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SAMPLE ENTRY

1 2 6

001 Paul, P.R.C.; Xavier, F.; Leena, A. (College of Veterinary and Animal Sciences, Trissur (India), Department, of Livestock Production Management) 3 Dairysoft: A computer programme for dairy farms. Indian 4 Journal of Animal Sciences (India). (Mar 2006).v. 76(3) p. 260-262 KEYWORDS: DAIRY FARMS; COMPUTER 5 SOFTWARE

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

E14 Development Economics and Policies

001. Choudhary, Anil K.; CSK Himachal Pradesh Krishi Vishvavidyalaya, Krishi Vigyan Kendra, Mandi (India). Yadav, D.S.; CSK Himachal Pradesh Krishi Vishvavidyalaya, Krishi Vigyan Kendra, Mandi (India). Singh, Amar; CSK Himachal Pradesh Krishi Vishvavidyalaya, Krishi Vigyan Kendra, Mandi (India). Technological and extension yield gaps in oilseeds in Mandi district of Himachal Pradesh. Indian Journal of Soil Conservation (India). (Dec 2009) v.37(3) p.224-229 KEYWORDS: ECONOMICS. OILSEEDS. TECHNOLOGY ASSESSMENT.

The technological and extension yield gaps of oilseeds were studied for two years (Kharif 2006 to Rabi 2007–08) under Front Line Demonstration Programme in oilseeds in Mandi district of Himachal Pradesh. There was a wide yield gap between the potential and demonstration yields in oilseeds mainly due to technology and extension gaps. Maximum extension gap was found in soybean, followed by gobhi sarson and the least in case of sesame. By adopting the improved production technology, oilseeds productivity could be raised upto 127% in soybean, 89% in sesame, 111% in linseed, 114% in toria and 93% in gobhi sarson. The improved technology package has enhanced the profitability of oilseeds in terms of net returns besides incremental benefit: cost ratio which raised from 2.58 to 3.87. Technology index varied between 28.46 and 53.21% indicating that there is dire need to educate the farmers to adopt economically viable technologies for maximizing profits of oilseeds through intensification of productive inputs. Improved technologies have also increased the water use efficiency in oilseed crops in Mandi district of Himachal Pradesh.

E50 Rural Sociology and Social Security

002. Singh, R.K.; Nand Educational Foundation for Rural Development, Lucknow (India). Singh, H.N.; IRRI, New Delhi (India). Singh, V.N.; NDUAT, Faizabad (India). Singh, Abha; Nand Educational Foundation for Rural Development. Lucknow (India). Singh, Sanjay; IARI, New Delhi (India). Singh, Nikhil; Nand Educational Foundation for Rural Development, Lucknow (India). Singh, Arvind; NDUAT, Faizabad (India). Helping farmers adapt to climate change: The NEFORD way. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.319-324 KEYWORDS: CLIMATIC CHANGE. FARMING SYSTEMS. PLANT ESTABLISHMENT. VARIETIES. DISASTER PREVENTION.

Significant increases in food production in the 20th century have contributed to the improvement of many farmers' livelihood and their economic growth. However, the gains have come with disproportionate environmental, cultural, health and social costs. The agriculture in the 21st century will have to address crucial challenges including climate change, by maintaining and enhancing environmental & cultural services and safeguarding nutritional quality, diversity of food and farming systems. Often the problems in agriculture are not solely caused by a lack or failure of science & technology, but instead derive from social, economic or legal framework. It is therefore critical to define first, what problems are best solved by changing social, economic or legal frameworks and second, those which are best solved by using technology. Further, the green revolution era model of transfer of technology is no more valid, particularly, when it comes to complex issues such as natural resource and climate change. Instead, innovative institutional arrangements are essential to successful design and adoption of ecologically and socially suitable agricultural systems. The roles of NGOs should be seen in this context. The advantage of NGOs lies in their independence status, freedom of raising voice of the poor and involvement at the grass-root level. Nand Educational Foundation for Rural Development (NEFORD) is one such NGO committed to transforming quality of live for the rural poor and under-privileged. It is dedicated to achieve sustainable economic development and preserve environment with the focus on marginal communities. NEFORD is leading an initiative called PARIS (Poverty Alleviation through Rice Innovation Systems) to improve food security (increase yields and reduce input cost), enhance flexibility in response to monsoon and climate change and maintain

profitability in the market economy. PARIS aims to build "Partnership for Rice Innovation Platform" and "Communication Systems" to improve information flow to farmers and feedback and facilitate communication through out the information supply chain. The project uses ICT to improve access to information on market, cropping choices, weather forecasts and technology options, for which an "Information Hub" has been developed via the internet and village computer centres, to facilitate information flow between farmers and project partners. The program is about taking "Research Into Use" (RIU). We know a lot about the potential uses of different technologies, but what we don't know is where it is "fit for purpose". To understand this, we are trying to bring together (a) knowledge of how a technology works, (b) appreciation of different agro-ecological conditions, in which it might be the best applied and (c) knowledge of socio-economic domain, in which it could be used. Matching the bio-physical and socio-economic characterizations with the technology profiles (options) enables us to test the usefulness of intervention. The paper highlights the concept of Rice Innovation Systems and describes the functional mechanism and provides examples from the fields on technologies for adaptation to climate change, the nature of trainings to improve farmers' skills and knowledge and innovative approaches for accelerating the pace of technology adoption to reach out larger number of people in a shortest possible time.

E90 Agrarian Structure

003. Chand, Subhash; Central Agriculture Research Institute, Port Blair (India). Raghupathy, R; Central Soil and Water Conservation & Research and Training Institute, Research Centre, Ootacamund (India). Madhu, M.; Central Agriculture Research Institute, Port Blair (India). Dynamics of agrarian structure of Nilgiris district of Tamil Nadu and its implications. Indian Journal of Soil Conservation (India). (Dec 2009) v.37(3) p.217-223 KEYWORDS: AGRICULTURAL STRUCTURE. LAND POLICIES. TAMIL NADU.

The importance of land ownership, access to it and its equitable distribution becomes a major concern of public policy. In fact, the existing structure sets a pre-condition for the manner in which the resources have to be used in a region. It affects the choice of technology as well as the rate of adoption of technological interventions. Due to fragmentation and scatteredness it is becomes difficult to adopt new technologies and innovations on smallholdings. In Nilgiris, the number of marginal and smallholdings witnessed a significant increase during the last four decades. Hence, increase in number of operation holding has not been accompanied by corresponding increase in area owned. On other hand the proportion of large holding to total numbers has declined, still there is skewness in the distribution of land in the district. The average holding size decreased appreciably (2.91 to 1.34 ha) during 1970–71 to 2005–06, which has resulted in degradation of common resources. The marginalization and landlessness has resulted into higher dependency of both human and livestock population on the forest, pasture and common lands. Thus, there is a need to implement the reforms with greater zeal and political will and ensure people's participation in the management of existing land based resources to check further degradation. Further, it is suggested that restrictions on sale of land from smallholdings, land ceiling, consolidation of lands and collective farming type of land reforms may strictly be followed in the district.

F01 Crop Husbandry

004. Singh, Sanjay Kumar; Indian Agricultural Research Institute, New Delhi (India). Singh, S.K.; Indian Agricultural Research Institute, New Delhi (India). Sharma, R.R.; Indian Agricultural Research Institute, New Delhi (India). Srivastav, Manish; Indian Agricultural Research Institute, New Delhi (India). Effect of pruning on morpho-physiological parameters and microclimate under high density planting of mango (Mangifera indica). Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.632-35 KEYWORDS: PRUNING. MICROCLIMATE. SPACING. MANGOES.

A field experiment was conducted during 2005–07 at Indian Agricultural Research Institute, New Delhi, to assess the effect of pruning intensity in some mango cultivars ('Amrapali', 'Mallika' and 'Dashehari'). Severely pruned trees had the highest number of sprouted shoots while the lowest was in control(unpruned). 'Amrapali' gave the least number of shoots. 'Mallika' had the maximum shoot length while least in 'Amrapali'. Light pruning produced the longest shoot than other pruning intensities. Canopy volume and tree girth were found to be more in 'Dashehari' and low in 'Amrapali'. The net photosynthetic rate, transpiration rates and leaf relative water content were higher in regular bearing cultivars ('Mallika' and 'Amrapali') than the biennial bearer ('Dashehari'). Severely and moderately pruned trees had the highest net photosynthetic rate and greatly reduced in un- pruned trees. The canopy of Amrapali showed the maximum light interception with lowest canopy relative humidity, while least light interception was registered in 'Dashehari'. Severe pruning led to better light penetration and increased canopy temperature, but declined with the reduction in pruning intensities. The lowest light penetrance, canopy temperature.

005. Mandal, M.K.; Uttar Banga Krishi Viswavidyalay, Cooch Behar (India). Pati, R.; Uttar Banga Krishi Viswavidyalay, Cooch Behar (India). Mukhopadhyay, D.; Uttar Banga Krishi Viswavidyalay, Cooch Behar (India). Majumdar, K.; Uttar Banga Krishi Viswavidyalay, Cooch Behar (India). Maximization of lentil (Lens culinaris) yield through management of nutrients. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.645-47 KEYWORDS: SOIL. SOIL ANALYSIS. LENTILS. YIELDS.

The field experiments were conducted during 2006–07 to study the soil test-based fertilizer recommendations in terms of yield maximization of 'B 77' lentil (Lens esculenta L.). The variety was selected with the targeted yield of 0.8 tonnes/ha and soil-test based recommendation as N-P-K-S-B: : 20: 50: 50: 40: 1.5 (as 100%) was considered for fertilizer levels, while Zn as Zn-EDTA @ 0.05% at 6th weeks of crops were applied. The average grain yield of lentil for the first year varied from 0.450 to 0.749 tonnes/ha, while that for the second year from 0.552 to 0.805 tonnes/ha. The average maximum yield (0.755 tonnes/ha) was obtained in the treatment where N-P-K-S-Zn-B as 100% was applied in soil.

006. Kumar, M.; Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora (India). Kumar, Ajay; Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora (India). Srivastava, A.K.; Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora (India). Low and medium cost green houses in hills and moutain agro-ecosystem of north western Himalaya. Indian Journal of Agricultural Sciences (India). (July 2009) v.76(7) p.497-500 KEYWORDS: GREENHOUSES. AGROINDUSTRY.

Three different greenhouse structures were tested for tomato (Lycopersion esculentum L. Mill. nom. Cons.) cultivation during 2005-07 to find out suitable greenhouse for crop production in mid hills of north-west Himalaya. The greenhouse effectiveness in providing the congenial environment for the crop was evaluated. All the 3 greenhouse could raise the winter temperature from 2 to 8 C than the outside and relative himidity was maintaned between 65 and 95%. These finding suggested that though the mechanically controlled greenhouse provides better control than the naturally ventilated greenhouse but the production cost is higher (Rs 5.10/kg). similarly, intial cost in the bamboo based greenhuse is low but the production cost was the highest (Rs 6.45/ka). The quonset type galvanized iron pipe based greenhouse using natural ventilation was found most economical (Production cost as Rs 4.99/ka).

007. Kubsad, V.S.; University of Agricultural Sciences, Dharwad (India). Palled, Y.B.; University of Agricultural Sciences, Dharwad (India). Mansur, C.P.; University of Agricultural Sciences, Dharwad (India). Effect of spacing and fertilizer levels on physiological parameters in relation to productivity of ashwagandha (Withania somnifera). Indian Journal of Agricultural Sciences (India). (July 2009) v.79(7) p.501-502 KEYWORDS: SPACING. FERTILIZERS. PRODUCTIVITY. WITHANIA SOMNIFERA.

A field experiment was conducted during rabi seasons of 2004 and 2005 at Agricultural Research Station, Annigeri, Kamataka, to study the effect of spacings and fertilizer levels on physiological parameters in relation to productivity of ashwagandha \{Withania somnifera Dunal) in Vertisols. Sixteen treatments comprising 4 spacings (15 cmx5 cm, 15 cmx10 cm, 30 cmx10 cm and 45 cmx10 cm) and 4 fertilizer levels (control, 12 and 24, 18 and 36 and 24 and 48 kg N and P/ha) were undertaken in factorial design. A spacing of 15 cmx10 cm proved superior over the other spacings in enhancing physiological parameters, viz leaf area index (4.254), leaf area duration (80.6 days), net assimilation rate (0.404 g/dm2/day) and yield attributes resulting in increased dry root yield (1.42 tones/ha). The higher fertilizer level of 24 kg N and 48 kg P/haincreased the physiological growth parameters, viz. dry matter production (14.987 g/plant), leaf area index (3.918), leaf area duration (72.8 days) and net assimilation rate (0.359 g/dm2/day); yield attributes, viz. root length (53.7 cm), root diameter (1.06 cm), fresh root weight (7.945 g/plant), dry root weight (3.295 g/plant), harvest index (15.1%) and consequently dry root yield (1.16 tonnes/ha).

008. Thakur, A.K.; Water Technlogy Centre for Eastern Region, Orissa (India). Chaudhari, S.K.; CSSRI, Division of Soil Science, Karnal (India). Singh, R.; Water Technlogy Centre for Eastern Region, Orissa (India). Kumar, Ashwani; Water Technlogy Centre for Eastern Region, Orissa (India). Performance of rice varieties at different spacing grown by the system of rice intensification in eastern India. Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.443-447 KEYWORDS: RICE. VARIETIES. INTENSIFICATION. LEAF AREA INDEX. CANOPY. LEAF AREA. SPACING.

A field study was carried out during the rainy seasons of 2005 and 2006 on sandy clay-loam soil at Deras Research Farm, Mendhasal in Khurda district, Orissa to evaluate the performance of 3 different duration rice (Oryza sativa L.) varieties, viz. 'Khandagiri' (short-duration, 100 days), 'Surendra' (medium-duration, 125 days) and 'Savitri' (longgduration, 150 days) under different spacing in system of rice intensification and compared with the conventional method. The results suggested that the optimum spacing under system of rice intensification in short-and medium-duration varieties was 20 cmx20 cm and for long-duration variety 25 cmx25 cm in terms of grain yield. At the spacing of 20 cmx20 cm, short-and medium-duration varieties gave 46.8 and 41.9% grain yield increase compared to conventional method. Long-duration variety gave 31.2% more grain yield in system of rice intensification than the conventional system at 25 cmx25 cm spacing. In different varieties, yield reduction at wider spacing was mainly due to less number of panicles/m2. Thin tillers, short panicles with less number of grains were responsible for reduction in grain yield at narrow spacing in system of rice intensification.

009. Barua, L.; Assam Agricultural University, Jorhat (India). Dept. of Nematology)Bora, B.C.; Assam Agricultural University, Jorhat (India). Dept. of Nematology). Compatibility of Trichoderma harzianum and Pseudomonas fluorescens against Meloidogyne incognita and Ralstonia solanacearum complex on brinjal. Indian Journal of Nematology (India). (Jun 2009) v. 39(1) p. 29-34 KEYWORDS: TRICHODERMA HARZIANUM. PSEUDOMONAS FLUORESCENS. MELOIDOGYNE INCOGNITA. RALSTONIA SOLANACEARUM. AUBERGINES.

Assay on population dynamics of Pseudomonas fluorescens and Trichoderma harzianum from two different substrates viz, vermicompost and wheat bran after different days of storage revealed that both the substrates, the population density of P. fluorescens significantly increased up to 45 days of storage. The substrate comprising of vermicompost recorded highest population of P. fluorescens after 15, 30 and 45 days of storage. The highest reduction of Meloidogyne incognita and R. solanacearum population in soil was observed in combine application of T. harziunum and P. fluorescence when applied against the complex. P. fluorescens was proved to be more promising followed by T. harzianum in suppressing the population of R. solanacearum.

F02 Plant Propagation

010. Kundan Kishore; Research Complex for NEH Region, Mozoram Centre, ICAR. Kolasib (India). Pathak, K.A.; Research Complex for NEH region, Mozoram Centre, ICAR. Kolasib (India). Shukla, Rohit; Research Complex for NEH region, Mozoram Centre, ICAR. Kolasib (India). Soft wood grafting in purple passion fruit (Passiflora edulis). Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.472-475 KEYWORDS: GRAFTING. PASSIFLORA EDULIS. PASSIFLORA. SOFTWOOD. QUALITY. FRUIT. YIELDS.

An experiment was conducted to evaluate effect grafting season, scion length and of grafting height was evaluated for grafting success, field survival disease incidence, yield and physic-chemical properties of purple passion fruit (Passiflora edulis Sims) during 2004--07. The grafting during June took the minimum days to callusing (7.33), bud swell (9.6) and bud burst (11.0). The graft success (74.2%), field survival (69.8%), yield (178.5 fruits/vine), fruit weight (44.3 g) and juice percentage (28.7) were significantly higher in June grafted vines. The early bud burst, higher graft success, field survival, early fruiting, yield, fruit weight and juice percentage were recorded with 25 cm scion length and 10 cm graft height. The interaction showed that the combination of June grafting, 25 cm scion length and 10 cm graft height took the minimum days for callus formation (6.6), bud swell (8.6) and bud burst (9.6). The maximum graft success (81.6%), survival (84.6%), growth rate (38.6 crn! month), early fruiting (236.0 days), more fruit weight (46.5 g), more yield (181.5 fruits/vine) and juice content (29.2%) were recorded with June grafting with 25 cm scion length and 10 cm grafting height. The minimum graft success, vine survival, yields and fruit weight was recorded with December grafting and with scion length of 15 cm and grafting height of 20 cm. The incidence of wilt and collar rot diseases were not observed in grafted passion fruit vine up to 2 years, while in control plot 34% vines were affected with diseases.

F03 Seed Production and Processing

011. Dadlani, Malavika; IARI, Division of Seed Science and Technology, New Delhi (India). Chakrabarty, S.K.; IARI, Division of Seed Science and Technology, New Delhi (India). Basu, Sudipta; IARI, Division of Seed Science and Technology, New Delhi (India). Impact of climate change and IP regime on the production and availability of quality seed. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.325-330 KEYWORDS: CLIMATIC CHANGE. SEED PRODUCTION. QUALITY. SEED.

Timely availability of high quality seeds of improved varieties, suitable to perform well in different growing environment, is a key component of agricultural production system. Hence, an effective seed production plan not only needs to take into account the overall commercial value of crop varieties, but also their potential to perform satisfactorily in respective agro-climatic regions, both under optimum and sub optimum conditions. In the present scenario of changing and fluctuating climate, this means that the seed plan should meet the demand of improved varieties having high commercial value and also be prepared to fulfil the contingent demands in fluctuating/unfavourable weather conditions. In India, drought and flood are of common occurrence in some part of the country or other. In the recent years, the rise in temperatures, particularly at flowering and grain filling stages, have also been experienced frequently. Intensive cropping schedules, growing industrialisation and poor soil management practices are affecting the soil status. Focussed and extensive crop improvement programmes, particularly in the post-New Seed Policy, 1988 period, resulted in a greater choice to the farmers with respect to new varieties and hybrids' availability. This, on one hand increased the profitability of the farmers, and on the other hand, also helped in increasing the Seed Replacement Rate (SRR), which is still much lower than the desired levels in different crops. The SRR has shown significant rise in the crops where suitable hybrids have been introduced, but in OPVs, specially in high volume, low profit crops,

which are crucial for national food security, viz., cereals and pulses, more is desired.The seed production programmes must, at all times, ensure availability of seeds of such varieties, which can be taken up in the event of uncertain weather/constraints. For instance, when a timely sown crop fails due to early moisture stress situation, the farmer may go for resowing with a late sown, short duration variety or if the crop fails due to unfavourable weather in one season, the farmer may go for a substitute second crop, provided seeds of suitable varieties are available and the farmers are well informed and guided. The second aspect of seed production in the changing climate concerns the yield and quality of the seed produced under unfavourable weather conditions. Of various climatic factors, it has been observed that high temperature and moisture stress to the seed crop not only reduces the seed yield, but also affects the seed quality and performance of the resultant crop. In general, delayed maturity, caused by one or more environmental factors, reduces seed quality to a significant level. However, elevated CO2 levels do not adversely affect the seed quality or yield. Given the assumption, that in post-PPV&FR regime the focus of the private sector would be to develop hybrids/varieties for favourable growing environments, developing varieties for unfavourable/uncertain environments and making available seeds of the same, following an advanced and timely planning will be the primary objectives of the public sector research and seed production organisations. To encourage this, a policy to provide certain incentives for the latter may be considered.

F04 Fertilizing

012. Malik, B.S.; Indian Agricultural Research Institute, New Delhi (India). Paul, S.; Indian Agricultural Research Institute, New Delhi (India). Ahlawat, A.K.; Indian Agricultural Research Institute, New Delhi (India). Singh, Anju M.; Indian Agricultural Research Institute, New Delhi (India). Shivay, Y.S.; Indian Agricultural Research Institute, New Delhi (India). Productivity and quality of wheat spp. grown with different fertilization conditions. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.636-40 KEYWORDS: BIOFERTILIZERS. ORGANIC FERTILIZERS. INORGANIC FERTILIZERS. COMPOSTING. QUALITY. AZOTOBACTER.

A study was conducted during 2004–06 on effect of different fertilization conditions on qualitative and quantitative traits in different genotypes in wheat using wheat cultivars 'HD 2733' and 'PDW 215' representing Triticum aestivum (L.) emend. Fiori & Paol and T. durum genotypes. Three types of fertilizers application, ie zero level,recommended NPK and vermicompost were used in main plots and biofertilizers Azotobacter chroococcum A 1 and A. chroococcum A 2 were applied in subplots. Significant differences were observed at varietal level on spike and peduncle length. Vermicompost and NPK application significantly enhanced effective tillers, peduncle length and grain yield. The biofertilizer application significantly improved grain yield and grain yield parameters over uninoculated plots. Varietal differences were observed for hardness score, sedimentation value and protein per cent. Fertilizer applied in the form of vermicompost and NPK showed significant difference for sedimentation value and protein per cent. Vermicompost application significantly enhanced the concentration of micronutrients (Fe, Zn, Cu and Mn.)

013. Kumar, Santosh; Banaras Hindu University, Institute of Agricultural Sciences, Varanasi (India). Verma, S.K.; Banaras Hindu University, Institute of Agricultural Sciences, Varanasi (India). Singh, T.K.; Banaras Hindu University, Institute of Agricultural Sciences, Varanasi (India). Singh, Shyambeer; Banaras Hindu University, Institute of Agricultural Sciences, Varanasi (India). Effect of nitrogen and sulphur on growth, yield and nutrient uptake by Indian mustard (Brassica juncea) under rainfed condition. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.648-50 KEYWORDS: MUSTARD. NITROGEN FERTILIZERS. SULPHUR FERTILIZERS. RAINFED FARMING. YIELDS.

