagated plantlets. There was significant increase in number of millable canes, cane length, number of nodes, cane diameter and cane yield. Besides, treated plantlets produced 5.45 and 1.52 times higher planting material (3 budded setts) over conventionally grown plants and un-treated micropropagated plantlets, respectively. Results signify the use of inoculation with diazotrophic bacteria in micropropagated plantlets for faster multiplication of disease-free healthy seed cane of sugarcane varieties for their adoption.

259 Venkateswarlu, O.; Agricultural Research Station, Podalakur (India). Sudhakar, B.V.G.; Agricultural Research Station, Tirupati (India). Sekhar, M. Reddi; Agricultural Research Station, Tirupati (India). Sukhakar, P.; Agricultural Research Station, Tirupati (India). Genetic divergence in confectionary types of groundnut (Arachis hypogaea L.). Legume Research (India). (Mar 2011) v.34(1) p.1-7 KEYWORDS: GENETIC DISTANCE. GROUNDNUTS. CONFECTIONERY. RECOMBINATION. ARACHIS HYPOGAEA.

Seventy four genotypes representing diverse geographic origin were studied for genetic divergence using Mahalanobis D2 statistic. These genotypes were grouped into twelve clusters. The mode of distribution of genotypes to various clusters was at random suggesting that there is no relationship between geographical distribution and genetic diversity. Based on intercluster distances, the clusters VII vs X, VI vs XII and X vs XII were found as divergent. Hence, selection of genotypes from these clusters namely ICGV 99032 (cluster VI), TCGS 647, JL 220 (cluster VII), ICGV 95477, JL 24, ICGV 99054, ICGV 86699 (cluster X) and ICGV 99029 (cluster XII) for hybridization programme may result into good recombinants. The characters 100-kernel weight, shelling percentage and harvest index contributed maximum towards genetic divergence in both D2 analysis and canonical root analysis. Further, canonical root analysis confirmed the clustering pattern obtained by D2 analysis.

260 Geetha, K.; Tamil Nadu Agricultural University, Paiyur (India). Regional Research Station. Mani, A.K.; Tamil Nadu Agricultural University, Paiyur (India). Regional Research Station. Hepziba, M. Juliet; Tamil Nadu Agricultural University, Paiyur (India). Regional Research Station. Latha, R.; Tamil Nadu Agricultural University, Paiyur (India). Regional Research Station. Shanthi, P.; Tamil Nadu Agricultural University, Paiyur (India). Regional Research Station. Studies on genetic diversity among germplasm accessions of horsegram Macrotyloma uniflorum (Lam) verde. Legume Research (India). (Mar 2011) v. 34(1) p.14-19 KEYWORDS: GENETIC RESOURCES. GENETICS. HYBRIDIZATION.

In the present study, the genetic divergence among 100 germplasm accessions was assessed using Mahalanobis D2 statistics. The genotypes were collected from different sources and the standard varieties were also included in the study. The experiment was carried out during Rabi 2009 at Regional Research Station, Paiyur. The observations were recorded on seed yield and its components. Based on D2 analysis, the 100 germplasm lines were grouped into sixteen different clusters. The cluster VI was the largest with 43 genotypes followed by cluster I (14) and cluster XV (11). The cluster XIV showed the

maximum mean value for seed yield followed by cluster VII. The intra and inter cluster divergence among the genotypes was varying in magnitude. Further it implies that the intra-cluster distance was maximum in cluster I followed by clusters II and XV. The widest inter cluster distance was noted between cluster I and XIII giving scope for hybridization among these genotypes for improvement of traits through pedigree breeding. The distance between clusters X and XII was minimum indicating close relationship between those clusters.

261 Pradhan, K.; Orrisa university of Agriculture and Technology, Bhubaneswar (India). College of Agriculture, Department of Plant Breeding and Genetics. Patra, R.K.; Orrisa university of Agriculture and Technology, Bhubaneswar (India). College of Agriculture, Department of Plant Breeding and Genetics. Variability and correlation studies on groundnut (Arachis hypogaeae L.) germplasm. Legume Research (India). (Mar 2011) v. 34(1) p.26-30 KEYWORDS: HERITABILITY. GENETIC GAIN. GROUNDNUTS. ARACHIS HYPOGAEA.

Four hundred sixty genotypes of groundnut germplasm were evaluated in four different seasons for phenotypic variation, heritability, genetic advance and correlations among pod yield and yield components. Pod yield/ha was observed to be high during pre-rabi and rabi seasons, might be due to increase in yield contributing characters. The GCV estimates were low for shelling percentage and moderate for hundred pod weight and hundred kernel weight. High heritability coupled with high genetic advance as per cent of mean has been noticed for hundred pod weight and hundred kernel weight. Consistently positive association in all the seasons was observed for unfilled pods per plant with number of branches per plant and hundred pod weights with hundred kernel weight. Rabi and kharif performance of yield and yield contributing characters were positively correlated except unfilled pods per plant and plant height. Selection for high yield in groundnut could be made by inclusion of pod weight, shelling percentage and hundred kernel weight as selection criteria along with plant height.

262 Patil, S.S.; Navsari Agriculture University, Navsari (India). Naik, M.R.; Navsari Agriculture University, Navsari (India). Patil, P.P.; Navsari Agriculture University, Navsari (India). Shinde, D.A.; Navsari Agriculture University, Navsari (India). Genetic variability, correlation and path analysis in soybean. Legume Research (India). (Mar 2011) v. 34(1) p.36-40 KEYWORDS: SOYBEANS. GLYCINE MAX. GENETIC VARIATION. GENETIC CORRELATION. STATISTICAL METHODS.

Estimation of variability, heritability, genetic advance, correlation and path analysis were carried out in soybean for 11 characters. The highest genotypic and phenotypic coefficient of variances were observed for plant height followed by seed yield per plant and pods per plant and it was lowest for days to 50% flowering, days to maturity, protein content and pod length. High heritability and genetic advance were observed for plant height, seed yield per plant and pods per plant. Seed yield per plant was positively and significantly correlated with plant height, pods per plant, days to 50 per cent flowering and days to maturity. Pod per plant recorded highest positive direct effect on seed yield per plant followed by plant height. The studies suggest that selection for pods per plant, seed yield and plant height to evolve high yielding varieties of soybean.

263 Bhardu, D.; Indian Veterinary Research Institute, Izatnagar (India). Division of Animal Genetics. Navale, P.A.; College of Agriculture, Pune (India). Department of Agricultural

Botany. Correlation and path analysis studies in F3 population of cowpea (Vigna unguiculata (L.) Walp.). Legume Research (India). (Mar 2011) v. 34(1) p.41-44 KEYWORDS: COWPEAS. VIGNA UNGUICULATA. VIGNA. STATISTICAL METHODS. SEGREGATION.

An investigation was carried out in F3 population of cross Dapoli safed x GC-10 and their parents to understand the association among the yield components and their direct and indirect effects on the seed yield. Grain yield per plant recorded significant and positive correlation with number of pods per plant, biomass at harvest, number of branches per plant, test weight, pod length, and vine length. Number of pods per plant recorded highest magnitude of direct effects on seed yield per plant followed by test weight, biomass at harvest and number of branches per plant. Hence, selection on the basis of high biomass at harvest, number of pods per plant, test weight, pod length, number of branches per plant and seed yield per plant in segregating populations of cowpea will be more effective in the development of promising genotypes.

264 Patil, S.S.; Navsari Agriculture University, Navsari (India). N.M. College of Agriculture. Naik, M.R.; Navsari Agriculture University, Navsari (India). N.M. College of Agriculture. Patil, A.B.; Navsari Agriculture University, Navsari (India). N.M. College of Agriculture. Ghodke, U.R.; Navsari Agriculture University, Navsari (India). N.M. College of Agriculture. Genetic diversity in soybean. Legume Research (India). (Mar 2011) v. 34(1) p.68-70 KEYWORDS: SOYBEANS. GLYCINE MAX. GENETIC RESOURCES.

A quantitative assessment of genetic diversity for eleven characters of soybean has been worked out by Mahalanobis's D2 statistics. The studies included thirty six genotypes of soybean obtained from different ecogeographical regions of India, which showed that there was a substantial genetic diversity between the genotypes with D2 values ranging from 33.64 to 379.08. Thirty six genotypes were grouped into six clusters. The clustering pattern revealed that genetic diversity was not necessarily associated with geographical diversity in this crop. The hybridization programme has been suggested on the basis of inter cluster divergence and cluster means for the character studied.

265 Rekha, R.; S.V. Agricultural College, Tirupati (India). Department of Genetics and Plant Breeding. Prasanthi, L.; S.V. Agricultural College, Tirupati (India). Department of Genetics and Plant Breeding. Sekhar, M. Reddi; S.V. Agricultural College, Tirupati (India). Department of Genetics and Plant Breeding. Latha, P.; S.V. Agricultural College, Tirupati (India). Department of Genetics and Plant Breeding. Sudhakar, S.; S.V. Agricultural College, Tirupati (India). Department of Genetics and Plant Breeding. Genetic diversity in pigeonpea [Cajanus cajan (L.) Millsp]. Legume Research (India). (Jun 2011) v. 34(2) p.139-142 KEYWORDS: PIGEON PEAS. CAJANUS CAJAN. GENETIC RESOURCES. BIODIVERSITY.

Genetic divergence among 49 genotypes of pigeonpea belonging to different eco-geographical regions was studied by using Mahalanobis D2 statistics. They were grouped into 6 clusters and clustering pattern of genotypes did not follow geographical origin, suggesting that geographical isolation may not be the only factor causing genetic diversity. Hence, selection of parents for hybridization should be more based on genetic diversity rather than geographic diversity. Phenol content contributed maximum towards genetic divergence followed by 100 seed weight, number of pods per plant and pod length.

266 Upadhyay, Devendra; Indira Gandhi Krishi Vishwavidyalaya, Raipur (India). Mehta, Nandan; Indira Gandhi Krishi Vishwavidyalaya, Raipur (India). Singh, Jitendra; Indira Gandhi

Krishi Vishwavidyalaya, Raipur (India). Sahu, Mayuri; Indira Gandhi Krishi Vishwavidyalaya, Raipur (India). Genetic divergence in dolichos bean (Dolichos lablab L.). Legume Research (India). (Jun 2011) v. 34(2) p.146-148 KEYWORDS: LABLAB PURPUREUS. GENETIC DISTANCE.

The experimental material comprised of 32 genotypes of dolichos bean (Dolichos lablab L.). Yield and its eight contributing characters were measured by Mahalanobis's D2 analysis. Thirty two genotypes were grouped into five clusters and the highest intra cluster distance was observed for cluster III followed by cluster V, cluster IV and cluster II. The highest inter cluster distance was observed between the clusters III and cluster I followed by cluster IV and I and cluster V and I. The minimum inter cluster distance was noted in between IV and II. Mean performance of individual cluster for different character were showed that cluster I is most suitable to select better genotypes for number pod per inflorescence and green pod yield per plant The genotypes collected from same geographical location fall in different clusters, revealed that geographical distance does not contribute to genetic divergence.

267 Reddy, D. Kodanda Rami; Agricultural Research Station, Podalakur (India). Venkateswarlu, O.; Agricultural Research Station, Podalakur (India). Jyothi, G.L. Siva; Agricultural Research Station, Podalakur (India). Obaiah, M.C.; Agricultural Research Station, Podalakur (India). Genetic parameters and inter-relationship analysis in blackgram [Vigna mungo. (L.) Hepper]. Legume Research (India). (Jun 2011) v. 34(2) p.149-152 KEYWORDS: HERITABILITY. GENETIC GAIN. URD. VIGNA MUNGO.

In present study, 70 germplasm accessions of blackgram were evaluated for seven economically important characters. The study showed considerable variability for these characters. Heritability in broad sense was high for all the characters studied except for number of seeds/pod and pod length. High heritability coupled with high genetic advance as per cent mean was observed for plant height, number of clusters/plant, number of pods/plant, 100-seed weight and seed yield/plant. The association analysis revealed that the genotypic correlation coefficients were higher than corresponding phenotypic ones for all the character combinations. Number of clusters/plant, number of pods/plant, number of seeds/pod and pod length had a significant positive association with seed yield. Plant height and 100 - seed weight had a positive association with seed yield. Selection for high yield in blackgram could be made by inclusion of number of clusters/plant and number of pods/plant as selection criteria along with plant height.

268 Pathania, Anju; CSK Himachal Pradesh Agricultural University, Sangla (India). Mountain Agricultural Research and Extension Centre. Sood, B.C.; CSK Himachal Pradesh Agricultural University, Palampur (India). Department of Crop Improvement. Bhateria, S.; CSK Himachal Pradesh Agricultural University, Palampur (India). Department of Crop Improvement. Genetic architecture of radiation induced variability for quantitative traits in chickpea (Cicer arietinum L.). Legume Research (India). (Sep 2011) v. 34(3) p.155-165 KEYWORDS: CHICKPEAS. CICER ARIETINUM. MUTATION. QUANTITATIVE ANALYSIS. GENETICS.

Seed samples of two varieties of chickpea namely HPG-17and Himachal chana-1 were irradiated with 30kR, 40kR, 50kR doses of gamma rays to induce variability for yield and related traits. Significant shift in mean values for quantitative traits was observed in M2 and M3 generations. Genetic parameters were higher for seed yield and related traits in M3 generation of HPG-17 and M2 generation of Himachal chana-1. The magnitude of

parameters of variability was more in 30kR treated population of HPG-17 and 40kR treated population of Himachal chana-1. High heritability coupled with high genetic advance observed for plant height, biological yield and seed yield per plant in HPG-17 and for pod bearing branches per plant in Himachal chana-1, indicate that these traits are likely to respond effectively to phenotypic selection. Significant positive additive and dominance effects were observed for majority of traits studied in 40kR and 50kR treated populations of HPG-17 and for 30kR and 40kR treated populations of Himachal chana-1.

269 Mahiboobsa, M.; University of Agricultural Science, Raichur (India). Department of Genetics and Plant Breeding. Dharmaraj, P.S.; University of Agricultural Science, Raichur (India). Department of Genetics and Plant Breeding. Lokesha, R.; University of Agricultural Science, Raichur (India). Department of Genetics and Plant Breeding. Muniswamy, S.; University of Agricultural Science, Raichur (India). Department of Genetics and Plant Breeding. Yamanura; University of Agricultural Science, Raichur (India). Department of Genetics and Plant Breeding. Stabilization and transfer of male sterility into the back ground of locally adopted cultivars of pigeonpea [Cajanus cajan (L) millsp.]. Legume Research (India). (Sep 2011) v. 34(3) p.172-177 KEYWORDS: PIGEON PEAS. CAJANUS CAJAN. MALE INFERTILITY.

The present investigation was carried out during 2009–2010 at the Agricultural Research Station, Aland Road, Gulbarga (16° 2’ N, 76° 42’ E, 443 m elevation) located in North Eastern Dry Zone (Zone-2) of Karnataka. The 12 F1,s were studied under the insect proof condition with the objective of transferring the male sterility into the back ground of locally adopted cultivars for developing stable male sterile lines. The cent per cent male sterility was found in two F1,s combinations viz., GT-288A x Maruti and ICPA-2078 x WRP-1. As these crosses showed maximum sterility they can be effectively used for back cross with its respective recurrent parent. In further back crossing sterile back ground of recurrent parent genome can be recovered along with male sterility. The plant to plant crosses of BC4F1 and BC5F1 generations studied revealed that there was no single cross which exhibited cent per cent male sterility or not even near to 99 per cent male sterility. There is no drastic improvement in male sterility from the previous generations to present. Hence it is not worthy to carry out back crossing for further generations. Therefore, these lines cannot be used in further hybrid breeding programme.

270 Shivade, H.A.; Regional Agricultural Research Station, Karjat (India). Rewale, A.P.; Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (India). Department of Agricultural Botany. Patil, S.B.; Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (India). Department of Agricultural Botany. Correlation and path analysis for yield and yield components in black gram [Vigna mungo (L.) hepper]. Legume Research (India). (Sep 2011) v. 34(3) p.178-183 KEYWORDS: STATISTICAL METHODS. URD. VIGNA MUNGO.

Thirty six genotypes of black gram were studied in randomized block design with three replications for correlations, and direct and indirect effects for fifteen quantitative characters. The yield contributing characters viz., plant height, number of branches per plant, number of clusters per plant, number of pods per plant, number of pods per cluster, length of pod, number of seeds per pod and dry matter per plant had strong positive association with seed yield per plant at both the phenotypic and genotypic level. The characters days to first flowering, number of clusters per plant, number of pods per cluster, length of pod, 100-seed weight, dry matter per plant, harvest index, number of seeds per

pod and number of branches per plant had positive direct effect on seed yield per plant at genotypic level. The selection based on number of clusters per plant, number of pods per plant, dry matter per plant, plant height, number of branches per plant, number of seeds per pod, length of pod and number of pods per cluster could help in genetic improvement of seed yield per plant in black gram population under study.

271 Patil, A.B.; Navsari Agriculture University, Navsari (India). N.M. College of Agriculture, Department of Genetics and Plant Breeding. Desai, N.C.; Navsari Agriculture University, Navsari (India). N.M. College of Agriculture, Department of Genetics and Plant Breeding. Mule, P.N.; Navsari Agriculture University, Navsari (India). N.M. College of Agriculture, Department of Genetics and Plant Breeding. Khandelwal, V.; Navsari Agriculture University, Navsari (India). N.M. College of Agriculture, Department of Genetics and Plant Breeding. Combining ability for yield and component characters in mungbean [Vigna radiata (L.) wilczek.]. Legume Research (India). (Sep 2011) v. 34(3) p.190-195 KEYWORDS: MUNG BEANS. VIGNA RADIATA RADIATA. COMBINING ABILITY. DIALLEL ANALYSIS. YIELD COMPONENTS.

A diallel technique was employed in which eight genotypically diverse lines of mungbean were crossed among themselves in all possible combinations excluding reciprocals. The analysis for combining ability revealed significant mean sum of squares of both general combining ability (GCA) and specific combining ability (SCA) for all the characters which indicated the presence of both additive and non-additive gene actions. Relative magnitude of mean square were higher than that of SCA mean sum of squares for the traits indicating the importance of additive gene effects for all the characters, whereas the ratio of the estimates of variances due to GCA to that of SCA indicated preponderance of non-additive type of gene action for most of the characters except for plant height and pods per plant. The good general combiners for seed yield per plant were GM-4, Pusa Vishal, GM-2k3 and K-851. The best specific cross combinations were Pusa Vishal x SML-668, GM-4 x GM-3, GM-2k5 x GM-2k3, SML-668 x GM-4, K-851 x GM-4, GM-2k5 x K-851, GM-05-08 x K-851 and GM-2k3 x GM-4 showed the highest SCA effect for seed yield per plant. These cross combinations could be utilized for further use in breeding programme for improvement in yield and quality of mungbean.

272 Reddy, D. Kodanda Rami; Acharya N.G. Ranga Agricultural University, Podalakuru (India). Agricultural Research Station. Venkateswarlu, O.; Acharya N.G. Ranga Agricultural University, Podalakuru (India). Agricultural Research Station. Obaiah, M.C.; Acharya N.G. Ranga Agricultural University, Podalakuru (India). Agricultural Research Station. Jyothi, G.L. Siva; Acharya N.G. Ranga Agricultural University, Podalakuru (India). Agricultural Research Station. Studies on genetic variability, character association and path co-efficient analysis in greengram [Vigna radiata.(L.)wilczek]. Legume Research (India). (Sep 2011) v. 34(3) p.202-206 KEYWORDS: MUNG BEANS. VIGNA RADIATA RADIATA. GENETIC VARIATION.

Thirty five divergent genotypes of greengram [Vigna radiata.(L.) Wilczek] were evaluated for yield and yield attributes during rabi, 2009–10. Genotypes differed significantly for all the characters studied. High genetic advance coupled with high heritability was observed for characters viz., plant height, number of pods/plant, shoot dry matter/plant and seed yield/plant, indicating there by the preponderance of additive gene action for these characters. Correlation analysis indicated that seed yield/plant was positive and significantly associated with days to maturity, plant height, number of pods/plant,

number of seeds/pod, 100-seed weight, shoot nitrogen, seed protein and shoot dry matter/plant. Path co-efficient analysis revealed that days to flowering, days to maturity, number of pods/plant, seed protein, shoot dry matter/plant and 100-seed weight had positive direct effects on seed yield/plant. Hence, selection on these traits could be improving seed yield in greengram.

273 Reddy, D. Kodanda Rami; Acharya N.G. Ranga Agricultural University, Podalakuru (India). Agricultural Research Station. Venkateswarlu, O.; Acharya N.G. Ranga Agricultural University, Podalakuru (India). Agricultural Research Station. Obaiah, M.C.; Acharya N.G. Ranga Agricultural University, Podalakuru (India). Agricultural Research Station. Jyothi, G.L. Siva; Acharya N.G. Ranga Agricultural University, Podalakuru (India). Agricultural Research Station. Heterosis for yield and yield components in greengram [Vigna radiata (L.) wilczek]. Legume Research (India). (Sep 2011) v. 34(3) p.207-211 KEYWORDS: MUNG BEANS. VIGNA RADIATA RADIATA. HETEROSIS. YIELD COMPONENTS.

A set of 20 crosses involving nine parents was studied to get information on the extent of heterosis over better parent (BP) and mid parent (MP) for yield and yield contributing characters in greengram. The maximum better parent heterosis for seed yield was observed to be 149.71% and that of mid parent found to be 159.69%. The crosses showing heterosis for seed yield was not heterotic for all the characters. PUSA 9672 x WGG 2, PUSA 9672 x TARM 21, PUSA 9672 x LGG 407, MGG 341 x LGG 407 and LGG 460 x LGG 407 hybrids were identified as promising for many desirable traits and they may be useful in exploiting hybrid vigour in greengram.

274 Chaithanya, B. Krishna; S.V. Agricultural College, Tirupati (India). Department of Genetics and Plant Breeding. Prasanthi, L.; S.V. Agricultural College, Tirupati (India). Department of Genetics and Plant Breeding. Reddy, K. Hariprasad; S.V. Agricultural College, Tirupati (India). Department of Genetics and Plant Breeding. Reddy, B.V. Bhaskara; S.V. Agricultural College, Tirupati (India). Department of Genetics and Plant Breeding. Study of inheritance of fusarium wilt resistance through molecular marker analysis in pigeonpea [Cajanus cajan (L.) millsp]. Legume Research (India). (Sep 2011) v. 34(3) p.212-216 KEYWORDS: PIGEON PEAS. CAJANUS CAJAN. WILTS. SEGREGATION.

The inheritance studies in F2 progenies of two crosses of pigeonpea LRG-41 X ICPL-8863 and TRG-22 X ICPL-87119 for Fusarium wilt resistance by using SCAR14f/r marker revealed that the inheritance was governed by a single dominant gene. All the resistant plants showed the amplification 937bp band and absent in susceptible plants which segregates in the ratio of 3 resistant:1 susceptible and thus confirming that the disease was controlled by a single dominant gene. These marker studies for two crosses indicated that the same gene in both resistant parents, ICPL-87119 and ICPL-8863 governs the resistance. Quick assessment of susceptibility or resistance to wilt at early crop stage will be possible with this SCAR14f/r marker, and it will eliminate the need for maintaining virulent isolates of the wilt pathogen and development of sick plots for artificial screening techniques.

275 Kant, Rama; N.D. University of Agriculture and Technology, Faizabad (India). Department of Genetics and Plant Breeding. Srivastava, R.K.; N.D. University of Agriculture and Technology, Faizabad (India). Department of Genetics and Plant Breeding. Heritability and genetic advance in urdbean [Vigna mungo (L.) hepper] . Legume Research (India). (Sep 2011) v. 34(3) p.226-229 KEYWORDS: VIGNA MUNGO. URD. GENETICS. HERITABILITY.

The present investigation consisted of six genetic populations i.e. P1, P2, F1, F2, BC1 and BC2 of six crosses were evaluated during Zaid and Kharif 2008. Experiments were conducted to estimate selection parameters i.e. heritability in broad sense and genetic advance as per cent of mean among the six cross families. High heritability coupled with high genetic advance (20%) were recorded for plant height (cross I, II and V), number of clusters per plant (cross II and III), number of seeds per pod (cross VI), 100-seed weight (cross II and V), harvest index (cross I, II, V and VI), seed yield per plant (in all crosses) and protein content in (cross V and VI) during Kharif. However, in Zaid it was observed for plant height (cross II), number of pods per plant (cross IV), pod seed ratio (cross II), 100-seed weight (cross II), biological yield per plant (cross III, IV and V), harvest index (cross II and III) seed yield per plant (cross I, II, III and VI) and protein content (cross V and VI).