A study was conducted during winter (rabi) seasons of 2003–05 to find out the response of Indian mustard to four levels of nitrogen (0, 40, 60 and 80 kg N/ha) and four levels of sulphur (0, 15, 30 and 45 kg S/ha) under rainfed conditions. Application of 80 kg N/ha significantly improved seed yield (1.27 t/ha), stover yield, nitrogen uptake (55.9 kg/ha), protein content and oil content, probably due to better crop growth and yield attributes of Indian mustard. Among the sulphur level, 45 kg S/ha being on par with 30 kg S/ha gave significantly higher seed yield (1.25 tonnes/ha), stover yield, sulphur uptake (20.7 kg/ha) and oil and protein content. Agronomic efficiency and apparent recovery was maximum at 60 kg N/ha and 15 kg S/ha, and it declined with further increases in the levels of nitrogen and sulphur. Optimum economic dose of nitrogen 39.5 – 46.3 kg/ha and 24.5 kg S/ha. Maximum net returns and benefit : cost ratio were observed with the application of 80 kg N and 45 kg S/ha, respectively.

014. Jain, M.P.; College of Agriculture, Jawaharlal Nehru Krishi Viswavidyalaya, Indore (India). Sharma, A.K.; College of Agriculture, Jawaharlal Nehru Krishi Viswavidyalaya, Indore (India). Conjunctive Use of Fertilizers and Manures in Soybean-wheat Sequence. Indian Journal of Dryland Agricultural Reserach and Development (India). (June 2009) v.24(1) p.20-23 KEYWORDS: FERTILIZERS. ORGANIC FERTILIZERS. CROPPING SYSTEMS. SOYBEANS. BALANCES.

The field experiment entitled ”Conjunctive use of fertilizers and manures in soybean-wheat sequence” was conducted during 2003-04 and 2004-05 in RED comprising of 16 treatments (8 treatments only chemical fertilizers and 8 conjunction of fertilizers and manures), each treatments replicated thrice. The studies on growth and yield attributing characters, grain and stover / straw yields and economics as affected by different treatments were conducted. The uptake of nutrient (NPK) by soybean under various treatments was also detennined. Grain yield data revealed that maximum yield in soybean (1823 kg ha-I in 2003 and 1952 kg ha-I in 2004) was attained in case of 50 % RDF through fertilizer+ 5 t FYM ha-I applied to each crop and in wheat (6113 kg ha-I in 2003-04 and 6049 kg ha-I in 2004-05) was recorded in treatment 75% RDF in soybean and 100% RDF in wheat trough chemical fertilizers. The minimum grain and straw yield in both the crops was noted in control. The net realization ha-I and C:B ratio in different treatments indicate that 50% of RDF through fertilizer along with 5 t FYM ha-I given to each crop provided good monetary return (Rs.40899) and C: B ratio (2.90). In situation of availability of only chemical fertilizers, 75% ofRDF to soybean crop and 100% RDF to following wheat crop which provided net return of Rs. 40922 ha-I. The minimum net returns (Rs. 27174 ha-I) and C:B ratio (2.45) was noted in control.

015. Verma, M.L.; Dr. Y.S. Parmar University of Horticulture and Forestry, Regional Horticultural Research Station, Mashobra (India). Singh, Charan; Central Soil and Water Conservation Research and Training Institute (ICAR), Dehradun (India). Bhardwaj, S.P; Best View Cottage, Shimla (India). Effects of biofertilizers on soil moisture, nutrient status and fruit productivity under organic cultivation of apple in Himachal Pradesh. Indian Journal of Soil Conservation (India). (Dec 2009) v.37(3) p.201-205 KEYWORDS: BIOFERTILIZERS. SOIL WATER CONTENT. SOIL FERTILITY. FERTILIZERS. ORGANIC AGRICULTURE.

The field experiment was conducted during 2004 and 2005 at the research farm of Regional Horticultural Research Station, Mashobra, Shimla, Himachal Pradesh to study soil moisture distribution, nutrient content and apple productivity under organic farming technology by using organic manure and FYM. Results revealed that the improvement in soil moisture availability, pH, organic carbon and nutrient status of the soil was significant under organic manure. Growth parameters, fruit characteristics and yield were recorded maximum with application of organic manure @ 5 kg tree−1 (T3) during 2004, T4 (organic manure @ 10 kg tree−1) during 2005 and T2 (Farm Yard Manure @ 100 kg tree−1) during both of years of experimentation while minimum under T1 (without manure - control) during 2004 and 2005. Soil moisture, pH, organic carbon and available N, P and K were recorded maximum under T2 (Farm Yard Manure @ 100 kg

tree−1) and T6 (organic manure @ 20 kg tree−1) during 2004 and 2005. Better quality Apple fruits were also recorded under T3 during 2004, T4 during 2005 and T2 during both the years of experimentation.

F06 Irrigation

016. Bandyopadhyay, K.K.; Central Institute for Cotton Research, Regional Station, Coimbatore (India). Prakash, A.H.; Central Institute for Cotton Research, Regional Station. Coimbatore (India). Sankaranarayanan, K.; Central Institute for Cotton Research, Regional Station, Coimbatore (India). Dharajothi, B.; Central Institute for Cotton Research, Regional Station, Coimbatore (India). Gopalakrishnan, N.; Central Institute for Cotton Research, Regional Station, Coimbatore (India). Effect of irrigation and nitrogen on soil water dynamics, productivity and input-use efficiency of Bt cotton (Gossypium hirsutum) in a Vertic Ustropept. Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.448-453 KEYWORDS: GOSSYPIUM HIRSUTUM. IRRIGATION. NITROGEN. PRODUCTIVITY. SOIL WATER.

A field experiment was conducted during 2006-08 in a mixed red and black calcareous soil at Coimabtore to study the effect of irrigation levels (protective irrigation and irrigation at 0.6 IW/CPE, 0.8 IW/CPE, 1.0 IW/CPE) and N levels (control, 60 kg N/ha, 90 kg N/ha and 120 kg N/ha) on soil water dynamics, productivity and input-use efficiency of 'RCH 2' Bt cotton (Gossypium hirsutum L.) under winter irrigated situation. It was observed that the seed cotton (1980-2160 kg/ha) and lint yield (700-772 kg/ha) under different irrigation treatments were statistically at par with the protective irrigation but increased significantly due to nitrogen application. However there was no significant difference among 60, 90 and 120 kg N/ha with respect to seed cotton and lint yield. There was significant reduction in water-use efficiency of cotton with the increase in the level of irrigation but there was increase in the water-use efficiency due to N application over no nitrogen control. However, there was no significant difference in the water-use efficiency due to 60,90 and 120 kg N/ha. The partial factor productivity of nitrogen decreased significantly with the increase in irrigation and N levels. Thus, 'RCH2Bt' cotton hybrid may be grown with protective irrigation and 60 kg N/ha to achieve higher water- and nitrogen-use efficiency without significant yield reduction in winter-irrigated situation in the southern zone of the country.

017. Buttar, G.S.; Punjab Agricultural University, Regional Station. Bathinda (India). Thind, H.S.; Punjab Agricultural University, Regional Station. Bathinda (India). Aujla, M.S.; Punjab Agricultural University. Regional Station, Bathinda (India). Effect of re-scheduling of initial and last irrigation on root growth, soil water extraction, yield and water use in cotton (Gossypium hirsutum). Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.454-457 KEYWORDS: COTTON. SOIL WATER. ROOTS. GROWTH. YIELDS. WATER. IRRIGATION.

A field investigation was undertaken during 2004-05 at Bathinda to quantify the effect of different timings of initial and last irrigation on root growth and its distribution in soil profile and subsequent effects on water extraction, yield and water use in cotton (Gossypium hirsutum L.). The initiation of irrigation at 28 days after sowing restricted root growth to surface layers which remained confined to 0-60 cm soil depth throughout the cropping season. On the other hand, higher root mass density and vertical distribution up to 180 cm was observed when the initial irrigation was applied at 42 days after sowing. Delayed first irrigation resulted in 28% increase in seed cotton yield and 16% in stick biomass. The improved yield was accompanied by 24% increase in number of bolls/plant and 8% increase in harvest index. The efficient water use in delayed first irrigation in terms of higher seed cotton yield resulted in an increase of 27% in water expense efficiency. Application of first and last irrigation at optimum time (after 42 and 170 days after sowing) resulted in an increase of 35% in seed cotton yield and 33% in water-expense efficiency without involving any additional cost.

F07 Soil Cultivation

018. Regar, P.L.; Central Arid Zone Research Institute, Regional Research Station, Pali-Marwar (India). Rao, S.S.; Central Arid Zone Research Institute, Regional Research Station, Pali-Marwar (India). Joshi, N.L.; Central Arid Zone Research Institute, Regional Research Station, Pali-Marwar (India). Effect of in-situ moisture conservation practices on productivity of rainfed taramira (Eruca sativa) in arid Rajasthan. Indian Journal of Soil Conservation (India). (Dec 2009) v.37(3) p.197-200 KEYWORDS: ERUCA SATIVA. MOISTURE CONTENT. ARID ZONES. RAJASTHAN.

A field experiment was conducted at Central Arid Zone Research Institute, Regional Research Station, Pali-Marwar during winter season (rabi) of 1997–98 to 2001–02 to find out the effect of bunding, tillage and straw mulch on taramira yield and water productivity. Field bunding significantly increased mean taramira biological yield by 13.4% and seed yield by 18.1% over no bunding due to increased availability of soil moisture. Water use efficiency also increased by 0.6 kg ha−1mm−1 over no bunding. The effect of deep tillage was variable and largely governed by the amount and distribution of rainfall. Deep tillage during intermittent drought period effectively conserved the soil moisture and significantly increased the seed yield of taramira. Straw mulching @ 5 t ha−1 significantly increased mean seed yield of taramira by 25% over no mulch, with increased water use efficiency by 1.8 kg ha−1mm−1. It is recommended that field bunding, deep ploughing during monsoon and straw mulching @ 5 t ha−1 may be followed for enhancement of taramira seed yield and water productivity through in-situ moisture conservation.

F08 Cropping Patterns and Systems

019. Awasthi, O.P.; Central Institute for Arid Horticulture, Bikaner (India). Singh, I.S.; Central Institute for Arid Horticulture, Bikaner (India). More, T.A.; Central Institute for Arid Horticulture, Bikaner, (India). Performance of intercrops during establishment phase of aonla (Emblica officinalis) orchard. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.587-91 KEYWORDS: INTERCROPPING. CROP RESIDUES. ECONOMIC ANALYSIS. PROFITABILITY. FRUIT CROPS.

A study was conducted during 2004–06 on intercropping under arid conditions of Bikaner in newly established 'NA7' aonla (Emblica officinals Gaertn). Mothbean (Vigna acontifolia (Jacq.) Marechal) grown during rainy (kharif) season was a common crop in rotation with winter (rabi) crops, i e fenugreek (Trigonella foenum-graceum Linn.), chickpea (Cicer arietinum L.), mustard [Brassica juncea (L) Czernj. & Cosson] and cumin (Cuminum cyminum L). Growth parameters in terms of plant height, stem girth, canopy spread and canopy volume of aonla was recorded to be significantly more with intercrops compared with its sole plantation. Higher grain and straw yield were recorded in mothbean–chickpea (497,1250 kg/ha) and mothbean-fenugreek (465,1161 kg/ha) crop sequence. Amongst the winter (rabi) crops, grain yield of fenugreek, chickpea, mustard and cumin were higher by 28.05, 38.11, 19.96 and 36.50%, respectively, when grown in association with aonla compared to its sole crops. The highest net profit (Rs 28 260/ha)was obtained from mothbean–cumin cropping system, followed by mothbean–chickpea (Rs 25 024/ha) cropping system. Mothbean–chickpea intercropping with aonla supplemented 22.01, 5.00 and 27.90 kg/ha nitrogen, phosphorus and potassium through crop residues, followed by mothbean– fenugreek crop sequence.

020. Kumar, Ram; Indian Grassland and Fodder Resarch Institute, Jhansi (India). Kumar, Sunil; Indian Grassland and Fodder Resarch Institute, Jhansi (India). Performance of annona (Annona squamosa)-based hortipasture system in realtion to legumes intercropping and fertility levels under rainfed conditions. Indian Journal of Agricultural Sciences (India). (July 2009) v.76(7) p.493-96 KEYWORDS: ANNONA SQUAMOSA. INTERCROPPING. FERTILITY. CENCHRUS CILIARIS.

A field experiment was conducted during 2002-05 on sandy loam soil to study the effect of legumes (stylosanthus hamata (L.) Taub and S. scabra (L.) vog. intercropping and fertility levels (P2O5 and K2 O at 0-0, 20-15,40-30 and 60-45 ka/ha) on growth productivity, quality, nutrients uotake economics of buffel grass (Cenchrus ciliaris L.) +annona (Annona squamosa L.)-gased hortipasture system. Intercropping of S. Hamata with buffel grass under annona tress resulted in significantly higher total dry forage (5.95 tonnes/ha) and crude protein yield (503.4 kg/ha) than S. scabra. Dry forage yield (6.07 tonnes/ha) and fruit quality of annona was significantly increased worth application of 40 kg P2O5 +30 kg K2O/ha compared with the control treatment. However crud protein yield (545.3 kg/ha) and fruit yield (7.14kg/tree) was significantly increased up to 60 kg P2O5 + 45kg K2O/ha. Application of phosphorus and potash also had a positive effect on maintance of legumes population when compared to control treatment. This effect was 91-8 and 84-.3% in the treatment where phosphorus and potsah was applied @ 60+45 kg/ha as compared to control treatments (78.3 and 67.2%) during the second and third years, respectively. maximum net returns (25 483/ha and benifit:cost ratio (2.17) were obtained by intercropping of S. hamanta along with application of 60 kg P2O5/ha+45 kg K2O/ha in buffel grass under annona tres.

021. Kumar, Narendra; Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora (India). Kumar, M.; Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora (India). Srtvastva, A.K.; Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora (India). Off-season vegetable-based cropping sequence under protected cultivation in mid-hills of north-western Himalayan region. Indian Journal of Agricultural Sciences (India). (July 2009) v.79(7) p.531-534 KEYWORDS: CROPPING SYSTEMS. GREENHOUSES. OFF SEASON CULTIVATION. OUT OF SEASON PRODUCTS. PLANTING. CULTIVATION. PRODUCTION POSSIBILITIES. PRODUCTS.

A field experiment was conducted during 2004-06 to evaluate year-round off-season vegetable cultivation, using naturally ventilated greenhouse. Five cropping sequences considering the off-seasonality of 2 months were selected for evaluation. The cropping sequence of squash - french bean - tomato - spinach gave highest economic yield (1 585 kg/100 m2/year) with production efficiency (4.34 kg/100 m2/ day), followed by capsicum - tomato - spinach cropping sequence that gave yield of 963 kg/100m2/year and production efficiency of 2.64 kg/100m2/day. Pooled analysis of two years data showed higher gross returns (Rs 11636/100m2/year) in cropping sequence of squash-frenchbean-tomato-squash, whereas net returns (Rs.8252/100m2/year). However highest B:C ratio of 3.14 was obtained for cropping sequence of capsicum - tomato - spinach. Lowest net returns (Rs 1 265/100m2/year) and B:C ratio (1.34) were recorded in cropping sequence of tomato-cucumber-frenchbean-coriander. It was also observed that planting geometry does not affect the crop performance. Selected cropping sequences resulted in 1.45 to 2.80 times higher crop yield inside the greenhouse as compared to open field condition. Thus 3 to 4 fold cropping intensity under greenhouse conditions can help in enhancing the vegetable production per unit area and time. The cropping sequences like squash-frenchbean-tomato-spinach and capsicum-tomato-spinach were found suitable and remunerative for low-cost naturally-ventilated greenhouse in mid-hills of north-western Himalaya.

022. Sheoran, Parvender; Regional Research Station for Kandi Area, Punjab Agricultural University, Nawanshahr (India). Sardana, Virender; Regional Research Station for Kandi Area, Punjab Agricultural University, Nawanshahr (India). Singh, Sukhvinder; Regional Research Station for Kandi Area, Punjab Agricultural University, Nawanshahr (India). Singh, Sher; Regional Research Station for Kandi Area, Punjab Agricultural University, Nawanshahr (India). Productivity potential and economic feasibility of maize {Zea mays)-greengram(Vigna radiata) intercropping system under rainfed conditions. Indian Journal of Agricultural Sciences (India). (July 2009) v.79(7) p.535-537 KEYWORDS: INTERCROPPING. MAIZE. PRODUCTIVITY. VIGNA RADIATA. VIGNA.

An experiment was conducted during rainy seasons of 2003 and 2004 to find out the most suitable economically and biologically sustainable maize (Zea mays L.)- based

intercropping system under rainfed conditions. Intercropping of greengram \Vigna radiata (L.) Wilczek] with maize was found to have increased the total productivity by 15.7—44.5% in comparison to sole cropping of maize. Among the intercropping associations, maize (50 cm) + greengram in 1:1 row proportion gave the maximum maize equivalent yield (2 904 kg/ha), land equivalent ratio (1.39), product of relative crowding co-efficient (K=5.28), area-time equivalent ratio (1.25) and monetary advantage (4.78xl0 3 Rs/ha). It was found to be the most efficient, productive and remunerative cropping system among all the crop combinations. Magnitude of reduction in yield of the base crop due to intercropping of greengram was the highest (45.7-53.5%) when maize was widely planted at 75/90 cm in 1:2 row ratios as against the 27.0-33.1% for maize planted at 50/60 cm in 1:1 row proportion. Paired row planting of maize + greengram intercropping in 1:1 row ratio showed yield reduction to the tune of 18.2%.

023. Jaiswal, A.N.; I.A.R.I., Division of Nematology, New Delhi (India). Jaiswal, R.K.; I.A.R.I., Division of Nematology, New Delhi (India). Biodiversity of maize cyst nematode, Heterodera zeae in maize-wheat cropping system in Himachal Pradesh. Annals of Plant Protection Sciences (India). (Mar. 2010) v.18(1) p.282-282 KEYWORDS: HETERODERIDAE. NEMATODA. BIODIVERSITY. MAIZE. CROPPING SYSTEMS. HIMACHAL PRADESH. PLANT NEMATODES.

024. Reddy, B. Sanjeeva; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Maruthi, V.; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Adake, R.V.; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Madal, U.K.; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Effect of Different Land configuration Practices on Productivity of Sorghum - Pigeonpea intercropping system in Shallow Alfisols. Indian Journal of Dryland Agricultural Reserach and Development (India). (Jun 2009) v.24(1) p.57-62 KEYWORDS: PRODUCTIVITY. SORGHUM. PIGEONS. INTERCROPPING. LUVISOLS.

Soil moisture plays an important role in increasing crop yields in the rainfed Alfisols of semi arid tropics. The effect of land configuration practices on soil moisture content and yield of sorghum-pigeonpea intercropping system were evaluated during kharif seasons of 2006-07 and 2007-08 on shallow Alfisol at Hyderabad. Availability of soil water during different stages of crop growth was increased by ridge - furrow system resulting in increased grain yield of sorghum - pigeonpea intercrops. In situ moisture conservation practices viz ridge-furrow and bed-furrows at 0.9 m spacing using tractor drawn furrower tool increased the sorghum grain yield by 29% (3528 kg ha-1) and 17% (3200 kg ha-1) during 2006 -07 and 36% (3210 kg ha-1) and 27% (2992 kg ha-1) during 2007-08 respectively over no furrows. Ridge - furrow practice improved sorghum equivalent yield to an extent of21 and 55% in 2006-07 and 2007 -08 respectively.

025. Das, Madhumitha; Water Technology Centre for Eastern Region, Orissa (India). Singhandhupe, R.B.; Water Technology Centre for Eastern Region, Orissa (India). Muduli, S.D.; Water Technology Centre for Eastern Region, Orissa (India). Chakraborty, H.; Water Technology Centre for Eastern Region, Orissa (India). Kumar, Ashwni; Water Technology Centre for Eastern Region, Orissa (India). Yield and nutrient uptake by groundnut (Arachis hypogaea) - rice (Oryza sativa) sequence to distillery effuent irrigation at various concentrations in red and lateritic soil of eastern India.. Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.433-437 KEYWORDS: NUTRIENT UPTAKE. PLANT NUTRITION. SOIL. GROUNDNUTS. WASTEWATER. WASTEWATER IRRIGATION. RICE.

A field experiment was conducted in red and laterite soil area of eastern India during 2005-07to study the yield responses and nutrient uptakes of groundnut (Arachis hypogaca L.) under distillery effluent irrigation, followed by rice (Oryza sativa L.) grown on effluent residues, a promising crop sequence of eastern India. The effluent was highly saline, had neutral pH and contained enormous amount of K, Ca, P, N, Mg, dissolved organic matter, Zn, Cu, Fe and Mn. Groundnut yield was improved by 68 to 724.56

kg/m3 under distillery effluent irrigation @ 3 em at 7 to 10 days interval through 4 treatments with no effluent as control or normal practice and carried over a substantial benefit to succeeding rice. Largest yield response was received with 4.375 m3 effluent volume. Nutrient uptakes were also improved, notably by 1.11 to 2.69 folds in K, 0.59 to 1.81 in P, 1.18 to 7.32 in eu and 0.25 to 1.75 in Zn without maintaining any uniformity with effluent amount applied in groundnut. More or less similar response was also evident in rice. Effluent application though improved relevant soil fertility attributes also enhanced soil salinity by 0.1 to 2.22 times after groundnut though it not sustained after rice. In respect to influence of crop yield, nutrient uptake and soil properties the alternate application of water with effluent has been proved best practice for groundnut - paddy sequence.

026. Chandra, Ramesh; GB Pant University of Agriculture and Technology, Pantnagar (India). Rana, N.S.; GB Pant University of Agriculture and Technology, Pantnagar (India). Kumar, Sanjay; GB Pant University of Agriculture and Technology, Pantnagar (India). Effect of sugarcane trash management at ratoon initiation and ratoon intercropped green manuring practices on the productivity and economics of sugarcane-ratoon-wheat sequence. Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.438-442 KEYWORDS: RATOONING. PRODUCTIVITY. PRODUCTION ECONOMICS. SUGARCANE. CROPPING SYSTEMS. RESIDUES. GREEN MANURES. MULCHES.

A field experiment was conducted during 2002-04 to study the effect of sugarcane trash management at ratoon initiation and ratoon intercropped green manuring practices on productivity and economics of ratoon and wheat Triticum aestivum L. emend. Fiori & paol.) crops in sequence on silty clay loam soil at Pantnagar. Results revealed that trash burning + Sesbania aculeata pers. green manure incorporation gave the highest ratoon cane yield (158 tonnes/ha). This treatment was significantly superior by recording increases of 50.6, 17.7 and 30.9% over trash removal, burning and incorporation treatments, respectively. Ratoon yield attributes, viz. number of milliable canes, cane weight, cane length and internode/cane followed the trend observed in cane yield. In succeeding wheat crop, treatment of trash burning + green manure incorporation in ratoon also recorded highest crop emergence, number of tillers and plant height at 60 days after sowing. It also recorded the highest and significantly high grain and straw yields of wheat by 15.0 and 15.1 % than the trash removal by 19.4 and 19.7% than trash burning and by 12.5 and 19.0% over trash incorporation treatments, respectively. This treatment also indicated highest net returns of Rs 1 30 226/ha from the sequence (sugarcanewheat) and was statistically similar to trash burning + green manure mulch and trash removal + green manure incorporation treatments. Irrespective of residue treatments in ratoon a dose of 100% NPK in wheat was found to be better than 75 or 125% NPK doses in terms of productivity and net returns from wheat.

F30 Plant Genetics and Breeding

027. Kar, C.S.; Central Research Institute for Jute and Allied Fibres, Kolkatta (India). Kundu, A; Central Research Institute for Jute and Allied Fibres, Kolkatta (India). Sarkar, D.; Central Research Institute for Jute and Allied Fibres, Kolkatta (India). Sinha, M.K.; Central Research Institute for Jute and Allied Fibres, Kolkatta (India). Mahapatra, B.S.; Central Research Institute for Jute and Allied Fibres, Kolkatta (India). Genetic diversity in jute (Corchorus spp) and its utilization: A review. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.575-86 KEYWORDS: JUTE. GERMPLASM. HYBRIDIZATION. GENETIC MARKERS. GENETIC VARIATION.

Natural fibres of commercial importance are obtained from the bark of two jute species (Corchorus capsularis L. and C. olitorius L.), and they are cultivated in different south-east Asian countries including India and Bangladesh. High-yielding varieties of both species evolved around a very narrow genetic base, supported by pedigree relationship, morphological analysis including distinctness, uniformity and stability (DUS)

testing and molecular marker analysis. A number of microsatellite markers developed recently has shown sufficient transferability between these two species and effectiveness in elucidating polymorphism. Molecular analysis of germplasm and released elite varieties using different marker systems indicated more narrowness of C. capsularis as compared to C. olitorius. The differentiation and separation of both species in the evolutionary pathway may not be recent, although cultivation for fibre use has a short history. Intra-specific hybridization utilizing diverse genotypes and inter-specific hybridization between C. capsularis/ C. olitorius and wild species having quality fibre characteristics and resistance to biotic and abiotic stresses should be emphasized to widen the narrow genetic base of both species.

028. Singh, I.P.; Indian Institute of Pulses Research, Kanpur (India). Katiyar, P.K.; Indian Institute of Pulses Research, Kanpur (India). Singh, S.K.; Indian Institute of Pulses Research, Kanpur (India). Inheritance of genes imparting resistance to pod fly (Melanagromyza obtusa) in pigeonpea (Cajanus cajan). Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.628-31 KEYWORDS: MELANAGROMYZA. PIGEON PEAS. PEST RESISTANCE.

A study was conducted during 2002–05 to examine the mode of inheritance of field resistance in 8 crosses involving 4 resistant parents, viz. 'PDA 88-2E', 'PDA 89-2E', 'PDA 92-2E' and 'PDA 93-2E' and 4 susceptible parents, viz. 'DA11', 'NDA1', 'ICP 5174' and 'ICP12386' and their allelic relationship among genes imparting resistance to pod fly (Melanagromyza obtusa L. Malloch.) in resistant parents. The parental lines, their F1s, F2s and back crosses were evaluated for the pest reaction. In the F1 of all crosses between resistant and susceptible parents, a susceptible reaction was observed that indicates dominance of susceptibility over the resistance. The segregation pattern in F2 of these crosses revealed that resistance was controlled by 2 genes (mor1mor1Mor2Mor2) with interaction between recessive and dominant alleles in resistant donors, 'PDA 88-2E' and 'PDA 89-2E' and 2 homozygous recessive genes (mor1 mor1 mor2 mor2) were responsible for resistance in the parents, 'PDA 92-2E' and 'PDA 93-2E'. From the reaction of individuals in F2 and backcross generations of crosses between resistant parents, the same genes were present in resistant lines,'PDA 88-2E' and 'PDA 89-2E' which were allelic but differed for a single gene with the genes present in 'PDA 92-2E' and 'PDA 93-2E'.

029. Ram, Bhagirath; SD Agricultural University, Gujarat (India). Tikka, S.B.S.; SD Agricultural University, Gujarat (India). Mahla, H.R.; SD Agricultural University, Gujarat (India). Stability of seed yield and quality characters in blackgram (Vigna mungo). Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.654-57 KEYWORDS: VIGNA MUNGO. STABILITY. QUALITY. SEED. YIELDS.

An experiment was conducted during rainy (kharif) season of 2007 to study the phenotypic stability parameters for seed yield and three quality characters in 100 genotypes of blackgram [Vigna mungo (L.) Hepper]. The G×E interaction was highly significant for seed yield/plant and water absorption (g/g seeds). The environment (linear) components were significant for all the characters. Pooled deviation (non-linear portion of variance) which is unpredictable portion of G×E interaction was significant for most of the traits except dal recovery. The crosses 'RBU38' × 'IU8-6', 'RBU38' ×'NUL7' and 'IPU99-1'×'NIC17556' had higher responsiveness therefore, these crosses were considered suitable for better environmental conditions. Whereas a best stable and desirable cross having high per se performance along with regression coefficient equivalent to unity and S2di equivalent to zero was 'IPU99-1'×'NUL7'.

030. Billore, S.D.; National Research Centre for Soybean, Indore (India). Ramesh, A.; National Research Centre for Soybean, Indore (India). Vyas, A.K.; National Research Centre for Soybean, Indore (India). Joshi, O.P.; National Research Centre for Soybean, Indore (India). Potassium-use emciencies and economic optimization as influenced by levels of potassium and soybean (Glycine max) genotypes under staggered planting. Indian Journal of Agricultural Sciences (India). (July 2009) v.79(7) p.510-514

KEYWORDS: POTASSIUM. POTASH FERTILIZERS. ECONOMICS. SOYBEANS. PLANTING. PRODUCTIVITY. GENOTYPES.

Field experiments were conducted during 2006-07 to study the effect of planting time and potassium levels on productivity, potassium uptake and potassium-use efficiency by promising soybean (Glycine max L. Merr.) genotypes under Malwa plateau of central India. Timely planting of soybean (last fortnight of June) showed superiority over the late planting with respect to all the parameters evaluated. Timely planting of soybean gave higher yield (20.28%) and potassium uptake (24.62%) over late planting. Potassium recovery, physiological and internal-use efficiency were higher in late planted soybean compared with the timely planting. The significantly highest net returns was recorded with 49.8 kg K/ha, while the maximum B:C ratio was associated with 33.2 kg K/ha. Potassium uptake increased concomitantly with the levels of potassium. Potassium-use efficiencies (agronomic, recovery efficiency, physiological efficiency and internal K use efficiency) decreased as the levels of potassium increased. All the 3 soybean genotypes were found to be identical in terms of productivity potential while soybean genotypes differed significantly among themselves with regards to potassium-use efficiencies. The economic optimum level of potassium for planting time and soybean genotypes ranged from 37 to 39 kg/ha. Variety like 'NRC 7' has immense utility when planting is delayed.

031. Gangopadhyay, K.K.; National Bureau of Plant Genetic Resources, New Delhi (India). Yadav, S.K.; National Bureau of Plant Genetic Resources, New Delhi (India). Kumar, Gunjeet; National Bureau of Plant Genetic Resources, New Delhi (India). Meena, B.L.; National Bureau of Plant Genetic Resources, New Delhi (India). Mahajan, R.K.; National Bureau of Plant Genetic Resources, New Delhi (India). Correlation, path-coefficient and genetic diversity pattern in fenugreek {Trigonella foenum-graecum). Indian Journal of Agricultural Sciences (India). (July 2009) v.79(7) p.521-526 KEYWORDS: TRIGONELLA FOENUM GRAECUM. GENETIC VARIATION. SELECTION RESPONSES. STATISTICAL METHODS.

An experiment was carried out during winter (rabi) season of 2004 and 2005 to assess the correlation, path-coefficient, and genetic variability in 40 morphologically diverse accessions of fenugreek (Trigonella foenum-graecum L.). Plant height, primary branches, days to 50% flowering, pods/plant, grains/pod, days to maturity, 1 000-seed weight and seed yield/plant showed significant differences and wide variations in both the years. Low differences between phenotypic co-efficient of variation and genotypic co-efficient of variation were observed for all descriptors in both the years. Pods/plant, 1 000-seed weight and seed yield/plant in both the years showed high heritability coupled with high genetic advance (per cent of mean) signifying the influence of additive gene effects. The descriptors pods/plant and 1 000-seed weight had positive and significant correlation with seed yield/plant and exerted positive and high direct effects on seed yield/plant for both the years. Ward's clustering technique grouped accessions into 3 clusters having 24, 5 and 11 accessions. Cluster I was the most distinct from other clusters. Principal Component Analysis (PCA) confirmed the groupings obtained through cluster analysis and showed revealed that the first 3 principal components accounted for 74.89% variation. PCI was related with primary branches, days to 50% flowering and seed yield/plant. From the principal component analysis ordination, it is observed that the scatters of points for the clusters have a central focus as well as significant outliers to some groups. This presumably comes from the third. The outliers and central clusters provide the opportunity to select accessions from the central as well as outliers for use in breeding programme.

032. Hariprasanna, K.; National Research Centre for Groundnut, Junagarh (India). Chunilal; National Research Centre for Groundnut, Junagarh (India). Radhakrishnan, T.; National Research Centre for Groundnut, Junagarh (India). Potential groundnut (Arachis hypogaea) genotypes with large seed size for sustaining groundnut farming. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(7) p.549-551 KEYWORDS: SEED SIZE. GROUNDNUTS. SEED SIZE. FRUIT. YIELDS.

Development of groundnut genotypes with higher productivity coupled with appropriate quality attributes is essential to boost the use of groundnut for direct consumption and to sustain the groundnut farming. Large-seeded groundnuts command a premium price both in the domestic and international markets. Seven advance breeding lines were evaluated for two seasons along with 3 check varieties possessing large seed size. Analysis of data indicated that the genotypes differed significantly for all the traits except for oil content. Three advance breeding lines, 'PBS 29077', 'PBS 29078' and 'PBS 29080', were found to possess superiority for both pod and kernel yields over the best check for yield 'GG 20'. The genotype 'PBS 29077' exhibited significantly higher seed size (100-kernel weight of 58.2 g) than the best check 'TKG 19A for the trait, while 'PBS 29078', 'PBS 29080' and 'PBS 29071' recorded seed size that was numerically superior to the checks. Highest mean harvest index was observed in 'PBS 29077' (40.9%). Because of the yield potential as well as seed size superiority 'PBS 29077', 'PBS 29078' and 'PBS 29080' would help the groundnut farmers in reaping rich dividends and to abate the competition from other lucrative crops like cotton, which is fast encroaching the traditional groundnut belts in India.

034. Yadava, D.K.; Indian Agricultural Research Institute, New Delhi (India). Sapra, R.L.; Indian Agricultural Research Institute, New Delhi (India). Vasudev, Sujata; Indian Agricultural Research Institute, New Delhi (India). Dass, B.; Indian Agricultural Research Institute, New Delhi (India). Prabhu, K.V.; Indian Agricultural Research Institute, New Delhi (India). Selection of high diversity with a minimal set of accessions from Indian mustard (Brassica juncea) germplasm collection. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(7) p.552-554 KEYWORDS: BRASSICA JUNCEA. GERMPLASM. PARENTS. SAMPLING.

A simplified procedure based on the K-Means Clustering and inertia score for the selection of diverse accessions from large germplasm collections ensuring higher evenness as well as richness in the sample is presented. A sample size of nearly 10% of the whole population selected on the basis of said procedure represented the entire spectrum of variability with a better evenness and resulted in a very high value of pooled Shannon Diversity Index of 17.11 as compared to 13.35 for the entire population. The sample also captured almost cent per cent richness, ie 59 descriptor states out of 60 present in the population. This minimal set of 27 diverse accessions,thus, selected can be effectively utilized in the development of germplasm core set as well as in the breeding programme.

035. Kemparaju, K.B.; Indian Agricultural Research Institute, New Delhi (India). Yadava, D.K.; Indian Agricultural Research Institute, New Delhi (India). Vasudev, Sujata; Indian Agricultural Research Institute, New Delhi (India). Yadav, Anil Kumar; Indian Agricultural Research Institute, New Delhi (India). Bhagwan Dass; Indian Agricultural Research Institute, New Delhi (India). Giri, S.C.; Indian Agricultural Research Institute, New Delhi (India). Prabhu, K.V.; Indian Agricultural Research Institute, New Delhi (India). Genetic analysis of yield and yield-attributing traits in Indian mustard (Brassica juncea). Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(7) p.555-558 KEYWORDS: BRASSICA JUNCEA. GENETICS. GENES. YIELD COMPONENTS.

The field experiments were conducted during 2005-08 to study the genetics of yield components of Indian mustard [Brassicajuncea (L.) Czern & Coss]. The 6 generations (Pl5 P2, F 1; F2, Bj and B2) of 11 primary cross combinations of Indian mustard, viz. 'NPJ 102'x'RGN 4 8 ' , 'NPJ 102'x'Laxmi', 'NPJ 102'x'Pusa Jagannath', 'NPJ 102'x'BEC 144', 'Pusa Agrani'x'Laxmi', 'Pusa Agrani'x'Pusa Jagannath', 'RGN 48'x'Laxmi', 'RGN 48'x'BEC 144', 'Ornamental rai'x'Pusa Jagannath', 'Pusa Jagannath'x'Ornamental rai', 'Pusa Jagannath'x'NPJ 50' were studied for 4 characters, viz. days to 50% flowering, days to maturity, seed yield/plant (g) and harvest index (%). The mean of 6 generations was subjected to scaling and joint scaling test to determine epistasis and genetic parameters m, d, h, i, j and 1 were studied. An epistatic digenic model including all types of interactions played a major role for all the primary cross combinations. The study revealed the importance of both additive and non-additive type of gene action for

all the traits studied. Duplicate epistasis played a relatively greater role than complementary epistasis. Therefore, reciprocal recurrent selection is suggested for development of superior varieties.

036. Pathak, Rakesh; Central Arid Zone Research Institute, Jodhpur (India). Singh, Manjit; Central Arid Zone Research Institute, Jodhpur (India). Henry, A; Central Arid Zone Research Institute, Jodhpur (India). Genetic divergence in clusterbean (Cyamopsis tetragonoloba) for seed yield and gum content under rainfed conditions. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(7) p.559-561 KEYWORDS: CYAMOPSIS PSORALIOIDES. GENETIC DISTANCE. SEEDS. YIELDS.

Genetic diversity was carried out in 40 genotypes of Clusterbean or guar [Cyamopsis tetragonoloba (L.) Taub.] during rainy (kharif) season of 2005-06 to 2007-08. Significant differences were observed due to genotypes. These genotypes were grouped into 7 clusters using Ward's Euclidean distance statistic. Majority of the genotypes constituted cluster I. The genotypes of common geographic origin or same location were grouped into different clusters. The average inter cluster D2 values indicated maximum statistical divergence between cluster HI and VI, followed by I and VI and II and VI. Cluster VI recorded highest pods/ plant, seed yield/plant, gum content, primary and secondary branches/plant.

037. Bashyal, B.M.; Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, (India). Ramesh Chand; Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, (India). Kushwaha, Chanda; Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, (India). Prasad, L.C.; Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, (India). Joshi, A.K.; Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, (India). Improved in vitro technique for screening of barley (Hordeum vulgare) genotypes against toxin produced by spot blotch pathogen Bipolaris sorokiniana. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(7) p.562-564 KEYWORDS: BARLEY. COCHLIOBOLUS SATIVUS. CHLOROSIS. VITROPLANTS.

An improved technique was developed for screening of barley genotypes in response to fungal toxin of B. sorokiniana. Sixteen genotypes of barley were screened against the toxin in vivo and in vitro conditions. Chlorosis symptom appeared at particular time interval in in vivo condition was correlated with the symptom appeared in in vitro with similar ranking order. Similar results for polyhouse and laboratory conditions were observed at different temperature treatments. Results of in vitro test were found consistant and with higher infiltration efficiency. Similar host response to the toxin in laboratory condition and standing plants open up the possibility of screening large number of genotypes against the earlier methods.

038. Singh, Pramod Kumar; Indian Institute of Vegetable Research, Varanasi (India). Rai, N.; Indian Institute of Vegetable Research, Varanasi (India). Singh, D.V.; Indian Institute of Vegetable Research, Varanasi (India). Reaction of some Indian bean (Lablab purpureus) genotypes against Dolichos yellow mosaic virus under Varanasi condition. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(7) p.565-568 KEYWORDS: LABLAB PURPUREUS. GENOTYPES. DISEASE RESISTANCE.

Three hundred genotypes of Indian bean (Lablab purpureus) were screened against dolichos yellow mosaic virus (DYMV) in both field and artificial conditions during 2005-07. It was observed that the lines 'VRSEM 894', 'VRSEM 860' and 'VRSEM 887' were found to be symptomless against DYMV in both natural and artificial screenings. Hence, these lines may be utilized as resistance sources for developing varieties/lines resistant against DYMV. Another study on the effect of environmental conditions on spread of DYMV incidence revealed that there was significant impact of temperature and humidity on the incidence of DYMV. The maximum per cent incidence was recorded at maximum and minimum temperature of 39.8 and 24.5°C along with relative humidity of 56 and 30.75, respectively.

039. Parveen, S.; I.A.R.I., Network Project on Insect Biosystematics (NPIB), Division of Entomology, New Delhi (India). Khokhar, S.; C.C.S.H.AU., Department of Entomology, Hisar (India). Md., K.; A.M.U., Department of Zoology, Aligarh (India). Comparative Morphology of Spermatheca and its utility in Diagnostics of Poecilocoris spp.. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.239-240 KEYWORDS: FUNGAL MORPHOLOGY. REPRODUCTION.

040. Kabade, K.H.; Junagadh Agricultural University, College of Agriculture, Department of Entomology, Junagadh (India). Bharodia, R.K.; Junagadh Agricultural University, College of Agriculture, Department of Entomology, Junagadh (India). Jethva, D.M.; Junagadh Agricultural University, College of Agriculture, Department of Entomology, Junagadh (India). Joshi, M.D.; Junagadh Agricultural University, College of Agriculture, Department of Entomology, Junagadh (India). Susceptibility of Genotypes of Okra to Bemisia tabaci. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.240-241 KEYWORDS: GENOTYPES. OKRAS. BEMISIA TABACI. BEMISIA.

041. Prasad, S.S.; Crop Research Station, Ghaghraghat, Bahraich (India). Yadav, S.S.; Crop Research Station, Bahraich (India). Gupta P.K.; Crop Research Station, Bahraich (India). Identification of Capsularis Jute donors against Insect and Mite pests. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.255-256 KEYWORDS: JUTE. PEST MITES. INSECT DISEASES.

042. Thakur, N.S; All India Coordinated Sorghum Improvement Project, Indore (India). Kushwaha, B.B.; All India Coordinated Sorghum Improvement Project, Indore (India). Sinha, N.K.; All India Coordinated Sorghum Improvement Project, Indore (India). Upadhya, S.N.; All India Coordinated Sorghum Improvement Project, Indore (India). Effect of Plant density and Nitrogen levels on Growth, Yield attributes and Yields of Sweet Sorghum (Sorghum bicolor (L.) Moench) Genotypes. Indian Journal of Dryland Agricultural Reserach and Development (India). (June 2009) v.24(1) p.34-38 KEYWORDS: NITROGEN CONTENT. SORGHUM. GENOTYPES. YIELD COMPONENTS.

A field experiment was conducted during rainy (Kharif) season of 2005 and 2006 at college of Agriculture, Indore (MP) to study the effect of plant density and nitrogen levels on growth, yield attributes and yields of sweet sorghum. The experiment was laid out in split plot design. Two genotypes viz. NSSH-104 and SSY-84 and two-plant densities (1.11 lakh and 1.48 lakh plants Iha) were in the main plot treatments and four nitrogen levels (30, 60, 90 and 120 kg ha,l) in the sub plot treatments. Plant density of 1.11 lakh plants /ha recorded maximum growth, dry matter/plant and yield attributing characters, while plant density of 1.48 lakh plants Iha was found optimum for higher yields, monetary returns and benefit cost ratio. Genotype NSSH-1 04 emerged as a promising genotype. Nitrogen level 120 kg ha'i found suitable for the maximum growth, dry matter production, yield attributes, yields and monetary returns.

043. Sharma, K.D.; CCS Haryana Agricultural University, Dept. of Agronomy, Crop Physiology Lab. Hissar (India). Kumar, Ashok; CCS Haryana Agricultural University, Dept. of Agronomy, Crop Physiology Lab. Hissar (India). Genotypic variation for agro-physiological traits and their utilization as screening indices for drought tolerance in wheat. Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p.1-5 KEYWORDS: DROUGHT RESISTANCE. WHEATS. GENOTYPES. SOIL WATER CONTENT. BIOMASS.

Plants of 56 genotypes of bread wheat (Triticum aestivum L.) were grown under irrigated and droughted conditions under field conditions at CCS Haryana Agricultural University, Hisar, India. Leaf water status, canopy temperature depression and gas exchange were measured in the flag leaf at anthesis and yield-attributes and yield were recorded at harvest. The results revealed that there was a significant genotypic variation for all traits. Seed yield was positively correlated with yield' attributes but a stronger relationship was observed with biomass. Drought susceptibility index (OSI) of genotypes matched for biomass and seed yield. Significant correlations were found among agro-

physiological traits. Genotypes with higher soil moisture use from deeper layers (90-180 mm) maintained higher leaf relative water content (RWC), transpiration rate (E), photosynthetic rate (PN) and cooler canopy (higher canopy temperature depression, CTO). Agro-physiological traits such as soil moisture use (90- 180 mm), RWC, PN and CTO were strongly correlated with seed yield. Since CTO is easier to measure than other characters, therefore, CTO measured at midday at the anthesis stage could be used as selection indices to screen large number of germ plasm lines of wheat for drought tolerance under field conditions.

044. Tiwari, V.; Directorate of Wheat Research, Karnal (India). Singh, R.P; Directorate of Wheat Research, Karnal (India). Shoran, Jag; Directorate of Wheat Research, Karnal (India). A method to verify the continuance of check varieties in multilocation yield trials - A case study in wheat. Indian Journal of Genetics and Plant Breeding (India) . (Feb 2010) v.70(1) p.6-10 KEYWORDS: VARIETIES. WHEATS. YIELDS. PERFORMANCE TESTING. STABILITY.

Three statistical tools, namely relative yield, yield responsiveness and Eberhart and Russel's parameters, were used for assessing the performance of three wheat check varieties used for evaluation of coordinated multi location yield trials. Relative yield indices over locations and over years revealed that the check HD2687 was the most stable one, while PBW343 showed above optimum performance and HD2329 showed below optimum performance. In responsiveness for yield, HD2687 showed stable responsiveness, while PBW343 showed higher responsiveness and HD2329 recorded low responsiveness. The study revealed that among the three check cultivars, HD2329 may be removed as a check due to its low yield performance, while HD2687, showing desirable features of responsiveness along with yield stability and PBW343 having high responsive attributes, should be continued as checks in the years to come. The continuance of check cultivars for multilocation yield testing should be based on the relative yield stability and responsiveness characteristics.

045. Khan, Hanif; Indian Agricultural Reserach Institute, Division of Genetics, New Delhi (India). Tomar, S.M.S; Indian Agricultural Reserach Institute, Division of Genetics, New Delhi (India). Chowdhury, S.; Indian Agricultural Reserach Institute, Division of Genetics, New Delhi (India). Genetic analysis of resistance to spot blotch (Bipolaris sorokiniana) in wheat. Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p.11-16 KEYWORDS: DISEASE RESISTANCE. SPOTS. COCHLIOBOLUS SATIVUS. COCHLIOBOLUS. WHEATS. GENOTYPES. COMBINING ABILITY. DIALLEL ANALYSIS.