276 Reddy, D. Kodanda Rami; Agricultural Research Station, Podalakur (India). Venkateswarlu, O.; Agricultural Research Station, Podalakur (India). Obaiah, M.C.; Agricultural Research Station, Podalakur (India). Jyothi, G.L. Siva; Agricultural Research Station, Podalakur (India). Genotype x environment interaction for grain yield and its components in redgram [Cajanus cajan (L.) millsp]. Legume Research (India). (Dec 2011) v. 34(4) p.288-291 KEYWORDS: CAJANUS CAJAN. STABILITY. GENOTYPES.

Ten redgram genotypes were evaluated for their yield performance during three years (2007–2010) under rainfed conditions. The experiment was laidout in randomized block design with three replications. Significant genotypic differences for yield and yield components characters were observed. Significant genotype-environment interaction indicated differential responses of the genotypes to the environmental changes. The stability analysis was carried out, which showed significant linear component of variation for all the traits including yield. The genotype LRG 41 was most stable which showed higher grain yield, number of pods/plant and 100-seed weight, whereas PRG 158 was found stable for number of branches/plant and ICPL 85063 for plant height.

277 Tripathy, S.K.; Orrisa university of Agriculture and Technology, Bhubaneswar (India). College of Agriculture. Lenka, D.; Orrisa university of Agriculture and Technology, Bhubaneswar (India). College of Agriculture. Ranjan, Rajesh; Orrisa university of Agriculture and Technology, Bhubaneswar (India). College of Agriculture. Maximization of mutation frequency in grasspea (Lathyrus sativus L.). Legume Research (India). (Dec 2011) v. 34(4) p.296-299 KEYWORDS: EMS. LATHYRUS SATIVUS. MUTATION. MUTAGENS.

Frequency of mutations (Chlorophyll, foliar and agronomic) have been reported following seed treatment of grasspea cv. Dhenkanal local with y-rays, EMS, NG and their combinations at varying doses. NG was the most potent mutagen for induction of mutation followed by EMS and y-rays. Combination treatments showed synergistic effect for mutation frequency. EMS and NG, singly or in combination with y-rays, were more or less equipotent in inducing agronomic mutations, while, y- ray was less effective.

278 Babbar, Anita; J.N. Krishi Vishwavidyalaya, Jabalpur (India). Department of Plant Breeding and Genetics. Prakash, Vijay; J.N. Krishi Vishwavidyalaya, Jabalpur (India). Department of Plant Breeding and Genetics. Tiwari, Prakash; J.N. Krishi Vishwavidyalaya, Jabalpur (India). Department of Plant Breeding and Genetics. Iquebal, M.A.; Indian Agricultural Statistics Research Institute, New Delhi (India). Division of Biometrics & Statistical Modelling. Genetic variability for chickpea (Cicer arietinum L.) under late sown

season. Legume Research (India). (Mar 2012) v. 35(1) p.1-7 KEYWORDS: CHICKPEAS. CICER ARIETINUM. GENETIC VARIATION. STATISTICAL METHODS.

Forty four promising lines of chickpea were grown in RBD with three replications under late sown season. The maximum genotypic coefficient of variation was noticed for damaged pod percentage, total number of seeds per plant and total number of pods per plant. Days to 50% flowering, days to maturity, plant height, 100 seed weight and seed yield per plant showing high heritability coupled with medium genetic advance as percentage of mean, whereas, damage pod percentage, number of seeds per plant and number of pods per plant showing medium heritability and high genetic advance as percentage of mean. Seed yield per plant showed high significant positive correlation with total number of seeds per plant, total number of pods per plant, biological yield, plant height and 100 seed weight, whereas, significant negative correlation with days to 50% flowering and damaged pod percentage. Based on D2 cluster analysis, the forty four genotypes were grouped into nine clusters, depending upon the genetic constitution of the genotypes. The maximum intra cluster distance was found in cluster IV followed by cluster I, cluster VI and cluster VIII. Inter cluster values varied from 2.75 to 9.02. Total pods per plant, 100 seed weight, days to maturity, biological yield and seed yield per plant considered as selection criteria, while selecting superior genotypes under late condition. High yielding advanced breeding lines viz. JG 14, JSC 56, AKG 70, JG 9602974, BG 3005, PG 03110, Phule G 00108 were found suitable under late sown condition.

279 Patil, A.B.; Navsari Agriculture University, Navsari (India). ACHF Farm. Desai, D.T.; Navsari Agriculture University, Navsari (India). ACHF Farm. Patil, S.A.; Navsari Agriculture University, Navsari (India). ACHF Farm. Patil, S.S.; Navsari Agriculture University, Navsari (India). ACHF Farm. Heterosis for yield and its components in vegetable lablab bean (Lablab purpureus L.). Legume Research (India). (Mar 2012) v. 35(1) p.18-22 KEYWORDS: LABLAB PURPUREUS. HETEROSIS. YIELDS. HETEROTIS.

A half diallel was taken up with eight parents with a view to obtain best heterotic crosses for vegetable yield and its attributing traits. Heterosis over better parent and standard check were estimated for yield and its contributing characters in 28 cross combinations. The hybrids viz., NBI-57 x NBI-69, NBI-69 x NBI-80, NBI-41 x NBI-69, NBI-32 x NBI-54 and NBI-23 x NBI-54 were the most heterotic for green pod yield per plant. The crosses exhibited highest heterosis due to increase in number of pods per plant significantly associated with increase in pod yield. In some crosses primary branches per plant, average pod weight, seeds per pod and pod length also contributed towards green pod yield per plant. The crosses showing highest heterotic effects and per se performance, these crosses could be considered for exploitation of hybrid vigour.

280 Patel, P.R.; S.D. Agricultural University, Radhanpur (India). Dry Land Agricultural Research Station. Jain, S.K.; Sardarkrushinagar Dantiwada Agricultural University, Deesa (India). Sorghum Research Station. Stability analysis for yield and yield component traits in new breeding lines of cowpea (Vigna unguiculata L.). Legume Research (India). (Mar 2012) v. 35(1) p.23-27 KEYWORDS: COWPEAS. VIGNA UNGUICULATA. STATISTICAL METHODS. GENOTYPES. STABILITY.

Stability analysis was carried out in eleven genotypes of cowpea over four different environments (two years and two locations) to identify phenotypically stable genotypes for yield and their component traits. Pooled analysis of variance for stability in the performance

of different genotypes of cowpea were highly significant for all the characters viz., days to 50% flowering, days to maturity, pods per plant, plant height, seeds per pod and seed yield. The G X E interaction was significant for all the characters except days to 50% flowering and seeds per pod and the significant mean square due to the environment (linear) indicated the existence of the real genotypic differences in characters for regression over the environmental mean. The genotypes namely GC-0525 for earliness, GC-0521, GC-0510 and GC-0119 for plant height, GC-0203, GC-0119, and GC-5 for pods per plant and GC-04 for seed per pod were found stable and they can be directly used for breeding program. Fo r improvement of grain yield, the genotype GC-0121 was most stable and found 20 % superior over the popular check variety GC-5.

281 John, K.; Regional Agricultural Research Station, Tirupati (India). Reddy, P. Raghava; Acharya N.G. Ranga Agricultural University, Hyderabad (India). Reddy, K. Hariprasad; S.V. Agricultural College, Tirupati (India). Sudhakar, P.; Regional Agricultural Research Station, Tirupati (India). Reddy, N.P. Eswar; S.V. Agricultural College, Tirupati (India).. Heterosis and inbreeding depression for vegetative traits in groundnut (Arachis hypogaea L.). Legume Research (India). (Mar 2012) v. 35(1) p.36-39 KEYWORDS: HETEROSIS. GROUNDNUTS. ARACHIS HYPOGAEA. INBREEDING DEPRESSION.

Among twenty eight F1s studied, twenty F1s exhibited significant positive heterosis over better parent. The F1, TPT-4 x K-1375 expressed the highest significant positive relative heterosis (41.73%) and heterobeltiosis (35.09%) with moderate inbreeding depression (11.39%) indicating the presence of additive gene action for the expression of plant height. For number of primary branches per plant, the F1, ICGV-91114 x K-1375 recorded the highest significant positive heterosis over mid-parent (41.68%), heterobeltiosis (22.48%) and standard heterosis (40.35%) with the highest (22.22%) inbreeding depression indicating the chances of getting desirable genotypes through selection from the further segregating generations of this cross. The F1, ICGV-91114 x K-1375 recorded the highest relative heterosis (469.23%) and heterobeltiosis (428.57%) coupled with high positive inbreeding depression for number of secondary branches per plant indicating the preponderance of additive gene action in the inheritance of this trait.

282 Lal, Chuni; Directorate of Groundnut Research, Junagadh (India). Singh, A.L.; Directorate of Groundnut Research, Junagadh (India). Hariprasanna, K.; Directorate of Groundnut Research, Junagadh (India). Rathnakumar, A.L.; Directorate of Groundnut Research, Junagadh (India). Gor, H.K.; Directorate of Groundnut Research, Junagadh (India). Chikani, B.M.; Directorate of Groundnut Research, Junagadh (India). Vidya, Chaudhari; Directorate of Groundnut Research, Junagadh (India). Genetics of some nutrients in groundnut (Arachis hypogaea L.) under moisture-deficit stress situations. Legume Research (India). (Mar 2012) v. 35(1) p.40-43 KEYWORDS: GROUNDNUTS. ARACHIS HYPOGAEA. NUTRIENTS. NUTS. BREEDING METHODS.

A study was under taken to work out the gene action responsible for the accumulation of five nutrients, namely Mn, N, K, Ca and Mg in leaf tissue of groundnut. Accumulation of Mn and Ca was found to be under the influence of both additive and non-additive gene effects with preponderance of the former. In case of N, Mg and K, genes that are mainly additive in nature were found to be important. Selection for these traits can be effective in the early generations. Maternal effects observed for accumulation of Mn, K and Mg are suggestive of the crucial role of selection of female parent in improvement for these

traits. This study has helped in the identification of good general combiners for Ca (CSMG 84-1), Mn (Chico and ICGV 86031), N (TAG 24), K (ICG 4747) and Mg (CGMG 84-1 and TMV 2 NLM), which can be used in the genetic improvement of groundnut with desirable levels of these nutrients.

283 Gokulakrishnan, J.; Annamalai University, Annamalai Nagar (India). Department of Gemetics and Plant Breeding, Faculty of Agriculture. Kumar, B. Sunil; Annamalai University, Annamalai Nagar (India). Department of Gemetics and Plant Breeding, Faculty of Agriculture. Prakash, M.; Annamalai University, Annamalai Nagar (India). Department of Gemetics and Plant Breeding, Faculty of Agriculture. Studies on genetic diversity in mung bean (Vigna radiata L.). Legume Research (India). (Mar 2012) v. 35(1) p.50-52 KEYWORDS: MUNG BEANS. VIGNA RADIATA RADIATA. GENETIC DISTANCE. BIODIVERSITY.

Genetic divergence among thirty genotypes was estimated using Mahalanobis's D2 statistic and total of six clusters were formed. Cluster II contained the highest number of thirteen genotypes followed by cluster I with eight genotypes and clusters V and VI contained one genotype each. The pattern of distribution of genotypes from different geographical locations into six clusters was random, demonstrating that geographical isolation may not be the only factor causing genetic diversity. The highest intra-cluster distance was observed for cluster V (17.30) and the lowest was observed for cluster I (9.52). While the highest inter-cluster distance was observed between cluster I and V (39.22). Cluster V recorded the highest mean for seed yield per plant, number of pods per plant, number of branches per plant, number of seeds per pod and 100 seed weight. Therefore, it was concluded that more emphasis should be given on cluster V for selecting genotypes as parents for crossing with the genotypes of cluster I which may produce new recombinants with desired traits.

284 Revanappa, S.B.; College of Agriculture, Bheemarayangudi (India). Department of Genetics and Plant Breeding. Kamannavar, P.Y.; University of Agricultural Sciences, Dharwad (India). AICRP on MULLaRP. Vijaykumar, A.G.; University of Agricultural Sciences, Dharwad (India). AICRP on MULLaRP. Ganajaxi, M.; University of Agricultural Sciences, Dharwad (India). AICRP on MULLaRP. Gajanan, D.K.; University of Agricultural Sciences, Dharwad (India). AICRP on MULLaRP. Arunkumar, B.; University of Agricultural Sciences, Dharwad (India). AICRP on MULLaRP. Salimath, P.M.; University of Agricultural Sciences, Dharwad (India). AICRP on MULLaRP. Genotype x environment interaction and stability analysis for grain yield in blackgram (Vigna mungo L.). Legume Research (India). (Mar 2012) v. 35(1) p.56-58 KEYWORDS: URD. VIGNA MUNGO. YIELDS. ENVIRONMENT. STABILITY.

Eleven genotypes of blackgram were tested at three locations viz. Dharwad, Bidar and Gulbarga that represented different agro-climatic conditions of North-Karnataka during kharif 2009 to study their yield stability. Pooled analysis of variance and stability analysis were performed. The genotype (G) x environment (E) interaction and both variance due to genotypes and environments were significant. The partitioning of G x E interaction into linear and non-linear components indicated that both predictable and unpredictable components shared the interaction. On the basis of stability parameters, the top yielding genotypes, K-7-7 (1050 kg/ha) and DU-1 (1024 kg/ha) exhibited the stable performance over the locations. Results also revealed that the genotypes; BDU-3-3, T-9 and DU-3 also gave higher yield. But their performance was unpredictable due to high deviation from regression.

285 Tripathy, Swapan K.; Orrisa university of Agriculture and Technology, Bhubaneswar (India). College of Agriculture. Lenka, D.; Orrisa university of Agriculture and Technology, Bhubaneswar (India). College of Agriculture. Ranjan, Rajesh; Orrisa university of Agriculture and Technology, Bhubaneswar (India). College of Agriculture. Pradhan, K.; Orrisa university of Agriculture and Technology, Bhubaneswar (India). College of Agriculture. Induced polygenic variability and selection strategy for seed yield in grasspea (Lathyrus sativus L.). Legume Research (India). (Mar 2012) v.35(1) p.59-63 KEYWORDS: LATHYRUS SATIVUS. YIELDS. GENETIC PARAMETERS.

Genetic variation induced in grasspea c v. Dhenkanal local following mutagenesis varied with mutagens, generations and characters studied. Number of seeds, pods and seed yield/plant were found to be docile for induced genetic variation. Treatments e.g., 40kR-ã-ray + 0.01% NG and 40kR ã-ray + 0.2% EMS + 0.01% NG induced appreciable genetic variation for seed yield with widest range, comparable mean value, high GCV, h2(bs) and GA compared to control in M2 and M3. Whereas, 0.02–0.03% NG with similar consideration had higher genetic variability in M3 than M2 indicating release of additional variability and further scope for selection of high yielding mutants. In contrast, 0.01% NG might be amenable for direct selection as it had the highest mean seed yield per plant along with low GCV, h2(bs) and GA.

286 Bhadru, D.; Rice Research Scheme, Karimnagar (India). Navale, P.A.; College of Agriculture, Pune (India). Department of Agricultural Botany. Genetic variability parameters in F2 and F3 populations of cowpea (Vigna unguiculata (L.) walp.). Legume Research (India). (Mar 2012) v. 35(1) p.75-77 KEYWORDS: COWPEAS. VIGNA UNGUICULATA. GENETIC VARIATION. SEGREGATION.

Genetic variability parameters were estimated in F2 and F3 populations of two crosses viz., Dapoli Safed x GC 10 and Manjarkheda local x G 1 of cowpea. In both the crosses magnitude of PCV, GCV, heritability and genetic advance values higher in F3 as compared to F2 population. Number of pods per plant, biomass at harvest, days to maturity, number of seeds per pod, pod length, 100-seed weight and seed yield per plant recorded higher GCV, PCV, heritability and genetic advances, indicating the prevalence of additive gene action in the control of these characters and simple selection helps in development of high yielding cowpea genotypes.

287 Sunil, N.; National Bureau of Plant Genetic Resources, Hyderabad (India). Regional Station. Varaprasad, K.S.; Directorate of Oilseeds Research, Hyderabad (India). Sivaraj, N.; National Bureau of Plant Genetic Resources, Hyderabad (India). Regional Station. Abraham, Babu; National Bureau of Plant Genetic Resources, Hyderabad (India). Regional Station. Kumar, Vinod; Directorate of Rice Research, Hyderabad (India). Identification and characterization of green gram [Vigna radiata (L.) r. wilczek.] photosensitive lines and their significance . Legume Research (India). (Mar 2012) v. 35(1) p.78-80 KEYWORDS: MUNG BEANS. VIGNA RADIATA RADIATA. PHOTOSENSITIVITY. PROVENANCE. GERMPLASM.

One hundred and forty four accessions of green gram germplasm collected from middle Eastern Ghats were characterized and evaluated for 22 qualitative and quantitative traits during post rainy season of 2006–07 and rainy season of 2007. Three accessions (IC546478, IC546486 and IC369703) exhibited primitive characters such as photosensitivity, spreading growth habit and slight twining tendency, which differed significantly in

comparison with the released varieties. Accession IC369703 was found promising for the quantitative traits viz. plant height (21.2 cm), primary branches (4.2) and pod clusters per plant (10.2) as against released varieties values ranging from 27–31.6cm, 1.4–2.4, 7.8–9.4 respectively. Based on the present study and previously reported archaeological evidences, it is proposed that green gram could have its origin in the cusp region of inner Western Ghats and inner Eastern Ghats.

F60 Plant physiology and biochemistry

288 Alam, Badre; National Research Centre for Agroforestry, Jhansi (India). Chaturvedi, Mayank; National Research Centre for Agroforestry, Jhansi (India). Newaj, Ram; National Research Centre for Agroforestry, Jhansi (India). Impact of varying shade on CO2 assimilation, carboxylation efficiency, thylakoid electron transport and water use efficiency in Sesamum indicum L.. Range Management and Agroforestry (India). (Dec 2011) v.32(2) p.79-82 KEYWORDS: STRESS. CARBON DIOXIDE. ANABOLISM. SHADE.

Important photosynthetic traits of sesame (Sesamum indicum L.) were studied under different regimes of shade (33%, 50%, and 75% of incident sunlight) with control (open sunlight). Significant reductions were observed in the rates of CO2 assimilation, Carboxylation efficiency, Thylakoid electron transport and Water Use Efficiency with increase in shade intensity. Maximum reductions in the photosynthetic traits were noted in 75% shade, followed by 50% shade, while a moderate reduction was recorded in 33% shade in comparison to open grown plants. Shade-induced adaptations to low light environment have been reflected in the functioning of photosynthetic apparatus through changing their light requirement to saturate the rate of CO2 assimilation. Light saturated rate of CO2 assimilation (Amax) was obtained at photosynthetic photon flux density (PPFD) of about 1400 µ mol m-2s-1 in both open and 33% shade grown plants, whereas, these were about 800 µ mol m-2s-1 for the plants grown in 50% or 75% shade. Shade-induced reductions in rate of CO2 assimilation has been corroborated with the reduction in the carboxylation efficiency, photosystem-2 (PS2) activity and efficiency of photochemical reactions. The results would be useful in developing or selecting shade-tolerant crops for semi-arid climate with resource utilization efficiency.

289 Rao, P.S.; Acharya N G Ranga Agricultural University, Hyderabad (India). Seed Research and Technology Centre. Bharathi, M.; Acharya N G Ranga Agricultural University, Hyderabad (India). Seed Research and Technology Centre. Reddy, K. Bayyapu; Acharya N G Ranga Agricultural University, Hyderabad (India). Seed Research and Technology Centre. Keshavulu, K.; Acharya N G Ranga Agricultural University, Hyderabad (India). Seed Research and Technology Centre. Rao, L.V. Subba; Acharya N G Ranga Agricultural University, Hyderabad (India). Seed Research and Technology Centre. Neeraja, C.N.; Acharya N G Ranga Agricultural University, Hyderabad (India). Seed Research and Technology Centre. Varietal identification in rice (Oryza sativa) through chemical tests and gel electrophoresis of soluble seed proteins. Indian Journal of Agricultural Sciences (India). (Apr 2012) v. 82(4) p. 304-11 KEYWORDS: ELECTROPHORESIS. PROTEINS. ORYZA SATIVA. RICE. SEED.

Variety identification has great significance from seed production, breeding as well as intellectual property rights point of view to ensure quality seed. Forty varieties of rice were identified on the basis of seed colour (phenol, modified phenol and NaOH), seedling response (GA3 and 2, 4-D) to chemical tests and electrophoresis of soluble seed proteins

(SDS-PAGE). Though no individual chemical test was able to distinguish all the genotypes, different chemical tests in conjunction were useful in identification of varieties. The SDS-PAGE of seed proteins was able to identify all the 40 genotypes of different origin and can be employed effectively for identification of these rice varieties. Dendrogram of the data indicated the wide diversity of the varieties released from Andhra Pradesh with similarity ranging from 0.36 to 0.98. Based on the response of 40 rice varieties to biochemical techniques and total soluble protein profiles through SDSPAGE, a comprehensive seed key' has been developed for rapid varietal identification.

F61 Plant physiology - Nutrition

290 Sharma, R.C.; Indian Statistical Institute, Kolkata (India). Agricultural and Ecological Research Unit. Banik, P.; Indian Statistical Institute, Kolkata (India). Agricultural and Ecological Research Unit. Effect of integrated nutrient management on baby corn–rice cropping system:economic yield, system productivity, nutrient-use efficiency and soil nutrient balance. Indian Journal of Agricultural Sciences (India). (Mar 2012) v. 82(3) p. 220-4 KEYWORDS: MAIZE. CROPPING SYSTEMS. PLANT NUTRITION. EFFICIENCY. RICE. SOIL FERTILITY.

The study was conducted to estimate the nutrient-use efficiency and soil nutrient balance of integrated nutrient management, five combinations of organic and inorganic sources of nutrients. Both partial factor productivity and agronomicuse efficiency of nitrogen, phosphorus and potassium was recorded maximum in F (70% RD of NPK through inorganic fertilizers + 30% N through FYM), F 2 3 (70% RD of NPK through inorganic fertilizers + 30% N through vermicompost) and F (recommended dose (RD) of NPK (150:26:33) through fertilizers), respectively. Apparently recovery efficiency for N and K was highest in F 1 1 , whereas P in F 3 . Physiological-use efficiency (PFP) was highest in F and treatment. INM showed actual N gain but apparent N losses. Maximum actual N gain was recorded where nutrients were applied through equal proportion (50:50) of organic and inorganic sources. Similar trend was recorded for actual and apparent P loss/gain as recorded for N. Results showed losses in actual K but gain in apparent K for all the treatments. 3 , followed by F 1.

F62 Plant physiology - Growth and development

291 Saroj, P.L.; Sardar Vallabh Bhai Patel University of Agriculture and Technology, Meerut (India). Perpetuation of Psidium species through stooling and assessment of growth behaviour of clonal rootstocks under subtropical conditions. Indian Journal of Agricultural Sciences (India). (Mar 2012) v. 82(3) p. 230-5 KEYWORDS: CLONAL VARIATION. ROOTSTOCK CROPS. ROOTSTOCKS. GROWTH. BEHAVIOUR. PSIDIUM. STOOLING.

The investigation was carried out to standardize vegetative means of mass perpetuation of Psidium species through stooling technique and to assess growth behaviour of clonal rootstocks under subtropical conditions. The coppicing capacity among Psidium species varied with maximum number of desirable shoots/ plant in Psidium chinensis (27.33) and minimum friedrichsthalianum (9.12). All the Psidium species under investigation, viz Psidium cujavillis, P. molle, P. chinensis P. cattleianum except P. friedrichsthalianum can be successfully perpetuated by stooling with the combined treatment of IBA+NAA (7500 ppm). The rooting success varied between 9.53 and 100.00%,

and field establishment of rooted shoots between 0.0-97.13%. The P. chinensis gave cent per cent rooting with 93.13% field establishment while P. friedrichsthalianum gave only 9.53 % rooting and no plants were established under field conditions. The remaining species, viz P. cujavillis, P. cattleianum and P. molle gave more than 91.69% rooting and more than 84.03% establishment of rooted shoots. The correlation between rooting versus biochemical and anatomical parameters revealed that higher phenol content and C:N ratio of stooled plants as well as more intercellular space and breadth of sclerenchymatous cells have better impact on rooting while higher protein and longer length of sclerenchymatous cells did not make any impact. Under uniform management, maximum plant height (106.90 cm) was obtained in P. cattleianum while minimum in P. chinensis (55.80 cm) after six months of transplanting. The stock girth was also maximum in P. cattleianum (3.91 cm), followed by P. molle (3.69 cm), P. cujavillis (3.32 cm) and minimum in P. chinensis (2.89 cm). The number of branches, intermodal length (cm), number of leaves / plant, average leaf area (cm 2) and total leaf area / plant (cm) also varied significantly. Based on initial growth behaviour, these Psidium species can be relatively categorized as dwarf (P. chinensis), semidwarf (P. molle) and vigourous species (P. cattleianum and P. cujavillis).

292 Parmar, V.K.; Junagadh Agricultural University, Junagadh (India). College of Agriculture, Department of Agronomy. Dudhatra, M.G.; Junagadh Agricultural University, Junagadh (India). College of Agriculture, Department of Agronomy. Thesiya, N.M.; Junagadh Agricultural University, Junagadh (India). College of Agriculture, Department of Agronomy. Effect of growth regulators on yield of summer greengram. Legume Research (India). (Mar 2011) v. 34(1) p.65-67 KEYWORDS: YIELDS. NAA. CROP MANAGEMENT.

The results of the experiment on effect of various plant growth regulators on yield of summer greengram revealed that the spray of significantly highest number of pods per plant and number of grains per pod of 22.15 and 7.45 respectively, were recorded under NAA 40 ppm at 20 and 40 DAS application. This treatment also recorded significantly the highest grain weight per plant (6.02 g). Spray of NAA 40 ppm at 20 and 40 DAS recorded maximum grain yield of 1228 kg/ha and stover yield (1890 kg/ha).

293 Soumya, V.I.; Tamil Nadu Agricultural University, Coimbatore (India). Sundaram, S.P.; Tamil Nadu Agricultural University, Coimbatore (India). Meenakumari, K.S.; College of Agriculture, Vellayani (India). Department of Agricultural Microbiology. Pink pigmented facultative methylotrophs induce direct morphogenesis in cowpea [Vigna unguiculata (L.) Walp]. Legume Research (India). (Jun 2011) v. 34(2) p.111-116 KEYWORDS: COWPEAS. VIGNA UNGUICULATA. MORPHOGENESIS. SEEDLINGS.

Fourteen pink pigmented facultative methylotroph (PPFM) isolates inhabiting phyllosphere of different tropical plants were screened for plant growth hormone production and effect on seed germination and seedling growth of cowpea (Vigna unguiculata (L.) Walp). The best isolates were selected for studying their effect on in vitro culture of cowpea. The isolates were found to induce direct morphogenesis of cowpea explants in hormone-free Murashige and Skoog medium. The response of cowpea to in vitro culture varied with the type of explant used. The regeneration percentage was comparatively more in epicotyl than in hypocotyl explants. The population of PPFMs in regenerated plantlets ranged from 10.5 to 18.2 cfu g−1 on fresh weight basis indicating a stable association between the bacteria and the plantlets. There was significant

increase in soluble protein and chlorophyll content of the regenerated plantlets over controls.

294 Singh, B.; Orrisa university of Agriculture and Technology, Bhubaneswar (India). Department of Plant Breeding and Genetics. Das, S.; Orrisa university of Agriculture and Technology, Bhubaneswar (India). Department of Plant Breeding and Genetics. Sinha, S.K.; Orrisa university of Agriculture and Technology, Bhubaneswar (India). Department of Plant Breeding and Genetics. Laboratory evaluation of adaptation through seedling response to digitonin and indole-butyric-acid in mungbean. Legume Research (India). (Dec 2011) v.34(4) p.278-282 KEYWORDS: IBA. ADAPTATION. MUNG BEANS. VIGNA RADIATA RADIATA.

Evaluation of newly evolved crop genotypes for yielding ability/adaptation through field trial is expensive and time consuming. Simple laboratory predictive techniques for adaptation would reduce costs of field evaluation and save time. Seedling response to a few selected chemicals have been reported as a simple approach to such laboratory evaluation of adaptation (LEA). In the present study utility of two chemicals: digitonin and indol-butyric acid (IBA) in laboratory evaluation of adaptation in mung bean has been reported.

295 Krishnakumary, K.; Kerala Agricultural University, Vellanikara (India). College of Horticulture. Pattern of fruit and seed development in vegetable cowpea varieties. Legume Research (India). (Mar 2012) v. 35(1) p.53-55 KEYWORDS: COWPEAS. VIGNA UNGUICULATA. SEEDS. VIGOUR.

An investigation to find out the physiological maturity stage of two cowpea varieties (Bhagyalakshmi and Lola) for vegetable and seed production was undertaken. Pods of various stages of maturity harvested at two days interval from anthesis were used for the study. Pattern of fruit and seed development studies revealed two phases of development and maturation in which pod development was followed by seed development. The pod length reached maximum at 12 days after anthesis in both cowpea varieties with higher pod weight and hence it is considered as the optimum stage of harvest for vegetable purpose. Seed development and maturity took place in the second phase. Seed qualities (germination and vigour) were maximum in pods harvested at 16 days after anthesis in bush cowpea variety Bhagyalakshmi” and at 18 days after anthesis in pole cowpea variety Lola” and hence considered as the optimum physiological maturity stage for seed purpose harvesting.

296 Prakash, M.; Annamalai University, Annamalai Nagar (India). Department of Genetics and Plant Breeding, Faculty of Agriculture. Narayanan, G. Sathiya; Annamalai University, Annamalai Nagar (India). Department of Genetics and Plant Breeding, Faculty of Agriculture. Kumar, B. Sunil; Annamalai University, Annamalai Nagar (India). Department of Genetics and Plant Breeding, Faculty of Agriculture. Effect of flyash seed pelleting on seed yield in blackgram [Vigna mungo (L.) hepper]. Legume Research (India). (Mar 2012) v. 35(1) p.64-67 KEYWORDS: URD. VIGNA MUNGO. SEED PELLETING. SEEDS. YIELDS.

Black gram is highly priced pulse, rich in protein (24%) and phosphoric acid. Besides being cooked for consumption with chepaties (rotis) and rice, it is also used in preparation of several South Indian dishes like idli, vada, dosa etc. In India, black gram is grown on an area of 2.07 million hectares with a production of 0.94 million tonnes. It is mainly grown in the States of Madhya Pradesh, Maharashtra, Uttar Pradesh, Rajasthan, Karnataka and Bihar. Seed is a biological entity. Flyash is generated during the combustion of coal in coal fired

thermal power plants and paper industry. In agricultural studies, it has been reported that flyash at optimum rate can be utilized as a fertilizer. Hence, a study was formulated to elucidate information on the use of flyash seed pelleting on seed yield in blackgram. The study revealed that the flyash pelleting 200 g/kg-1 registered significantly higher values for plant height (cm), number of branches per plant, days to 50% flowering, number of clusters per plant, number of pods per plant, pod length, pod weight, seed weight/pod and seed yield plant-1 (g).

297 Sarvamangala, Cholin; University of Agricultural Sciences, Dharwad (India). Department of Genetics and Plant Breeding. Uma, M.S.; University of Agricultural Sciences, Dharwad (India). Department of Genetics and Plant Breeding. Macha, Sangeeta; University of Agricultural Sciences, Dharwad (India). Department of Genetics and Plant Breeding. Biradar, Suma; University of Agricultural Sciences, Dharwad (India). Department of Genetics and Plant Breeding. Salimath, P.M.; University of Agricultural Sciences, Dharwad (India). Department of Genetics and Plant Breeding. Association analysis over seasons in broad genetic background of cowpea {Vigna unguiculata (L.) walp}. Legume Research (India). (Mar 2012) v. 35(1) p.68-71 KEYWORDS: COWPEAS. VIGNA UNGUICULATA. SEEDS. YIELDS.

Cowpea [Vigna unguiculata (L.) Walp.] is a valuable warm season pulse crop grown for its grain, vegetable and also fodder. Very few efforts have made to understand the association of various yield components and their direct and or indirect influence on yield of cowpea. In the present study twenty genotypes of cowpea selected from various genetic back ground were used to study the association pattern among morphological traits and direct and indirect effect of these traits on productivity is also discussed. number of clusters plant, pods per plant had positive correlation with seed yield whereas, clusters per plant, pod length and test weight had a positive direct effect on seed yield and days to maturity has negative direct effect on seed yield. Few genotypes were identified to be superior over the local check (C-152).

298 Parmar, V.K.; Junagadh Agricultural University, Junagadh (India). College of Agriculture, Department of Agronomy. Dudhatra, M.G.; Junagadh Agricultural University, Junagadh (India). College of Agriculture, Department of Agronomy. Thesiya, N.M.; Junagadh Agricultural University, Junagadh (India). College of Agriculture, Department of Agronomy. Effect of growth regulators on growth characters of summer greengram. Legume Research (India). (Mar 2012) v.35(1) p.81-82 KEYWORDS: GROWTH CONTROL. MUNG BEANS. VIGNA RADIATA RADIATA.

A field experiment was conducted during summer season of 2004 to find out the effect of various plant growth regulators on growth of summer greengram. The results revealed that the spray of GA3 20 ppm at 20 and 40 DAS was significantly superior for growth parameters viz. plant height (56.38 cm) at harvest, leaves per plant (20.44) and number of branches per plant (10.63) at harvest followed by the treatment of NAA 20 ppm at 20 and 40 DAS.

H10 Pests of plants

299 Shukla, J.N.; Centre of Excellence for Genetics and Genomics of Silkmoths, Hyderabad (India). Laboratory of Molecular Genetics Centre for DNA Fingerprinting and Diagnostics. Nagaraju, J.; Centre of Excellence for Genetics and Genomics of Silkmoths,

Hyderabad (India). Laboratory of Molecular Genetics Centre for DNA Fingerprinting and Diagnostics. Doublesex: a conserved downstream gene controlled by diverse upstream regulators. Journal of Genetics (India). (Sep 2010) v.89(3) p.341-356 KEYWORDS: GENES. DROSOPHILA. SEX DETERMINATION.

Sex determination, an integral precursor to sexual reproduction, is required to generate morphologically distinct sexes. The molecular components of sex-determination pathways regulating sexual differentiation have been identified and characterized in different organisms. The Drosophila doublesex (dsx) gene at the bottom of the sex-determination cascade is the best characterized candidate so far, and is conserved from worms (mab3 of Caenorhabditis elegans) to mammals (Dmrt-1). Studies of dsx homologues from insect species belonging to different orders position them at the bottom of their sex-determination cascade. The dsx homologues are regulated by a series of upstream regulators that show amazing diversity in different insect species. These results support the Wilkin's hypothesis that evolution of the sex-determination cascade has taken place in reverse order, the bottom most gene being most conserved and the upstream genes having been recruited at different times during evolution. The pre-mRNA of dsx is sex-specifically spliced to encode male or female-specific transcription factors that play an important role in the regulation of sexually dimorphic characters in different insect species. The generalization that dsx is required for somatic sexual differentiation culminated with its functional analysis through transgenesis and knockdown experiments in diverse species of insects. This brief review will focus on the similarities and variations of dsx homologues that have been investigated in insects to date.

300 Arora, Ramesh; Punjab Agricultural University, Ludhiana (India). Department of Entomology. Kaur, Jaspreet; Punjab Agricultural University, Ludhiana (India). Department of Entomology. Singh, Karnail; Punjab Agricultural University, Ludhiana (India). Department of Entomology. Population dynamics and seed yield losses by the gram caterpillar (Helicoverpa armigera) in rabi forage legumes . Range Management and Agroforestry (India). (Dec 2011) v.32(2) p.108-112 KEYWORDS: TRIFOLIUM ALEXANDRINUM. HELICOVERPA ARMIGERA. LEGUMES. FORAGE. PEST INSECTS. YIELDS. LOSSES.

Gram caterpillar, Helicoverpa armigera (Hubner) (Noctuidae: Lepidoptera) is a major threat to agriculture in Africa, Asia, Oceania and parts of Europe. The pest has a preference for feeding on the floral parts of host plants especially forage and grain legumes. H. armigera is the key pest of Egyptian clover (Berseem) seed crop in northern India. Other Rabi forage legumes like Persian clover (Shaftal) and alfalfa (Lucerne) also suffer similar damage by H. armigera. The population dynamics and seed yield losses by the pest on popular genotypes of these forage legumes were studied for 3 consecutive years (2006-07 to 2008-09). Across genotypes, H. armigera build up started in standard meteorological week (SMW) 16, reached a peak value of 11.3 larvae/m2 in SMW 19, and declined to a low of 0.4 larvae/m2 in SMW 25. The overall pooled mean larval population was 3.27±0.034, 2.74±0.034, 2.56±0.034, 1.06±0.034 and 0.33±0.034/m2 in berseem varieties BL 1, BL 42, BL 10, lucerne variety LLC 5 and shaftal variety S 69, respectively. The avoidable yield losses were highest in Egyptian clover genotypes BL 10 (72.51 – 74.52%) followed by BL 42 (69.53 – 71.83%). Alfalfa (LLC 5) and Persian clover (S 69) recorded much lower yield losses of 40.46–45.70% and 25.26–31.10%, respectively. Among the three recommended insecticides, endosulfan 35 EC2.5l/ha recorded the highest cost-benefit (C:B) ratios of 1:7.6 to 1:20.9 as

compared to 1:4.8 to 1:19.8 and 1:4.0 to 1:17.5 in case of indoxacarb 15 EC500ml/ha and spinosad 48 SC50 ml/ha, respectively.

301 Bajya, D.R.; Central Institute of Cotton Research, Sirsa (India). Regional station. Monga, D.; Central Institute of Cotton Research, Sirsa (India). Regional station. Meena, B.L.; Central Institute of Cotton Research, Sirsa (India). Regional station. Tyagi, M.P.; Central Institute of Cotton Research, Sirsa (India). Regional station.. Insecticide resistance management strategies for managing cotton pest complex. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 1-5 KEYWORDS: GOSSYPIUM HIRSUTUM. INSECTICIDES. MANAGEMENT. COTTON. COMPLEXING.

The Insecticide Resistance Management (IRM) strategies for managing cotton pest complex revealed that sucking and bollworm complex were low in IRM plots compared to Farmer Practice (FP) plots. The strategic positioning of insecticides coupled with ecofriendly technologies to abundance of natural enemies in cotton eco system in IRM plots. By following the IRM strategies, the net profit over non IRM villages (Rs. 4300 & Rs. 4190/ha) was higher in lRM plots by saving in plant protection cost due to reduction in number of insecticidal sprays (37.5 & 44.4%) and increased seed cotton yield (8.1 & 5.8%) during both the year.

302 Patel Yogesh; Jawaharlal Nehru Krishi Vishwavidyalaya, Vidisha (India). College of Agriculture, Department of Entomology. Sharma, H.B.; Babu Shivnath Agrawal College, Mathura (India). Das, S.B.; Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur (India). Novel insecticides for management of whitefly, Bemisia tabaci (Genn.) in cotton. Annals of Plant Protection Sciences. (March 2010) v.18(2) p. 6-9 KEYWORDS: GOSSYPIUM HIRSUTUM. COTTON. BEMISIA TABACI. INSECTICIDES.

Field trial were conducted in two crop seasons with Amerrican cotton variety JK-4 to study the comparative bioefficacy of six insecticides, against whitefly, Bemisia tabaci, using foliar application. Insecticide of thio-ureas class, dafenthiuron 50 SC 400 g ai/ha was found most effective and recorded maximum reduction in population of whitefly, with maximum increase in yield over control, net profit and was relatively safer for potent predators. However, triazophos 40 EC 500 I ai/ha and acetamiprid 20 SP 20 g ai/ha were the next effective insecticides. The results suggested that difenthiuron. triazophos and acetamiprid were good substitutes from conventional insecticides in vogue. which could be used in formulating a successful management for B. tabaci in cotton.

303 Singh, Gaje; Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (India). Department of Entomology. Prasad, C.S.; Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (India). Department of Entomology. Sirohi, Anil; Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (India). Department of Entomology. Dhaka, S.S.; Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (India). Department of Entomology. Ali, N.; Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (India). Department of Entomology. Effect of bio-pesticides against Stem fly and Pod borer complex in Field pea. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 10-12 KEYWORDS: BIOPESTICIDES. PEAS.

Six treatments viz., BeaUveria bassiana 2.0 kg/ha., Metarrhizium anisopliae. 2.0 kg/ha, NSKE 5% neemarin 3 lit/ha., B.t. 0.5 kg/ha and cartap hydrochloride (4G) 15 kg/ha at

sowing time + endosulfan (35EC) 1.5 lit/ha and an untreated control. The minimum stem fly infestation of 1.3 and 1.4% was recorded with cartap hydrochloride 4G + endosulfan 35EC during rab; 2006–2007 and rabi 2007–2008, respectively. The treatment with BI was found best with minimum pod borer infestation of 7.3 and 4.4% during rabi 2006–2007 and rabi 2007-200S, respectively. The maximum average yield of 17.54 q/ha, maximum net return of Rs 13830/ha and highest cost benefit ratio (7.1) was obtained with cartap hydrochloride 4G + endosulfan 35EC.

304 Dhaka, S.S.; Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (India). Department of Entomology. Field evaluation of insecticides and bio-pesticides against Helicoverpa armigera on tomato. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 13-16 KEYWORDS: HELICOVERPA ARMIGERA. MANAGEMENT. LYCOPERSICON ESCULENTUM. EVALUATION. BIOPESTICIDES.

A field study was carried out on the efficacy of different sequential application of some novel insecticides viz., novaluron 10 E.C., indoxacarb 14.5 S.C., bifenthrin 10 E.C., lambda cyhalothrin 5 E.C., and biopesticides viz., nucleopolyhedrovirus (NPV) of Helicoverpa armigera, Bacillus thuringiensis var. kurstaki and neemarin, against H. armigera in comparison with sequential application of conventional insecticide i.e. endosulfan 35 E.C. and untreated control on tomato hybrid Pusa Ruby. Results showed that among different sequential application of insecticides, indoxacarb with lowest fruit infestation of 2.53 and 2.83 and highest yield of 39.45 & 38.85 q/ha were recorded during both the seasons, respectively. While among the biopesticides, neemarin followed by Bt and NPV with mean fruit yield of 30.27 and 29.60, 28.17 and 27.61 and 26.70 and 26.11 q/ha were optained in two seasons, respectively. Relatively higher numbers of predatory coccinelids (Coccinella septumpunctata.) were recorded in endosulfan insecticides as well as biopesticidesapplied plots as compared to treated plots.

305 Devi, K.Dhanapati; Manipur University, Imphal (India). Department of Life Sciences. Varatharajan, R.; Manipur University, Imphal (India). Department of Life Sciences. Loganathan, S.; Manipur University, Imphal (India). Department of Life Sciences. Bioassay of Pochonia (Verticillium) lecanii against tea aphid and red spider mite and their field density in Manipur. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 17-21 KEYWORDS: VERTICILLIUM. TOXOPTERA AURANTII.

The mycoinsecticide, Pochonia (Verticillium) lecanii was tested against tea aphid and red spider mite at 3 concentrations viz., 0.25%, 0.50% and 0.75% and all the three concentrations were found effective against red spider mite (RSM), Oligonychus coffeae and aphid (Toxoptera aurantii in a dose dependent manner. Field studies showed that aphids attacked tea from March to October with maximum incidence during September (160 aphids/5cm length of tea twig) in the tea fields of Manipur, whereas red spider mite infests during March-April with the peak density of 90 mites/foliage.

306 Satyanarayana, N.V.V.; Acharya N G Ranga Agricultural University, Bapatla (India). Agicultural College, Department of Entomology. Ramachandra Rao, G.; Acharya N G Ranga Agricultural University, Bapatla (India). Agicultural College, Department of Entomology. Arjuna Rao, P.; Acharya N G Ranga Agricultural University, Bapatla (India). Agicultural College, Department of Entomology. Incidence and management of Spodoptera litura (Fab.)on post rainy season groundnut. Annals of Plant Protection Sciences (India). (March

2010) v.18(2) p.22-25 KEYWORDS: SPODOPTERA LITURA. WET SEASON. GROUNDNUTS. MANAGEMENT.

Incidence of Spodoptera litura in terms of larval population showed non-significant relationship with maximum temperature, relative humidity, wind speed, spiders and coccinellid predatory beetles, but significant relationship with minimum temperature. The results of chemical control trials indicated that emamectin benzoate 0.00725% + was the most effective treatment followed by indoxacarb 0.0145% and indoxacarb 0.00725%+ novaluron. 0.005% in reducing the larval population of S. litura.

307 Kumar, M.K.; Indian Agricultural Research Institute, New Delhi (India). Division of Entomology. Srivastava, Chitra; Indian Agricultural Research Institute, New Delhi (India). Division of Entomology. Garg, A.K.; Indian Agricultural Research Institute, New Delhi (India). Division of Entomology. In virto selection of deltamethrin resistant strain of Trigoderma granarium and its susceptibility. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 26-30 KEYWORDS: TROGODERMA GRANARIUM. DELTAMETHRIN.

Deltamethrin resistant strain of Trogoderma granarium was developed in the laboratory with field collected population from local market of Delhi as parental strain, through six successive generations by maintaining a selection pressure of 80% in each generation. The initial concentration of deltamethrin for selection pressure was increased from 0.0389 to 0.1076% in sixth generation. The increase in resistance based on LC50 values, in each of ten successive generations were x 1.554, x2.217, x2.956, x3.092, x3,429 and x3.656. Cross resistant results showed that bifenthrin was not effective against deltamethrin resistant strain of T. granarium, malathion and dichlorvos showed good susceptibility.

308 Man Bihari; Chandra Shekhar Azad University of Agriculture & Technology, Kanpur (India). Department of Horticulture. Surya Narayan; Kulbhaskar Ashram Post Graduate College. Allahabad (India). Department of Horticulture. Seaseonal incidence and damage of Diaphorina citri on citrus. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p. 31-33 KEYWORDS: CITRUS. DIAPHORINA CITRI. SEASONAL CROPPING. DAMAGE.

Incidence of citrus psylla (Diaphorina citrl) was observed in six citrus crops and peak population of insect was found in March to September. In the months mean, population of citrus psylla varied from 0.96 to 5.74/unit in sweet orange to kagzi lime during September to July in two xears of experimentation.

309 Sujatha, A.; Andhra Pradesh Horticultural University, Ambajipeta (India). Horticultural Research Station. Chalam, M.S.V.; Acharya N G Ranga Agricultural University, Bapatla (India). Agicultural College, Department of Entomology. Arulraj, S.; Central Plantation Crops Research Institute, Kasaragad (India). AICRP on Palms. Monitoring and management of coleopteran pests of coconut through pheromone traps in Andhra Pradesh. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p.34-40 KEYWORDS: ORYCTES RHINOCEROS. RHYNCHOPHORUS FERRUGINEUS. PHEROMONE TRAPS. MONITORING.

Among the insect pests of coconut, the red palm weevil Rhynchophorus ferrugineus and rhinoceros beetle, Oryctes rhinoceros are reckoned as important. Roving survey made in eight coconut growing districts of Andhra Pradesh during the years 2000 to 2008 showed low to medium incidence of rhinoceros beetle in all the districts and severe incidence of red

palm weevil in East Godavari district. This information on relative severity of the two pests was useful to guide in suitable interventions for integrated pest management. Efficacy of pheromone lures of rhinoceros beetle (Ethyl 4-methyl octonoate) and red palm weevil (4 methyl-5-nonanol) from different sources were tested. There were distinctly high catches of rhinoceros beetle recorded in rhino lure during April, May, June, September and October months, while red palm weevil lures recorded higher catches of weevils in March, April, May, June and July months. Among the sources compared, rhino lure appeared superior for trapping rhinoceros beetle, while the red palm weevil lure from CPCRI, Kayangulam proved superior against red palm weevil. Trapping and destruction of rhinoceros beetle through pheromone traps resulted in the reduction of leaf and spindle damage by 27.3 and 59.9%, respectively. Use of pheromone trap for red palm weevil was found to effectively reduce the palm damage by 78% and 93% dead palms.

310 Kumar, Rakesh; Narendra Deva University of Agricultrure and Technology, Faizabad (India). Department of Entomology. Ali, Shamshad; Narendra Deva University of Agricultrure and Technology, Faizabad (India). Department of Entomology. Umesh Chandra; Narendra Deva University of Agricultrure and Technology, Faizabad (India). Department of Entomology. Seasonal incidence of sap feeders on sesame (Sesamum indicum L.) and correlation with Abiotic factors. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 41-48 KEYWORDS: SESAMUM INDICUM.