Diallel analysis of spot blotch resistance was laid out involving six resistant and two susceptible genotypes of spring wheat of diverse origin in order to evaluate their general combining ability (GCA) and specific combining ability (SCA). The parents chosen showed wide variation for area under disease progress curve (AUDPC) of spot blotch. GCA and SCA effects were statistically significant for AUDPC score suggesting that additive as well as non- additive genetic mechanisms were involved in the expression of resistance in these parents. Wheat genotypes Chirya-3, Shanghai-4, Suzhoe 128-0Y, Suzhoe 1-58, Longmai and CuanmaiNo.18 had significantly negative GCA effects for AUDPC in F1 generations, suggesting their prime suitability for use in wheat breeding programs to improve resistance to spot blotch. The estimate of narrow- sense heritability was 0.69 whereas broad-sense heritability was 0.92 in F1s. The results indicated predominance of additive gene action in the inheritance of spot blotch resistance in spring wheat.

046. Shanthi, P.; Allahabad Agricultural Institute, Dept. of Genetics and Plant Breeding. Allahabad (India). Babu, G. Suresh; Allahabad Agricultural Institute, Dept. of Genetics and Plant Breeding. Allahabad (India). Satyanarayana, E.; Allahabad Agricultural Institute, Dept. of Genetics and Plant Breeding. Allahabad (India). Kumar, R. Sai; Allahabad Agricultural Institute, Dept. of Genetrics and Plant Breeding. Allahabad (India). Combining ability and stability studies for grain yield and quality parameters in

QPM (Zea mays L.) inbred line crosses. Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p.22-28 KEYWORDS: COMBINING ABILITY. STABILITY. GRAIN. YIELDS. QUALITY. GENOTYPE ENVIRONMENT INTERACTION.

Studies on combining ability, stability and G x E interaction were carried out at two locations (Hyderabad and Allahabad) and in two seasons (Kharif 2003 and Kharif 2004) for grain yield and three quality parameters viz., protein content, oil content and tryptophan content in 45 single cross hybrids developed using 10 x 10 diallel set (excluding reciprocals). From this study it is inferred that, the three hybrids P4 x P7, P2 X P6 and Ps x P10 were considered as most stable and good specific combiners for grain yield and quality parameters (protein, oil and tryptophan content) along with higher per se values for the four characters studied. These hybrids can be exploited as better QPM hybrids for commercialization across the wide environments through heterosis breeding and also for the derivation of QPM inbred lines in segregating generations. Among the ten parents, the parents P3 and P1were found to be the best parents for grain yield, while, the parents P4, P7 and P2 for protein, oil and tryptophan content.

047. Lakshmana, D.; Regional Agricultural Research Station, Bijapur (India). Birandar, B.D.; Regional Agricultural Research Station, Bijapur (India). Deshpande, S.K.; Regional Agricultural Research Station, Bijapur (India). Madaiah, D.; Regional Agricultural Research Station, Bijapur (India). Studies on combining ability and heterosis involving diverse cytoplasmic male sterility system in pearl millet. Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p. 29-33 KEYWORDS: COMBINING ABILITY. HETEROSIS. CYTOPLASMIC MALE STERILITY. PENNISETUM GLAUCUM.

Investigation was undertaken to study the combining ability and to quantify the magnitude of heterosis of alloplasmic isonuclear lines of pearl millet. The results revealed that the lines with A4 cytoplasm are significantly better general combiner for grain yield per ear, ear weight, ear length and productive tillers per plant than the lines with A1 and A5 cytoplasm. Pollinators IP-1497, IP-973, IP- 872 and IP-10085 proved their utility for breeding high yielding hybrids. None of the pollinators proved to be good combiners simultaneously for all the traits. Majority of the hybrids carrying A4 cytoplasm were highly heterotic for the traits viz., days to maturity, plant height, ear head weight, grain yield/ear, grain yield Iplant and ear length. On the other hand, majority of the As based hybrids were highly heterotic for productive tillers, ear length, flag leaf area and peduncle length. The mean as well as range of heterosis for days to flowering, days to maturity, plant height, flag leaf area and 1000-grain weight was limited in all the three sources of cytoplasm. The magnitude of heterosis was high for ear weight, grain yield/ear and grain yield/plant and A4 based hybrids had maximum heterosis for grain yield per plant and other panicle components, followed by A1 and As indicating a distinct advantage of these cytoplasms.

048. Jose, Franklin Charles; Government Arts College, Department of Plant Biology and Biotechnology, Coimbatore (India). Mohammed, M.M. Sudheer; Government Arts College, Department of Plant biology and Biotechnology, Coimbatore (India). Sanil, R.; Government Arts College, Department of Plant biology and Biotechnology, Coimbatore (India). Dorai, R.; Government Arts College, Department of Plant biology and Biotechnology, Coimbatore (India). Madanan, M.G.; Government Arts College, Department of Plant biology and Biotechnology, Coimbatore (India). Analysis of phaseolin and total storage protein-based diversity in common bean landraces of Nilgiri using S0S-PAGE. Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p.34-38 KEYWORDS: GLOBULINS. STORAGE PROTEINS. KIDNEY BEANS. SEED STORAGE. SEED. BIODIVERSITY. GERMPLASM CONSERVATION. LAND RACES.

Seed storage protein variation was studied in 20 common bean landraces (LRs) collected from different traditional farming villages of Nilgiris district ofTamilnadu, India, with Sodium Oodecyl Sulphate Polyacrylamide Gel Electrophoresis (SOS-PAGE). Evaluation of common bean germ plasm with seed storage proteins is essential for conservation, breeding and to determine the possible origin of common beans. The electrophoretogram revealed major seed proteins such as phaseolin (PHS),

Phytohemagglutinin (PHA), a-amylase inhibitors (aAls) and Arcelin (ARL). The purified PHS fraction has three and two subunits, respectively in the Andean and Mesoamerican land races. A dendrogram was constructed based on Jaccard's coefficients of protein markers using the average distance method, which has separated the accessions into two major clusters, eight Mesoamerican and twelve Andean. This result proved that Nilgiris' common bean popUlation is highly diverse and there is immense scope for further improvement. A better knowledge of seed storage protein variation of common beans will help in genetic improvement and conservation programme for its land races in Nilgiris.

049. Cholin, Sarvamangala; University of Agricultural Science, Dept. of Genetics and Plant Breeding. Dharwad (India). Gowda, M.V.C.; University of Agricultural Science, Dept. of Genetics and Plant Breeding. Dharwad (India). Nadalf, H.L.; University of Agricultural Science, Dept. of Genetics and Plant Breeding. Dharwad (India). Genetic variability and association pattern among nutritional traits in recombinant inbred lines of groundnut (Arachis hypogaea L.). Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p.39-43 KEYWORDS: GENETIC VARIATION. INBRED LINES. GROUNDNUTS. GENOTYPE ENVIRONMENT INTERACTION. OLEIC ACID. PROTEINS. OILS. HERITABILITY.

Groundnut (Arachis hypogaea L.) is the world's third most important source of oil and fourth most important source of vegetable protein. Oil content, protein content and fatty acid composition (OIL ratio) are the most important quality attributes of groundnut. A mapping population segregating for these traits was evaluated for genetic variability and correlation among the traits. The population exhibited significant variation among the genotypes, seasons and G x E interaction. Moderate magnitude of variability followed by higher heritability was observed for most of the quality traits. Negative correlation between oil and protein content, oleic and linoleic acid indicated their antagonistic nature. All the eight fatty acids were correlated with each other either positively or negatively. Superior RILs were identified for higher protein content, oil content, oleic acid and OIL ratio from the population.

050. Reddi, S.H.N.; College of Agriculture, Department of Agricultural Botany, Nagpur (India). Naole, V.P.; College of Agriculture, Department of Agricultural Botany, Nagpur (India). Goyal, V.S.; College of Agriculture, Department of Agricultural Botany, Nagpur (India). Patil, P.V.; College of Agriculture, Department of Agricultural Botany, Nagpur (India). Kalamkar, Vandana B.; College of Agriculture, Department of Agricultural Botany, Nagpur (India). Sable, N.H.; College of Agriculture, Department of Agricultural Botany, Nagpur (India). Mahaeshwari, J.J.; College of Agriculture, Department of Agricultural Botany, Nagpur (India). Ghorpade, P.B.; College of Agriculture, AIl India Coordinated Research Project on Linseed, Nagpur (India). Evaluation of three cycle of recurrent selection for improvement of seed yield in safflower using genetic male sterility. Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p.44-47 KEYWORDS: MALE INFERTILITY. RECURRENT SELECTION. SAFFLOWER. BREEDING METHODS. BREEDS (ANIMALS). GENETIC VARIATION.

Three cycles of recurrent selection for seed yield were conducted in a genetically broad·based population of safflower segregating for genetic male sterility for development of safflower varieties with broad genetic base. Four families from C1, 26 families from C2 and 41 families from C3 were significantly out-yielded the check variety, Bhima. The percent increase in seed yield over check variety, Bhima ranged from 24.37 to 35.52%. The hlighest yield was recorded by half-sib 68 (2131 kglha) followed by half-sib 109 (2091 kglha) and half sib 92 (1985 kglha) in advanced yield trials. The application of recurrent selection procedure provides a better approach for development of higher yielding safflower varieties with a broad genetic base.

051. Patra, Nandita; G.B. Pant Univ. of Agric. & Tech, Department of Genetics and Plant Breeding, Pantnagar (India). Agrawal, R.C.; National Bureau of Plant Genetic Resources, New Delhi (India). Chawla, H.S.; G.B. Pant Univ. of Agric. & Tech, Department of

Genetics and Plant Breeding, Pantnagar (India). Assessment of distinctiveness, uniformity and stability of basmati rice (Oryza sativa L.) varieties based on morphological descriptors. Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p.48-57 KEYWORDS: STABILITY. RICE. POLYMORPHISM. COMBINING ABILITY.

Eighteen basmati rice varieties were characterized using morphological descriptors adopted from the DUS guidelines of PPV & FR Authority and subsequently examined for their Distinctiveness, Uniformity and Stability. Among the 46 visually assessed characters 26 characters were monomorphic, 11 characters were dimorphic and seven characters were polymorphic indicating their potential for variet-al characterization and distinctiveness. No intra-varietal variation was observed for any of the visual characteristics and expression of characters in different varieties remained same for the two consecutive years confirming the uniformity and stability of the varieties. Combined Over Years Distinctiveness (COY-D) analysis was made on 14 measurable DUS descriptors which revealed distinctiveness for all varieties with respect to each other. COY-D analysis was complemented with MJRA analysis. The slope of the MJRA curves in both the years and regression coefficients indicated that all the considered characters were not completely independent and they are interacting with each other as well as with environment. Combined Over Years Uniformity (COY-U) analysis for five of the measurable characteristics revealed that 15 out of 18 varieties were almost uniform for the characters under study. However the other three varieties were non-uniform for one or two characters emphasizing the need for their further purification to attain a considerable level of homogeneity in their heterogeneous blend. On the basis of grouping characteristics unique morphological profiles could be established for seven varieties. When all the 60 morphological descriptors were studied two more varieties could be distinguished. Thus the morphological DUS descriptors could establish distinctiveness of some varieties but varieties showing overlapping of the expression for these characters could not be discriminated hence some other markers/ descriptors could be considered for complementing the morphological DUS descriptors for establishing the distinctiveness.

052. Joshi, Abhilasha; G.B. Pant Univ. of Agric. & Tech, Department of Genetics and Plant Breeding, Pantnagar (India)Chawla, H.S.; G.B. Pant Univ. of Agric. & Tech, Department of Genetics and Plant Breeding, Pantnagar (India). Biochemical and molecular markers for establishing distinctiveness of aromatic rice (Oryza sativa L.) varieties. Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p.58-64 KEYWORDS: AROMATIC COMPOUNDS. RICE. ELECTROPHORIDAE. RAPD. GENETIC MARKERS. ISOENZYMES.

Use of biochemical and molecular markers in OUS testing for establishing distinctiveness as a complement to morphological descriptors has been attempted in this study. Twenty indigenous aromatic rice (Oryza sativa L.) varieties were studied for morphological descriptors, total soluble proteins and isozymes as biochemical and RAPO molecular markers for determining distinctive features. 50S-PAGE for total soluble proteins and isozyme analysis revealed moderate and moderate to high degree of polymorphism respectively. UPGMA analysis of combined isozyme data of different enzymes could discriminate all varieties except Bindli from Tilakchandan and two related varieties ofTiiakchandan.ln general neither morphological descriptors nor biochemical markers could discriminate especially related indigenous varieties of a particular group. A high degree of polymorphism was detected among the twenty aromatic rice varieties through 9 random primers used for RAPO marker analysis. UPGMA cluster analysis of RAPD data could distinguish all the twenty rice varieties. It can be concluded that in situations where the morpho-physiological OUS descriptors are not able to establish distinctiveness of a variety then biochemical and molecular markers may be used as additional or complement descriptors for resolving distinctiveness of indigenous related varieties.

053. Chaudhary, Babita; IARI, Division of Genetics, New Delhi (India)Mani, V.P.; Vivekananda Parvatiya Krishi Anusandhan Sansthan, Uttrakhand (India). Genetic analysis of resistance to Turcicum Leaf Blight in semi- temperate early maturing genotypes of maize (Zea mays). Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p.65-70 KEYWORDS: SETOSPHAERIA TURCICA. CHRONIC COURSE. MAIZE. DISEASE RESISTANCE. MATURITY. COMBINING ABILITY. HERITABILITY.

Turcicum leaf blight (Exserohilum turcicum) is the most common and chronic disease of maize, especially in Himalayan hilly region. Studies on inheritance of the disease were conducted using six generations derived from 4 susceptible (CM 128, V 327, V 128 and V 17) and 2 resistant inbred lines (V 335 and V 13) having early maturity suited to hilly region. The 6 parents and their 15 F1's, 15 F2's, 15 BC1's and 15 BC2's, were studied for reaction to turcicum leaf blight at 2 locations namely, Hawalbagh Research Farm of Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora during kharif 2000 and at Sihora Farm, RUdrapur during rabi, 2000-01. Significant additive and dominance variances were observed in most of the crosses in the two environments mentioned above. The study suggested that both additive and dominance components were important in the inheritance of turcicum leaf blight, the magnitude of additive component being relatively higher than non-additive component. Gene interactions and environment were also found to be important. The resistant lines V 335 and V 13 were found to be the best general combiners. Highly significant SCA effects were observed in both environments in 3 crosses, viz. V 327 x V 335, V 335 x V 17 and V 13 x V 128, which involved one disease resistant parent. Significant GCA and SeA variance also indicated that the additive and non- additive components were important in the inheritance of resistance to turcicum leaf blight in maize. Low to high Hns estimates were observed with good genetic advance, especially at Hawalbagh during kharif 2000. The higher estimates of additive component of variance, heritability and genetic advance during kharif 2000 indicated that selection for turcicum leaf blight resistance was likely to be more effective at Hawalbagh during kharif than at Rudrapur during rabi. Population improvement approach, preferably, reciprocal recurrent selection may be followed for the development of early maturing and turcicum leaf blight resistant cultivars of maize, especially for the Himalayan hilly region.

054. Sohu, R.S.; Punjab Agricultural University, Department of Plant Breeding and Genetics, Ludhiana (India). Dilawari, Maridul; Punjab Agricultural University, Department of Plant Breeding and Genetics, Ludhiana (India). Singh, Paramjit; Punjab Agricultural University, Regional Research Station, Bathinda (India). Gill, B.S.; Punjab Agricultural University, Department of Plant Breeding and Genetics, Ludhiana (India). Chahal, G.S.; Punjab Agricultural University, College of Agriculture, Ludhiana (India). Inheritance studies for earliness, yield and fibre traits using simplified triple test cross in G. hirsutum. Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p.71-75 KEYWORDS: FIBRES. YIELDS. COTTON. BREEDING METHODS. GENE INTERACTION. GENETIC VARIATION.

The simplified triple test cross analysis provides a precise test for epistasis along with unambiguous estimates of additive and dominance genetic variance. Different generations of simplified triple test cross analysis grown in a randomized complete block design with three replications were evaluated for major quantitative characters of earliness, yield and fibre quality. The analysis of variance for epistasis revealed the presence of epistasis for most of the characters studied. The analysis of variance for sums indicated the presence of additive genetic component in the inheritance of most of the characters except for number of monopods and sympods per plant, plant height, bolls at first sympod, bolls at sympod at 50 per cent plant height, boll weight, fibre strength and fibre quality index. Whereas the analysis of variance for differences indicated the involvement of dominance component in the inheritance of length of first sympod, days to maturity, seed cotton yield, number of bolls per plant, lint yield, ginning outturn, 2.5% span length, fibre fineness and fibre maturity. Both additive and dominance components of genetic variation were observed to be involved in the inheritance of length of first sympod, days to maturity, seed cotton yield, number of

bolls per plant, lint yield, ginning outturn and 2.5% span length. Out of these, length of first sympod, days to maturity, number of bolls per plant, ginning outturn and 2.5% span length showed higher magnitude of dominance genetic component indicating degree of dominance to be in the range of over dominance. The appropriate breeding methods for the improvement of different characters have been discussed.

055. Sarkar, B.N.; Central Muga Eri Research and Training Institute, Central Slik Board, Lahdoigargh (India). Gogoi, S.N.; Central Muga Eri Research and Training Institute, Central Slik Board, Lahdoigargh (India). Genetic variability studies in Eri silkworm (Samia ricini Donovan) of North Eastern Region of India. Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p.76-79 KEYWORDS: GENETIC VARIATION. SILKWORMS. AGROCLIMATIC ZONES. TESTING.

Three eri silkworm breeds namely SRI-001, SRI-010 and SRI-024 have been identified as the most promising for the agro climatic conditions of North Eastern region of India. Breed SRI-010 showed the highest cocoon yield (20.88 kg) followed by SRI-Q24 (20.01 kg) and SRI-001 (18.82 kg). Cocoon yield is positively is correlated with larval period (0.201), effective rate of rearing (0.302) and fecundity (0.668) and negatively correlated with cocoon weight (-0.061), cocoon shell weight (-0.002). Genotypic co-efficient of variation (GCV) and Phenotypic co-efficient of variation (PCV) showed closeness for the characters like ERR, cocoon yield and hatching indicated minimal influence on the expression of these traits. High heritability coupled with high genetic advance (GA) percent mean and high GCV in traits shown in cocoon yield, hatching percentage and pupal weight.

056. Rao, A.R.; Indian Agricultural Statistics Research Institute, New Delhi (India). Choudhary, Shiv Kumar; Rajendra Agricultural University, Bihar (India). Wahi, S.D.; Indian Agricultural Statistics Research Institute, New Delhi (India). Prabhakaran, V.T.; Indian Agricultural Statistics Research Institute, New Delhi (India). An index for simultaneous selection of genotypes for high yield and stability under incomplete genotype x environment data. Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p.80-84 KEYWORDS: GENOTYPES. GENOTYPE ENVIRONMENT INTERACTION. SELECTION CRITERIA. YIELDS. STABILITY.

A family of simultaneous selection indices is proposed here, which can be used for selecting genotypes simultaneously for high yield and stability under incomplete genotype x environment situations. Three indices are proposed by assigning different weights to yield (W1) and stability (W2) as w1=0.8, W2 =0.2 (11); w1=0.7, W2 =0.3 (12); w1=0.6, W2 =0.4 (13). These indices are tested for their performance based on Pearsonian correlations between yield based ranks and index based ranks, stability based ranks and index based ranks on ground nut data. It was found that the performance of 11 index is best for selecting high yielders as well as stable performers to the extent of 0%-10% of incompleteness in genotype x environment data. Among the top 4 out of 15 varieties selected based on 11, it is found that 2 - 3 are high yielders and high stable performers for 0%-1 0% of incompleteness.

057. Mishra, Maneesh; Central Institute for Sub-tropical Horticulture, Biotechnology Laboratory, Division of Crop Improvement, Lucknow (India). Shree, Yukti; Central Institute for Sub-tropical Horticulture, Biotechnology Laboratory, Division of Crop Improvement, Lucknow (India). Pati, Rajesh; Central Institute for Sub-tropical Horticulture, Biotechnology Laboratory, Division of Crop Improvement, Lucknow (India). Seal, Shubhendu; Central Institute for Sub-tropical Horticulture, Biotechnology Laboratory, Division of Crop Improvement, Lucknow (India). Shukla, Neelam; Central Institute for Sub-tropical Horticulture, Biotechnology Laboratory, Division of Crop Improvement, Lucknow (India). Kamle, Madhu; Central Institute for Sub-tropical Horticulture, Biotechnology Laboratory, Division of Crop Improvement, Lucknow (India). Ramesh Chandra; Central Institute for Sub-tropical Horticulture, Biotechnology Laboratory, Division of Crop Improvement, Lucknow (India). Srivastava, Alka; Lucknow University, Department of Botany, Lucknow (India). Micropropagation of Mangifera

indica L. cv. Kurakkan through somatic embryogenesis. Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p.85-90 KEYWORDS: STRESS. MANGIFERA INDICA. MANGIFERA. POLYEMBRYONY. ROOTSTOCKS. SOMATIC EMBRYOGENESIS. MANGOES. MICROPROPAGATION.

Nucellar embryogenesis was induced in Mangifera indica L. cv. Kurakkan, a polyembryonic salt tolerant, dwarfing rootstock. Nucellus tissue excised from 3.5 cm long fruits developed pro-embryonic callus in 19 days of inoculation on modified MS medium supplemented with 4.521JM 2,4- D, 0.05% malt extract and 13.781JM spermidine. Somatic embryogenesis exhibited high frequency (158.33 embryos). However, all the differentiated embryos proliferated on medium having low level of sucrose (4% w/v) and auxin (2.26IJM 2,4-0). Most of the proembryonic calli converted into heart shaped and cotyledonary embryos by reducing temperature to 15°C. Somatic embryos were matured on modified MS medium fortified with 0.381JM ABA, 0.571JM IAA and 30.30IJM PEG. Matured somatic embryos germinated (around 30%) on MS medium supplemented with 2.681JM NAA, 11.601JM kinetin and 2736.91JM glutamine.

058. Srivastav, Manish; Indian Agricultural Research Institute, New Delhi (India). Kumar, Mahesh; Indian Agricultural Research Institute, New Delhi (India). Dubey, A.K.; Indian Agricultural Research Institute, New Delhi (India). Singh, A.K.; Indian Agricultural Research Institute, New Delhi (India). Sairam, R.K.; Indian Agricultural Research Institute, New Delhi (India). Relationship between physiological parameters and vigour indices in polyembryonic genotypes of mango (Mangifera indica). Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.469-471 KEYWORDS: VIGOUR. POLYEMBRYONY. MANGOES. CHLOROPHYLLS. GENOTYPES.

A study was conducted during 2006-07 to investigate relationships of various physiological parameters associated with vigour of mango seedlings. Nucellar seedlings of 16 poly embryonic genotypes of mango were used for study. Vigour index was calculated in two ways by considering both length of the seedling and dry weight of seedling. Physiological parameters, viz. chlorophyll contents, stomatal density, net CO2 assimilation, relative water content, bark percentage and phenol contents were determined at different intervals. Vigour index I and vigour index II had linear positive regression relationship with chlorophyll 'a', chlorophyll 'b' and total chlorophyll among 16 mango genotypes. It was evident that genotypes showing vigorous growth had higher assimilation rate/unit leaf area than the less vigorous genotypes. The relationship between net CO2 assimilation with vigour index I (R2 = 0.82) and vigour index II (R2 = 0.72) was found linearly positive. However, stem bark percentage recorded in 16 mango genotypes showed linear negative relationship with vigour index I (y =-140.9x + 9838, R2 = 0.65) and vigour index II (y = -17.63x + 1044, R2 = 0.72). Similarly, vigorous genotypes had less phenol content in leaves and vice versa. Results showed that physiological parameters, viz. chlorophyll 'a', net CO2 assimilation, RWC (%), bark (%) and total leaf phenol contents are important criteria for determining vigour of mango seedlings at nursery stage.

059. Nautiyal, P.C.; Directorate of Groundnut Research. Junagadh (India). Kulkarni, Ganesh; Directorate of Groundnut Research. Junagadh (India). Seed SDS-PAGE protein profIle in dormant and non-dormant types of groundnut (Arachis hypogaea) cultivars. Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.476-478 KEYWORDS: ELECTROPHORESIS. SEED. GROUNDNUTS. VARIETIES.

SDS-PAGE protein profile was studied during seed desiccation and germination in seed dormant and non-dormant groundnut (Arachis hypogaea L.) cultivars. Comparison of protein profiles of seed dormant and non-dormant types before harvest, at final-harvest and during different hours of curing showed variation in interplay of protein bands of both low and high molecular weights. Protein profile also varied due to application of ethrel, whereas little or no difference was observed between protein profiles of ABA-treated and non-treated seeds at 24 hr of germination. Seed during curing or desiccation remained physiologically active and probably the proteins appearing during desiccation might help the seed in prolonging its viability and vigour,

however these proteins disappeared during germination. Detailed studies are required to understand the role of LEAs protein in longevity, dormancy and in desiccation tolerance.

060. Thakur, I.K.; Dr. Y.S. Parmar University of Horticulture & Forestry, Solan (India). Chauhan, K.C.; Dr. Y.S. Parmar University of Horticulture & Forestry, Solan (India). Singh, Charan; CSWCRTI, Dehradun (India). Evaluation and genetic improvement through progeny trials in different provenances of Bauhinia variegata suitable for foothills of the Himalayas.. Indian Journal of Soil Conservation (India). (Dec 2009) v.37(3) p.185-192 KEYWORDS: BAUHINIA VARIEGATA. BREEDING METHODS. PROGENY. HIGHLANDS. HIMALAYAN REGION.

Seeds were collected from phenotypically superior trees of Bauhinia variegata at 35 geographical locations from the natural distribution area in Himachal Pradesh during March–April and sown in the nursery in the last week of June. After fifteen month's growth, data were recorded on plant height, collar diameter, internodal length, number of branches, number of leaves, leaf area, fresh and dry shoot weight, fresh and dry root weight. The leaf samples were collected and analyzed for mineral nutrients and proximate principles viz., N, P, K, Ca, Mg, dry matter, crude protein, crude fibre, ether extract, total ash and nitrogen free extract. All the traits showed significant differences in the phenotypic characteristics. Estimates of variability and genetic parameters showed that leaf area and plant height were under additive type of gene action. Significant and positive correlation between different characteristics indicated the possibility of indirect selection in the species.

061. Rao, V.K.; GB Pant University of Agriculture and Technology, Pantnagar (India). Rathore, A.C.; Narendra Dev University of Agriculture & Technology, Kumarganj, Department of Horticulture, Faizabad (India). Singh, H.K.; Narendra Dev University of Agriculture & Technology Kumarganj, Department of Horticulture, Faizabad (India). Screening of aonla (Emblica officinalis Gaertn.) cultivars for leaf chlorophyll and amino acid under different sodicity and salinity levels. Indian Journal of Soil Conservation (India). (Dec 2009) v.37(3) p.193-196 KEYWORDS: SOFT FRUITS. VARIETIES. CHLOROPHYLLS. AMINO ACIDS. SALINITY. SALINE SOILS.

Two independent set of experiments were conducted to screen 6 aonla cultivars (NA-6, 7, 10, 18, chakaiya and anand 1) grown under different sodicity (control, 15, 30, 45, 60 ESP) and salinity (control, 5, 10, 15 dSm−1) levels. It was found that total chlorophyll content in the leaves of aonla cultivars decreased with increasing levels of sodicity and salinity. The chlorophyll content decreased maximum in NA-18 and Anand - 1 followed by NA-10, whereas minimum in Chakaiya followed NA-7 and NA-6. Free proline and total free amino acid content in leaves increased in all cultivars with increasing sodicity/salinity levels. Maximum free proline and total free amino acids were recorded at 60.00 ESP and 15.00 dSm−1 ECe levels with minimum in control. Thus, based on biochemical analysis of leaves in different cultivars of aonla it is concluded that Chakaiya, NA-7 and NA-6 are successfully grown with 90 per cent survivility in sodic soil upto 30.0 ESP and saline soil upto 10.0 dSm−1 ECe.

062. Rana, J.C.; National Bureau of Plant Genetic Resources, New Delhi (India). Sharma, S.K; National Bureau of Plant Genetic Resources, Regional Station, Phagli (India). Plant genetic resources management under emerging climate change. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.267-283 KEYWORDS: PLANT GENETIC RESOURCES. CLIMATIC CHANGE. CROP MANAGEMENT. STRESS. SPECIES. PHENOLOGY.

Plant genetic resources (PGR) are the basic raw materials required to cater current and future needs of crop improvement. Climate change is expected to result in increased frequency of abiotic stresses like drought, heat stress, submergence, increased soil salinity etc. The negative impacts of climate change are visible in the form of declining crop productivity, shifting in crop suitability areas, species migration and extinction, emergence of new pests and weeds and altered phenology. Already, the existing genetic base of our crops and varieties has shrunken, and in future we may find it difficult to

cope with new climatic challenges with the existing information on genetic resources. Consequently, food and sustainable livelihood security of larger section of populations is jeopardized. Substantial knowledge and insight is, therefore, needed to gauge what types of diversity now exist in the gene banks, and what will be needed in the future. There is a need to assemble and screen germplasm strategically and discover new sources of variations which will enable us to address the very pertinent issue of climate change. Strategies like genetic enhancement/pre-breeding using crops wild relatives, developing core sets, focused identification of germplasm, mapping and cloning gene and gene constructs, allele mining, bioprospecting for novel biomolecules, and promoting on farm conservation in order to allow genes to evolve and respond to new environments would be of great help to mitigate the climate change impacts. There is also need to mobilize national and international opinion to make food security and poverty alleviation central in climate negotiations.

063. Rao, V. Ramanatha; ATREE, Bangalore (India). In situ/on-farm conservation of crop biodiversity. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.284-293 KEYWORDS: STORAGE. FARM STORAGE. GENETIC RESOURCES. CLIMATIC CHANGE. BIODIVERSITY.

Agrobiodiversity conservation should be the basic component of any national agricultural improvement programme. Programmes that manage agricultural genetic resources need to reconsider their strategies. Conservation based on genebanks (ex situ conservation) must be broadened and be integrated with on-farm/in situ conservation to be able to conserve much large species and genetic diversity than would otherwise be possible. In situ conservation of agricultural biodiversity (crop and related species diversity) must be made an integral part of agricultural development and supplemented by ex situ conservation. It is obvious that the public sector will have to take the lead in implementing such a comprehensive approach, in which the private sector has an important supportive role. National and intergovernmental laws and regulations will have to provide the necessary legal framework. Civil society organisations (CSOs) as well as the private sector are becoming increasingly important in filling this framework with development reality on the ground. There is a great need for us to adapt to changing conditions accepting realities of climate change, which is a complex task and requires much research as much is unknown. We are in early stages of understanding the changing rules of the game, but I believe there is sufficient experience and diverse resources available to deal with the situation on short term basis, but for long term solutions further research is needed. Complacency should be out and we need to be strategic and need to involve several stakeholders and plan early and systematically. Some amount of crystal gazing and innovation (that may or may not seem right, right now). That means we need to be flexible and be able to change fast when situation demands.

064. Singh, Anurudh K; H.No. 2924, Sector 23, Gurgaon (India). Role of core collection and pre-breeding in management and use of genetic resources for designing crops under changing climate. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.294-299 KEYWORDS: GENETIC RESOURCES. CLIMATIC CHANGE. GENETIC VARIATION. GENE POOLS. VARIETIES.

The success to designing new cultivars, adapted to the changed climate primarily depends on the information regarding the genetic variability available within the taxonomic gene pool of cultivated species. This needs quantification of genetic variability within manageable set of collections and information about the phylogenetic relationships between distant sources of genetic variability and the cultivated species to enable introgression of desirable gene(s) into cultivated gene pool in a usable from. The core collection approach and gene pool grouping followed by pre-breeding can play an effective role in providing access to wide range of genetic resources, bringing their desirable gene(s) into cultivated species to meet the challenges of climatic changed. The present article discusses the possible application of these approaches along with concerns and future perspective.

065. Sharma, B.; Indian Agricultural Research Institute, Division of Genetics, Delhi (India). Towards season-free agriculture. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.300-304 KEYWORDS: CROPS. GENETIC TRANSFORMATION. GENE TRANSFER. BUTTERMAKING. STRESS.

Applied molecular genetics, popularly known as biotechnology, has opened opportunities beyond imagination. It is likely to revolutionize the science of plant breeding in not too distant future. With the possibility of transferring genes across the biological world, it has become possible to create new plant genotypes carrying traits not only unique to closer or distant taxa, but even those from animal and microbial kingdoms. A thorough churning of cropping patterns should be possible by creating new varieties adaptable to unconventional environments.Two major environmental factors determine the acceptability of any crop or different varieties of a particular crop. These are temperature and photoperiod. Genotypes that are neutral (insensitive) to day length and simultaneously tolerant to high as well as low temperatures could be cultivated in any part of the year, especially in tropical and subtropical regions of the globe. Efforts will also be needed to make such varieties tolerant/resistant/immune to the various biotic (e.g. pests and diseases) and abiotic (drought, salinity etc.) factors which perpetually inflict crops, leading to huge economic losses. All the above properties are under genetic control. Genes controlling these traits, one way or the other, can be harvested from close and distant taxa and used in genetic transformation. Genes for opposite properties, e.g. simultaneous tolerance to high as well as low temperatures, can be pyramidied in a single genotype, and their cultivation will not be season bound.. Consequences of such an eventuality will have tremendous impact on world agriculture, ultimately leading to solving the food problem of ballooning populations in the poorest countries.

066. Prabhu, K.V.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Singh, A.K.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Basavaraj, S.H.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Cherukuri, D.P.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Charpe, A.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Krishnan, S. Gopala; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Gupta, S.K.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Joseph, M.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Koul, S.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Mohapatra, T.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Pallavi, J.K.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Samsampour, D.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Singh, A.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Singh, Vikas K.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Singh, A.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Singh, V.P.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Marker assisted selection for biotic stress resistance in wheat and rice. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.305-314 KEYWORDS: STRESS. WHEATS. RICE. GENETIC MARKERS.

Use of molecular markers has emerged as a powerful and efficient approach to complement traditional plant breeding for improving crops. An array of molecular markers are now available that include RFLP that is based on Southern blot hybridization and, RAPD, ISSR, SSR and STS are based on polymerase chain reaction. The AFLP and CAPS markers are the other PCR based markers involving pre and post amplification restriction digestion, respectively. The most recent marker system is single nucleotide polymorphism (SNP) that utilizes the vast DNA sequence resources available in different crop species. Each of these markers has its own strengths and limitations. Markers are being used in several different aspects of crop improvement including estimation of

genetic diversity, construction of high density genome maps, mapping and tagging of genes, map-based isolation of genes and marker assisted selection (MAS). MAS is carried out for transferring target gene(s) from one genetic background to another using tightly linked markers (foreground selection). MAS is also carried out to quickly recover recurrent parent genome in backcross breeding using a large number of either random or mapped markers having whole genome coverage (background selection). Hence, MAS requires markers tightly linked to the genes for the target traits as well as high-density genome maps in crops of interest. This condition is not fulfilled in all crops and traits. The Division of Genetics, IARI has taken a lead in this approach in breeding for rust resistance in wheat, blight and blast resistance in rice. MAS has been effectively employed in pyramiding identified genes involving short breeding cycles through background and foreground selection thereby adding resistance to established cultivars of each crop.

067. Dass, Sain; Indian Agricultural Research Institute, Directorate of Maize Research, New Delhi (India). Kaul, J.; Indian Agricultural Research Institute, Directorate of Maize Research, New Delhi (India). Manivannan; Indian Agricultural Research Institute, Directorate of Maize Research, New Delhi (India). Singode, Avinash; Indian Agricultural Research Institute, Directorate of Maize Research, New Delhi (India). Chikkappa, G.K.; Indian Agricultural Research Institute, Directorate of Maize Research, New Delhi (India). Single cross hybrid maize – A viable solution in the changing climate scenario. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.331-334 KEYWORDS: MAIZE. HYBRIDS. CLIMATIC CHANGE.

Maize is one of the viable solutions for addressing changing climate. Being C4, maize can fix maximum CO2 compared to other crop species. The slight rise in temperature would not affect the maize production. Over the years, maize has witnessed a phenomenal growth with respect to area, production and productivity in the country. This is attributed to the cultivation of high yielding stress-free Single Cross hybrids. Single Cross Hybrid technology offers an easy, viable and economical option to the farmers. Maize is a potential crop for diversification of cropping system. In context of peri-urban agriculture, specialty corn viz., babycorn and sweet corn hold great promise for ensuring livelihood security. The single cross hybrids of Quality Protein Maize enriched with tryptophan and lysine provide a nutritious feed to poultry, cattle and for poor people particularly for those who consume maize as staple food thereby providing food and nutritional security. Maize has also great potential for high growth of seed sector and export.

068. Gadag, R.N.; Indian Agricultural Research Institute, Division of Genetics, New Delhi India). Aski, M.S.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Kumar, Sushil; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Kumari, Jyoti; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Specialty corn hybrids - new strategy and perspective of maize in climate change. Indian Journal of Genetics and Plant Breeding (India) . (Nov 2009) v.69(4) p.335-343 KEYWORDS: CLIMATIC CHANGE. MAIZE. SWEET CORN.

Specialty corns attract particular attention on account of steady increase in demand and production over the recent years in India as well as their utility in adjusting to drought conditions. To address major limitation of low productivity, initiatives were made towards developing single cross hybrids in baby corn, sweet corn and pop corn. Respective quality parameters relating to tender ear characteristics (baby corn) biochemical components relating to sweetness (sweet corn) as well as popping parameters (pop corn) were considered. Diverse maize genotypes were identified for baby corn purpose and new experimental hybrids in baby corn were developed. In respect of sweet corn, elite hybrids superior to the checks (Madhuri and Priya) in terms of productivity and quality were identified. Elite hybrids in pop corn were identified meeting the requirement of quality and productivity in comparison to respective checks. This initiative is expected to give much needed impetus at realizing the potentiality of specialty corns in general and for adapting to adverse effects of climate change in

particular. Further, by using elite hybrids of all specialty corns (including QPM) as well normal field corns together, a multiple range of options and products can be contemplated with potential benefits to farmers. Such strategy and plan for using diverse maize types for ensuring continuous and wide range of harvesting duration is indicated.

069. Dubey, L.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Prasanna, B.M.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Ramesh, B.; Chaudhary Charan Singh Meerut University, Meerut (India). Analysis of drought tolerant and susceptible maize genotypes using SSR markers tagging candidate genes and consensus QTLs for drought tolerance. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.334-351 KEYWORDS: DROUGHT. MAIZE. GENOTYPES. QUANTITATIVE TRAIT LOCI.

Drought stress, particularly at flowering stage, has been identified as the most important factor limiting maize production and productivity in India. In this study, a set of 24 tropical maize lines with differential responses to drought stress, including 16 lines from CIMMYT (Mexico) and eight lines from India, were characterized using 37 polymorphic microsatellite/SSR markers, including 29 SSRs tagging specific candidate genes involved in drought stress tolerance in maize. These genes, distributed on nine of the ten maize chromosomes, also colocalized with 17 'consensus QTLs' for various morpho-physiological traits associated with drought tolerance at flowering stage. The analysis using these 37 candidate gene-specific and drought 'anchor' markers tagging consensus QTLs led to unambiguous differentiation of the genotypes as well as assessment of genetic diversity in these important genetic resources. A total of 119 SSR alleles with a mean of 3.22 alleles per locus were identified. Polymorphism Information Content (PIC) of the 37 SSR loci ranged from 0.09 (umc1627) to 0.78 (umc1056 and bnlg1866), with a mean PIC of 0.56. The study resulted in identification of eleven highly informative markers with PIC values iÝ 0.65, as well as five unique SSR alleles in DTPW-C9-F55-2-3, DTPW-C9-F115-1-4, DTPY-C9-F142-1-2, K64R and CML537. Pair-wise genetic similarity (GS) values, estimated using Jaccard's coefficient, ranged between 0.14 (HKI1025-K64R; HKI1025-CML247) and 0.74 (HKI-335-HKI-209), with a mean GS of 0.31, indicating high level of genetic divergence among the genotypes selected for the study. Cluster analysis revealed clear genetic differentiation of the DTP (drought tolerant population) lines developed at CIMMYT (Mexico) from those developed and identified in India (e.g. CM140). Principal Component Analysis (PCA) aided in further elucidation of the genetic relationships as well as differentiation of genotypes largely based on their phenotypic responses to drought stress. The analysis also led to identification of specific, highly informative SSR markers, namely dupssr12 (bin 1.08), umc1042 (bin 2.07), bnlg1866 (bin 1.03), umc1056 (bin 5.03), dup13 (bin 7.04), umc1069 (bin 8.08), umc1962 (bin 10.03), bnlg1028 (bin 10.06) and umc1344 (bin 10.07), which significantly contributed to the differentiation of the drought tolerant and susceptible genotypes analysed in the study. These SSR markers could be further validated and potentially deployed in molecular marker-assisted breeding for drought tolerance in maize.

070. Satyavathi, C. Tara; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Begum, Sakkira; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Singh, B.B.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Unnikrishnan, K.V.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Bharadwaj, C.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Analysis of diversity among cytoplasmic male sterile sources and their utilization in developing F1 hybrids in Pearl millet [Pennisetum glaucum (R.) Br]. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.352-360 KEYWORDS: CYTOPLASMIC MALE STERILITY. PENNISETUM GLAUCUM. F1 HYBRIDS.

The present study aims at analysis of diversity among parental lines of different cytoplasmic sources and their utilization in developing F1 hybrids. Seven male sterile cytoplasmic lines belonging to A1 – 3; A4 – 2 and A5 – 2 were crossed with three elite

restorers. The cluster analysis done with molecular data obtained from genomic DNA using SSR markers grouped the parental lines belonging to A1 cytoplasm into one cluster, A4 into one and A5 into the other. The assessment of the performance of the F1 hybrids was done through standard heterosis, heterobeltiosis and economic heterosis. The study clearly indicated that all the seven cytoplasmic male sterile lines coming from different cytoplasmic sources are capable of producing new superior hybrids. Physiological characters like chlorophyll, relative carotenoids and root length density have also been studied to assess the performance of parents and F1 hybrids. Higher economic heterosis was observed for yield in A1 cytoplasm compared to A4 and A5 cytoplasms. Desirable effects of earliness and maturity can be obtained using A4 cytoplasm while desirable heterosis could be obtained for plant height, spike girth, number of nodes, chlorophyll content, relative carotenoids and 1000 grain weight from A5 cytoplasm.

071. Kaila, V.; CSK Himachal Pradesh Agricultural University, Depatment of Crop Improvement, Molecular Cytogenetics and Tissue Culture Lab. Palampur (India). Sood, V.K.; CSK Himachal Pradesh Agricultural University, Depatment of Crop Improvement, Molecular Cytogenetics and Tissue Culture Lab. Palampur (India). Chaudhary, H.K.; CSK Himachal Pradesh Agricultural University, Depatment of Crop Improvement, Molecular Cytogenetics and Tissue Culture Lab. Palampur (India). Bhandari, J.C.; CSK Himachal Pradesh Agricultural University, Depatment of Crop Improvement, Molecular Cytogenetics and Tissue Culture Lab. Palampur (India). Sood, Archit; CSK Himachal Pradesh Agricultural University, Depatment of Crop Improvement, Molecular Cytogenetics and Tissue Culture Lab. Palampur (India). Mittal, R.K.; CSK Himachal Pradesh Agricultural University, Depatment of Crop Improvement, Molecular Cytogenetics and Tissue Culture Lab. Palampur (India). Morphological and RAPD markers - mediated assessment of genetic diversity amongst various Trifolium species and identification of potential ideotypes for genetic upgradation of berseem under changed climate in mid-hills of north-west Himalayas. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.361-366 KEYWORDS: GENETIC VARIATION. TRIFOLIUM RESUPINATUM. CLIMATIC CHANGE. FORAGE.

Genetic diversity among 25 genotypes belonging to nine species of genus Trifolium was evaluated on the basis of agro-morphological traits using Mahalanobis D2 statistic and RAPD markers with the objective of identifying the species showing affinity with berseem in order to enhance its genetic base for its genetic upgradation. Mean values revealed superiority of SH 48 (shaftal), Wardan, Bundel berseem 2, Bundel berseem 3, Saidi and Fahli (berseem), PRC 3 (red clover), EC 401713 (constantinopole clover) and Palampur (arrowleaf clover) for various fodder traits. D2 statistic grouped the 25 genotypes into four clusters. In contrast, RAPD analysis grouped the genotypes into three clusters and further sub-clusters corresponding to different species. Both D2 statistic and RAPD analysis revealed low genetic diversity among white clover and berseem genotypes whereas, red clover genotypes were found more divergent. T. apertum and T. constantinopolitanum exhibited more affinity towards berseem than any other species.

072. Talukdar, Akshay; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Verma, Khushbu; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Gowda, D.S. Samrat; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Lal, S.K.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Sapra, R.L.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Singh, K.P.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Singh, R.; Indian Agricultural Research Institute, National Phytotron Facility, New Delhi (India). Sinha, P.; Indian Agricultural Research Institute, Division of Plant Pathology, New Delhi (India). Molecular breeding for charcoal rot resistance in soybean I. Screening and mapping population development. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4)

p.367-370 KEYWORDS: MOLECULAR GENETICS. CHARCOAL. ROTS. DISEASE RESISTANCE. SOYBEANS. MACROPHOMINA PHASEOLINA.