Five sap feeders were observed viz., white fly (Bemisia tahacl), leaf hopper (Orosius abicinctus), green bug (Nezara viridula), lygaeid bug (Aphanus sordidus) and cotton aphid (Aphis gossypii) at different stages of crop growth. The population of whitefly, sesame leaf hopper, green sting bug and cotton aphid were found negatively correlated with minimum temperature, relative humidity and rainfall and positively correlated with maximum temperature in all varieties of sesame viz., Type 4, Type-12, Type-13. Type-78 and Shekhar.

311 Sinha, Bikramjit; National Institute of Science Technology and Development Studies, New Delhi (India). Global biopesticide research trends: a bibliometric assessment. Indian Journal of Agricultural Sciences (India). (Feb 2012) v.82(2) p.95-101 KEYWORDS: AGRICULTURAL RESEARCH. BACILLUS THURINGIENSIS. PEST CONTROL. PESTICIDES. BIOPESTICIDES. ENVIRONMENT.

Combined realization of the negative effects of chemical pesticides and the positive attributes of biopesticide led to intensive research programmes on the later by both public and private institutions across nations. This has generated a knowledge pool and accumulated vast scientific literature. This paper tries to capture the nature of basic research in biopesticide and growth of the discipline during the last four decades. Bibliometric methods such as analysis of title-word and author keywords have been used to capture direction of research and to identify thrust areas of research. Growth of biopesticide research output has been encouraging, particularly since 1996. Microbial pesticides, particularly thuringiensis-related research has dominated the discipline so far. The paper also identifies the leading institutes, countries, and the nature of inter-country as well as inter-institutional collaboration. As in most other disciplines of science, United tates had an upper hand in biopesticide research, followed distantly by India. Two aspects that need immediate attention are the decline in participation of industry and international collaboration in biopesticide research, both of which are critical for developing cost-effective and environment-friendly pesticides having world-wide application.

312 Patel, Yogesh; Jawaharlal Nehru Kirshi Vishwavidyalaya, Jabalpur (India). College of Agriculture. Department of Entomology. Sharma, H.B.; Babu Shivnath Agrawal College, Mathura (India). Das, S.B.; Jawaharlal Nehru Kirshi Vishwa vidyalaya, Jabalpur (India). Novel insecticides for management of whitefly, Bemisia tabaci(Genn.)in cotton. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 6-9 KEYWORDS: GOSSYPIUM HIRSUTUM. COTTON. BEMISIA TABACI. INSECTICIDES.

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313 Singh, Gaje; Sardar Vallabhbhai Patel Univerisity of Agriculture & Technology, Meerut (India). Department of Entomology. Prasad, C.S.; Sardar Vallabhbhai Patel Univerisity of Agriculture & Technology, Meerut (India). Department of Entomology. Sirohi, Anil; Sardar Vallabhbhai Patel Univerisity of Agriculture & Technology, Meerut (India). Department of Entomology. Dhaka, S.S.; Sardar Vallabhbhai Patel Univerisity of Agriculture & Technology, Meerut (India). Department of Entomology. Ali, N.; Sardar Vallabhbhai Patel Univerisity of Agriculture & Technology, Meerut (India). Department of Entomology. Effect of bio-pesticides against Stem fly and Pod borer complex in Field pea. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 10-12 KEYWORDS: BIOPESTICIDES. PEAS.

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314 Dhaka, S.S.; Sardar Vallabhbhai Patel Univiersity of Agriculture and Technology, Meerut (India). Department of Entomology. Singh, G.; Sardar Vallabhbhai Patel Univiersity of Agricultureand Technology, Meerut (India). Department of Entomology. Ali, N.; Sardar Vallabhbhai Patel Univiersity of Agriculture and Technology, Meerut (India). Department of Entomology. Yadav, Arvind; Sardar Vallabhbhai Patel Univiersity of Agriculture and Technology, Meerut (India). Department of Entomology. Yadav, Adbhut; Sardar Vallabhbhai Patel Univiersity of Agriculture and Technology, Meerut (India). Department of Entomology. Field evaluation of insecticides and bio-pesticides against Helicoverpa armigera on tomato. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 13-16 KEYWORDS:

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315 Devi, Dhanapati K.; Manipur University, Imphal (India). Department of Life Sciences. Varatharajan, R.; Manipur University, Imphal (India). Department of Life Sciences. Loganathan, S.; Margo Biocontrols Pvt. Ltd., Bangalore (India). Bioassay of Pochonia (Verticillium) lecanii against tea aphid and red spider mite and their field density in Manipur. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 17-21 KEYWORDS: VERTICILLIUM. TOXOPTERA AURANTII.

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316 Satyanarayana, N.V.V.; Acharya NG Ranga Agricultural University, Bapatla (India). Agicultural College. Department of Entomology. Rao, G.Ramachandra; Acharya NG Ranga Agricultural University, Bapatla (India). Agicultural College. Department of Entomology. Rao, P.Arjuna; Acharya NG Ranga Agricultural University, Bapatla (India). Agicultural College. Department of Entomology. Incidence and management of Spodoptera litura (Fab.) on post rainy season groundnut. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.22-25 KEYWORDS: SPODOPTERA LITURA. WET SEASON. GROUNDNUTS. MANAGEMENT.

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317 Kumar, M.K.; Indian Agricultural Research Institute, New Delhi (India). Division of Entomology. Srivastava, Chitra; Indian Agricultural Research Institute, New Delhi (India). Division of Entomology. Garg, A.K.; Indian Agricultural Research Institute, New Delhi (India).

Division of Entomology. In virto selection of deltamethrin resistant strain of Trigoderma granarium and its susceptibility. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 26-30 KEYWORDS: TROGODERMA GRANARIUM. DELTAMETHRIN.

Deltamethrin resistant strain of Trogoderma granarium was developed in the laboratory with field collected population from local market of Delhi as parental strain, through six successive generations by maintaining a selection pressure of 80% in each generation. The initial concentration of deltamethrin for selection pressure was increased from 0.0389 to 0.1076% in sixth generation. The increase in resistance based on LC50 values, in each of ten successive generations were x 1.554, x2.217, x2.956, x3.092, x3,429 and x3.656. Cross resistant results showed that bifenthrin was not effective against deltamethrin resistant strain of T. granarium, malathion and dichlorvos showed good susceptibility.

318 Sujatha, A.; Andhra Pradesh Horticultural University (India). Horticultural Research Station. Chalam, M.S.V.; Agricultural College, Bapatla (India). Department of Entomology. Arulraj, S.; Central Plantation Crops Research Institute, Kasaragad (India). AICRP on Palms. Monitoring and management of coleopteran pests of coconut through pheromone traps in Andhra Pradesh. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.34-40 KEYWORDS: ORYCTES RHINOCEROS. RHYNCHOPHORUS FERRUGINEUS. PHEROMONE TRAPS. MONITORING.

Among the insect pests of coconut, the red palm weevil Rhynchophorus ferrugineus and rhinoceros beetle, Oryctes rhinoceros are reckoned as important. Roving survey made in eight coconut growing districts of Andhra Pradesh during the years 2000 to 2008 showed low to medium incidence of rhinoceros beetle in all the districts and severe incidence of red palm weevil in East Godavari district. This information on relative severity of the two pests was useful to guide in suitable interventions for integrated pest management. Efficacy of pheromone lures of rhinoceros beetle (Ethyl 4-methyl octonoate) and red palm weevil (4 methyl-5-nonanol) from different sources were tested. There were distinctly high catches of rhinoceros beetle recorded in rhino lure during April, May, June, September and October months, while red palm weevil lures recorded higher catches of weevils in March, April, May, June and July months. Among the sources compared, rhino lure appeared superior for trapping rhinoceros beetle, while the red palm weevil lure from CPCRI, Kayangulam proved superior against red palm weevil. Trapping and destruction of rhinoceros beetle through pheromone traps resulted in the reduction of leaf and spindle damage by 27.3 and 59.9%, respectively. Use of pheromone trap for red palm weevil was found to effectively reduce the palm damage by 78% and 93% dead palms.

319 Kumar, Rakesh; Narendra Deva University of Agriculture and Technology, Faizabad (India). Department of Entomology. Ali, Shamshad; Narendra Deva University of Agricultrure and Technology, Faizabad (India). Department of Entomology. Chandra, Umesh; Narendra Deva University of Agricultrure and Technology, Faizabad (India). Department of Entomology. Seasonal incidence of sap feeders on sesame (Sesamum indicum L.) and correlation with Abiotic factors. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.41-48 KEYWORDS: SESAMUM INDICUM.

Five sap feeders were observed viz., white fly (Bemisia tahacl), leaf hopper (Orosius abicinctus), green bug (Nezara viridula), lygaeid bug (Aphanus sordidus) and cotton aphid (Aphis gossypii) at different stages of crop growth. The population of whitefly, sesame leaf

hopper, green sting bug and cotton aphid were found negatively correlated with minimum temperature, relative humidity and rainfall and positively correlated with maximum temperature in all varieties of sesame viz., Type 4, Type-12, Type-13. Type-78 and Shekhar.

320 Sitaramarju, S.; Acharya N G Ranga Agricultural University, Bapatla (India). Agricultural College. Department of Entomology. Prasad, N.V.V.S.D.; Acharya N G Ranga Agricultural University, Lam Guntur (India). Agricultural College. Department of Entomology. Research station. Krishnaiah, P.V.; Acharya NG Ranga Agricultural University, Bapatla (India). Agricultural College. Department of Entomology. Seasonal incidence of sucking insect pests on Bt cotton in relation to weater parameters. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 49-52 KEYWORDS: GOSSYPIUM HIRSUTUM. SUCKING INSECTS. WEATHER.

The seasonal incidence of sucking insect pests on Bt cotton indicated that the major activity of aphids was observed from 41 sl standard week attaining peak during 46th standard week. Among the sucking pests, leafhoppers was the dominant pest with high activity from 4] SI standard week to 48th standard week with peak population level at 45th standard week. The peak incidence of thrips was observed during 38th standard week. The incidence of whitefly was low throughout the season with peak incidence in 46th standard week. The incidence of aphids had significant negative association with minimum temperature. The correlation between thrips and morning relative humidity showed significant negative influence, whereas maximum and minimum temperatures were found positive and significant. Leafhoppers showed significant negative correlation with morning and evening relative humidities. Both maximum and minimum temperatures were found to exert significant negative correlation, whereas morning relative humidity showed significant positive correlation on the whitefly population. Regression studies showed that the influence of all the major weather parameters was high on aphids (69.6%), leafhoppers (64.1%), thrips (70.0%) and whiteflies (66.1%).

321 Birah, Ajanta; Central Agricultural Research Institute, Port Blair (India). Kumar, Krishna; Central Agricultural Research Institute, Port Blair (India). Bhagat, Someshwar; Central Agricultural Research Institute, Port Blair (India). Singh, P.K.; Central Agricultural Research Institute, Port Blair (India). Srivastava, R.C.; Central Agricultural Research Institute, Port Blair (India). Evaluation of pest management modules against Earias vittella (Febricius) on okra. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.53-55 KEYWORDS: ABELMOSCHUS ESCULENTUS. EARIAS VITTELLA. INTEGRATED PEST MANAGEMENT. EVALUATION.

Fruit damage by Earias Villella was significantly less in aU the modules as compared to control at each picking as well as in pooled analysis. Integrated module (M3) which included seed Streatment with thiamethoxam 3g/kg sced + foliar spray of neem (Neembaan) 3 ml/lt at 40 days after sowing + foiar spray of endosulfan (1 ml/lt) + neem 3 ml/lt at 50 days after sowing + foliar spray of spinosad 3.0 ml/lt at 60 days after sowing recorded less incidence of shoot and fruit borer (4.8%) and more fruit yield (81.33 q/ha) as compared to untreated control (13.6% incidence and fruit yield 52.22 q/ha) the incease in yield over control in this module was 55.7%.

322 Hole, U.B.; College of Agriculture, Kolhapur (India). Jadhav, S.R.; College of Agriculture, Kolhapur (India). Relationship between population build up of Aonidiella

aurantii (Maskell) on rose and weather parameters. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p. 56-59 KEYWORDS: AONIDIELLA AURANTII. WEATHER.

The incidence of scales was observed on 30 rose cultivars, and increased gradually, reaching its peak (65.33 scales/stern) in the first week of March and declined thereafter. Tmax, Tmin, RH-I, RHI-II and BSH were in the range of 30.3 to 34.5°C, 9.1 to 11.1°C, 11 to 91%,11 to 31%, 9.1 to 10.1 hours, respectively, prevailed during 5 th to 9 th MW appeared to be congenial for multiplication of scales. Increase in scale population was observed to be positively and highly significantly, positively correlated with Tmax, BSH and Tmin, respectively during phase-I; while Tmax and Tmin were found to be negatively and highly significant1y correlated with increase in scale population in Phase-II.

323 Prasad, S.S.; Narendra Deva University of Agricultrure and Technology, Baharaich (India). Crop Research Station. Gupta, P.K.; Narendra Deva University of Agricultrure and Technology, Baharaich (India). Crop Research Station. Effect of organic manures on yield and yellow stem borer infestation in semi deep water rice. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 60-62 KEYWORDS: INFESTATION. ORYZA SATIVA.

Field trials were conducted to manage yellow stem borer (YSB) population using organic manures alone or in combination with nitrogenous fertilizer in a semi-deep water rice. The results indicated that organic manures, viz press mud 10 ton/ha, vermicompost 2.3 ton/ha and green manuring with Sesbania acculeata 40 kg seed rate recorded significantly low average YSB infestation of 3.4, 3.7 and 4.4%, respectively, incomparison to recommended dose of inorganic fertilizers with 8.8% average YSB infestation. Also the combination of green manuring with S. acculeata 40 kg/ha seed rate and 50% N as top dressing with moderate infestation of 6.6%, was found most effective in increasing rice grain yield to 2.20 ton/ha in comparison to 3.3% YSB infestation and 1.12 ton/ha mean yield.

324 Chavan, B.P.; Mahatma Phule Krishi Vidyapeeth, Ahmednagar (India). Post Graduate Institute. Department of Entomology. bpchavan123mail.com. Kadam, J.R.; Mahatma Phule Krishi Vidyapeeth, Ahmednagar (India). Post Graduate Institute. Department of Entomology. Effect of liquid formulations of Pochonia (Verticillium) lecanii (Zimm.) vigeas on viability and virulence against mealy bug. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 63-66 KEYWORDS: ADJUVANTS. MACONELLICOCCUS. VERTICILLIUM LECANII. FORMULATIONS.

Effect of liquid formulations of Pochonia (Verticillium) lecanii on growth in culture medium and the subsequent mortality of mealy bug, Maconellicoccus hirsutus were evaluated. The treatment including P. (V) l. + glycerol 8% + tween 80 1% + arachid oil 5% proved to be most effective recording maximum surface coverage (92.0%) and biomass (32.10g) at 10 days of inoculation and bioefficacy at 14 days. However, it was on par to the formulations with P (V) l. + glycerol 5% + tween 80 1% + arachid oil 2% and P. (V) l. + glycerol 2% + tween 80 1% + arachid oil 0.5%. considering viability and virulence. P. (V) l. + glycerol 2% + tween 80 1% + arachid oil 0.5% and P. (V) l. + glycerol 5% + tween 80 1% + arachid oil 2% were emerged as best combinations.

325 Subharani, S.; Institute of Bioresources and Sustainable Development, Imphal (India). Distributed Information Sub Centre (DISC). Singh, T.K.; Manipur University, Canchipur (India). Entomology Research Laboratory. Biology of pod fly, melanagromyza obtusa

malloch on cajanus cajan(L.) Millsp. in Manipur. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p. 67-69 KEYWORDS: CAJANUS CAJAN. MELANAGROMYZA.

The biology of Pod fly, Melanagromyza obtusa was studied during 2004–2005 at a temperature of 19.58°C and 70.15% relative humidity. The mean longevity of the adult was 6.59 ± 0.38 days. The incubation period varied from 2.5 to 3.5 days, the average being 2.99 ± 0.16 days. There were three larval instars which took 7.75 ± 0.53 days to enter into pupal stage. The pupal period lasted for about 9 to 13 days with an average of 11.38 ± 0.74 days. The life cycle of M obtusa was completed in 41.74 ± 0.81 days.

326 Kumar, Rakesh; Narendra Deva University of Agricultrure and Technology, Faizabad (India). Department of Entomology. rakeshentomologymail.com. Ali, Shamshad; Narendra Deva University of Agricultrure and Technology, Faizabad (India). Department of Entomology. Chandra, Umesh; Narendra Deva University of Agricultrure and Technology, Faizabad (India). Department of Entomology. Population dynamics of flower feeders in sesame (Sesamum indicum L.) and correlation with Abiotic factors. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p. 70-76 KEYWORDS: SESAMUM INDICUM.

A field trial was conducted during kharif 2006 and 2007 to find out the fourteen insect-pests population associated with sesame (cv. Type-4, Type-12, Type-13, Type-78 & Shekhar) at different stages of crops growth stages. Four flower feeders viz. Asphondylia sesami, Oxyctomia dispar, Dasyneura sesami and Mylabris pustulala were observed to infest all varieties of sesame. The population of sesame gall fly, flower beetle, sesame budflyand blister beetle were found positively correlated with the minimwn, maximwn temperatures and relative humidity and negatively correlated with rainfall in all varieties of sesame during both the years.

327 Reddy, Srinivasa D.; Horticultural Research Station, Andhra Pradesh (India). Division of Entomology. Srivastava, Chitra; Indian Agricultural Research Institute, New Delhi (India). Divisioin of Entomology. Gotyal, B.S.; Central Research Institute for Jute and Allied Fibres, Barrackpore (India). Division of Entomology. Evaluation of insect growth regulatory activity of neem formulation against Helicoverpa armigera (Hiibner). Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p. 77-81 KEYWORDS: HELICOVERPA ARMIGERA. FORMULATIONS. EVALUATION.

Ten commercially available neem formulations viz.. vijayneem (0.15 EC), achook (0.15 EC), econeem (O.30EC and 1.00EC), gronim (0.30Ec and 0.15EC), neemgold (0.03EC), nimbecidine (0.03EC) and neemazal (1EC and 5EC) were evaluated for insect growth regulatory activity (IGRA) against third instar larvae of, Helicoverpa armigera. Maximum larval mortality (50.0%) was observed for gronim 0.15EC and econeem lEC at 0.08% concentration whereas neemgold and nimbicedine showed 46.6 and 40.0% larval mortility, respectively at 0.2% concentration only. Neemgold (0.01%) showed highest pupal mortality. The data for the lethal growth inhibition revealed that neemgold 0.03 EC has lowest GI50 value of 0.0038% ans was the best formulation tested for its IGRA against H. armigera in vitro.

328 Sinha, S.R.; Indian Agriculture Research Institute, New Delhi (India). Devision of Entomology. Sharma, R.K.; Indian Agriculture Research Institute, New Delhi (India). Devision of Entomology. Effect of insecticides on insect pests of Brinjal. Annals of Plant Protection

Sciences (India). (Mar 2010) v.18(2) p. 82-85 KEYWORDS: AMRASCA BIGUTTULA. BEMISIA TABACI. INSECTICIDES. LEUCINODES ORBONALIS.

Two foliar sprays of bifenthrin 50 g a.i./ha or an insecticide mixture, chlorpyriphos+cypermethrin 1000 ml/ha were effective in managing leafhopper and whiteflies. However, borer infestation might be minimized by two sprays of either cartap hydrochloride 500 g a.i./h or endosulfan 700 g a.i./ha or carbosulfan 750 ml/ha and also observed to inproduce high yield (24.93, 23.60 & 24.78 MT/ha) as well as cost benefit ratio (1:3.16,1:3.25 & 1:3.45), respectively as compared to control that gave 15.03 MT/ha with C:B of 1:2.15.

329 Kapadia, M.N.; Junagadh Agricultural University, (India). College of Agriculture. Department of Entomology. Butani, P.G.; Junagadh Agricultural University, (India). College of Agriculture. Department of Entomology. Jethva, D.M.; Junagadh Agricultural University, (India). College of Agriculture. Department of Entomology. Virani, V.R.; Junagadh Agricultural University (India). College of Agriculture. Department of Entomology. Beria, N.N.; Junagadh Agricultural University (India). College of Agriculture. Department of Entomology. Management of White grub, Apogonia rauca (Feb.) in groundnut. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p. 86-89 KEYWORDS: ARACHIS HYPOGAEA. LARVAE.

Field trial was conducted for 2 years to fmd out the effective management of white grub, Apogonia rauca (for 2 years) in groundnut during monsoon seasons, 2006–2008. Looking tn the efficacy, yield and economics, seed treatment of chlorpyriphos 20 EC 25 mllkg seed (CBR 1:11.00) with general treatments of spraying carbaryl 0.2% on host trees viz. babul, neem and ber surrounding the field with 3 to 4 days of pre-monsoon rain, spraying of crop with monocrotophos 0.05% was found to be effective and economical for the management of white grub in kharif groundnut.

330 Sutaria, V.K.; Junagadh Agricultural University (India). College of Agriculture. Department of Entomology. Motka, M.N.; Junagadh Agricultural University, (India). College of Agriculture. Department of Entomology. Jethva, D.M.; Junagadh Agricultural University, (India). College of Agriculture. Department of Entomology. Ramoliya, D.R.; Junagadh Agricultural University, (India). College of Agriculture. Department of Entomology. Field efficacy of insecticides against jassid, Empoasca kerri (Pruthi) in soybean.. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p. 94-97 KEYWORDS: EMPOASCA. GLYCINE MAX. INSECTICIDES.

Nine different insecticidal treatments were tested against Empoasca kerri in soybean during the year 2007. The results on the efficacy of insecticidal treatments showed that the thiamethoxam 0.05%, acetamiprid 0.004% and imidacloprid 0.01% were the most effective treatments for the control of jassid in soybean. Considering the yield of this crop, spraying with thiamethoxam 0.05% gave the maximum grain yield (1889 kg/ha), followed by acetamiprid 0.004% (1852 kg/ha) and imidacloprid 0.0] % (1815 kg/ha). The highest net return was also found in thiamethoxam 0.05% (Rs. 17920) followed by acetamiprid 0.004% (Rs. 17,328) and imidacloprid 0.01% (Rs. 16,736).

331 Yadav, U.S.; Narendra Deva University of Agricultrure and Technology, Baharaich (India). Crop Research Station. dr.u.s.yadavmail.com. Yadav, Adhbut; Narendra Deva University of Agricultrure and Technology, Baharaich (India). Crop Research Station.

Performence of jute cultivars against apion corchori anomis sabulifera and polyphagotarsonemus latus. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.98-100 KEYWORDS: ANOMIS. CORCHORUS. VARIETIES.

Eight jute (Corchorus capsularis) cultivars along with standard check (Var. IRC-212. & JRC-321) were evaluated against stem weevil (Apion corchon), semilooper (Anomis sabulifera) and yellow mite (Polyphagotarsonemus latus). Results revealed that the cv. NDC-2005-7 was significantly superior and most promising against stem weevil, semilooper and yellow mite with an average in~station of 9.9, 5.4 and 7.9%, respectively and may be considered as multiple resistant and significantly superior to standard check varieties JRC 212 and IRC-321.

332 Ahmed, Tariq; University of Kashmir (India). PG Department of Zoology. Section of Entomology. Nabi, Shabnum; University of Kashmir, (India). PG Department of Zoology. Section of Entomology. Applicatoin of Dyar's kaw ti different hopper instars of choroedocus illustris walker (Orthoptera:Achrididae). Annals of Plant Protection Sciences (India). (Marh 2010) v.18(2) p. 101-103 KEYWORDS: ORTHOPTERA. ACRIDIDAE.

The Dyaraaaaa's law was applied in lepidopterous larvae. This law can also be applied in case of acridoids where successive formation of instars is a progressive development. The measurements of head width of the successive instrars were made separately in both the sexes and within the same sex. The head width in successive instars increased in a geometrical progression. The average ratio of increase in each instar for males was 1.264 (minimum) at 27°C under isolated conditions and gone up to 1.309 (maximum) at 37°C under crowded conditions, while as in female hoppers, the average increase was 1.233 (minimum) at 37°C under crowded conditions and reaches up to 1.409 (maximum) at 27°C under the same crowded conditions, before they reached the adult stage. The calculated head width was found close to the observed head width.