Charcoal rot caused by Macrophomina phaseolina is a major yield reducing disease in the soybean growing countries across the world. Its effect is more pronounced in crops under stress, biotic or abiotic. Changing global climatic conditions particularly occurrence of frequent drought or drought-like situations are making soybean more vulnerable to this disease. Improper screening methods rendered conventional breeding approaches unproductive. Identification of molecular marker(s) linked to the charcoal rot resistance gene would greatly facilitate screening and thus accelerate the development of new cultivars. A core set of 100 diverse genotypes were subjected to screening for resistance under paper towel methods. No genotypes were immune; 7 germplasm lines appeared to be resistant. F1 hybrids were produced by crossing resistant and highly susceptible genotypes. Parental polymorphism and purity of the F1 hybrids was established using SSR markers. Advancement has been made to develop mapping population to map QTL for charcoal rot resistance in soybean.

073. Talukdar, Akshay; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Verma, Khushbu; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Gowda, D.S. Samrat; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Lal, S.K.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Sapra, R.L.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Singh, K.P.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Singh, R.; Indian Agricultural Research Institute, National Phytotron Facility, New Delhi (India). Sinha, P.; Indian Agricultural Research Institute, Division of Plant Pathology, New Delhi (India). Molecular breeding for charcoal rot resistance in soybean I. Screening and mapping population development. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.367-370 KEYWORDS: MOLECULAR GENETICS. CHARCOAL. ROTS. DISEASE RESISTANCE. SOYBEANS. MACROPHOMINA PHASEOLINA.

Charcoal rot caused by Macrophomina phaseolina is a major yield reducing disease in the soybean growing countries across the world. Its effect is more pronounced in crops under stress, biotic or abiotic. Changing global climatic conditions particularly occurrence of frequent drought or drought-like situations are making soybean more vulnerable to this disease. Improper screening methods rendered conventional breeding approaches unproductive. Identification of molecular marker(s) linked to the charcoal rot resistance gene would greatly facilitate screening and thus accelerate the development of new cultivars. A core set of 100 diverse genotypes were subjected to screening for resistance under paper towel methods. No genotypes were immune; 7 germplasm lines appeared to be resistant. F1 hybrids were produced by crossing resistant and highly susceptible genotypes. Parental polymorphism and purity of the F1 hybrids was established using SSR markers. Advancement has been made to develop mapping population to map QTL for charcoal rot resistance in soybean.

074. Malarvizhi, D.; Tamil Nadu Agricultural University, Dept. of Rice, Centre for Plant Breeding and Genetics, Coimbatore (India). Thiyagarajan, K.; Tamil Nadu Agricultural University, Dept. of Rice, Centre for Plant Breeding and Genetics, Coimbatore (India). Vijayalakshmi, C.; Tamil Nadu Agricultural University, Dept. of Crop Physiology, Coimbatore (India). Manonmani, S.; Tamil Nadu Agricultural University, Dept. of Crop Physiology, Coimbatore (India). Exploration of heterosis for yield and morpho physiological traits in hybrid rice (Oryza sativa L.): A comparative study under flooded and aerobic conditions. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.371-382 KEYWORDS: HETEROSIS. ORYZA SATIVA. AEROBIOSIS. FLOODED LAND.

The global water crisis threatens the sustainability of irrigated rice production in all the rice producing countries. Development of rice hybrids with high yield potential for aerobic conditions would be one of the exciting research to overcome the existing water crisis. Present investigation was carried out to identify the best combining parents and

hybrids suitable for aerobic cultivation based on their physiological and yield contributing traits. One hundred and twenty hybrids along with four lines, 30 testers and two check hybrids viz., ADTRH 1 and CORH 2, were raised in randomized block design in three replications under aerobic and flooded conditions. Data were recorded at vegetative (55–60 days), panicle initiation (75–80 days), flowering and maturity stage for physiological and quantitative traits for all the parents and hybrids included in the study. The hybrid COMS 14A x IR55838-B2-2-3-2-3 and COMS 14A x IR 36 showed superiority for number of productive tillers, panicle length, number of filled grains, spikelet fertility, total dry matter production and harvest index; the hybrid IR 68888 A x IR 72875-94-3-3-2 for number of productive tillers, spikelet fertility, relative water content, root dry weight, harvest index, root shoot ratio and IR 68897 A x IR 36 for number of productive tillers, panicle length, spikelet fertility, total dry matter production and harvest index. These four hybrids can be best utilized commercially for both flooded and water limited conditions. The parental lines involved in the above hybrids also had high per se performance for grain yield under aerobic condition. In general, higher yield was obtained in most of the hybrids under flooded condition. A few hybrids had equal performance under both conditions. The female parents IR 68888A and COMS 14A and the male parents IR55838-B2-2-3-2-3, IR 36,WGL 14 and WGL 32100 best suited for irrigated conditions also had good performance for most of the yield contributing traits and physiological parameters under aerobic condition. The hybrids developed from these parental lines were found superior for most of the yield and physiological traits under aerobic condition. Therefore these parental lines could serve as basic materials for developing high yielding hybrids suitable for water limited conditions.

075. Yadav, S.K.; SKN College of Agriculture, Department of Plant Breeding and Genetics, Jobner (India). Raje, R.S.; Indian Agricultural Research Institute, Division of Genetics, New Delhi (India). Maloo, S.R.; R.C.A., Department of Plant Breeding and Genetics, Udaipur (India). Identification of high yielding, salt tolerant and stable genotypes of bread wheat (Triticum aestivum L.). Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.394-399 KEYWORDS: HIGH YIELDING BREEDS. GENOTYPES. TRITICUM AESTIVUM. SALINE SOILS.

In the present investigation eighteen genotypes of wheat were evaluated under normal and saline soil environments over two years in rabi seasons in R.B.D. with two replications to study the g × e interaction and to identify stable genotypes. Pooled analysis of variance indicated significant variance due to genotype and g × e interaction for all the characters. Variance due to g × e (lin.) was significant for plant height, spikelets per ear, grain yield per ear, 1000-grain weight and grain yield per plant. The variance due to g × e (lin.) was higher than variance due to pooled deviation for all the characters except days to flowering. Environmental indices were higher under normal as compared to saline environments for all characters except for days to flowering. Out of eighteen genotypes, genotypes KRL 19, Job 673 and Kh 65 showed average response (b ≅ 1) and were highly stable (S2di=0). Out of these, the genotype KRL 19 had higher mean value than population mean, thus this genotype should be used in the hybridization programme. Genotypes Job 673 and Kh 65 should be used in hybridization programme and should be crossed with high yielding genotypes such as Raj 3077 to develop high yielding and stable genotypes. Genotypes KRL 20 and Job 666 showed above average stability with mean equivalent to population mean. Thus, these were suitable for high saline conditions. These genotypes should be crossed with high yielding genotypes like Raj 3077 to develop high yielding genotypes suitable for highly saline soils.

076. Joshi, A.K.; Banaras Hindu University, Varanasi (India). Dept. of Genetics and Plant Breeding). Mishra, B.; Directorate of Wheat Research, Karnal (India). Prashar, M.; Directorate of Wheat Research, Flowerdale Shimla (India). Tomar, S.M.S.; Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics). Singh, R.P.; CIMMYT, Apodo (Mexico). Ug99 race of stem rust pathogen : challenges and current status of research to sustain wheat production in India. Indian Journal of Genetics and

Plant Breeding (India). (Aug 2008) v. 68(3) p. 231-241 KEYWORDS: WHEATS. PRODUCTION. PATHOGENS. GENETICS. PLANT BREEDING.

077. Dhakate, P.M.; Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics). Vinod; Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics). Singh, B.; Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics). Tiwari, S.; Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics). Tomar, S.M.S.; Indian Agricultural Research Institute, New Delhi (India). Div. of Genetics). Inheritance and linkage analysis of leaf rust resistance, node and leaf pubescence in interspecific derivative of Triticum aestivum L.. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 242-247 KEYWORDS: TRITICUM AESTIVUM. GENE TRANSFER. GENETICS. INHERITANCE (ECONOMICS).

Genetic analysis was carried out in cytologically stable Selection (Sel.) T2836-1 (2n = 6x = 42), an interspecific derivative involving, bread wheat Triticum aestivum, a wheat progenitor T. urartu and T. militinae, a mutant of T. timopheevi to study the mode of inheritance of leaf rust resistance, leaf and node pubescence and glume hardness. Linkage between different traits was also investigated. The study revealed that Sel. T2836-1 carries a single dominant gene for resistance to Indian pathotypes, 77-1,77-5 and 77-7 of Puccinia triticina. However, test of allelism revealed than the resistance is allelic to the gene Lt 24. Further, molecular analysis also confirmed the presence of Lt24 in Sel. T2836-1. Study further indicated that pubescence of leaf was controlled by duplicate dominant genes, whereas node pubescence was governed by a single dominant gene. Monogenic dominant control was also indicated for glume hardness in Sel. T2836-1. The linkage analysis indicated that character node pubescence is linked with one of the duplicate dominant genes controlling leaf pubescence and the distance between these genes is 36.84 Kosambi unit.

078. Singh, S.; Narendra Dev University of Agriculture and Technology, Faizabad (India). Dept. of Plant Molecular Biology and Genetic Engineering). Singh, K.N.; Narendra Dev University of Agriculture and Technology, Faizabad (India). Dept. of Plant Molecular Biology and Genetic Engineering). Kant, R.; Narendra Dev University of Agriculture and Technology, Faizabad (India). Dept. of Genetics and Breeding). Mehfooz, S.; Indian Institute Pulses Research, Kanpur (India). Dutta, S.; Indian Institute Pulses Research, Kanpur (India). Assessment of genetic diversity among pigeonpea genotypes using SSR markers. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 255-260 KEYWORDS: CAJANUS CAJAN. GENETIC RESOURCES. BIODIVERSITY. GENOTYPES. PIGEON PEAS.

Twenty two SSR mar~ers of different crop species origin were used to assess polymorphism through their SSR fingerprinting of 16 cultivated pigeon pea genotypes. Four hundred twenty five bands were amplified in all the sixteen genotypes. A total of 46 SSR fragments were amplified. Eight primers showed 100% polymorPhism. Based on dendrogram constructed using the similarity coefficient values, 16 genotypes were grouped into two distinct clusters. Cluster I comprises mostly late duration genotypeswhile cluster II comprises medium duration genotypes except CO-6 and Bahar. Both the clusters and sub-cluster in the dendrogram were supported by high bootstrap values, thus indicating that the SSR could be a good choice to classify the genotypes. Genotypes with high molecular diversity could be used in breeding methodologies and development of gene pools with broad genetic base. The genotype specific bands developed by the SSR primers could also be used for ciJltivar identification.

079. Bera, S.K.; National Research Centre for Groundnut, Junagarh (India). Bhatt, D.M.; National Research Centre for Groundnut, Junagarh (India). Genotypic comparison for androgenic callogenesis and organogenesis among cultivated, wild and intersepecific hybrid of groundnut. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 261-264 KEYWORDS: ANTHER CULTURE. GROUNDNUTS. ARACHIS HYPOGAEA. HYBRIDS. CALLOGENESIS.

Anther or microspore culture is one of the efficient techniques for invitro plant regeneration and has been exploited in haploid breeding. Six groundnut cultivars, five wild Arachis species and four synthetic interspecific hybrids. were studied for invitro androgenic callogenesis and regeneration. Androgenic callogenesis in groundnut starts four to five days after culturing in MS salts with vitamins of B5+12.362IJM NAA+2.22IJM BAP+87.64IJM sucrose (m/v) and 0.6% agar (m/v) irrespective of ecotype. Callogenesis ranged from 21 % to 72% among the genotypes studied. Cultivated genotypes were more responsive to callogenosis than wild species and interspeicific hybrids. Organogenesis induced in half the strength MS salts with vitamins of B5+6.66mM BAP+2.68I1M NAA+2.89IJM GA3 +B7.64IJM sucrose (m/v) and 0.6% agar (m/v). Four cultivated genotypes viz., GG 2, J 11, JL24 and TMV 2 induced shoot development and plants were regenerated from cultivars GG 2 and J 11. Regenerated plants were confirmed as 2n = 4x = 40 by root tip analysis indicating that regenerated plants were regenerated either from sporophytic tissue of microspore or spontaneous doubled haploid.

080. Sharma, S.; Punjab Agricultural University, Ludhiana (India). Dept. of Plant Breeding, Genetics and Biotechnology). Saxena, A.K.; Punjab Agricultural University, Ludhiana (India). Dept. of Plant Breeding, Genetics and Biotechnology). Gill, B.S.; Punjab Agricultural University, Ludhiana (India). Dept. of Plant Breeding, Genetics and Biotechnology). Dhillon, S.K.; Punjab Agricultural University, Ludhiana (India). Dept. of Plant Breeding, Genetics and Biotechnology). Identification of soybean [Glycine max (L.) Merrill] genotypes with superior quality traits and their correlation with oil and protein. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 265-268 KEYWORDS: YIELDS. GLYCINE MAX. GENOTYPES. SOYBEANS. QUALITY. OILSEEDS.

Seventy four soybean genotypes of five different groups i.e. SL, PK, DS, Bragg and Pusa were analysed for physico-chemical and cooking quality. Oil correlates negatively with protein, cooking time and volume expansion after soaking. No Kokroos were found in any of the tested genotypes. Water absorption after soaking/cooking correlates positively with volume expansion. Genotypes of SL group exhibited superiority over other groups w.r.t. most of the quality traits and yield. Protein correlates negatively with yield (r = -0.16) and oil (r = -0.51).

081. Sumathi, P.; Tamil Nadu Agricultural University, Coimbatore (India). Centre for Plant Breeding and Genetics). Muralidharan, V.; Tamil Nadu Agricultural University, Coimbatore (India). Centre for Plant Breeding and Genetics). Study of gene action and heterosis in monostem/shybranching genotypes in sesame (Sesamum indicum L.). Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 269-274 KEYWORDS: SESAMUM INDICUM. HETEROSIS. GENOTYPES. COMBINING ABILITY.

Eleven genotypes consisting of five lines (branched genotypes) and six testers (monostem genotypes) were crossed in a line x tester mating design. The resulting~hirty hybrids were evaluated for general and specific combining ability, variance components and heterosis. The sea variance was greater than the gea variance for the traits days to 50 percent flowering, days to maturity, number of capsules, capsule length, number of seeds per capsule, 100-seed weight, seed yield per plant and oil content suggesting that these characters were governed predominantly by non-additive components. The GCA variances were predominant in plant height and number of branches, indicating that these characters were by and large governed by additive component of heritable variance. The line TMV3 showed high gea for seed yield, days to 50 percent flowering, days to maturity, plant height, number of capsules and oil content while the tester, KS 990812 recorded "significantly high gea effect for number of capsules. The specific combining ability effects showed that out of thirty hybrids, four hybrids viz., CO 1_x Cordebergea, Paiyur 1 x KS 99153, TMV 4 x MT 34 and TMV 5 x KS 99037 showed significant positive sea effect for single plant yield. Regarding the branching characters all the thirty hybrids registered favourable sea effects, Heterosis was worked out over mid parent, better parent and standard parent C01. The cross Paiyur1 x Cordebergea was early in flowering and duration, while the cross TMV5 x

Cordebergea was having superior heterosis for monostem I shybranching nature with desirable seed yield per plant. TMV3 x KS 990813 was superior for number of capsules per plant and seed yield per plant. Paiyur Ix MT34 showed good performance for number of seeds per capsule and oil content with desirable heterosis for seed yield per plant. These superior crosses can be utilized for hybrid development.

082. Lavanya, C.; Directorate of Oilseeds Research, Hyderabad (India). Gopinath, V.; Directorate of Oilseeds Research, Hyderabad (India). Inheritance studies for morphological characters and sex expression in pistillate lines of castor (Ricinus communis L.). Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 275-282 KEYWORDS: RICINUS COMMUNIS. SEX HORMONES. INHERITANCE (ECONOMICS). PETIOLES.

Inheritance of morphological characters in four crosses of pistillate x pistillate lines indicated that stem colour was controlled by single gene while red stem colour was dominant over green stem colour. However, green stem colour in the cross DPC 13 x M 574 and green colour of petiole, capsules and spines in cross M 574 x DPC 11 showed digenic epistatic ratio to red stem colour, red colour of petiole, capsules and spines. The characters plant type and bloom were monogenically controlled while normal plant type and presence of bloom were dominant over dwarf plant type and absence of bloom respectively. Joint sEigregation analysis indicated that stem colour, plant type and bloom were segregating independently in all the four crosses. Pistillate character was dominant over pistillate with interspersed staminate flowers [ISF] and controlled by one [P1] or two [P1P2] to four genes [P1P2 P3P J. Joint segregation analysis indicated linkage between stem colour and dwarf plant type in ,the cross DPC 13 x DPC 11 and pistillate character [J'1] and plant type [PtN] in cross M 574 x DPC 11. The Clistance between stem colour [Rstlgst] to plant type [PtDw] and single gene for pistillate character and plant type was estimated as 40.2 centimorgans and 47.6 centimorgans based on square root offrequency of double recessive phenotypes in F2 data.

063. Gupta, A.J.; Sher-e-Kashmir University of Agriculture and Technology, Srinagar (India). Div. of Olericulture). Singh, Y.V.; Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Vegetable Science). Ram, H.H.; Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Dept. of Vegetable Science). Seed protein profiles and cultivar identification in garden pea (Pisum sativum L.). Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 283-287 KEYWORDS: PISUM SATIVUM. ELECTROPHORESIS. GENOTYPES. VARIETIES.

Electrophoretic patterns of seed proteins of 23 genotypes of garden pea (Pisum sativum L.) when analyzed by SDS-PAGE were placed in 22 groups on the basis of banding pattern. All the genotypes showed different banding patterns except PMR-43 and Azad Pea-3 which fell in the same group and showed similar banding pattern. The similarity between two genotypes might be possible due to their derivation from the cross of same parental combination. On the basis of distance matrix and UPGMA analysis, dissimilarity between genotypes was established and most dissimilar genotypes viz., Bonneville vs PMR-43, Bonneville vs Azad Pea-3, Bonneville vs VL-7 and NDVP.9 vs IP-3 (Pant Uphar) were identified. Seed protein electrophoresis is thus useful in identifying pea cultivars and in breeding programme.

084. Tuteja, O.P.; Central Institute for Cotton Research, Sirsa (India). Verma, S.K.; Central Institute for Cotton Research, Sirsa (India). Singh, M.; Central Institute for Cotton Research, Sirsa (India). Effect of G. harknessii based cytoplamic male sterility on seed cotton yield and fibre quality traits in upland cotton (Gossypium hirsutum L.). Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 288-295 KEYWORDS: GOSSYPIUM HIRSUTUM. YIELDS. FIBRES. CUCUMOVIRUSES.

To study the effect of male sterile cytoplasm on seed cotton yield and fibre properties of hybrid cotton, five cytoplasmic male sterile lines (A) and their maintainers (B) were crossed with six restorer lines and two types of hybrids i.e. A x Rand B x R were

developed. The hybrids were evaluated for seed cotton yield, ginning out turn, 2.5% span length, uniformity ratio, micronaire value and tenacity. The results showed that, sterile cytoplasm has detrimental effect on yield of hybrid cotton. The hybrids produced by using restorers with G. harknessii cytoplasm as the female parent showed about 4.76 to 15.63 % reduction in yield However, no negative effect was observed for ginning out turn and other fibre quality traits. On the contrary, increased 2.5% span length was observed CMS based hybrids ranging from 0.36 to 15.63 per cent. The reduction in micronaire value was also observed in almost all the A x R hybrids except in one of the cross combinations F 505A x CIR 72. The highest reduction in micronaire value was up to 30 % in the hybrid combination Bikaneri Narma A x CIR 32 with sterile cytoplasm. Similarly, increase in tenacity value was noticed in CMS based hybrids, which was also reflected on strength/length ratio. The detrimental effect of sterile cytoplasm on yield could be overcome by using suitable restorer and stable CMS lines, attempting more number of cross combinations to find out the suitable hybrids with high yield potential and better fibre quality with CI'y'IS system.

085. Chandra, A.; Indian Grassland and Fodder Research Institute, Jhansi (India). Crop Improvement Div.). Pandey, K.C.; Indian Grassland and Fodder Research Institute, Jhansi (India). Crop Improvement Div.). Genetic relatedness among weevil resistant Medicago species and Indian susceptible cultivars of lucerne (Medicago sativa L.) using SSR and RAPD markers. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 296-300 KEYWORDS: MEDICAGO SATIVA. GENETIC RESISTANCE. PCR. DNA. RAPD. CURCULIONIDAE.

Fifty-two species of genus Medicago were screened against lucerne weevil (Hypera postica Gyll.) and accessions belonging to five species viz,. M. laciniata, M. muricoleptis, M. rugosa, M. tenoreana and M. scutellata were identified as potential resistance source. Genetic relatedness using SSR and RAPD markers of these species were estimated along with five Indian weevil susceptible cultivars namely Anand 2, LLC 3, RL 88, T 9 and CO 1. Both SSR and RAPD based dendrograms revealed grouping of all five Indian cultivars into one cluster. Moreover, RAPD based dendrogram indicated sub grouping of M. scutel/ata accession with Indian cultivars. Both data sets showed more closeness of M. scutellata and M. muricoleptis with Indian cultivars as genetic distance between these species were comparable over other suggesting use of such species for improvement of Indian cultivars of lucerne for weevil resistance.

086. Doule, R.B.; Vasantdada Sugar Institute, Pune (India). Tissue Culture Section). Kawar, P.G.; Vasantdada Sugar Institute, Pune (India). Molecular Biology and Genetic Engineering Lab.). Devarumath, R.M.; Vasantdada Sugar Institute, Pune (India). Molecular Biology and Genetic Engineering Lab.). Nerkar, Y.S.; Vasantdada Sugar Institute, Pune (India). Molecular Biology and Genetic Engineering Lab.). Field performance and RAPD analysis for assessment of genetic variation in sugarcane somaclones. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 301-306 KEYWORDS: SUGARCANE. SACCHARUM BARBERI. SOMACLONAL VARIATION. RAPD. GENETIC VARIATION.

Sugarcane somaclones derived by callus culture of the sugarcane variety CoC 671 were evaluated for thei quantitative attributes and assessed for the geneth variation by RAPD analysis. Assessment at 12th month VSI2179 gave higher cane yield compared to somaclones and the parent CoC 671. Somaclone variants, VSI17 48 anc VSI2179 gave significantly higher sugar yield over the check CoC 671. VSI 1748, VSI 2003 and VSI 2179 were significantly superior for brix, sucrose and CCS percentage over their parent. RAPD profiling ot somaclones, VSI1733 with 21 primers (13.8%), VSI1748 and VSI1855 with four primers (3.0%) and VSI 2003 and VSI2179 with one primer (0.3%) revealed polymorphism as compared to CoC 671. These promising clones are being evaluated in different agro-climatic zones of Maharashtra.

087. Monga, D.; Central Institute for Cotton Research, Sirsa (India). Kumar, M.; Central Institute for Cotton Research, Nagpur (India). Chakrabarty, P.K.; Central Institute for

Cotton Research, Sirsa (India). Use of an rRNA internal transcribed spacer region to distinguish closely related isolates of the genera Rhizoctonia. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 313-316 KEYWORDS: RHIZOCTONIA. RIBOSOMES. SOLANINE. PCR.

Inter- and intra-specific variation among isolates of Rhizoctonia bataticola and R. solanithe causal organism, of root rot of cotton were evaluated by analysis of the internal transcribed spacer (ITS) sequences of the rRNA region. The ITS region was first amplified by polymerase chain reaction (PCR) with specific primers and amplification products, which ranged between 540 to 680 bp were obtained for all the isolates analyzed. The degree of polymorphism observed did not allow proper identification of most of the isolates. Analysis of two internal transcribed spacer sequences ITS 1 and ITS 2, revealed that within the isolates of R. bataticola, the size of ITS 1 region ranged from 135 to 184 bp while the size of ITS 2 varied by 4 bp. The size of ITS 1 ranged from 155 to 205 bp, while the size of ITS 2 ranged from 149 to 251 bp in isolates of R. solani. Based on phylogenetic analysis of the ITS 1 and ITS2 sequences different isolates of R. bataticoldand R. solaniwere grouped in separate clusters.

088. Majeed, S.; Dr.Y.S. Parmar University of Horticulture and Forestry, Solan (India). Dept. of Biotechnology). Wani, A.M.; Dr.Y.S. Parmar University of Horticulture and Forestry, Solan (India). Dept. of Tree Improvement and Genetic Resources). Sharma, D.R.; Dr.Y.S. Parmar University of Horticulture and Forestry, Solan (India). Dept. of Tree Improvement and Genetic Resources). Genetic divergence between half-sib families of Bunium persicum (Boiss) Fedtsch. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 317-319 KEYWORDS: GENETIC DISTANCE. YIELDS. HERITABILITY.

The present investigation on Bunium persicum (Boiss.) Fedtsch was carried out with an objective to assess the genetic variability of these species in Himachal Pradesh and Jammu & Kashmir. A wide range of variation was observed among the five sites for various morphological and yield contributing attributes. Clustering pattern of five populations revealed that they could be classified into two clusters. Cluster I consisted of Gurez, Sangla and Khrew sites whereas, Cluster II included Kalpa and Harwan sites. Highest heritability was recorded for number of days from bulb sprouting to complete flowering followed by number of umblets per umbel which indicates that these characters can be improved upon selection.

089. Ram, T.; Directorate of Rice Research, Hyderabad (India). Majumder, N.D.; Indian Institute of Pulses Research, Kanpur (India). Laha, G.S.; Directorate of Rice Research, Hyderabad (India). Ansari, M.M.; National Research Institute for Soybean, Indore (India). Kar, C.S.; Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora (India). Mishra, B.; Directorate of Wheat Research, Karnal (India). Identification of donors for sheath blight resistance in wild species of rice. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 317-319 KEYWORDS: SPECIES. ORYZA SATIVA. IDENTIFICATION.

090. Girija; University of Agricultural Sciences, Dharwad (India). Dept. of Genetics and Plant Breeding). Salimath, P.M.; University of Agricultural Sciences, Dharwad (India). Dept. of Genetics and Plant Breeding). Patil, S.A.; University of Agricultural Sciences, Dharwad (India). Dept. of Genetics and Plant Breeding). Gowda, C.L.L.; International Crop Research Institute for Semi Arid Tropics, Patencheru (India). Sharma, H.C.; International Crop Research Institute for Semi Arid Tropics, Patencheru (India). Biophysical and biochemical basis of host plant resistance to pod borer (Helicoverpa armigera Hubner) in chickpea (Cicer arietinum L.). Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 320-323 KEYWORDS: CICER ARIETINUM. HELICOVERPA ARMIGERA. BIOPHYSICS.

091. Katiyar, P.K.; Indian Institute of Pulses Research, Kanpur (India). Dixit, G.P.; Indian Institute of Pulses Research, Kanpur (India). Singh, B.B.; Indian Institute of

Pulses Research, Kanpur (India). Genetic base of advanced urdbean breeding lines developed in India as revealed by pedigree analysis. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 324-326 KEYWORDS: GENETICS. PROGENY. BREEDS (ANIMALS). REGISTRATION.

092. Kumar, S.; Rajasthan Agricultural University, Bikaner (India). Plant Biotechnology Centre). Saxena, S.N.; Rajasthan Agricultural University, Bikaner (India). Plant Biotechnology Centre). Jat, R.S.; Indian Agricultural Research Institute, New Delhi (India). National Research Centre for Plant Biotechnology). Sharma, R.; Rajasthan Agricultural University, Bikaner (India). Plant Biotechnology Centre). Agrobacterium tumefaciens mediated genetic transformation of moth bean [Vigna aconitifolia (Jacq) Marechal]. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 327-329 KEYWORDS: VIGNA ACONITIFOLIA. AGROBACTERIUM. GENETIC TRANSFORMATION.

093. Singh, V.K.; Gobind Ballabh Pant Unviersity of Agriculture and Technology, Pantnagar (India). Dept. of Genetics and Plant Breeding). Singh, G.; Gobind Ballabh Pant Unviersity of Agriculture and Technology, Pantnagar (India). Dept. of Vegetable Science). Diversity for fatty acid composition of advanced breeding lines of Indian mustard [Brassica juncea (L.) Czern & Coss]. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 330-333 KEYWORDS: BRASSICA JUNCEA. YIELDS. FATTY ACIDS. PROGENY.

094. Husain, F.; International Crops Research Institute for Semi Arid Tropics, Patencheru (India). Wide Crosses Lab.). Mallikarjuna, N.; International Crops Research Institute for Semi Arid Tropics, Patencheru (India). Wide Crosses Lab.). Jadhav, D.R.; International Crops Research Institute for Semi Arid Tropics, Patencheru (India). Wide Crosses Lab.). Pollen preservation and germination studies in Arachis species. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 334-336 KEYWORDS: SPECIES. POLLEN. PRESERVATION. GERMINATION.

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096. Rathore, P.; Punjab Agricultural University, Faridkot (India). Regional Stn.). Singh, M.; Punjab Agricultural University, Faridkot (India). Regional Stn.). Pathak, D.; Punjab Agricultural Unviersity, Ludhiana (India). Dept. of Plant Breeding and Genetics). Gill, J.S.; Punjab Agricultural University, Faridkot (India). Regional Stn.). Atwal, A.K.; Punjab Agricultural Unviersity, Ludhiana (India). Dept. of Plant Breeding and Genetics). Genetic analysis for seed oil content and component fatty acids in American cotton (Gossypium hirsutum L.). Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 340-343 KEYWORDS: GOSSYPIUM HIRSUTUM. GENETIC DISORDERS. FATTY ACIDS. LIPID CONTENT.

097. Prasath, D.; Indian Institute of Spices Research, Calicut (India). Div. of Crop Improvement and Biotechnology). Ponnuswami, V.; Tamil Nadu Agricultural University, Coimbatore (India). Horticulture College and Research Institute). Screening of chilli (Capsicum annuum L.) genotypes against Colletotrichum capsici and analysis of biochemical and enzymatic activities in inducing resistance. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 344-346 KEYWORDS: CAPSICUM ANNUUM. CHILLIES. GENOTYPES. COLLETOTRICHUM CAPSICI. ENZYME ACTIVITY.

098. Sankaran, M.; ICAR Research Complex for North Eastern Hill Region, Lembucherra (India). Singh, N.P.; ICAR Research Complex for North Eastern Hill Region, Lembucherra (India). Chattopadyay, K.; ICAR Research Complex for North Eastern Hill Region, Lembucherra (India). Prakash, J.; ICAR Research Complex for North Eastern Hill Region, Lembucherra (India). Das, S.P.; ICAR Research Complex for North Eastern Hill Region, Lembucherra (India). Genetic divergence in lablab bean [Lablab purpureas (L.) Sweet]. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 347-349 KEYWORDS: POLLINATION. SPECIES. GENETIC DISTANCE. LABLAB PURPUREUS.

F50 Plant Structure

099. Joshi, D.C.; G.B. Pant Univ. of Agric. & Tech., Department of Genetics and Plant Breeding, Pantnagar (India). Shrotria, P.K.; G.B. Pant Univ. of Agric. & Tech., Department of Genetics and Plant Breeding, Pantnagar (India). Singh, Ravindra; G.B. Pant Univ. of Agric. & Tech., Department of Genetics and Plant Breeding, Pantnagar (India). Chawla, H.S.; G.B. Pant Univ. of Agric. & Tech., Department of Genetics and Plant Breeding, Pantnagar (India). Morphological characterization of forage sorghum [Sorghum bicolor (L.) Moench] varieties for DUS testing. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.383-393 KEYWORDS: SORGHUM. SORGHUM BICOLOR. PLANT ANATOMY.

Twenty six varieties of forage sorghum [Sorghum bicolor (L.) Moench] which included 20 released and notified and 6 indigenous local varieties were characterized using 40 morphological descriptors adopted from the DUS guidelines of PPV & FR Authority and ICAR and subsequently examined for their Distinctiveness, Uniformity and Stability. Among the 26 visually assessed characters 2 characters were monomorphic, 10 characters were dimorphic and 14 characters were polymorphic indicating their potential for varietal characterization and distinctiveness. No intra-varietal variation was observed for any of the visual characteristics and expression of characters in different varieties remained same for the two consecutive years confirming the uniformity and stability of the varieties. Combined Over Years Distinctiveness (COY-D) analysis was made on 14 measurable DUS descriptors which revealed distinctiveness for all the 26 varieties. COY-D analysis supported with MJRA analysis revealed that the slope of the MJRA curve and regression probability were too negligible which indicated that all the considered characteristics were independent and their interactions with environment as well as with themselves were negligible in both the years. This indicates the distinctiveness of all the candidate varieties. Combined Over Years Uniformity (COY-U) analysis revealed that all the released and notified varieties were more or less uniform for the 14 measurable characters. However, three local varieties viz. Rampur local, Gwalior local and Rajasthan local were not uniform for 7, 6 and 4 measurable characters respectively emphasizing the need for their further purification to attain a considerable level of homogeneity in their heterogeneous blend. The present experimental material possessed relatively low magnitude of differences between PCV and GCV, high heritability coupled with high to moderate genetic advance for most of the measurable descriptors, thus emphasizing their consistency and stability over the years and their utility in varietal characterization. On the basis of grouping characteristics unique morphological profiles could be established for 9 varieties. When all the 33 morphological descriptors of PPV & FR Authority and 7 morphological descriptors of ICAR were studied distinctiveness could be obtained for two more varieties viz. UPFS 38 and SSG 59-3. Thus out of a total of twenty six varieties unique morphological profiles could be obtained for 11 varieties. However, the rest of 15 varieties remained in groups of two or three varieties. Thus the morphological DUS descriptors could establish distinctiveness of some varieties but varieties showing overlapping of the expression for these characters could not be discriminated hence some other markers/descriptors could be thought for complementing the morphological DUS descriptors.

F60 Plant Physiology and Biochemistry

100. Sharma, M.K.; Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar (India). Singh, S.R.; Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar (India). Sundouri, A.S.; Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar (India). Srivastava, K.K .; Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar (India). Banday, F.A.; Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar (India). Effect of chemicals and pruning on russeting, yield and quality of ‘Golden Delicious’ apple (Malus domestica). Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.592-94 KEYWORDS: RUSTS. YIELDS. QUALITY. PRUNING. APPLES.

A study was conducted during 2005-06 on the influence of chemical treatments and light pruning on russeting and yield and quality of 'Golden Delicious' apples (Malus domestica L.) The treatments were, 0.2% wettable sulphur (T1), 3% Ca(OH)2 (T2), 0.4% MnSO4 (T3), 0.1% Boric acid (T4), 0.2% wettable sulphur + Ca (OH)2 @ 3% (T5), MnSO4 @ 0.4% + Ca (OH)2 @ 3% (T6), wettable sulphur (0.2%) + 0.4% MnSO4 + 0.1% boric acid (T7), 0.2% wettable sulphur + 3% Ca (OH)2 + 0.4% MnSO4 (T8), light pruning 15 days after petal fall (T9) and no treatment (control) (T10). Chemical treatments were repeated thrice at weekly interval starting from the petal fall as foliar sprays and the observations were recorded on russeting percentage, extent of russeting, fruit yield and physico-chemical characteristics of 'Golden Delicious' apples. Spray of 0.2% wettable sulphur + 0.4% MnSO4 + 0.1% boric acid (T7) significantly reduced fruit russeting, followed by spray of 0.2% wettable sulphur. The extent of russeting was also lower with these treatments. Yield as well as weight, length, diameter, TSS and total sugars of fruits were significantly higher in T7, followed by T5 and T4. The frequency and extent of russeting was higher in control plants. All the treatments improved yield and quality of 'Golden Delicious' apples over control.

101. Dubey, A.K.; Indian Agricultural Research Institute, New Delhi (India). Srivastav, Manish; Indian Agricultural Research Institute, New Delhi (India). Singh, A.K.; Indian Agricultural Research Institute, New Delhi (India). Pandey, R.N.; Indian Agricultural Research Institute, New Delhi (India). Growth and physiological response of salt-sensitive and salt-tolerant rootstocks of citrus to paclobutrazol under salt stress. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.595-599 KEYWORDS: SALT TOLERANCE. ROOTSTOCKS. CITRUS. PACLOBUTRAZOL. OSMOTIC STRESS. CHLOROPHYLLS. SALINITY.

The response of paclobutrazol was studied during 2006-07 on salt-sensitive 'Soh Sarkar' (Citrus karna Raf.) and salt-tolerant 'Rangpur lime' (Citrus limonia Osbeck) under salt stress. One-year-old seedlings of both rootstocks were grown in earthen pots of 10 inches size containing 5 kg soil. Paclobutrazol (0, 125 and 250 ppm) was applied 7 days prior to salinization is a 1 ½ litre solution/pot. Computed amount of NaCl (1 000 mg/kg soil) was added in solution form to get soil salinity level of 2 dS/m. Paclobutrazol mitigated the salinity stress effects in both the rootstocks. Application of 250 ppm paclobutrazol increased plant height (34.70%), leaves/plant (170.61%), root length (51.83%), shoot fresh weight (51.89%) and dry weight (44.88%), root fresh weight (14.42%) and dry weight (58.06%) under salt stress than salinized control without paclobutrazol application in salt-susceptible 'Soh Sarkar'. While in 'Rangpur lime', application of 125 ppm paclobutrazol increased maximum plant height (10.33%), root length (68.84%), shoot fresh weight (31.38%)and dry weight (41.25%), root fresh weight (95.40%) and dry weight (76.34%) under salt stress as compared to salinized seelings without paclobutrazol. Root to shoot ratio increased maximum in 'Soh Sarkar' (35.30%) and in 'Rangpur lime'(24.32%) with application of 125 ppm paclobutrazol under salt stress. Paclobutrazol-treated plants of the both rootstocks had less defoliation and toxicity symptoms appeared on fewer leaves. Relative water content, chlorophyll a and b, total chlorophyll and chlorophyll a to b ratio in both rootstocks increased by

application of paclobutrazol. Membrane injury index reduced by 20.18% in Soh Sarkar and 51.83% in 'Rangpur lime' with application of 250 ppm paclobutrazol under salt stress than salinized seedlings without paclobutrazol treatment. The findings suggested that paclobutrazol promoted salt stress avoidance in both salt-sensitive and salt-tolerant rootstocks of citrus.

102. Chowdhury, H.; Central Research Institute for Jute and Allied Fibres, Kolkata, (India). Saha, A.R.; Central Research Institute for Jute and Allied Fibres, Kolkata, (India). Sarkar, S.K.; Central Research Institute for Jute and Allied Fibres, Kolkata, (India). Tripathi, M.K.; Sunnhemp Research Station (CRIJAF), Pratapgargh (India). Allelopathic effects of jute (Corchorus capsularis and C. olitorius) and sisal (Agave sisalana) leaf leachates on rice (Oryza sativa), wheat (Triticum aestivum) and greengram (Vigna radiata). Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.624-27 KEYWORDS: ALLELOCHEMICALS. CORCHORUS CAPSULARIS. CORCHORUS OLITORIUS. GERMINATION. SEEDLINGS. SISAL. JUTE. RICE. WHEATS. VIGNA RADIATA.

A study was conducted during 2007 to screen leaf leachates of jute (Corchorus capsularis L. and C. olitorius L.) and sisal (Agave sisalana Perrine) for allelochemicals effect on germination and seedling growth of some test plants. A rice(Oryza sativa L.), wheat (Triticum aestivum L. emeond. Fiori & Paol.) and (greengram [Vigna radiata (L.) R. wilczek] allelochemicals present in the leachates inhibited differentially the germination and growth of the plants. Effect of allelochemicals on germination of the plants was less pronounced as compared to that on seedling growth. Highest inhibition on germination (paddy seeds by about 28% over control) and seedling vigour (about 48 – 62% vigour loss over the control) in the plants was recorded in case of Capsularis jute leaf extracts. Among the test plants, seedling growth of wheat was affected most by the leachates. Similar effect on germination and seedling growth of plants was also recorded when leaf samples were incorporated into soil (1: 10, w/w).

F61 Plant Physiology - Nutrition

103. Singh, V.K.; Central Institute for Sub-tropical Horticulture, Division of Plant physiology. Lucknow (India). Singh, Gorakh; Central Institute for Sub-tropical Horticulture, Division of Horticulture. Lucknow (India). Bhriguvanshi, S.R.; Central Institute for Sub-tropical Horticulture, Division of Crop Production, Lucknow (India). Effect of polyethylene mulch on soil nutrient level root, leaf and fruiting characteristics of mango (Mangifera indica). Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.411-417 KEYWORDS: POLYETHYLENE. LEAVES. FRUITING. ROOTS. MANGOES. YIELDS.

A study was conducted during 2004-08 on the impact of black polyethylene film (100 Jl thick) on root growth, flowering and fruiting characteristics and nutritional and hydrothermal properties of soil, anatomical changes in roots and pedicel and ;stomatal behaviour of leaves in 'Chausa' and 'Langra' mango (Mangifetra indica L.). Mulching treatment stimulated the lateral root growth in nutrient rich upper soil layer in particular. The anatomical structure of roots of mulched trees showed more unicellular and tubular root hairs with prominent conductive tissue compared to nonnmulched ones. Primitive abscission zone in the pedicels with increase in size of stomatal pore in leaves of mulched tree was categorically noticed. Enhancement in flowering (35 to 50%), maximum fruit retention (381.61 and 566.47) and minimum fruit drop (14 and 51) with enhancement in yield (82.60 and 117.50 kg/tree) in both the cultivars was recorded in mulched trees compared with the non-mulched ones. Alleviated soil temperature (21.0-25.8) was also noticed in the mulching treatments. The data on nutritional status clearly revealed the improvement in the level of N (2.50%), P (18.69 ppm), K (130.0 ppm), Ca (521.95 ppm), Zn (0.93 ppm), Cu (1.61 ppm), Fe (4.90 ppm), in soil and leaves in both the cultivars with different magnitude with mulching. However there was no significant changes in Mn level, pH of soil, organic content in mulched as compared to non-mulched

soil. Significant increase with cultivars variation in gas exchange parameters and chlorophyll fluorescence was recorded in mulched trees.

104. Anjaneyulu, K.; Indian Institute of Horticultural Research, Bangalore (India). Raghupathi, H.B.; Indian Institute of Horticultural Research, Division of Soil Science and Agricultural Chemistry. Bangalore (India). Identification of yield-limiting nutrients through DRIS leaf nutrient norms and indices in guava (Psidium guajava). Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.418-421 KEYWORDS: YIELDS. DIAGNOSIS. GUAVAS. PLANT NUTRITION.

A study was conducted during 2005-07 to develop diagnostic leaf nutrient norms for identifying yield-limiting nutrients in 'Allahabad Safeda' (Psidium guajava L.). By diagnosis and recommendation integrated system (DRIS), the whole population was divided into 2 sub-groups and identified 45 nutrient expressions as diagnostic norms from the data collected on nutrient concentration in leaves and yield. Among the nutrient ratios selected to form diagnostic parameters PIN (0.105), N/K (1.375), P/Mg (0.485), P/Zn (0.006), KlZn (0.042), MglK (0.302), MglS (1.147), Fe/Zn (4.302) etc. had shown higher variance and lower co-efficient of variation that are found to have greater diagnostic precision. The overall imbalance of the nutrients was assessed based on sum of the indices irrespective of sign, which is referred to as nutritional balance index (NBI). Higher the sum value, larger will be the plant nutritional imbalance and vice-versa. The diagnosis of nutrient balance through DRIS indices indicated that the most common yield-limiting nutrients were zinc and potassium. In addition, 5 nutrient ranges were derived using mean and standard deviation as low, deficient, optimum, high and excess for each nutrient to serve as a guide for diagnostic purpose. The study indicated that the optimum ranges for N, P and K were 1.69 to 2.19, 0.168 to 0.236 and 1.20 to 1.67%. Similarly, the optimum ranges for Ca, Mg and S were 0.60 to 1.27,0.35 to 0.50 and 0.29 to 0.47% respectively. The optimum iron ranged from 114 to 178 ppm, manganese from 34 to 77 ppm, zinc from 29 to 41 ppm and copper from 6 to 12 ppm.

105. Kumar, P. Naveen; Indian Agricultural Research Institute, New DelhI (India). Mishra, R.L.; Indian Agricultural Research Institute, New DelhI (India). Dhiman, S.R.; YS Parmar University of Horticultural and Forestry, Solan (India). M Ganga; Tamil Nadu Agricultural University, Coimbatore (India). Kameswari, Lalitha; Andhra Pradesh Horticultural University, Hyderababd (India). Effect of micronutrient sprays on growth and flowering of chrysanthemum. Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.426-428 KEYWORDS: TRACE ELEMENTS. SPRAYS. CHRYSANTHEMUM. FOLIAR APPLICATION. GROWTH. FLOWERING.

Field experimentation was conducted during 2006-D7 at 3 locations to study the effect of foliar application of micronutrients, viz. zinc sulphate (ZnS04), ferrous sulphate (FeS04.7 H20) and manganese sulphate (MnS04) each at 4 levels, 0.2, 0.4, 0.6 and 0.8% including a control, on growth and flowering of chrysanthemum (Dendranthema grandiflora Tzvelev) at Coimbatore, Hyderabad and Solan. At Coimbatore, foliar application of FeS04 0.8% (T4) recorded longest flowering duration (42.69 days) and maximum flower yield (124.21 g/plant, 1.67 kg/plot) over the control (85.29 g/plant and 1.36 kg/plot). At Hyderabad, duration of flowering was recorded maximum with foliar spray of FeS04 at 0.2% (62.3 days) which was at par with ZnS04 or MnS04 at 0.4% (61.0 and 60.3 days, respectively) and the number of flowers per spray was increased by all the micronutrients at lower level (0.2%). The treatment MnS04 (0.4%) also resulted in recording maximum average flower weight (2.17 g) and more number of flowers/plant (200). At Solan, foliar spray with MnS04 (0.6%) thrice recorded significantly maximum number of side shoots/plant over all other treatments. FeS04.7 H20 at 0.2% recorded maximum number. of flowers/spray, followed by ZnS04 at 0.6% or 0.2% and FeS04 at 0.6% which were at par with each other.

106. Hamza, S.; Indian Institute of Spices Research, Calicult (India). Srinivasan, V.; Indian Institute of Spices Research, Calicult (India). R. Dinesh; Indian Institute of Spices Research, Calicult (India). Nutrient diagnosis of cardamom (Elettaria cardamomum)

gardens in South India). Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.429-432 KEYWORDS: DIAGNOSIS. NUTRIENTS. CARDAMOMS. SOIL CHEMICOPHYSICAL PROPERTIES.