333 Sri, Aruna I.; Agricultural College, Bapatla (India). Department of Entomology. Rao, Ramasubba V.; Agricultural College, Bapatla (India). Department of Entomology. Sekhar, Raja P.; Agricultural College, Bapatla (India). Department of Entomology. Chalam, M.S.V.; Agricultural College, Bapatla (India). Department of Entomology. Taxonomic studies on different lepidopteran caterpillarson cotton chilli and pulses. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.104-107 KEYWORDS: TAXONOMY. LARVAE. GOSSYPIUM HIRSUTUM.

Different Lepidopteran larvae were collected from various places from Guntur district on cotton, chilli and pulses. The larvae were reared, preserved, identified through proper studies. The larvae viz., Earias vittella, Spodoptera litura, Pectinophora gossypiella, Helicoverpa armigera, Utetheisa pulchella, Maruca vilrata, Sphenarches caffer were identified and described based on the morphological characters and chaetotaxy of thoracic and abdominal segments especially 3rd abdominal segment and arrangement of crochets on the ventral pro legs. For easy identification of these larvae, a taxonomic key was prepared with the help of line diagrams of thoracic and abdominal segments.

334 Geroh, Monika; Chaudhary Charan Singh Haryana Agricultural University, Haryana (India). Department of Zoology and Aquaculture. Gulati, Rachna; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Department of Entomology. Sharma, S.S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Department of

Entomology. Kaushik, H.D.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Department of Entomology. Aneja, D.R.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Department of Maths and Statistics. Effect of abiotic stresses on population build up of Tetranychus urticae koch and its predator, Stethorus punctillum weise on okra. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p. 108-113 KEYWORDS: ABELMOSCHUS ESCULENTUS. STETHORUS PUNCTILLUM. TETRANYCHUS URTICAE.

Studies on seasonal incidence of Tetranychus urticae, a two spotted spider mite and its coccinellid predator, Stethorus punctillum were carried out in summer and kharif seasons of 2006–2007 on okra. Mite T urticae population showed two peaks on okra, during first week of June (47.1, 48.8, 46.0 and 8.5, 13.5 & 9.3 mites cm 2 leaf from ventral surface and dorsal surface of the leaves of three strata, respectively) and during first week of August (36.8, 45.9, 21.4 & 17.9, 21.5, 7.3 mites cm 2 leaf from ventral and dorsal surface of the leaves of three strata, respectively). Predatory beetle, S. punctillum also showed two peaks; first in the fifth week of July (1.0, 1.3, 0.2 on ventral & 0.3, 0.8,0.0 beetles/leaf on dorsal surface of the three strata, respectively) and second in the first week of August (0.3, 1.2, 0.0 on ventral & 0.4, 0.7, 0.0 beetles/leaf on dorsal surface of the leaves of three strata, respectively) which coincided with peak in T urticae population. Strata wise, middle strata harboured significantly more number of mites and beetles followed by top and bottom strata. Among abiotic factors, maximum and minimum temperature and relative humidity played a significant role in the population build up of T urticae.

335 Mahto, T.P.; Rajendra Agricultural University Bihar, (India). Tirhut College of Agriculture. Department of Entomology & Agriculture Zoology. Yadav, R.P.; Rajendra Agricultural University Bihar, (India). Tirhut College of Agriculture. Department of Entomology & Agriculture Zoology. Compartibility of Beauveria bassiana balsamo with vermicomposts from oilcake based feed mixtures. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.114-117 KEYWORDS: BEAUVERIA BASSIANA.

For ascertaining the degree of compatibility of Beauveria bassiana with vermicompost prepared from cow dung alone and in combination with three oilcakes viz; neem, castor and karanj cakes. The results revealed that the population of B. bassiana maintained increasing trend up to 30 days and started to decrease from 45th day of inoculation in vermicompost derived from different types of feed mixtures. Its population in oilcake based vermicomposts, however, recorded a decline of 8.6 to 42.4,10.9 to 47.4 and 13.0 to 48.7% at 15,30 and 45 days of inoculation, respectively over its corresponding population in vermicompost from cow dung alone, maximum and minimum values being in the vermicompost from cow dung + castor cake (4.5: 0.5), respectively.

336 Kumar, Yogesh; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Department of Entomology. Kumar, Krishan; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Department of Entomology. Kaushik, H.D.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Department of Entomology. Effect of tenperature and relativ humidity on larvaland pupal development of Greater wax moth, galleria mellonella Linn. on two diets. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p 118-122 KEYWORDS: APIS MELLIFERA. GALLERIA MELLONELLA. DIET.

Larval and pupal development of Galleria mellanella were studied at 25, 30, 35 and 40°C each with 30, 50 and 80% relative humidity. In addition effect of two diets i.e. Haydak

and 2 years old Apis mellifera comb pieces was also provided at these temperature and relative humidity levels. For larval development, temperature of 40°C was found unsuitable and Haydak diet was proved more suitable as compared to 2 years old A. mellifera comb pieces. Pupal development was faster at higher temperatures whereas same at three humidity levels.

337 Das, Debanand; Assam Agricultural University (India). Krishi Vigyan Kendra. Saikia, Prabal; Assam Agricultural University (India). Krishi Vigyan Kendra. Indigenous technical knowledge for management of rice pests in Assam. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.123-126 KEYWORDS: ORYZA SATIVA. PEST CONTROL.

A field study was conducted to collect indigenous technical knowledge followed by farmers for the management of rice pests at three villages of Lakhimpur district of Assam. Summer ploughing, use of healthy seed, burning of stubbles, application of different plant parts like Citrus grandis. Eupatorium odoratum, Polygonum sp. Vitex negundo. Azadiracta indica etc., water management practices, application of cow dung and goat excreta, use of dead crab/frog, use of bonefire were most commonly practised by the farmers for the management of various pests of rice. These practices are economical and environmental friendly.

338 Singh, Dan; Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (India). Department of Agricultural Extension. Singh, D.K.; Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (India). Department of Agricultural Extension. Yadav, R.N.; Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (India). Department of Agricultural Extension. Singh, V.K.; Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (India). Department of Agricultural Extension. Assessment of knowledge and adoption to IPM in rice cultivation. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p. 127-130 KEYWORDS: INTEGRATED PEST MANAGEMENT. ORYZA SATIVA. CULTIVATION.

It was observed that 41.3% basmati rice growers were having medium knowledge level about the application of Trichoderma harzianum for soil treatment and 47.5% was having low knowledge level as seed treatment. Similarly low knowledge level about the application of Beauvaria bassiana and neem cake as soil treatment. There were no adoption with respect to B. bassiana and neem cake as soil treatment. Also no adoption of B. thuringiensis and light traps in insect control of rice cultivation.

339 Swamy, Gopala S.V.S.; Regional Agricultural Research Station, Guntur (India). Prasad, N.V.V.S.D.; Regional Agricultural Research Station, Guntur (India). Compartive evaluation of different pest management strategies on cotton. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 131-135 KEYWORDS: GOSSYPIUM HIRSUTUM. EVALUATION. PEST CONTROL.

Studies were carried out to examine the profitability of IPM vis-a-vis non-IPM fanning practices under rainfed conditions. During the study period, higher incidence of natural enemies was observed in IPM and untreated check, while these insects were kept at low in farmers and ETL blocks due to insecticide sprays. In IPM module, the natural enemies were found playing a major role in suppressing the pest populations particularly early season sucking pest complex. The economics of control strategies and the resultant monitory returns revealed that the cost benefit ratio was highest in IPM strategy (4.42) as it

required minimum insecticidal interventions. IPM programme successfully resulted in lower production costs through reduced pesticide consumption which ultimately helped in conserving naural enemy species and sustaining biodiversity.

340 Mir ud din, Mehraj; Chaudhary Charan Singh University, Meerut (India). Department of Plant Protection. Gaurav, S.S.; Chaudhary Charan Singh University, Meerut (India). Department of Agricultural Botany. Prasad, C.S.; Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (India). Biocontrol laboratory. Tyagi, Ashish; Chaudhary Charan Singh University, Meerut (India). Department of Plant Protection. Field evaluation of Bacillus thuringiensis for cotrol of Plutella xylostella (l.) on Cauliflower. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.141-143 KEYWORDS: BACILLUS THURINGIENSIS. BRASSICA OLERACEA. PLUTELLA XYLOSTELLA. CAULIFLOWERS.

The field efficacy of Bacillus thuringiensis in comparison of chemical insecticides were carried out against diamondback moth, Plutella xylostella, in cauliflower field. Different formulations of B. thuringiensis (viz., Halt WP, Bioasp WP, Delfin WG and Delfin of 0.5 kg/ha) and chemical insecticides (triozophos & malthion 800 ml/ha.) were applied with the help of knapsack sprayer in 25 m! plots in evening hours. The spraying was done two times at an interval of 15 days starting from pest occurrence. The result clearly revealed that third day of first spray, all the treatment, increased their efficacy for larval mortality. Trizophos resulted in maximum mortality (91%) followed by malathion (64%) and Halt WP (45%). The data of mortality generated after 5 days of first spray revealed that Halt WP had minimum (63%) larval mortality which was at par with Malathion (63%). Although, Trizophos had maximum of 91% larval mortality followed by Delfin WG (79%) and Bioasp WP (78%) being at par with each other. After seven days of first spray, absolute mortality was observed with treatment Trizaphos, Halt WP (87%), Delfin WG (95%), Delfin OF (94%) and Bioasp WP (94%) mortality, respectively. Similar trend was observed in the second spray after 1, 3, 5 and 7 days after treatment.

341 Upadhyay, Meenakhsi; Bipin Bihari Post Graduate College. Jhansi (India). Srivastava, A.K.; Bipin Bihari Post Graduate College. Jhansi (India). Response of Wheat varieties to lesser grain borer, Rhizopertha dominica(Febr.). Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.144-147 KEYWORDS: RHYZOPERTHA. TRITICUM AESTIVUM.

Fecundity, hatching, pupation, adult emergence, developmental periods, number of generations adult longevity, F1 progeny and index of susceptibility indicated that the varieties K-9107 and K-9162 as prefered and the varieties K-68, K80–27 K-9465, PBW-343 were less preferred food for R. dommlca.

342 Tyagi, Ashish; Chaudary Charan Singh University, Meerut (India). Department of Plant Protection. Gaurav, S.S.; Chaudary Charan Singh University, Meerut (India). Department of Agricultural Botany. Prasad, C.S.; Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (India). Biocontral laboratory. Mir ud din Mehraj; Chaudary Charan Singh University, Meerut (India). Department of Plant Protection. Efficacy and economics of Biopesticides combinations and insecticide against tomato fruit borer. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.148-152 KEYWORDS: BEAUVERIA BASSIANA. HELICOVERPA ARMIGERA. TRICHOGRAMMA PRETIOSUM. BIOPESTICIDES.

Efficacy of eight treatments consisting combined use of biopesticides i.e. Bacillus thuringiensis, NPV and Beauveria bassiana with egg parasitoid, Trichogramma pretiosum including a chemical spray schedule and control were tested against Tomato fruit borer, Helicoverpa armigera. Four sprays of B. thuringiensis 1 kg/ha with release of T. pretiosum 0,000 parasitoid eggs at ten days interval was proved most effective treatment in terms of reduction in fruit damage, net return and yield but four sprays of NPV 250 LE/ha along with release of T. pretiosum 50,000 parasitoid at ten days interval was proved to be most cost effective treatment/schedule for management of tomato fruit borer. However, four chemical insecticide sprays (endosulphan 1.6 lit/ha, cypermethrin 1.0 lit/ha, endosulphan 1.6 lit/ha, Deltamethrin 0.8 lit/ha,) also ranked third in terms of cost effectiveness but due to its hazards in soil, atmosphere and crop produce, it is not advised for the control of H armigera to the farmers.

343 Bhat, J.A.; Sher-e-Kashmir University of Agricultural Science and Technology of Kashmir, (India). Wani, N.A.; Sher-e-Kashmir University of Agricultural Science and Technology of Kashmir, (India). Mohi-ud-din, S.; Sher-e-Kashmir University of Agricultural Science and Technology of Kashmir, (India). Lone, G.M.; Sher-e-Kashmir University of Agricultural Science and Technology of Kashmir, (India). Pukhta, M.S.; Sher-e-Kashmir University of Agricultural Science and Technology of Kashmir, (India). Relatives virulence fo local entomopathogenic fungal isolates infecting apple stem borer, Aeolesthes sarta solsky.. Annals of Plant Protection Sciences. (Mar 2010) v.18(2) p.153-155 KEYWORDS: BEAUVERIA BASSIANA. METARHIZIUM ANISOPLIAE. ENTOMOGENOUS FUNGI. INFECTION.

The pathogenicity of three local entomopathogenic fungal isolates, Beauveria bassiana, B. brongniartii and Metharhizium anisopliae, each at three concentrations (1 x 10 8, 1 x 10 6 and 1 x 10 4 conidialml of spore suspension), was established against the grubs of A. sarta under laboratory conditions. All the isolates proved pathogenic though with varied degree and virulence to the grubs of A. sarta. The fungal isolate B. bassiana proved most promising against the grubs of A. sarta followed by B. brongniartii and Metarhizium inosopliae.

344 Singh, Vivek; Sardar Vallabh Bhai Patel University of Agricultural & Technology, Meerut (India). Department of Plant Pathology. Kumar, Ravinder; Sardar Vallabh Bhai Patel University of Agricultural & Technology, Meerut (India). Department of Plant Pathology. Singh, Gopal; Sardar Vallabh Bhai Patel University of Agricultural & Technology, Meerut (India). Department of Plant Pathology. Prasad, C.S.; Sardar Vallabh Bhai Patel University of Agricultural & Technology, Meerut (India). Department of Plant Pathology. Management of sheath blight of rice with integration of Trichoderma harzianum and Pseudomonas fluoresens. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 156-158 KEYWORDS: ORYZA SATIVA. PSEUDOMONAS FLUORESCENS. RHYZOPERTHA. TRICHODERMA HARZIANUM.

The present investigation was undertaken to asses combined application of fungal and bacterial antagonists (Trichoderma harzianum & Pseudomonas fluorescens-27) applied as seedling root dip and foliar spray against the sheath blight of rice caused by Rhizoctonia solani under glass house conditions. Seedling root dip with T. harzianum + P. fluorescens-27 and foliar spray with T. harzianitm was the most effective in reducing the disease severity (45.8–48.0%) and disease incidence (60.1–61.5%) followed by seedling root dip with T. harzianum + P. fluorescens-27 and foliar spray with P. fluorescens-27 which resulted in the

reduction of disease severity (43.0–43.4%) and disease incidence (56.7–56.9%), respectively. Among all the integrated treatments, reduction of sheath blight was lowest In combination of seedling root dip with T. harzianum +P. fluorescens-27 with disease severity of (26.9–28.3%) and disease incidence of (31.5–34.7%).

345 Udhayakumar, R.; Annamalai University, Annamalainagar (India). Faculty of Agriculture. Department of Plant Pathology. Rani, S. Usha.; Annamalai University, Annamalainagar (India). Faculty of Agriculture. Department of Plant Pathology. Epidemiological and nutritional factors on growth of colletorichum gloeosporioides (Penz.) Penz. and Sacc. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.159-163 KEYWORDS: COLLETOTRICHUM. EPIDEMIOLOGY.

Studies were conducted to find out the favourable conditions and nutritional factors on the growth and conidial germination of C. gloeosporioides irr vitro. The temperature of 25°C was found to be good for the mycelial growth (89.6mm) and conidial germination (69%) of C. gloeosporioides. At 100% relative humidity, the mycelial growth (90mm) and conidial germination (87%) was higher. In this context, different light period were tested, continuous light favoured the both mycelial growth and conidial germination of pathogen. Among the ten culture media tested, potato dextrose agar was found to be best for mycelial growth (84.8mm), mycelial dry weight (625.4mg) and acervuli production of C. gloeosporioides. With regard to different carbon and nitrogen sources tested, the pathogen produced maximum mycelial growth and mycelial ary weight when basal medium was supplemented with manitol (79.5mm & 590.8mg) as a carbon source and ammonium nitrate (86.6mm & 680.8 mg) as a nitrogen source.

346 Mishra, Versha; D.G. College, Kanpur (India). Department of Botany. Gautam, Rashmi; D.G. College, Kanpur (India). Department of Botany. Srivastava, K.C.; D.A.V. College, Kanpur (India). Department of Botany. Srivastava, Neena; Dr. Harbansrai Bachchan College, Unnao (India). Department of Botany. Effect of culture media, temperature and pH on growth of Phytophthora drechsleri f.sp. cajani. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p. 164-166 KEYWORDS: CULTURE MEDIA. PHYTOPHTHORA DRECHSLERI. TEMPERATURE.

Maximum vegetative growth of pathogen was recorded on oat meal agar medium at 30°C temperature and 6.5 pH. Sporangial germination of the pathogen started at 15°C after 180 minutes and at 20 25°C after 120 minutes. Maximum sporangial germination was observed at 6.5 pH in complete dark condition.

347 Mrinmay, K. Maiti; Bidhan Chandra Krishi Viswa Vidyalaya, Nadia (India). Department of Plant Pathology. Basu, Amitava; Bidhan Chandra Krishi Viswa Vidyalaya, Nadia (India). Department of Plant Pathology. Quantitative estimation of chorophyll, Starch and total soluble sugar in potato cultivers infected with phytophthora infestans. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.167-171 KEYWORDS: PHYTOPHTHORA. INFESTATION. SOLANUM. QUANTITATIVE ANALYSIS.

The kinetics of accumulation of chlorophyll, total so luble sugar and starch, was studied in four potato cultivars, when infected with Phytophthora infestans. Maximum chlorophyll content was found in Kufri Badshah followed by Kufri Jyoti, Kufri Ashoka and Kufri Chandramukhi at 50 DAP. Chlorophyll content was gradually decreased in all the tested cultivars as the blight progressed. But total chlorophyll content in leaves of cultivars Kufri

Chandramukhi and KufriAshoka was significantly decreased. Total soluble sugar and starch contents were found significantly reduced as the progress of blight took place. In case of susceptible cultivars i.e, Kufri Ashoka and Kufri Chandramukhi, the rate of depletion of total soluble sugar was significantly higher as compared to tolerant cultivars viz., Kufri Jyoti and Kufri Badshah.

348 Singh, S.P.; ICAR Research Complex for NEH Region Andhra Pradesh Centre, (India). Plant Protection Unit. Agarwal, R.K.; Bundelkhand University, Jansi (India). Department of Botany. Bhagawati, R.; ICAR Research Complex for NEH Region, Basar (India). Andhra Pradesh Centre. Plant Protection Unit. Studies on mode of survival, host range and date of sowing on collar rot disease incidence in chick pea. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.172-176 KEYWORDS: CICER ARIETINUM. SOWING DATE. CORTICIUM ROLFSII. CHICKPEAS. DISEASE CONTROL.

Out of 54 plant species tested, the pathogen was able to infect 41 of them indicated that the fungus had a very wide host range. The disease incidence was low (16%) while sown on 1st October. The germination percentage was very less (10%) compared to other sowing dates. Further, Mid-October sown chick pea also exhibited low disease incidence (37.1%) and good germination percentage.

349 Ram, Jeewa; Maharana Pratap University of Agriculture and Technology, Udaipur (India). Rajasthan College of Agriculture. Department of Plant Pathology. Thankore, B.B.L.; Maharana Pratap University of Agriculture and Technology, Udaipur (India). Rajasthan College of Agriculture. Department of Plant Pathology. Diversity of pathogens causing storage rot and impact of storage structures on Ginger rot. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 177-180 KEYWORDS: RHYZOPERTHA. ZINGIBER OFFICINALE. STORAGE. PATHOGENS.

Three different ginger storage structures i.e. pits, heaps and mud plaster were generally used in Rajasthan. Association of Aspergillus niger, Rhizophus stolonifer, Rhizoctonia solani, Macrophomina phaseolina, Alternaria alternata, Fusarium solani and Pythium aphanidermatum was found under traditional storage structures of ginger rhizomes. Out of these, P. aphanidermatum and F. solani were more frequency of association with ginger rot diseased rhizomes. The maximum infection index of F. solani (18.3%) was observed in heap storage structure, while P. aphanidermatum (16.3%) infection index was high in mud plaster structure storage of ginger rhizomes. The mud plaster was found more susceptible to rotting in storage and its range was 2.0% to 18.3% during 2001 in Dungarpur and Udaipur districts whereas during 2002, it ranged from 1.0% to 15.6%, respectively. Minimum infection index was 2.0% and 1.0% in pits storage structure of ginger.

350 Gupta, P.K.; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (India). Department of Plant Pathology. Sharma, N.D.; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (India). Department of Plant Pathology. Singh, Dhirendra; Janta Vedic College Baraut, (India). Department of Agriculture Botany, Genetics & Plant Breeding. Occurrence of cercosporoid on medicinal plants of Madhya Pradesh. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 181-183 KEYWORDS: DRUG PLANTS. SURVEYS.

During 2004–2005, periodical survey of different places in Madhya Pradesh (Chitrakoot, Seoni, Narsinghpur, Bilaspur and the neighburhood of Jabalpur) were made within a radius of about 15–20 km. The correct identity of the medicinal plant was prime

important to protect their medicinal values from the damage and fifteen Cercosporoid were recorded in medicinal plants and enumerated as new host record from the state of M.P.

351 Singh, Sushil K.; Narendra Deva University of Agricultrure and Technology, Faizabad (India). Department of Plant Pathology. Chand, Ramesh; Banaras Hindu University, Varanasi (India). Institute of Agricultural Sciences. Department of Mycology & Plant Pathology. Singh, Dinesh; Iandian Agricultural Research Institute, New Delhi (India). Division of Plant Pathology. Kumar, D.; Narendra Deva University of Agricultrure and Technology, Faizabad (India). Department of Plant Pathology. Comparative study of leaf spot and leaf blight symptoms or xanthomonas campestris pv. pathenii on parthenium. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 184-187 KEYWORDS: PARTHENIUM. SPOTS. SYMPTOMS.

A comparative study on growth, physiological, biochemicals, host range and diseases incidence was done of new strain bacterium producing leaf spot and leaf blight producing strains of Xanthomonas campestris pv. parthenii. No variation in physiological, biochemical and host range between both the strains of X. campestris pv. parthenii, were recorded. The disease incidence caused by leafspot strain was 40% as compared to leaf blight strain (8.7%). Leafspot causing strain was more virulent, host specific and with filst multiplication rate. The leaf spot producing strain of X. campestris pv. parthenii was potential to use as bio-agent to destroy Parthenium hysterophorus a noxious weed.

352 Singh, Vimla; Deen Dayal Upadhyay University, Gorakhpur (India). Department of Botany. Singh, Devendra; Deen Dayal Upadhyay University, Gorakhpur (India). Department of Zoology. Studies on natural transmission of papaya ringspot virus disease in eastern Uttar Pradesh. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.188-192 KEYWORDS: MYZUS PERSICAE. TRANSMISSIONS. VIRUSES. VECTORS. PAPAYAS.

The natural spread of papaya ring spot virus (PRSV) disease in the eastern Uttar Pradesh region occurs by aphid vectors which transmit the disease through wounds created during sucking of sap for feeding. Five aphid vectors viz. Aphis craccivora, A. gossypii, A. citricola, Myzus persicae and Rhopalosiphum maidis, were very common in the surveyed areas. The present investigation was undertaken to evaluate the most efficient vector for natural transmission of papaya ring spot disease to Carica papaya. L. and to study the virus-vector relationship. Myzus persicae, was the most efficient (transmitting 70% disease within 12 days after inoculation feeding with severe ring spot and distortion of symptoms on foliage). It could acquire the virus without any pre-acquisition fasting, and showed a decline in transmission after 4 hrs of pre-acquisition fasting. It could acquire the virus in just 30 seconds of acquisition feeding with optimum at 3 min., the transmission efficiency showed a decline with further increase in acquisition feeding. The aphid could readily transmit PRSV after 2 min. of infection feeding with an optimum transmission after 6 min. of infection feeding. The virus was totally inactivated at 4 hrs of post-acquisition fasting. M persicae ceased to be infective very soon and could infect not more than 2 plants in succession revealing non-persistent nature' stylet borne nature of PRSV.

353 Debnath, A.; Uttar Banga Krishi Viswavidyalaya Pundibari (India). Department of Plant Pathology. Bandyopadhyay, S.; Uttar Banga Krishi Viswavidyalaya Pundibari (India). Department of Plant Pathology. Dutta, S.; Bidhan Chandra Krishi Viswavidyalaya, Mohanpur (India). Department of Plant Pathology. Bio-control options for management of rhizome rot

and wilt disease comples of ginger in terai agro-ecological region. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.193-196 KEYWORDS: GINGER. PSEUDOMONAS. RHIZOMES. ROTS. WILTS. DISEASE CONTROL. COMPLEXING. TRICHODERMA.

Among the different isolates of Trichoderma tested, Trpun (Trichoderma Pundibari isolate) showed the highest growth inhibition against Fusarium solani (50%) and Fusarium moniliforme (59%) in in vitro. Application of bio-agent consortia i.e. both Pseudomonas fluorescens and Trichoderma Pundibari isolate as seed and well as soil treatment showed improved plant vigour by producing highest dry weight of plant (27.90 g) as compared to other treatments. Maximwn disease reduction of 82.7% over control was found when rhizome and soil were treated with Pseudomonasjluorescens and Trichoderma Pundibari isolate combination. This treatment also produced the highest yield of 5.47 kg/plot.

354 Jain, Anuj; Janth Vedic College, Uttar Pradesh (India). Department of Botany. Mohan, Jitendra; Janth Vedic College, Uttar Pradesh (India). Department of Botany. Pathogenicity of fusarium oxysporum and meloidogyne incognita and cumulative effects on tomato. Annals of Plant Protection Sciences (India). (March 2010) v.18(2) p. 197-201 KEYWORDS: FUSARIUM OXYSPORUM. LYCOPERSICON ESCULENTUM. MELOIDOGYNE INCOGNITA. PATHOGENICITY.

The pathogenicity of wilt fungus Fusarium oxysporum f. sp. lycopersici and root-knot nematode Meloidogyne incognita was evaluated at different inoculum levels ontomato Solanum lycopersicum. Results showed that with the increase in time interval as well as inoculum level, there was corresponding increase in wilt indices. At the highest inoculum (4 g) mycelial mat! pot after 15 days of inoculation, there was complete wilting of all the lower leaves and terminal portion of stem. In general, lethal effects on tomato plant were observed at 2 g mycelial mat (containing 3 x 10 6 /conidia) pot/500g soil, wherein slight drooping of lower leaves was recorded after 30 days of inoculation. Pathogenicity of M incognita was also tested on tomato. An initial inoculum level of 1,000 J2/500g soil caused significant reduction in plant growth characters and 2 J2/g soil was found to be threshold level. Both the pathogens simultaneously or 10 days prior the other one revealed early expression of wilt symptoms in the treatments where fungus and nematode were inoculated simultaneously (N+F) or nematode was inoculated 10 days prior to fungus (N+F10).

355 Tyagi, Suruchi; Mahanand Mission Horizon College, Ghaziabad (India). Department of Botany. Mishra, Vandana; Mahanand Mission Horizon College, Ghaziabad (India). Department of Botany. Prasad, D.; Indian Agriculture Research Institute, New Delhi (India). Division of Nematology. Effect of Rotylenchulus reniformis on groundnut in presence or absence of Rhizoctonia bataicola. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.202-205 KEYWORDS: ARACHIS HYPOGAEA. MACROPHOMINA PHASEOLINA. ROTYLENCHULUS RENIFORMIS.

The interaction between reniform nematode Rotylenchulus reniformis and dry root rot fungus Rhizoctonia bataticola was studied on groundnut cv. M-13 under glass house conditions. The effect of the nematode in combination with the fimgus enhanced the suppression of plant growth characters. Maximum reduction in plant shoot weight (35.33 g) was observed when nematode was inoculated one week prior to fimgus. The nematode reproduction rate was also observed to be lowest (4.64), when nematode and fungus inoculated simultaneously.

356 Meher, H.C.; Indian Agricultural Research Institute, New Delhi (India). Division of Nematology. Gajbhaiye, V.T.; Indian Agricultural Research Institute, New Delhi (India). Division of Agricultural Chemicals. Prasad, D.; Indian Agricultural Research Institute, New Delhi (India). Division of Nematology. Singh, G.; Indian Agricultural Research Institute, New Delhi (India). Division of Nematology. Liquid chromatography method for estimation of free amino acids and a growth regulator from chick pea and tomato infected with Meloidogyne incognita. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.206-213 KEYWORDS: AMINO ACIDS. CICER ARIETINUM. HPLC. MELOIDOGYNE INCOGNITA. LYCOPERSICON ESCULENTUM.

A simple and rapid Liquid Chromatography method for estimation of histidine, methionine, leucine, isoleucine, phenylalanine, tyrosine, tryptophan and gibberellic acid from Cicer arietinum and Solanum lycopersicum was used. The main advantage is that it did not require sample derivatization and other amino acids did not interfere in the analysis. The method was based on a binary gradient resolution of the analytes in a reverse phase CIS column and UV detection and estimation at a wavelength of 210 nm. The mobile phase comprised of A [water +TFA (0.1%)] and B [acetonitrile + TFA (0.085%)]. The gradient was 25% B in 25 min at a flow rate of 1 ml/min with an equilibration time of 15 min. The method easily measured Phe, Tyr and Trp implicated in nematode-plant interactions. The method was validated for specificity, linearity, precision and applied for estimation of the test analytes from root, shoot and fruit of chick pea and tomato. The concentration of amino acids and GA3 were more in the galled than un-galled root tissues and consequently, their levels decreased in shoots and fruits of chick pea and tomato.

357 Gupta, R.L.; Indian Agricultural Research Institute, New Delhi (India). Division of Agricultural Chemicals. Prasad, D.; Indian Agricultural Research Institute, New Delhi (India). Division of Nematology. Bijul, Lakshman A.; Indian Agricultural Research Institute, New Delhi (India). Division of Agricultural Chemicals. Nematicidal activity of o,o-diaryl o-Ethyl phosphorothionates against Meloidogyne incognita. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.214-219 KEYWORDS: MELOIDOGYNE INCOGNITA. NEMATICIDES.

Twenty one O,O-diaryl O-ethyl phosphorothionates having different sustituents in the phenyl ring were tested in vitro for nematicidal activity against root-knot nematode, Meloidogyne incognita. Out of these, eight which showed good activity, were evaluated under glass house conditions on cowpea. These compounds had considerably increased the plant growth characters and significantly reduced the number of galls on the root system. O,O-Diphenyl O-ethyl phosphorothionate showed the highest activity in vitro (LC50=161 g/ml) and also highly decreased the galls besides significantly increasing all the plant growth parameters of cowpea at lower concentration i.e. 1251g/ml. Its nematicidal activity was found better than triazophos, a standard nematicide.

358 Singh, Sunaina; Mahanand Mission Horizon College, Ghaziabad (India. Department of Botany. Prasad, D.; Indian Agricultural Research Institute, New Delhi (India). Division of Nematology. Management of Rotylenchulus reniformis on sunflower through Botanicals. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(2) p.220-222 KEYWORDS: HELIANTHUS ANNUUS. ROTYLENCHULUS RENIFORMIS.

Plant growth characters of sunflower were significantly enhanced with the application of aqueous and acetone extracts of effective concentrations of leaves and roots of Calotropis procera, Solanum surattense, Datura stramonium and Parthenium hysterophorus. Growth of sunflower including shoot, root length, dry weights of shoot and root were significantly high in aqueous extracts of Calotropis leaf and root as against Parthenium, Solanum and Daturaleaf and root extracts. All the treatments of acetone extracts, Calotropis and Parthenium root were effective in enhancing growth parameters of sunflower. The population of R. reniformis in soil and root, 100 days after inoculation showed significant reduction of nematode population in both extracts of Calotropis leaf and root.

359 Nadaf, Hasansab A.; CCS Haryana Agricultural University, Hisar (India). College of Agriculture, Dept.of Entomology. Rao, S.R. Koteswara; Acharya N.G. Ranga Agricultural University, Hyderabad (India). College of Agriculture, Department of Entomology. Singh, T.V.K.; Acharya N.G. Ranga Agricultural University, Hyderabad (India). College of Agriculture, Department of Entomology. Rahman, S.J.; Acharya N.G. Ranga Agricultural University, Hyderabad (India). College of Agriculture, Department of Entomology. Effect of temperature and relative humidity on the biology of groundnut bruchid, caryedon serratus (Olivier) in controlled conditions. Legume Research (India). (Mar 2011) v.34(1) p.59-61 KEYWORDS: CARYEDON. BIOLOGY. TEMPERATURE. RELATIVE HUMIDITY.

Studies on the biology of C.serratus at ambient conditions, RH 50%, 80% and 90% at temperature 30°C revealed the average egg period as 6.3, 10.42, 5.48 and 7.12 days, the grub period of 21.08, 23.08, 20.72 and 19.18 days and the pupal period of 9.22, 13.66, 9.4 and 9.66 days at ambient conditions, RH 50%, 80% and 90% at temperature 30°C, respectively. The average longevity of adult male was 12.78, 20.98, 14.58 and 13.18days and adult female was 17.94, 25.44, 17.34 and 15.52 days at above ambient conditions.

360 Umbarkar, P.S.; Junagadh Agricultural University, Junagadh (India). College of Agriculture, Department of Entomology. Parsana, G.J.; Junagadh Agricultural University, Junagadh (India). College of Agriculture. Department of Entomology. Jethva, D.M.; Junagadh Agricultural University, Junagadh (India). College of Agriculture. Department of Entomology. Screening of greengram genotypes for resistance against gram pod borer, helicoverpa armigera (Hubner). Legume Research (India). (Mar 2011) v. 34(1) p.71-72 KEYWORDS: HELICOVERPA ARMIGERA. TESTING.

Among the ten genotypes/cultivars of greengram screened for their reactions to gram pod borer, H. armigera, GM-2K-5, GM-9926 and GM-2K-3 harboring 1.48, 2.20 and 2.30 larvae per plant, respectively were found comparatively less susceptible than genotypes GM-02-13 and GM-04-04, the highly susceptible ones with 4.65 and 4.09 larvae per plant, respectively. The remaining genotypes/cultivars viz., GM-9925, GM-9924, GM-05-08, GM-4 and GM-05-05 harburing 2.47, 3.08, 3.17, 3.23 and 3.31 larvae per plant, respectively registered moderately susceptible reactions.

361 Joshi, M.D.; Junagadh Agricultural University, Junagadh (India). College of Agriculture, Department of Entomology. Patel, V.N.; Junagadh Agricultural University, Junagadh (India). College of Agriculture, Department of Entomology. Effectiveness of beauveria bassiana on soybean leaf miner, Aproaerema modicella deventer. Legume

Research (India). (Mar 2011) v. 34(1) p.73-74 KEYWORDS: BEAUVERIA BASSIANA. SOYBEANS. GLYCINE MAX.

The results of two applications of nine different insecticidal treatments against leaf miner, (Aproaerema modicella Deventer) infesting soybean revealed that the treatments with all the chemicals were found most effective for the control of the pest. Among the eco-friendly pesticides used NSKE 5 per cent was found most effective followed by neemazol 2 ml/litre. Also, Beauveria bassiana was found effective against the pest as it showed increasing trend in the pest mortality.

362 Kambrekar, D.N.; UAS, Dharwad (India). Regional Agricultural Research Station. Somanagouda, G.; UAS, Dharwad (India). Regional Agricultural Research Station. Basavarajappa, M.P.; UAS, Dharwad (India). Regional Agricultural Research Station. Halagalimath, S.P.; UAS, Dharwad (India). Regional Agricultural Research Statiob. Effect of different dosages of emamectin benzoate 5 sg and indoxacarb 14.5 sc on pod borer, helicoverpa armigera infesting chickpea. Legume Research (India). (Mar 2012) v. 35(1) p.13-17 KEYWORDS: CHICKPEAS. CICER ARIETINUM. HELICOVERPA ARMIGERA.

The experiment on bio-efficacy of Emamectin benzoate 5% SG and Indoxacarb 14.5 SC on pod borer, Helicoverpa armigera was conducted at the Agricultural Research Station, Annigeri on variety Annigeri-1 during rabi 2010–11. Application of Emamectin benzoate 5 % SG 13 g a.i./ha resulted in maximum larval reduction, lesser pod damage and higher grain yield of chickpea which was followed by the same insecticide 11 g a.i./ha without any adverse effects of different dosages on the three natural enemies and no phytotoxic effects on chickpea crop. Further, Indoxacarb 14.5% SC 75 g a.i./ha has recorded maximum larval reduction, lesser pod damage and higher grain yield of chickpea which is followed by Indoxacarb 14.5 % SC 50 g a.i./ha.

363 Kanhere, R.D.; Junagadh Agricultural University, Junagadh (India). Department of Entomology. Patel, V.N.; Junagadh Agricultural University, Junagadh (India). Department of Entomology. Umbarkar, P.S.; Junagadh Agricultural University, Junagadh (India). Department of Entomology. Kakde, A.M.; Junagadh Agricultural University, Junagadh (India). Department of Entomology. Bio-efficacy of different insecticides against spotted pod borer, maruca testulalis (geyer) infesting cowpea. Legume Research (India). (Mar 2012) v. 35(1) p.44-46 KEYWORDS: COWPEAS. MARUCA VITRATA. MARUCA. VIGNA UNGUICULATA.

A field experiment was conducted to evaluate the relative efficacy of nine chemical insecticides against spotted pod borer, [Maruca testulalis (Geyer)] infesting cowpea during Kharif season of 2009. The results revealed that endosulfan 0.07 per cent caused highest mortality (89 to 87%) of M. testulalis. But the effectiveness of the eco-friendly insecticides like NSKE 5 per cent (85 to 83% mortality) and azadirachtin 0.001 per cent (84 to 82 per cent mortality) were statistically at par with that of endosulfan 0.07 per cent. Thus, two sprays of endosulfan (0.07%) or neem seed kernel extract (5%) or azadirachtin (0.001%), first at the time of 50 percent flowering and second at 15 days after first spray can be recommended to the farmers for controlling this pest on cowpea during the Kharif season which were equally effective (85 to 82% mortality) against M. testulalis infesting cowpea.

H20 Plant diseases

364 Dubey, Mukesh K.; Central Institute of Medicinal and Aromatic Plants, Lucknow (India). Genetic Resources and Biotechnology Division. Shasany, Ajit K.; Central Institute of Medicinal and Aromatic Plants, Lucknow (India). Genetic Resources and Biotechnology Division. Dhawan, Omp.; Avesthagen Limited, Bangalore (India). International Technology Park. Shukla, Ashutosh K. Khanuja, Suman P.S. AFLP Studies on downy-mildew-resistant and downy-mildew-susceptible Genotypes of Opium Poppy. Journal of Genetics (India). (Apr 2010) v. 89(1) p.9-19 KEYWORDS: DISEASE RESISTANCE. MILDEWS. PAPAVER SOMNIFERUM.

Downy mildew (DM) caused by Peronospora arborescens, is a serious disease in opium poppy (Papaver somniferum), which has a world-wide spread. The establishment of DM-resistant cultivars appears to be a sustainable way to control the disease. In this paper, we present the results of a study aimed at the identification of amplified fragment length polymorphism (AFLP) markers for DM-resistance in opium poppy. Three opium poppy genotypes (inbred over about 10 years): Pps-1 (DM-resistant), Jawahar-16 (DM-susceptible) and H-9 (DM-susceptible) were crossed in a diallel manner and the F1 progeny along with the parents were subjected to AFLP analysis of chloroplast (cp) and nuclear DNA with seven and nine EcoRI / MseI primer combinations, respectively. cpDNA AFLP analysis identified 24 Pps-1 (DM-resistant)-specific unique fragments that were found to be maternally inherited in both the crosses, Pps-1 × Jawahar-16 and Pps-1 × H-9. In the case of nuclear DNA AFLP analysis, it was found that 17 fragments inherited from Pps-1 were common to the reciprocal crosses of both (i) Pps-1 and Jawahar-16 as well as (ii) Pps-1 and H-9. This is the first molecular investigation on the identification of polymorphism between DM-resistant and DM-susceptible opium poppy genotypes and development of DM-resistant opium poppy genotype-specific AFLP markers. These AFLP markers could be used in future genetic studies for analysis of linkage to the downy mildew resistance trait.

365 Latha, P.; Regional Agricultural Research Station, Tirupati (India). Sudhakar, P.; Regional Agricultural Research Station, Tirupati (India). Krishna, M. Bala; College of Horticulture, Kodur (India). Department of Soil Science and Biochemistry. Began, C. Rajiya; Regional Agricultural Research Station, Tirupati (India). Reddy, K. Raja; Regional Agricultural Research Station, Tirupati (India). Estimation of groundnut kernel aflatoxins by high performance liquid chromatography using immunoaffinity column clean up and post column photochemical derivatization. Legume Research (India). (Mar 2011) v. 34(1) p.31-35 KEYWORDS: HPLC. GROUNDNUTS. ARACHIS HYPOGAEA. AFLATOXINS. ELISA.

This study was carried out in order to quantify the aflatoxins with precision through High Performance Liquid Chromatography (HPLC) using Immunoaffinity column clean up, Post Column Photochemical Derivatization and flurescence detection. Standard aflatoxin peaks (G1, G2, B1, B2) obtained by the above HPLC unit were sharp without any disturbances in the chromatogram. Peanuts which were artificially inoculated with virulent strain of Aspergillus flavus and in healthy peanuts were tested for aflatoxin levels by HPLC. The aflatoxin B1 was 516 ppb in infected sample and was completely absent in healthy groundnut kernels. Aflatoxin B1 concentration estimated by Indirect Competitive ELISA method (523 ppb) is slightly higher than those detected by HPLC (516 ppb).

366 Prasanthi, L.; Acharya N.G. Ranga Agricultural University, Tirupati (India). Regional Agricultural Research Station. Reddy, B.V. Bhaskara; Acharya N.G. Ranga Agricultural University, Tirupati (India). Regional Agricultural Research Station. Rani, K. Rekha; Acharya

N.G. Ranga Agricultural University, Tirupati (India). Regional Agricultural Research Station. Devi, R. Mehala; Acharya N.G. Ranga Agricultural University, Tirupati (India). Regional Agricultural Research Station. Geetha, B.; Acharya N.G. Ranga Agricultural University, Tirupati (India). Regional Agricultural Research Station. Prasad, Y. Siva; Acharya N.G. Ranga Agricultural University, Tirupati (India). Regional Agricultural Research Station. Reddy, K. Raja; Acharya N.G. Ranga Agricultural University, Tirupati (India). Regional Agricultural Research Station. Development of rapd/scar marker for yellow mosaic disease resistance in blackgram. Legume Research (India). (Jun 2011) v. 34(2) p.129-133 KEYWORDS: URD. RAPD. PLANT VIRUSES.

A total of 130 random oligonucleotide primers were surveyed to identify yellow mosaic resistant genotypes in blackgram. Primer OPQ-1525 was found to produce a consistent marker, which differentiated resistant genotype from susceptible genotype. An identified random amplified polymorphic DNA (RAPD) marker, OPQ-1, linked to YMV resistant was cloned and sequenced. Their end sequences were used to design an allele-specific sequence characterized amplicon region primer SCAR (20f/r). The marker designed was amplified at a specific site of 532bp only in resistant genotypes. This would help for screening different genotypes and segregating generations in marker-assisted breeding programme.

H50 Miscellaneous plant disorders

367 Singh, Samunder; CCS Haryana Agricultural University, Hisar (India). Dept. of Agronomy. Punia, S.S.; CCS Haryana Agricultural University, Hisar (India). Dept.of Agronomy. Yadav, Ashok; CCS Haryana Agricultural University, Hisar (India). Dept.of Agronomy. Hooda, V.S.; CCS Haryana Agricultural University, Hisar (India). Dept.of Agronomy. Evaluation of carfentrazone-ethyl+metsulfuron-methyl against broadleaf weeds of wheat. Indian Journal of Weed Science (India). (Jan-Jun 2011) v.43(1-2) p.12-22 KEYWORDS: HERBICIDES. SURFACTANTS. SYNERGISM. WHEATS.

Several broadleaf herbicides are available for weed control in wheat, but alone they are not effective against all infesting weeds. Tank mixture often results in antagonism or crop injury, thus reducing crop yield. Field experiments were conducted at CCS Haryana Agricultural University during 2009–10 and 2010–11 to evaluate the efficacy of premix of carfentrazone-ethyl+metsulfuron-methyl (17.5 to 50 g/ha) with and without surfactant and compared with alone application of carfentrazone (20 g/ha), metsulfuron (4 g/ha) and 2, 4-D amine (500 g/ha) along with weedy check treatment. Premix of carfentrazone+metsulfuron at 25 g/ha+0.2% surfactant provided effective control of Malva parviflora, Lathyrus aphaca, Convolvulus arvensis, Rumex dentatus, Melilotus indica, Medicago denticulata, Anagallis arvensis, Coronopus didymus and Chenopodium album which were not effectively controlled by alone application of these herbicides. A non-ionic surfactant (NIS) was essential to increase the efficacy of carfentrazone+metsulfuron mixture. Premix of carfentrazone+metsulfuron 25 g/ha with 0.2% NIS reduced the population of weeds by 97–99% during 2009–10 and 2010–11, respectively, provided 95% control of infested weeds, reducing their dry weight by 98–99%, increasing tiller numbers by 26%, biological yield by 28% and grain yield of wheat by 31% over untreated control. Crop injury (5–15%) by the application of carfentrazone+metsulfuron with 0.2% NIS or carfentrazone alone was transient and caused no reduction in crop yield. The premix of carfentrazone+metsulfuron 25 g/ha+0.2% NIS had similar level of control to its higher rates of 30 and 50 g/ha, but was

significantly better than alone application of 2, 4-D, metsulfuron or carfentrazone. In another field study, where Fumaria parviflora and Rumex spinosus were dominant weeds, tank mix of carfentrazone+metsulfuron 20+4 g with 0.2% NIS provided good control than their alone applications in a wheat field during 2009–10. The effect of tank mix application of carfentrazone+metsulfuron at 20+4 g/ha was similar to 600 g/ha of 2, 4-D amine and ester, but better than lower rates of 2, 4-D formulations. None of the 2, 4-D formulations was effective against R. spinosus, whereas metsulfuron, carfentrazone and their tank mix provided 85, 78 and 92% control of R. spinosus, respectively, and produced 41% higher tillers of wheat over untreated check. Similarly, tank mix of carfentrazone+metsulfuron 20+4 g/ha provided good control of F. parviflora in a fallow field during 2010–11. Alone application of carfentrazone or metsulfuron was not effective though plants treated with carfentrazone+metsulfuron recovered later on, but at later stages crop can smother it and the effect of tank mixture was similar to 600 g/ha of 2, 4-D ester, but better than its amine formulation and lower rates of 2, 4-D against this weed.

368 Singh, Samunder; CCS Haryana Agricultural University, Hisar (India). Dept. of Agronomy. Singh, Kuldeep; CCS Haryana Agricultural University, Hisar (India). Dept.of Agronomy. Punia, S.S.; CCS Haryana Agricultural University, Hisar (India). Dept.of Agronomy. Yadav, Ashok; CCS Haryana Agricultural University, Hisar (India). Dept.of Agronomy. Dhawan, Rupa S.; CCS Haryana Agricultural University, Hisar (India). Dept.of Agronomy. Effect of stage of phalaris minor on the efficacy of accord plus (fenoxaprop+ metsulfuron, readymix). Indian Journal of Weed Science (India). (Jan-Jun 2011) v.43(1-2) p.23-31 KEYWORDS: RESISTANCE TO CHEMICALS. HERBICIDES. TREATMENT DATE. PHALARIS. HERBICIDES. TANKS.

Screen house and field studies were carried out at CCS Haryana Agricultural University, Hisar during 2009–10 and 2010–11 to evaluate the efficacy of ready-mix formulation of fenoxaprop and metribuzin (Accord Plus) applied at two growth stages of Phalaris minor. Metribuzin 150, 180 and 210 g/ha and Accord Plus 275 g a.i./ha were compared with tank mix of pinoxaden+carfentrazone 50+20 g/ha each applied at 38 and 60 days after sowing (DAS) of wheat under field conditions during 2010–11. Delayed application resulted in 33 and 28% reduced efficiency of herbicides against P. minor, respectively, at 3 and 5 weeks after treatment (WAT) (data averaged over treatments). Metribuzin 150 and 180 g/ha was least effective against P. minor when applied 60 DAS, whereas its application at 210 g/ha and Accord Plus resulted in 44 and 16% lower mortality of P. minor, respectively, over their application 38 DAS. Delayed application also lowered wheat tillers resulting in lower grain yield. Wheat yield was reduced by 23 and 18% by metribuzin 210 g/ha and Accord Plus 275 g a.i./ha compared to 14% in tank mix of pinoxaden+carfentrazone when applied 60 over 38 DAS. Under screen house conditions, 19 populations of P. minor were evaluated at two growth stages (2–4 leaf and 4–6 leaf) with three rates of Accord Plus (137.5, 275 and 550 g a.i./ha) during 2009–10 and 2010–11. Mortality of P. minor populations was 44, 65 and 97% at the 4–6 leaf stage of application compared to 83, 98.5 and 100% when applied at the 2–4 leaf stage, respectively, with three rates of Accord Plus (data averaged over populations). Accord Plus 275 g a.i./ha applied at the 2–4 leaf stage provided 90–100% control of all the populations of P. minor, whereas delayed application at 4–6 leaf stage provided 45 to 85% control. P. minor populations, Rasidan, Nangla, Barhi, Suchan Kotli and Uchana were controlled by 50% by 275 g a.i./ha of Accord Plus application at 4–6 leaf stage. P. minor populations, Barhi, Suchan Kotli, Koyal,

Jakholi and Chanarthal were not completely knocked down by even 550 g a.i./ha of Accord Plus with delayed application at the 4–6 leaf stage. Some of these populations have already exhibited loss of efficacy against fenoxaprop and clodinafop under field conditions. Care need to be taken in timely application of Accord Plus where efficacy of one of the mixture partners (fenoxaprop) is questionable.

H60 Weeds

369 Singh, R.P.; Banaras Hindu University, Varanasi (India). Institute of Agricultural Sciences, Dept. of Agronomy. Singh, Ramesh K.; Banaras Hindu University, Varanasi (India). Institute of Agricultural Sciences, Dept. of Agronomy. Singh, M.K.; Banaras Hindu University, Varanasi (India). Institute of Agricultural Sciences, Dept. of Agronomy. Impact of climate and carbon cioxide change on weeds and their management-a review. Indian Journal of Weed Science (India). (Jan-Jun 2011) v.43(1-2) p.1-11 KEYWORDS: CLIMATIC CHANGE. PLANT COMPETITION. LIFE CYCLE. WEEDS.

Climate change directly affects the geographic range of species, the timing of species life cycle (phenology), the population dynamics of species, the decline and extinction of some species and the invasion of other species. Plants with C3 photosynthetic pathways are expected to benefit more than C4 from CO2 enrichment. However, rising global temperature may give competitive advantage to C4 plants than C3. This differential response of C3 and C4 plants will alter crop weed interaction because of the fact that majority of weeds are C4 and most of the food grain crops are C3. Higher levels of carbon dioxide could stimulate the growth of some weed species and greater production of rhizomes and tubers in perennial weeds making them difficult to control. Warmer temperatures will accelerate the rate at which day degrees accumulate, so the life cycles of some plant species may accelerate. As a result weeds are likely to mature and start to decay earlier.

370 Gupta, Anil; Kurukshetra University, Kurukshetra (India). Department of Botany. Aggarwal, Ashok; Kurukshetra University, Kurukshetra (India). Department of Botany. Chhavi, Mangla; Kurukshetra University, Kurukshetra (India). Department of Botany. Kumar, Aditya; Kurukshetra University, Kurukshetra (India). Department of Botany. Tanwar, Anju; Kurukshetra University, Kurukshetra (India). Department of Botany. Effect of herbicides fenoxaprop-p-ethyl and 2, 4-d ethyl-ester on soil mycoflora including vam fungi in wheat crop. Indian Journal of Weed Science (India). (Jan-June 2011) v. 43(1-2) p.32-40 KEYWORDS: WHEATS. MYCORRHIZAE. FUNGI. HERBICIDES. VESICULAR ARBUSCULAR MYCORRHIZAE.

Wheat (Triticum aestivum L.) is the major staple food of India and its increased production is essential for food security. Weeds constitute one of the biggest problems in agriculture that not only reduce the yield and quality of wheat crop but also utilize essential nutrients. Hence, weed control is essential for increasing wheat production. Despite of its control on weeds, herbicides also affect beneficial non-targeted soil microbes including VAM fungi. Fenoxaprop-P-ethyl and 2, 4-D ethyl-ester are two most widely used herbicides in northern India to control monocot and dicot weeds, respectively. However, their effects on mycorrhizal fungi are seldom highlighted. Therefore, the present investigation was focused on the effect of these herbicides on soil fungi of wheat crop alongwith special emphasis on mycorrhizal fungi. Three doses of each herbicide i. e. fenoxaprop and 2, 4-D (recommended dose 0.1 kg/ha; 0.5 kg/ha, half of the recommended dose 0.05 kg/ha; 0.25

kg/ha and double of the recommended dose 0.2 kg/ha; 1.0 kg/ha), respectively, were applied and their effect on soil fungi was studied at 30th, 60th, 90th and 120th day of treatment. Warcup's soil plate method, wet sieving and decanting technique and rapid clearing and staining techniques were used for qualitative study, isolation of mycorrhizal spores and root colonization, respectively. Our results indicate that both herbicides had significant deleterious effects on soil fungi, mycorrhizal spore numbers and percentage root colonization and this effect increased with herbicide concentration. In our chemical warfare against weeds, it is necessary to avoid serious injuries to the beneficial soil microbes. Therefore, use of herbicides in high doses should be resorted to carefully and judiciously.

371 Walia, U.S.; Punjab Agricultural University, Ludhiana (India). Department of Agronomy. Kaur, Tarundeep; Punjab Agricultural University, Ludhiana (India). Department of Agronomy. Nayyar, Shelly; Punjab Agricultural University, Ludhiana India). Department of Agronomy. Kaur, Rupinder; Punjab Agricultural University, Ludhiana (India). Department of Agronomy. Performance of ready mix formulation of fenoxaprop+metribuzin for the control of grass and broadleaf weeds in wheat. Indian Journal of Weed Science (India). (Jan-June 2011) v. 43(1-2) p. 41-43 KEYWORDS: WHEATS. PHALARIS. HERBICIDES. AGROPYRON.

An experiment was conducted for three years at the Research Farm of Department of Agronomy, Punjab Agricultural University, Ludhiana during rabi seasons of 2007–08 to 2009–10. The experimental field was heavily infested with Phalaris minor and broadleaf weeds. A new herbicide i. e. AEF 04 6360-8%+DIC 1468–14%-22% EC (fenoxaprop-P-ethyl+metribuzin) was applied at 165, 220, 275, 330 and 550 g/ha as post-emergence (30–35 DAS). The results of three years revealed that application of this herbicide at 275 and 330 g/ha provided effective control of P. minor and broadleaf weeds in wheat crop and were found statistically at par with Atlantis 3.6 WDG (mesosulfuron 3.0%+iodosulfuron 0.6% at 12+2.24 g) on dry matter accumulation by P. minor and broadleaf weeds. On an average of three years, post-emergence application of AEF 046360-8%+DIC 1468–14%-22% EC at 275 and 330 g/ha as well as Atlantis 3.6 WDG at 14.4 g/ha increased wheat grain yield by 58.8, 64.2 and 67.3% as compared to unweeded (control) treatment, respectively.

372 Kumar, Pawan; CCS Haryana Agricultural University, Hisar (India). Dept.of Agronomy. Yadav, S.K.; CCS Haryana Agricultural University, Hisar (India). Dept.of Agronomy. Kumar, Manoj; CCS Haryana Agricultural University, Hisar (India). Dept.of Agronomy. Influence of integrated nutrient management on weed emergence and productivity in pearl millet (Pennisetum glaucum)-wheat (Triticum aestivum) cropping system. Indian Journal of Weed Science (India). (Jan-June 2011) v. 43(1-2) p. 44-47 KEYWORDS: NUTRITIONAL REQUIREMENTS. NUTRIENTS. FERTILIZERS. ORGANIC FERTILIZERS. WEEDS. WHEATS.

Field investigations conducted at CCS Haryana Agricultural University, Hisar, India during 2007–08 and 2008–09 revealed that both the doses and sources of nutrients increased weed emergence in pearl millet-wheat cropping system. The increase in fertilizer dose decreased weed emergence and manures as source of nutrients increased weed emergence during both the crops. The increase in fertilizer dose increased pearl millet, wheat and wheat equivalent yield and highest yield was recorded with the application of 50% recommended NPK dose through fertilizers+50% N through farm yard manure in kharif and 100% recommended NPK dose through fertilizers in rabi season during both the years and it was closely followed by the treatment where recommended dose during both the years was applied through chemical fertilizers. Among the organic sources, the increase in

yield was highest with farm yard manure (FYM) and it was followed by green manure and wheat straw in descending order of magnitude.

373 Punia, S.S.; CCS Haryana Agricultural University, Hisar (India). Dept.of Agronomy. Singh, Samunder; CCS Haryana Agricultural University, Hisar (India). Dept.of Agronomy. Yadav, Dharambir; CCS Haryana Agricultural University, Hisar (India). Dept.of Agronomy. Bioefficacy of imazethapyr and chlorimuron-ethyl in clusterbean and their residual effect on succeeding rabi crops. Indian Journal of Weed Science (India). (Jan-June 2011) v. 43(1-2) p.48-53 KEYWORDS: CROPS. RESIDUAL EFFECTS. MUSTARD. WHEATS. CHICKPEAS.

Bioefficacy and phytotoxicity of imazethapyr and chlorimuron in clusterbean and its carryover effect on succeeding rabi crops was studied in field experiments at CCSHAU, Hisar during kharif 2006–07 and 2007–08. Weed flora of the experimental field was dominated by Digera arvensis, Trianthema portulacastrum, Physallis minima, Corchorus olitorius, Solanum nigrum and Cyperus rotundus. Post-emergence application of chlorimuron at 6 and 8 g/ha although provided good (90–92%) control of weeds but caused 20–30% injury to clusterbean resulting in severe yield reductions. PPI (pre-plant incorporation), PRE (pre-emergence) and POE (post- emergence) application at 21–28 DAS at 80–100 g/ha of imazethapyr provided season long control (85–95%) of clusterbean weeds. POE application of imazethapyr at 80 and 100 g/ha although caused mild injury to clusterbean in terms of yellowing of leaves and stunted crop growth upto 7 DAT, but it diminished within three weeks without any yield reduction. Maximum seed yield (1424 kg/ha) of clusterbean was obtained with imazethapyr at 100 g/ha PRE which was at par with weed free check, but during 2007, PRE application of imazethapyr at 80 g/ha gave maximum seed yield (1720 kg/ha) which was at par with its application at 80 and 100 g/ha as PRE, PPI or post-emergence 21 DAS. Chlorimuron and imazethapyr, irrespective of their dose and time of application, did not cause any injury to wheat, barely and chickpea planted as succeeding crop after harvest of clusterbean, but both these herbicides caused severe injury to mustard.

374 Pasha, Md. Latheef; Acharya N.G. Ranga Agricultural University, Hyderabad (India). Department of Agronomy. Reddy, M.D.; Acharya N.G. Ranga Agricultural University, Hyderabad (India). Department of Agronomy. Reddy, M.G.; Acharya N.G. Ranga Agricultural University, Hyderabad (India). Department of Agronomy. Devi, M.Uma; Acharya N.G. Ranga Agricultural University, Hyderabad (India). Department of Agronomy. Effect of irrigation schedule, weed management and nitrogen levels on weed growth in rice (Oryza sativa) under aerobic conditions . Indian Journal of Weed Science (India). (Jan-June 2011) v. 43(1-2) p.54-60 KEYWORDS: RICE. WEEDING. PENDIMETHALIN. NITROGEN. IRRIGATION SCHEDULING. AEROBIOSIS.

A field study was conducted at Agricultural Research Station, Kampasagar, Nalgonda district of Andhra Pradesh during the kharif seasons of 2008 and 2009 to find out the effect of irrigation schedules, weed management practices and nitrogen levels on weed growth, nutrient depletion and yield of aerobic rice. The major weed flora observed in the experimental plot was Echinochloa colona L., Cynodon dactylon Pers., Dactyloctenium aegyptium Beauv., Cyperus rotundus L. (Monocots), Eclipta alba Hassk., Trianthemaportulacastrum L. and Amaranthus viridis L. (Dicots) during both the years. Irrigation scheduled at seven days interval during vegetative stage and four days interval during reproductive stage resulted in significantly higher weed density, weed dry matter

production and NPK removal by weeds and higher panicle number and weight, filled spikelets per panicle grain yield and NPK uptake at harvest than that of irrigation scheduled once in two days. Pre-emergence application of pendimethalin 1 kg/ha fb cono weeding at 30 DAS and one HW at 45 DAS recorded significantly lower weed density, weed dry matter production and NPK uptake by weeds and significantly higher panicle number and weight, filled spikelets per panicle, NPK uptake at harvest and grain yield than that of pre-emergence application of pendimethalin 1 kg/ha fb 2, 4-D Na salt 1 kg/ha at 40 DAS and HW at 20 and 45 DAS. Among latter treatments, significantly lower values of above said weed parameters and significantly higher crop parameters were observed with pre-emergence application of pendimethalin 1 kg/ha fb 2, 4-D Na salt 1 kg/ha at 40 DAS as compared to HW at 20 and 45 DAS. Weed density, weed dry matter production and NPK removal by weeds and panicle number, length and weight, filled spikelets per panicle, grain yield and NPK uptake at harvest were significantly higher at 180 kg N/ha during both the years.

375 Maity, Swapan Kumar; Uttar Banga Krishi Viswavidyalaya, Cooch Behar (India). Department of Agronomy. Mukherjee, P.K.; Uttar Banga Krishi Viswavidyalaya, Cooch Behar (India). Department of Agronomy. Effect of brown manuring on grain yield and nutrient use efficiency in dry direct seeded kharif rice (Oryza sativa L.). Indian Journal of Weed Science (India). (Jan-June 2011) v. 43(1-2) p.61-66 KEYWORDS: WEEDS. INTEGRATED CONTROL. RICE. FLORA. NUTRIENTS. EFFICIENCY.

A field study was carried out during kharif seasons of 2006 and 2007 at university research farm for generating information on weed flora and to work out integrated weed management practices with its economics in dry direct seeded kharif rice. Among the weed flora, emergence of grasses like Cynodon dactylon and Echinochloa colona, sedges like Cyperus rotundus, Cyperus iria and Fimbristylis miliacea and broad-leaved weeds like Ludwigia parviflora, Ageratum conyzoides, Spilanthes paniculata, Eclipta alba and Enhydra fluctuans were recorded during experimentation. Among the integrated weed management practices, butachlor 1.5 kg/ha as pre-plant surface application followed by practices of brown manuring and post-emergence application of 2, 4-D 0.50 kg/ha at 40 days after sowing recorded highest grain yield (3.0 and 3.88 t/ha), highest net returns (Rs.11889 and 19029/ha) and benefit: cost ratio (0.74 and 1.19) during both the years of investigation. The grain yield was statistically at par with the grain yield (3.14 and 3.98 t/ha) obtained from season long weed free condition. There has been considerable improvement in nutrient use efficiency due to adoption of weed control practices coupled with nitrogen management and among the integrated weed management practices highest nutrient use efficiency of N (50.00 and 64.67 kg grain yield/kg nutrient applied), P (229.36 and 296.64 kg grain yield/kg nutrient applied) and K (90.36 and 116.87 kg grain yield/kg nutrient applied) were highest with butachlor 1.5 kg/ha + brown manuring + 2, 4-D 0.5 kg/ha in both the years.

376 Kachroo, Dileep; Sher-e-Kashmir University of Agricultural Science and Technology, Jammu (India). Farming System Research Centre. Bazaya, B.R.; Sher-e-Kashmir University of Agricultural Science and Technology, Jammu (India). Farming System Research Centre. Efficacy of different herbicides on growth and yield of direct wet seeded rice sown through drum seeder. Indian Journal of Weed Science (India). (Jan-June 2011) v. 43(1-2) p.67-69 KEYWORDS: WEEDS. WEED CONTROL. RICE. CROAKERS. HERBICIDES. ECONOMICS.

An investigation was conducted at Chatha Farm of Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu during kharif seasons of 2006 and 2007 on

the efficacy of different herbicides on growth and yield of direct wet seeded rice (DWSR) sown through drum seeder. Fourteen weed control treatments were tested in randomized block design replicated thrice. All the weed control treatments significantly reduced the population and dry weight of weeds which resulted in significantly higher growth and yield of rice over weedy check. Though the weed free treatment yielded significantly higher than other treatments, but it was not economical (1.55 B: C ratio). Among the herbicides pretilachlor 0.5 kg/ha at 6 DAS fb rotary hoe at 20 DAS not only significantly reduced population and dry weight of weeds but also increased the grain yield of rice with the concomitant increase in the yield attributes and also resulted in highest net returns (Rs. 25918/ha) and benefit: cost ratio (2.25).

377 Ratnam, M.; Regional Agricultural Research Station, Guntur (India). Rao, A.S.; Regional Agricultural Research Station, Guntur (India). Integrated weed management in chickpea (Cicer arietinum L.). Indian Journal of Weed Science (India). (Jan-June 2011) v. 43(1-2) p.70-72 KEYWORDS: WEEDS. WEED CONTROL. CHICKPEAS. CICER ARIETINUM. OXYFLUORFEN.

A field experiment was conducted during rabi 2006–07 to 2008–09 at RARS, Lam Farm, Guntur to find out most suitable integrated weed management practice for control of weeds in chickpea. Results indicated that weed control treatments significantly reduced the density and dry weight of weeds in chickpea. Post-emergence application of imazethapyr 63 g/ha caused 20% crop injury among the herbicides under study. Integrated treatments were found to be superior (83–89% WCE) to alone application of herbicides. Among the treatments, pre-emergence application of oxyfluorfen 100 g/ha fb hand weeding at 30 DAS recorded maximum (2272 kg/ha) and was on par with all other integrated treatments and also with hand weeding at 15 and 30 DAS. Among the individual herbicides, pre-emergence application of pendimethalin 1.5 kg/ha recorded maximum grain yield and was on par with other individual herbicides.

378 Degra, M.L.; Agricultural Research Station, Jaipur (India). Pareek, B.L.; Rajasthan Agricultural University, Bikaner (India). Department of Agronomy. Shivran, R.K.; ARS, Kota (India.)Jat, R.D.; CCSHAU, Hisar (India). Integrated weed management in indian mustard and its residual effect on succeeding fodder pearl millet. Indian Journal of Weed Science (India). (Jan-June 2011) v. 43(1-2) p.73-76 KEYWORDS: MUSTARD. WEEDS. RESIDUAL EFFECTS. PENNISETUM GLAUCUM. WEED CONTROL. NITROGEN. SULPHUR.

A field experiment was conducted at the Agronomy Farm, ARS, Durgapura, Jaipur during 2003–05 on loamy sand soils analyzing low in available N and S and medium in available P and K. The increasing rates of S did not influence the weed density by markedly increasing the dry matter of weeds. Hand weeding twice showed the maximum control of weeds, which was significantly superior to other treatments. The successive rates of S nutrition upto 60 kg `S/ha markedly enhanced the dry matter, siliquae, seeds/siliqua and seed yield plant in both the years. However, plant height and 1000-seed weight showed significant response only upto 40 kg S/ha and remained at par with higher levels of S nutrition. The yield of succeeding fodder pearl millet was highest (370.0 q/ha) weed control measures brought about measurable improvement in growth and yield attributes, and yield of mustard compared with the weedy check. The two HW being at par with the herbicides coupled with HW increased the pooled mean seed yield of mustard significantly by 46.3% over weedy check. The application of 60 kg S/ha recorded significantly highest (Rs.

21077/ha) pooled mean, net return and B: C ratio (2.51) of mustard over lower levels. Two HW being at par with both the herbicides coupled with HW gave highest net return (Rs. 20050/ha), whereas B: C ratio was significantly higher under isoproturon 0.50 kg/ha with 60 kg S/ha.

379 Singh, Guriqbal; Punjab Agricultural University, Ludhiana (India). Department of Plant Breeding and Genetics. Weed management in summer and kharif season blackgram [Vigna mungo (L.) Hepper]. Indian Journal of Weed Science (India). (Jan-June 2011) v. 43(1-2) p.77-80 KEYWORDS: URD. VIGNA MUNGO. PLANT COMPETITION. WEEDS. ECONOMICS. FLUCHLORALIN. PENDIMETHALIN.

Field experiments conducted during summer seasons for four years (2002, 2003, 2004 and 2005) and during kharif seasons for three years (2002, 2003 and 2005) showed that unchecked weeds caused a reduction of 41.2 and 41.6% in blackgram yield during the two respective seasons. In summer season, pendimethalin 0.75 kg/ha, pendimethalin 0.45 kg/ha+hand weeding (HW) 25 days after sowing (DAS), fluchloralin 0.675 kg/ha, two HW 25 & 40 DAS and weedy check recorded weed dry matter of 4.87, 3.45, 5.87, 3.40 and 23.6 q/ha and grain yield of 11.47, 11.75, 10.72, 11.95 and 7.02 q/ha with net returns of Rs. 10033, 10035, 9401, 9330 and 4828/ha, respectively. In kharif season, the respective treatments had weed dry matter of 4.16, 4.26, 4.93, 2.90 and 20.9 q/ha and grain yield of 10.43, 10.76, 10.60, 11.76 and 6.86 q/ha with net returns of Rs. 8577, 8649, 9233, 9064 and 4604/ha.

380 Yadav, S.L.; Maharana Pratap University of Agriculture & Technology, Udaipur (India). Department of Agronomy. Kaushik, M.K.; Maharana Pratap University of Agriculture & Technology, Udaipur (India). Department of Agronomy. Mundra, S.L.; Maharana Pratap University of Agriculture & Technology, Udaipur (India). Department of Agronomy. Effect of weed control practices on weed dry weight, nutrient uptake and yield of clusterbean [Cyamopsis tetragonoloba (L.) Taub.] under rainfed condition. Indian Journal of Weed Science (India). (Jan-June 2011) v. 43(1-2) p.81-84 KEYWORDS: CYAMOPSIS PSORALIOIDES. PENDIMETHALIN. ALACHLOR. WEEDING. WEEDS.

Imazethapyr, quizalofop-P-ethyl, pendimethalin and alachlor at 0.1, 0.06, 1.0 and 2.0 kg/ha, respectively, alone and with hand weeding 40 DAS were compared with one and two hand weedings against mixed weed flora in clusterbean. All the weed control treatments significantly reduced the dry weight of complex weed flora, although they differed in their effect on monocot and dicot weeds. Imazethapyr alone and with hand weeding 40 DAS effectively controlled both monocot and dicot weeds, while quizalofop-ethyl controlled only monocot weeds. Uninterrupted weed growth depleted 108.5 kg N, 15.8 kg P and 151.6 kg K/ha, while such losses were lowest with two hand weedings 20 and 40 DAS. Highest grain yield was obtained with weed free check (1840 kg/ha) followed by two hand weedings (1720 kg/ha) and imazethapyr 100 g/ha+hand weeding 40 DAS (1711 kg/ha) and it was significantly higher than all other treatments. Maximum uptake of N (133.8 kg/ha), P (32.5 kg/ha) and K (135.1 kg/ha) by clusterbean was recorded in two hand weedings (20 and 40 DAS), while in weedy check plots N, P and K uptake by crop was 40.6, 9.8 and 41.1 kg/ha, respectively.

381 Singh, M.; University of Florida/IFAS, Florida (USA). Citrus Research and Education Center, Department of Horticulture Science. Sharma, Shiv D.; University of Florida/IFAS,

Florida (USA). Citrus Research and Education Center. Department of Horticulture Science. Singh, Samar; CCSHAU, Uchani, Karnal (India). Regional Research Station. Influence of surfactants and ammonium sulfate on the efficacy of glyphosate. Indian Journal of Weed Science (India). (Jan-June 2011) v. 43(1-2) p.85-89 KEYWORDS: GLYPHOSATE. SURFACTANTS. AMMONIUM SULPHATE. GRASSES. HERBICIDES.

A study was conducted to examine the effect of ammonium sulfate (AMS) applied with and without surfactants (Induce, Silwet L-77 and Methylated seed oil) on the efficacy of glyphosate. Herbicide treatments were applied to broadleaf weeds-Brazil pusley (Richardia brasiliensis), Spanish needles (Bidens pilosa), Florida beggarweed (Desmodium tortuosum) and Pigweed (Amaranthus retroflexus) and grassy weeds-Guineagrass (Panicum maximum), Johnsongrass (Sorghum halepense) and Crowfoot grass (Dactyloctenium aegyptium). The per cent control of both weed types was significantly higher with the application of AMS or the surfactant individually, or the surfactant plus AMS to glyphosate at 370 g/ha over no surfactant or AMS. Per cent control of grass weeds was 100 with the addition of any one of the surfactant except with glyphosate+L-77, where per cent control of Guinea grass and Johnson grass was only 82 and 85, respectively, two weeks after treatment (WAT). Per cent control of Brazil pusley and Spanish needles with glyphosate at 370 g/ha was low (20–38) 1 WAT. Addition of AMS improved efficacy of glyphosate in Brazil pusley 1 and 2 WAT. This effect, however, could not be observed 3 WAT. Effect of addition of AMS was apparent in Spanish needles and Florida beggarweed 2 WAT. Glyphosate alone, however, provided 93–100% control of Spanish needles, Florida beggarweed and pigweed 3 WAT. Per cent control of grassy weeds was complete 2 WAT with glyphosate at 370 g/ha with or without surfactants except with L-77 where it showed antagonistic effect.

382 Meena, Babulal; Junagadh Agricultural University, Junagadh (India). Sagarka, B.K.; Junagadh Agricultural University, Junagadh (India). Pisal, R.R.; Junagadh Agricultural University, Junagadh (India). Impact of some herbicides and cultural practices on weed and crop parameters in kharif pigeonpea [Cajanus cajan (L.) Millsp.]. Legume Research (India). (Mar 2011) v. 34(1) p.55-58 KEYWORDS: CAJANUS CAJAN. PIGEON PEAS. WEEDS. HERBICIDES. PENDIMETHALIN. YIELDS.

Integration of pendimethalin pre emergence, quizalofop ethyl post emergence and oxadiargyl pre emergence with one hand weeding and one interculturing at 40 DAS proved effective in reducing total weed density and dry weight of weeds. The maximum yield and net return accured under weed- free closely followed by pendimethalin 900 g ha−1 as pre emergence followed by one hand weeding and one interculturing at 40 DAS, quizalofop ethyl 40 g ha-1 as post emergence followed by one hand weeding and one interculturing at 40 DAS and oxadiargyl 90 g ha-1 as pre emergence followed by one hand weeding and one interculturing at 40 DAS.

383 Ali, Shaukat; S.D. Agricultural University, Banaskantha (India). C.P. College of Agriculture, Department of Agronomy. Patel, J.C.; S.D. Agricultural University, Banaskantha (India). C.P. College of Agriculture, Department of Agronomy. Desai, L.J.; S.D. Agricultural University, Banaskantha (India). C.P. College of Agriculture, Department of Agronomy. Singh, Jitendra; S.D. Agricultural University, Banaskantha (India). C.P. College of Agriculture, Department of Agronomy. Effect of herbicides on weeds and yield of rainy season greengram (Vigna radiata L. wilczek). Legume Research (India). (Dec 2011) v. 34(4) p.300-

303 KEYWORDS: MUNG BEANS. VIGNA RADIATA RADIATA. PENDIMETHALIN. WEEDS. YIELDS.

A field experiment was conducted during rainy season of 2009 on sandy loam soil to study the influence of weeds on yield of rainy season greengram (Vigna radiata L. Wilczek). Application of imazethapyr 100 g/ha at 15–20 days after sowing was found most effective in reducing population and dry weight of weeds and maximum yield of greengram Quizalofop-p-ethyl 100 g/ha applied at 15–20 DAS was also equally effective.

J10 Handling, transport, storage and protection of agricultural products

384 Geetha, R.; Agricultural College & Research Institute, Madurai (India). Department of Seed Science & Technology. Krishnasamy, V.; Agricultural College & Research Institute, Madurai (India). Department of Seed Science & Technology. Effect of scarification and storability of Cenchrus glaucus (Blou buffel) cv. CO1. Range Management and Agroforestry (India). (Dec 2011) v.32(2) p.104-107 KEYWORDS: CENCHRUS. ACIDIFICATION. DORMANCY. FORAGE. GRASSES. KEEPING QUALITY.

Cenchrus seeds are chaffy, light and bulky, which do not flow freely, adding to the cost of cleaning, storage and transport. Seed scarification with sulphuric acid 300ml/kg for 5 and 10 minutes duration greatly reduced the bristles without any damage to caryopses. The scarified seeds recorded higher germination of 44% as compared to control (23%). Scarification did not affect the viability of seeds. The loss in vigour of the seeds was observed only after eight months of storage.

385 Jayashree, E.; Indian Institute of Spices Research, Kozhikode (India). Visvanathan, R.; Indian Institute of Spices Research, Kozhikode (India). Thin layer drying of ginger (Zingiber officinale) in a multi-rack type solar tunnel drier. Indian Journal of Agricultural Sciences (India). (Apr 2012) v. 82(4) p. 351-5 KEYWORDS: DRYING. QUALITY. SOLAR ENERGY.

Drying of ginger in a multi-rack type solar tunnel drier was studied. The drier consists of a UV-stabilized transparent plastic collector and a drying tunnel. Fresh ginger rhizomes were washed, peeled, spread in single layer in trays and dried from an initial moisture content of 594.01 to final moisture content of 9.89% (db). The temperature, relative humidity and solar intensity received under ambient and inside the solar tunnel drier were recorded. Mathematical modeling for thin layer drying showed that the diffusion approximation model best described the overall drying process of ginger in a solar tunnel drier. The overall effective moisture diffusivity of ginger in solar tunnel drier was 1.82 × 10-7 m2/s. The essential oil and oleoresin content of solar tunnel dried ginger were 2.0 and 4.5%, respectively and was at par with the quality of sun dried ginger. However, the microbial load of solar tunnel dried ginger was 6.12 log cfu/g where as for sundried ginger it was 6.69 log cfu/g and hence solar tunnel drying was considered superior.

386 Umbarkar, P.S.; Junagadh Agricultural University, Junagadh (India). College of Agriculture. Parsana, G.J.; Junagadh Agricultural University, Junagadh (India). College of Agriculture. Jethva, D.M.; Junagadh Agricultural University, Junagadh (India). College of Agriculture. Estimation of yield losses by pod borer complex in greengram. Legume Research (India). (Dec 2011) v. 34(4) p.308-310 KEYWORDS: VIGNA RADIATA RADIATA. YIELDS. MUNG BEANS.

Investigations were carried out to evaluate the yield losses caused by pod borer complex on greengram during kharif, 2008 at College Farm, Junagadh Agricultural University, Junagadh. The results revealed that lower larval population of pod borers was observed in protected plots than unprotected plots. Significantly minimum pod damage (12.94%) and grain damage (9.47%) were recorded from protected plots. By providing protection with the endosulfan 0.07% and monocrotophos 0.04% alternatively at weekly intervals starting from flowering stage to the pod maturity stage of the crop, 513.67 kg/ha grain yield and 36.41% avoidable yield loss can be saved.

N01 Agricultural engineering

387 Singh, Dushyant; Central Institute of Agricultural Engineering, Bhopal (India). Mondal, D.P.; Central Institute of Agricultural Engineering, Bhopal (India). Heat-treatment process and peening intensity on abrasive wear response of agricultural grade boron steel in dry sand and slurry. Indian Journal of Agricultural Sciences (India). (Feb 2012) v. 82(2) p. 152-7 KEYWORDS: EQUIPMENT. FARM EQUIPMENT. ARID ZONES. SAND. HEAT TREATMENT. CYCLING. SOIL.

The aim of present study is to understand the low stress abrasive wear response of heat-treated and shot peened agricultural grade boron steel under dry and slurry conditions. Heat-treatment (annealing, inter-critical annealing and quenching and tempering) was carried out to alter the mechanical as well microstructural properties of steel. The surface properties were further improved by shot peening carried out at 0.17 A and 0.27 A peening intensities. The wear test methodology adopted in this study is very well simulated with working condition of soil working fast wearing components of agricultural implements like cultivator sweeps, furrow opener of seed drills and plough share etc. The study reveals that the heat-treatment and shot peening together improve the abrasive wear resistance of boron steel significantly in dry condition but heat-treatment does not have any significant effect on abrasive wear resistance in slurry due to the presence of corrosive media, besides shot peening under such circumstances leads to inferior wear resistance. This technique is found promising to improve the quality of soil working agricultural components working in dry condition but not fruitful in slurry condition.

P05 Energy resources and management

388 Mallikarjuna, G.B.; University of Agricultural Sciences, Manjunath , Bangalore (India). Gandhigram Krishi Vigyan Kendra. T.R.; Kuvempu University, Shivamogga (India). Megeri, S.M.; University of Agricultural Science, Dharwad (India). Department of Statistics. Statistical approach to energy use efficiency of maize-urdbean intercropping system. Legume Research (India). (Jun 2011) v. 34(2) p.134-138 KEYWORDS: INTERCROPPING. MAIZE. ZEA MAYS.

Replicated values of energy use efficiency of different data sets were subjected to Anderson-Darling Normality Test and Shapiro-wilk test. Non significant result noticed between the data sets indicated analyses using regular analysis of variance (parametric). Analysis of variance of the values of energy use efficiency noticed to be non significant between the treatments in all the data sets. However, for maize it could be noticed that overall energy use efficiency is noticed to be better in Paired row of maize with two rows of urdbean, which recorded energy use efficiency value 11.56 compared to 11.26 and 11.00 of 2:1 and 1:1 row ratio respectively.

P10 Water resources and management

389 Palsaniya, D.R.; National Research Centre for Agroforestry, Jhansi (India). Singh, Ramesh; National Research Centre for Agroforestry, Jhansi (India). Tiwari, R.K.; National Research Centre for Agroforestry, Jhansi (India). Yadav, R.S.; National Research Centre for Agroforestry, Jhansi (India). Dhyani, S.K.; National Research Centre for Agroforestry, Jhansi (India). Integrated watershed management for natural resource conservation and livelihood security in semi-arid tropics of India. Indian Journal of Agricultural Sciences (India). (Mar 2012) v. 82(3) p. 241-7 KEYWORDS: WATERSHED MANAGEMENT. NATURAL RESOURCES. NATURE CONSERVATION. SEMIARID CLIMATE.

Present study was undertaken during 2005–06 to 2009–10 to assess the impact of integrated watershed management interventions, viz soil and water conservation measures, agroforestry development, crop demonstrations with improved package of practices, plantation and human resource development on natural resource conservation and livelihood security in Garhkundar–Dabar watershed. Soil and water conservation measures generated 25 thousand cubic m water storage capacity, reduced number of dry wells to 2 % from 86 %, increased average available water column depth in wells from 0.88 m to 4.36 m and enhanced water availability to round-the-year from four to five months during the study period. Runoff per unit area and soil loss from treated watershed was 46 and 42.2 % lower than the untreated watershed respectively in 2009. The average productivity of major crops and cropping intensity increased by 26 and 119.5% respectively in 2009–10 as compared to 2005–06. The fodder availability increased by 208 % and within four years, watershed became a fodder secure area with fodder surplus of 1.992 tonne/year/animal as compared to (-) 0.569 tonne/year/animal in 2005–06. The increased direct and indirect employment opportunities in watershed reduced migration to 9% in 2009–10 from 29% in 2007–08.

P30 Soil science and management

390 Singh, I.S.; Central Institute of Arid Horticulture, Bikaner (India). Awasthi, O.P.; Changes in soil properties under tree species Singh, R.S.; Changes in soil properties under tree speciesMore, T.A.; Changes in soil properties under tree speciesMeena, S.R.; Changes in soil properties under tree species. Changes in soil properties under tree species. Indian Journal of Agricultural Sciences (India). (Feb 2012) v. 82(2) p. 146-51 KEYWORDS: CATIONS. ION EXCHANGE CAPACITY. LOAM SOILS. SAND. NUTRIENT AVAILABILITY. SOIL. TREE CLASSES.

A study was conducted to study the effects of ber (Ziziphus mauritiana Lamk), drumstick (Moringa olerifera Lam), karonda (Carissa congesta Wt.) and khejri (Prosopis cineraria L. Druce) on the physical and chemical properties of soil at different depths (0–15, 15–30, 30–45 and 45–60 cm). The increase in the porosity and water-holding capacity and decrease in the bulk density (of subsurface soils) in the sites under plantations were marginal, when compared to open sites. There was slight decrease in the pH of soil under vegetated area, whereas no appreciable change in EC was observed. There was an appreciable increase in the organic carbon (0.04 to 0.13%) and available nitrogen content (69 to 100 kg/ha) in the sites under vegetation. Fruit plants, particularly ber and drumstick

growing in the arid region indicated the process of deposition of bases such as Ca and Mg in the surface layers from lower strata. Overall results showed that exchangeable cations such as Ca, Mg, and Na and available P and K have depicted a poor potential activity in the maintenance of fertility which is affected by the young nature of plantation. The increase/decrease of soil properties due to the influence of plantation was more in surface (0–15 cm) and subsurface (15–30 cm) than in the sub-surface layers of 30–45 and 45–60 cm. The results obtained from the physical and chemical analyses indicated that among the four different fruit plantations, ber recorded substantial improvement and maintenance in soil fertility followed by drumstick. The nutrient return through litter fall followed the order K N Ca in Z. mauritiana and M. olerifera and N Ca K, Ca N K in C. congesta and P. cineraria respectively. The soils belong to the order Entisol and the calcareous pH is well adopted for the plantation of these fruit trees.

391 Kenghe, R.N.; Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (India). Nimkar, P.M.; Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (India). Shirkole, S.S.; Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (India). Shinde, K.J.; Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (India). Effect of moisture content and bulk density on minimum fluidization velocity of lathyrus (Lathyrus sativus L.) grain. Legume Research (India). (Dec 2011) v. 34(4) p.259-266 KEYWORDS: LATHYRUS. LATHYRUS SATIVUS. MOISTURE CONTENT. SOIL DENSITY.

The relationship between pressure drop and the rate of airflow through agricultural products is important in design of drying or aeration systems. Pressure drops were measured in Lathyrus (cv. NLK-40, Pratik and Ratan) beds. The respective grain beds were at 7.33 to 18.80%, 6.75 to 18.30% and 7.90 to 19.40% (d.b.) moisture content with bulk density of 805 to 895, 795 to 875 and 770 to 855 kg m3. The pressure drops were measured at 0.2 m bed depth for superficial air velocities ranging from, 0.0421 to 0.9813 m3 m2, 0.0450 to 1.1024 m3 m2 and 0.0484 to 1.1693 m3 s-1 m-2, respectively, for NLK-40, Pratik and Ratan. With increase in moisture content the minimum fluidization velocity values were found decreased. It was observed that with increase in bulk density the values of minimum fluidization were decreased linearly. The results indicated that 1% increase in moisture content decreased the pressure drop by 3.10%, whereas, 1% increases in bulk density decreased the pressure drop by 7.16%.

P34 Soil biology

392 Kumar, Jitender; CCS University, Meerut (India). University Teaching Departments, Department of Horticulture. Effect of phosphorus and rhizobium inoculation on the growth, nodulation and yield of garden pea (Pisum sativum L.) cv. mattar ageta-6. Legume Research (India). (Mar 2011) v. 34(1) p.20-25 KEYWORDS: PEAS. RHIZOBIUM. PHOSPHORUS. ROOT NODULATION. YIELDS.

A field experiment was conducted during the rabi (winter) season of 1999–2000 on sandy loam soil to study the effect of Rhizobium inoculation and phosphorus on growth, nodulation and yield of garden pea (Pisum sativum L.) cv. Mattar Ageta-6. The results revealed that the application of 120 kg P2O5/ha with Rhizobium inoculation significantly increased the plant height, number of leaves per plant, number of nodules per plant, fresh weight of nodules per plant and dry weight of nodules per plant followed by 100 kg/ha phosphorus application with Rhizobium inoculation of pea seeds. However, minimum days

to first flowering and marketable maturity took with the application of phosphorus 120 kg/ha with un-inoculated control. The number of pods per plant, length of the pod (cm), number of seeds per pod and yield of mature green pods (q/ha) was significantly increased by the application of 120 kg P2O5/ha and Rhizobium inoculation.

393 Kumar, Sandeep; CCS Haryana Agricultural University, Hisar (India). Yadav, A.S.; CCS Haryana Agricultural University, Hisar (India). Isolation and characterization of some strains and mutants of rhizobium s p. (Vigna) for poly-â-hydroxybutyrate (PHB) production and symbiotic properties. Legume Research (India). (Jun 2011) v. 34(2) p.123-128 KEYWORDS: RHIZOBIUM. BRADYRHIZOBIUM. PLASTICS. POLYMERS.

Twenty-one wild type (WT) strains of Rhizobium/Bradyrhizobium sp. (Vigna) were screened on minimal medium supplemented with Nile blue A for PHB production by observing yellow/ orange fluorescence under U V. The two WT strains MBR16 and MBR25 were good PHB producers. After their NTG mutagenesis nine mutants producing low, intermediate and high amount of PHB were obtained. Out of all the strains/mutants, the mutant MHt1of MBR16 produced the maximum amount of PHB (1.24 g/l). A highly significant positive correlation was found between the amount of PHB produced by the strains/mutants and shoot dry weight and total shoot nitrogen of mungbean plants inoculated with these strains/mutants.

P35 Soil fertility

394 Talukdar, Dibyendu; University of Calcutta, Hooghly (India). R.P.M. College. Morpho-physiological responses of grass pea (Lathyrus sativus L.) genotypes to salt stress at germination seedling stages. Legume Research (India). (Dec 2011) v. 34(4) p.232-241 KEYWORDS: GERMINATION. LATHYRUS SATIVUS. SALINITY. SEEDLINGS. OSMOTIC STRESS.

Response of eight different grass pea (Lathyrus sativus L.) genotypes to salinity (0, 50, 100, 150 and 200 mM NaCl)-induced stress was studied at both germination and seedling growth stages. Among the genotypes, significant decrease in germination, dry weight, K content and accumulation of Na occurred in HL and LSP-1 from 100 mM and in BioR-231, BioR-202 and BioL-203 from 150 mM treatment. In contrast, nearly normal growth and dry weight in ML, B1 and BioL-212 even at 200 mM treatment might be attributed to maintenance of normal cellular equilibrium of K+/Na+ ratio and leaf photosynthetic pigments at elevated treatment level. This resulted in better tolerance of these three genotypes to high salt stress than the other five genotypes. On the basis of the performance, the treatment of 150 mM NaCl was detected as critical to most of the grass pea genotypes under salt stress.

P40 Meteorology and climatology

395 Das, Purnima; Assam Agricultural University, Jorhat (India). Saikia, Simanta; Assam Agricultural University, Jorhat (India). Kalita, Surjit; Assam Agricultural University, Jorhat (India). Hazarika, Lakshmi Kanta; Assam Agricultural University, Jorhat (India). Datta, Satyendra Kumar; Assam Agricultural University, Jorhat (India). Effect of temperature on biology of red spider mite (Oligonychus coffeae)on three different TV clones. Indian Journal of Agricultural Sciences (India). (Mar 2012) v. 82(3) p. 255-9 KEYWORDS: TETRANYCHIDAE. TEMPERATURE. THERMAL ANALYSIS. CLONES.

An experiment to study the effect of temperature and diet on growth and development of the red spider mite (RSM), Oligonychus coffeae Nietner (Acarina:Tetranychidae) revealed prolongation of life cycle period up to 18.79 days at 20°C, which, however, was reduced to 8.06 days at 35°C. The longevity of adult male and female were 12.7 and 28.3 days, respectively at 20°C. Amongst the TV (Tocklai Vegetative) clones of tea, TV was found to be the most preferred diet, followed by TV 10 and TV 6 1 . Fecundity was 120.7±21.74, 114.7±14.88 and 102.0±24.75 on TV 1 , TV respectivelyThe thermal constant needed for egg to adult formation ranged from 149.60 to 185.38 day°C on TV 6 and TV 1 10 clone.

396 Kumar, P. Suresh; Indian Agricultural Research Institute, New Delhi (India). Sagar, V.R.; Indian Agricultural Research Institute, New Delhi (India). Effect of concentration and temperature of osmotic solution on mass transfer kinetics and its influence on quality of aonla (Emblica officinalis) segments. Indian Journal of Agricultural Sciences (India). (Apr 2012) v.82(4) p.318-22 KEYWORDS: ASCORBIC ACID. MASS TRANSFER. REDUCTION. OSMOTIC DRYING. EVAPORATION.

An experiment was conducted to find out the optimum osmotic concentration and temperature for the preparation of osmo-vac dehydrated aonla segments. Blanched segments were dipped in various sugar concentration, viz. 40°B, 50°B, 60°B and 70°B with the temperature viz., 40°C, 50°C, 60°C and 70°C for six hours without any agitation. At the end of osmosis, segments were analyzed for various quality parameters and sensory attributes. It was indicated that water loss (WL) and solid gain (SG) increased with the increase in sugar concentrations and temperatures of the solution during osmosis process. The regression analysis showed that the process variables have significant effect on osmosis. Sensory attributes revealed that 60° B sugar concentration with 60°C temperature gave better results than the rest of the treatments.

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12. Central Institute for Research on Buffaloes
    Sirsa Road, Hisar-125001, Haryana

13. National Research Centre for Equines
    Hisar-125001, Haryana

14. Central Inland Fisheries Research Institute
    Barrackpore-700120, West Bengal

15. National Institute of Research on Jute & Allied Fibre Technology
    12, Regent Park, Kolkata-700040,
    West Bengal

16. Directorate of Oilseeds Research
    Hyderabad-500 030, Andhra Pradesh

17. Central Potato Research Institute
    Shimla-171 001, Himachal Pradesh

18. Central Tobacco Research Institute
    Bhaskar Nagar, Rajamundry-533105, Andhra Pradesh

19. Central Plantation Crops Research Institute
    Kasargod-671124, Kerala

20. National Bureau of Animal Genetic Resource
    P.B. No.129, Karnal-132 001,
    Haryana

21. Central Research Institute for Jute & Allied Fibres
    Nilganj, Barrackpore-700120, West Bengal

22. Central Research Institute for Dryland Agriculture
Hyderabad-500 059,
Andhra Pradesh

23. Central Avian Research Institute
Izatnagar-243 122, Uttar Pradesh

24. Directorate of Experiment Station
G.B. Pant Univ. of Agri. & Technology
Pantnagar – 263 145, Distt. Udham Singh Nagar, Uttarakhand

25. Indian Agricultural Statistical Reserch Institute
Librarary Avenu, Pusa, New Delhi

26. Central Institute of Brackishwater Aquaculture
75, Santhome High Road,
Raja Annamalaipuram,
Chennai-600028, Tamilnadu

27. Central Institute of Fisheries Education
Panch Marg, off yari Road, Andheri (West),
Mumbai-400061, Maharashtra

28. Central Institute for Research on Goats
Makhdoom, Mathura-281122,
Uttar Pradesh

29. Crop Protection Research Centre (CPRC)
St. Xavier's College, Tirunelveli, Tamilnadu

30. Central Soil Salinity Research Institute
Karnal 132001, Haryana

31. Central Tuber Crops Research Institute
Sreekariyam, Thiruvananthapuram -695017, Kerala

32. National Bureau of Animal Genetic Resources
G.T. Road Bye-Pass, P.B.No.129,
Near Basant Vihar,
Karnal-132001, Haryana

33. National Bureau of Plant Genetic Resources
Pusa Campus, New Delhi 110012

34. National Centre for Integrated Pest Management
LBS Building, Pusa Campus,
New Delhi-110012

35. National Dairy Research Institute
Karnal-132001, Haryana

36. National Research Centre on Camel
Post Bag No.07, Jorbeer,
Bikaner-334001, Rajasthan

37. Directorate of Groundnut Research
Ivenagar Road P.B.No.5,
Junagadh-362001, Gujarat

38. National Research Centre for Citrus
Nagpur, Maharashtra

39. National Research Centre on Mithun
Jharnapani, P.O. Medziphema-797106

40. ICAR H.Q. Library

41. Directorate of Knowledge Management in Agriculture (DKMA)
ICAR, KAB-I, Pusa Campus, New Delhi-110012

42. Indian Institute of Pulses Research (IIPR)
Kalyanpur, Kanpur-208024
(U.P.)

43. Central Rice Research Institute
Cuttack-753006 (Odisha)

44. Society for Plant Protection Sciences
Div. of Nematology, LBS Centre,
IARI, Pusa Campus,
New Delhi-110012

45. Soil Conservation Society of India
National Societies Block A/G-4
NASC Complex, DP Shastri Marg
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