The nutrient analysis data of 123 samples obtained from cardamom-growing tracts in South India was compared with already worked out leaf nutrient diagnosis and recommendation integrated system (DRIS) indices values to find out the deviation limitation of nutrients from corresponding critical concentrations. The results revealed that 74, 54, 50, 46, 43, 41, and 38% leaf samples analyzed have Zn, K, P, Ca, Mg, Cu and Mo concentrations below the required critical values, respectively. The limiting leaf nutrients were in the order Zn K P Ca Mg Cu Mo Fe Mn N. Correlation analysis showed that the soil nutrients at the base of cardamom plants are significantly and positively correlated with soil nutrients at interspaces, leaf nutrients and cardamom yield. An increase in soil pH resulted in increased availability of soil Ca, Mg and B. Soil organic carbon increased leaf N content, while leaf Ca increased leaf Mo content. Soil available P, K, Cu and leaf Cu were significantly and positively correlated with cardamom yield.

F62 Plant Physiology – Growth and Development

107. Talukder, B; Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar (India). Jana, J.C.; Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar (India). Integrated nutrient management for better growth, yield and quality of green chilli (Capsicum annuum) in terai region of West Bengal. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.600-03 KEYWORDS: AZOSPIRILLUM. AZOTOBACTER. CHILLIES. ECONOMIC ANALYSIS. NITROGEN FERTILIZERS.

An experiment was conducted during winter seasons of 2004–06 to study the effect of inoculation with biological nitrogen fixers on growth and yield of ‘Suryamukhi’ chilli (Capsicum annuum L.). The growth, yield and quality characters of green chilli crop increased with the inoculation of biological nitrogen fixers using Azotobacter and Azospirillum. Performance of Azospirillum was better as compared to Azotobacter. Dual inoculation gave a synergistic effect in increasing crop growth and yield. Dual inoculation with the biological nitrogen fixers, 100% recommended dose of N-fertilizer 80 kg N/ha and farmyard manure 15tonnes/ha recorded maximum growth, yield (7.43tonnes/ ha) and quality parameters, and cost : benefit ratio of 1.55 and no significant difference was observed when N-fertilizer level was reduced to 75%. Thus associative nature of the above biofertilizers helped to save 25% nitrogenous fertilizer in chilli crop. There was increased content in plant nitrogen (84.10 mg/kg), phosphate (84.42 mg/kg) and potash (57.46mg/kg), leaf chlorophyll (0.204 mg/100g) and residual available soil nitrogen (202.90 kg/ha), phosphate (67.10 kg/ha) and potash (70.50 kg/ha) with dual inoculation with the biological nitrogen fixers along with full dose of N-fertilizer.

108. Mahala, N.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Biotechnology and Molecular Biology). Jain, S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Biotechnology and Molecular Biology). Jain, R.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Biotechnology and Molecular Biology). Phenotyping and microsatellite marker analysis of CSR10 (salt tolerant indica) x HBC19 (Taraori Basmati) F6 lines obtained using single seed descent method. Indian Journal of Genetics and Plant Breeding (India). (Aug 2008) v. 68(3) p. 248-254 KEYWORDS: ORYZA SATIVA. MICROSATELLITES. EVOLUTION. ORGANIC FERTILIZERS.

A population in F6 generation comprising of 201 lines derived from the cross between CSR10 (salt tolerant, indica) and Taraori Basmati (HBC19) using single seed decent method, was evaluated for variation in agronomic and Basmati grain quality traits and for microsatellite allelic profile in relation to the parental rice varieties. Substantial variability was observed for plant height, productive tillers per plant, 1000-grain weight, yield per plant, kernel length (L) and breadth (B) and US ratio. The grain yield per plant

showed positive correlation with number of productive tillers per plant and 1000-grain weight. Kernel length and breadth respectively had positive and negative correlations with US ratio. The path coefficient analysis recorded that number of productive tifters per piant, plant height and 1000-grain weight were the main contributors towards grain yield. A total of 20 randomly selected F 6 plants were subjected to SSR marker analysis using 15 SSR markers covering all toe chromosomes. The F6 plants had an allele from either of the two parental lines (homozygous condition) or alleles from both the parental rice varieties (heterozygous condition). At three SSR loci new/recombinant alleles were observed, which indicate the active recombination between genomes of two rice varieties. SSR allelic profile based two dimensional principal compogent analyses demonstrated high level of diversity between "CSR10 and HBC19 with the 20 CSR10 xHBC19 F6 plants, interspersed between them. SSR analysis also showed an average homozygosity of 93.3% in F6 lines, which is close to expected value of 98%.

H10 Pests of Plants

109. Lakshmamma, P.; Directorate of Oilseeds Research, Hyderabad (India). Lakshminarayana, M.; Directorate of Oilseeds Research, Hyderabad (India). Prayaga, Lakshmi; Directorate of Oilseeds Research, Hyderabad (India). Alivelu, K.; Directorate of Oilseeds Research, Hyderabad (India). Lavanya, C.; Directorate of Oilseeds Research, Hyderabad (India). Effect of defoliation on seed yield of castor (Ricinus communis). Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.620-23 KEYWORDS: DEFOLIANTS. BEAVERS. SEEDS. YIELDS. SPIKES. CROP LOSSES. PEST CONTROL.

Field investigation was carried out during 2005–07 to determine yield loss to different levels of defoliation at different growth stages in ‘DCS 9’castor (Ricinus communis L.) Treatments consisted of 4 defoliation levels (25, 50, 75, and 100%) at primary, secondary and tertiary spike initiation stages along with control. Per cent defoliation affected was not exactly at the prescribed levels, but nearer to them. Number of leaves removed at 25% defoliation ranged from 3 to 6, at 50% from 5 to 11 at 75% from 7 to 17 and from 10 to 25 at 100% at different stages of defoliation. The actual defoliation was 23–32% for 25% defoliation, 50–55% for 50%, 58–71% for 75% defoliation at different stages of defoliation. With increase in per cent defoliation, there was significant reduction in seed yield. The reduction in seed yield ranged from 10 to 20%, 20 to 23%, 24 to 36% and 26 to 55% with 25, 50, 75 and 100% defoliation, respectively. On an average, defoliation at primary stage showed 21% yield reduction and at secondary stage showed 33% yield reduction. Tertiary stage defoliation showed 26% yield reduction. Defoliation at secondary spike initiation stage was found to be the most sensitive stage which reduced total seed yield. The practical information generated during the study could be utilized in designing the pest management strategies in castor.

110. Rao, K. Rajasekhara; ICAR Research Complex for North Eastern Hill Region, Meghalaya (India). Thakur, N.S. Azad; ICAR Research Complex for North Eastern Hill Region, Meghalaya (India). Seed treatment and intercrop systems for the management of leaf folder (Nacoleia vulgalis) and stem fly (Ophiomyia phaseoli) in soybean (Glycine max). Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.662-65 KEYWORDS: OPHIOMYIA PHASEOLI. SEED TREATMENT. INTERCROPPING. SOYBEANS.

A field experiment was conducted during rainy (kharif) season of 2003 and 2004 on the use of integrated management practices, viz. (i) seed treatment of soybean either with imidachloprid 200SL 5.0 ml/kg seed or carbofuran 3G 250 g /kg seed, (ii) intercropping of soybean with either maize or rice to study the effects of these practices on major insects like leaf folder Nacoleia vulgalis Guen, N. dimenalis Guen. and stem fly Ophiomyia phaseoli (Tryon) and their natural enemies occurring in soybean ecosystem. The plot (fertilizer) with imidachloprid seed treatment and rice as intercrop recorded lowest (9.1%) leaf folder damage, followed by carbofuran seed treatment plot + rice, and carbofuran or imidachloprid seed treatment plots with maize as intercrop and highest benefit : cost ratio of 1.92. The damage by stem fly was significantly higher in

maize intercrop and less in carbofuran seed treatment plot without maize as intercrop. When neem cake powder was used as nutritional source to soybean the damage by leaf folder, stem fly and leaf feeding beetles was less when compared to fertilized treatments. The combined advantage of using seed treatment as a method of control measure to leaf folder and stem fly up to more than 30 days and the intercropping of soybean with maize or rice to enhance the activity of natural enemies is recommended in reducing the pest abundance. Spiders were more active in soybean + rice intercrop system, whereas coccinellids were higher in soybean + maize intercrop system. The spider activity was very high (20 spiders/10 plants) in soybean + rice system.

111. Ameta, O.P.; Maharana Pratap University of Agriculture and Technology Udaipur (India). Bunker, G.K.; Maharana Pratap University of Agriculture and Technology Udaipur (India). Validation and populanzation of integrated pest management technology in cotton (Gossypium hirsutum). Indian Journal of Agricultural Sciences (India) . (July 2009) v.79(7) p.527-530 KEYWORDS: COTTON. PEST CONTROL. PHEROMONE TRAPS.

Experiments were conducted during rainy {kharif) season of 2003-06 on validation of integrated pest management technology in cotton (Gossypium hirsutum L.) at village Badgaon and adjoining area, Banswara, Rajasthan. The results of IPM technology were compared with non- integrated pest management farmers' practices which included 9-10 spray of insecticides. The IPM module recorded the lower population of aphids {Aphis gossypii Glower), jassi {Amrasca biguttula biguttula Ishida), whitefly {Bemisia tobaci Genna), thrips {Thrips tabaci Lindeman) and bollworms, viz. Earias insulana Fab. Helicoverpa armigera Hubner compared to non-IPM practices. The mean per cent damage by H.armigera and E.insulana (4.20 and 7.18) to square, flower (4.67 and 4.98), green boll (3.80 and 5.62), open boll (19.21) and locule (21.64) was found less in IPM fields as compared with non IPM fields which exhibited 6.68 and 10.11, 7.86 and 9.18, 6.42 and 10.38. 26.94 and 28.13 % damage, respectively. The seed cotton yield of 1 918, 1 804 , 1 820 and 1 780 kg/ha was recorded during 4 years in IPM fields as against 1 488,1 504,1 453 and 1 392 kg/ha in non IPM fields during 2003, 2004,2005 and 2006, respectively. The IPM module also encouraged the population of natural enemies, viz Coccinellids and Chrysoperal carnea and spiders in cotton fields. The mean cost: benefit ratio in an integrated pest management field was 1:2.76 as against cost benefit: ratio of only 1:1.47 in non-IPM fields.

112. Patnaik, H.P.; Orissa University of Agriculture and Technology, Bhubaneswar (India). Khanda, C.M.; Orissa University of Agriculture and Technology, Bhubaneswar (India). Rout, S.K.; Orissa University of Agriculture and Technology, Bhubaneswar (India). Mahapatra, P.K.; Orissa University of Agriculture and Technology, Bhubaneswar (India). Earthworm species diversity in coastal plain areas of Orissa. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(7) p.569-571 KEYWORDS: COASTAL PLAINS. OLIGOCHAETA. BIODIVERSITY. ORISSA.

Preliminary sampling of earthworms in various habitats across 4 villages of Puri district of Orissa showed the prevalence of 7 different earthworm species belonging to 4 distinct families, viz. Octochaetidae, Megascolecidae, Moniligastridae and Glossoscolecidae. The worm species, Octochaetona surensis (Michaelsen), Pontoscolex corethrurus (Mueller), Drawida willsi Michaelsen, Lampito mauritii Kinberg and Octochaetona barkudensis (Stephenson) prevailed in coconut gardens in soils with slightly acidic to neutral reaction (pH: 6.1-7.2) and high organic carbon content (1.23 - 1.46 g%). D. willsi, Drawida limella and Pellogaster bengalensis were exceptionally found in coconut gardens, cultivated fields and rice fields respectively. The worm species D. willsi, O. surensis and L. mauritii were considered as superior in terms of their survival under artificial conditions in the laboratory.

113. Bajya, D.R.; Central Institute for Cotton Research, Regional Station, Sirsa (India). Monga, D.; Central Institute for Cotton Research, Regional Station, Sirsa (India). Meena, B.L.; Krishi Vigyan Kendra, Rajasthan (India). Tyagi, M.P.; CCS University, K.V. (PG) College, Meerut (India). Insecticide Resistance Management strategies for managing

Cotton pest complex. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.1-5 KEYWORDS: GOSSYPIUM HIRSUTUM. INSECTICIDES. PEST CONTROL. INSECTICIDES. PEST RESISTANCE.

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 IRM 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.

114. Patel, Yogesh; J.N.K.V.V., College of Agriculture, Department of Entomology, Ganjbasoda (India). Sharma, H.B.; B.S.A. College of Mathura, Mathura (India). Das, S.B.; J.K. Krishi Vishwa Vidhyalaya, Jabalpur (India). Novel Insecticides for Management of Whitefly, Bemisia tabaci (Genn.) in Cotton. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.6-9 KEYWORDS: BEMISIA TABACI. GOSSYPIUM HIRSUTUM. INSECTICIDES. PEST INSECTS. CHEMICAL CONTROL. INSECT CONTROL. 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 l 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.

115. Singh, Gaje; S.V.P. Univ. of Agri. & Tech. , Dept. of Entomology, Meerut (India). Prasad, C.S.; S.V.P. Univ. of Agri. & Tech. , Dept. of Entomology, Meerut (India). Sirohi, Anil; S.V.P. Univ. of Agri. & Tech. , Dept. of Entomology, Meerut (India). Kumar, A.; S.V.P. Univ. of Agri. & Tech. , Dept. of Entomology, Meerut (India). Dhaka, S. S.; S.V.P. Univ. of Agri. & Tech. , Dept. of Entomology, Meerut (India). Ali, N.; S.V.P. Univ. of Agri. & Tech. , Dept. of Entomology, Meerut (India). Effect of Bio-pesticides against Stem fly and Pod borer complex in Field pea. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.10-12 KEYWORDS: BIOPESTICIDES. PISUM SATIVUM. ETIELLA ZINCKENELLA.

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) 18kg/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 rabi 2006- 2007 and rabi 2007-2008, respectively. The treatment with Bt was found best with minimum pod borer infestation of 7.3 and 4.4 % during rabi 2006-2007 and rabi 2007-2008, 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.

116. Dhaka, S.S.; S.V. Patel University of Agriculture and Technology, Department of Entomology, Meerut (India). Singh, G.; S.V. Patel University of Agriculture and Technology, Department of Entomology, Meerut (India). Ali, N.; S.V. Patel University of Agriculture and Technology, Department of Entomology, Meerut (India). Yadav, Arvind; S.V. Patel University of Agriculture and Technology, Department of Entomology, Meerut (India). Yadav, Adbhut; S.V. Patel University of Agriculture and Technology, Department of Entomology, Meerut (India). Field evaluation of Insecticides and Bio-pesticides against Helicoverpa armigera on Tomato. Annals of Plant Protection Sciences (India). (Mar 2010)

v.18(1) p.13-16 KEYWORDS: HELICOVERPA ARMIGERA. SOLANUM LACINIATUM. SOLANUM. BIOPESTICIDES. INSECTICIDES.

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, Bacillu 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 biopesticides applied plots as compared to treated plots.

117. Devi, K. Dhanapati; Manipur University, Department of Life Sciences, Imphal (India). Varatharajan, R.; Manipur University, Department of Life Sciences, Imphal (India). Loganathan, S.; Margo Biocontrols Pvt.Ltd, Sadashivanagar, 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). (Mar 2010) v.18(1) p.17-21 KEYWORDS: OLIGONYCHUS. TOXOPTERA AURANTII. BIOASSAYS. VERTICILLIUM LECANII. TEA. TETRANYCHIDAE. MANIPUR.

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.

118. Satyanarayana, N.V.V.; Acharya NG Ranga Agricultural University, Agricultural College, Department of Entomology, Bapatla (India). Rao, G. Ramachandra; Acharya NG Ranga Agricultural University, Agricultural College, Department of Entomology, Bapatla (India). Rao, P. Arjuna; Acharya NG Ranga Agricultural University, Agricultural College, Department of Entomology, Bapatla (India). Incidence and Management of Spodoptera litura (Fab.) on Post rainy season Groundnut . Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.22-25 KEYWORDS: SPODOPTERA LITURA. PEST CONTROL. 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.

119. Kumar, M.K.; Division of Entomology, I.A.R.I., New Delhi (India). Srivastava, Chitra; Division of Entomology, I.A.R.I., New Delhi (India). Garg, A.K.; Division of Entomology, I.A.R.I., New Delhi (India). In vitro selection of Deltamethrin resistant strain of Trogoderma granarium and its susceptibility to Insecticides. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.26-30 KEYWORDS: TROGODERMA GRANARIUM. DELTAMETHRIN. INSECTICIDES.

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 x1.554, 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.

120. Sujatha, A.; Andhra Pradesh Horticultural University, Horticultural Research Station, A.P. (India). Chalam, M.S.V.; Agricultural College, Department of Entomology, Bapatla (India). Arulraj, S.; AICRP on Palms, C.P.C.R.I., Kasaragod (India). Monitoring and Management of Coleopteran pests of Coconut through Pheromone traps in Andhra Pradesh. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.34-40 KEYWORDS: COCONUTS. ORYCTES RHINOCEROS. RHYNCHOPHORUS FERRUGINEUS. PEST INSECTS. COLEOPTERA.

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.

121. Kumar, Rakesh; N.D. University of Agriculture and Technology, Department of Entomology, Faizabad (India). Ali, Shamshad; N.D. University of Agriculture and Technology, Department of Entomology, Faizabad (India). Chandra, Umesh; N.D. University of Agriculture and Technology, Department of Entomology, Faizabad (India). 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(1) p.41-48 KEYWORDS: SESAMUM INDICUM. SAP.

Five sap feeders were observed viz., white fly (Bemisia tabaci), leaf hopper (Orosius albicinctus), 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.

122. Sitaramaraju, S.; Agricultural College, Department of Entomology, Bapatla (India). Prasad, N.V.V.S.D.; A.N.G. Ranga Agri. Univ., Regional Agricultural Research Station. Guntur (India). Krishnaiah, P.V.; Agricultural College, Department of Entomology, Bapatla (India). Seasonal incidence of Sucking Insect pests on Bt cotton in relation to Weather parameters. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.49-52 KEYWORDS: GOSSYPIUM HIRSUTUM. SUCKING INSECTS. METEOROLOGICAL FACTORS.

The seasonal incidence of sucking insect pests on Bt cotton indicated that the major activity of aphids was observed from 41st standard week attaining peak during 46th standard week. Among the sucking pests, leafhoppers was the dominant pest with high activity from 41st 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%).

123. 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 (Fabricius) in Okra. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.53-55 KEYWORDS: ABELMOSCHUS ESCULENTUS. EARIAS VITTELLA. PEST CONTROL. EVALUATION. OKRAS.

Fruit damage by Earias vittella was significantly less in all 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 seed + foliar spray of neem (Neembaan) 3 ml/lt at 40 days after sowing + foiar spray of endosulfan (1 ml/lit) + 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 %.

124. 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(1) p.56-59 KEYWORDS: AONIDIELLA AURANTII. WEATHER. ROSA.

The incidence of scales was observed on 30 rose cultivars, and increased gradually, reaching its peak (65.33 scales/stem) in the first week of March and declined thereafter. Tmax, Tmin, RH-1, RHII and BSH were in the range of 30.3 to 34.5^{o}C, 9.7 to 11.7^{o}C, 77 to 91%, 17 to 31%, 9.7 to 10.1 hours, respectively, prevailed during 5th to 9th MW appeared to be congenial for multiplication of scales. Increase in scale population was observed to be positively and highly significantly, positively correlated with T max, BSH and T min, respectively during phase-I; while Tmax and Tmin were found to be negatively and highly significantly correlated with increase in scale population in Phase-II.

125. Prasad, S.S.; N.D. Univ. of Agri. & Tech, Crop Research Station, Ghaghraghat (India). Gupta, P.K.; N.D. Univ. of Agri. & Tech, Crop Research Station, Ghaghraghat (India). Effect of Organic Manures on Yield and Yellow stem borer infestation in Semi Deep water Rice. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.60-62 KEYWORDS: ORGANIC FERTILIZERS. BIOFERTILIZERS. SOIL AMENDMENTS. FERTILIZERS. NITROGEN FERTILIZERS. RICE. STEM EATING INSECTS. INFESTATION.

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.

126. Chavan, B.P.; Mahatma Phule Krishi Vidyapeeth, Post Graduate Institute, Department of Entomology, Ahmednagar (India). Kadam, J.R.; Mahatma Phule Krishi Vidyapeeth, Post Graduate Institute, Department of Entomology, Ahmednagar (India). Effect of liquid formulations of Pochonia (Verticillium) lecanii (Zimm.) Viegas on viability and virulence against Mealy bug. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.63-66 KEYWORDS: VERTICILLIUM LECANII. PATHOGENICITY. PSEUDOCOCCIDAE. ADJUVANTS. MACONELLICOCCUS.

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.

127. Subharani, S.; Institute of Bioresources and Sustainable Development., Distributed Information Sub Centre (DISC), Imphal (India). Singh, T.K.; Manipur University, Entomology Research Laboratory, Canchipur (India). Biology of Pod Fly, Melanagromyza obtusa Malloch on Cajanus cajan (L.) Millsp. in Manipur. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.67-69 KEYWORDS: CAJANUS CAJAN. MELANAGROMYZA. MANIPUR.

The biology of Pod fly, Melanagromyza obtusa was studied during 2004-2005 at a temperature of 19.58oC 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.

128. Kumar, Rakesh; N.D. University of Agriculture and Technology, Department of Entomology, Faizabad (India). Ali, Shamshad; N.D. University of Agriculture and Technology, Department of Entomology, Faizabad (India). Chandra, Umesh; N.D. University of Agriculture and Technology, Department of Entomology, Faizabad (India). 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(1) p.70-76 KEYWORDS: SESAMUM INDICUM. POPULATION DYNAMICS.

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 pustulata were observed to infest all varieties of sesame. The population of sesame gall fly, flower beetle, sesame budfly and blister beetle were found positively correlated with the minimum, maximum temperatures and relative humidity and negatively correlated with rainfall in all varieties of sesame during both the years.

129. Reddy, D. Srinivasa; Horticultural Research Station, Entomology, A.P (India). Srivastava, Chitra; Indian Agricultural Research Institute, Division of Entomology, New Delh (India). Gotyal, B.S.; CRIJAF, Entomology, Barrackpore (India). Evaluation of Insect Growth Regulatory Activity of Neem formulation against Helicoverpa armigera (Hübner). Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.77-81 KEYWORDS: HELICOVERPA ARMIGERA. INSECT GROWTH REGULATORS.

Ten commercially available neem formulations viz., vijayneem (0.15EC), achook (0.15 EC), econeem (0.30EC 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 1EC 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.

130. Sinha , S.R.; I.A.R.I., Division of Entomology, New Delhi (India). Sharma, R.K.; I.A.R.I., Division of Entomology, New Delhi (India). Effect of Insecticides on Insect Pests of Brinjal. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.82-85 KEYWORDS: INSECTICIDES. PEST INSECTS. AUBERGINES. AMRASCA BIGUTTULA. BEMISIA TABACI. BEMISIA. LEUCINODES ORBONALIS. LEUCINODES.

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.

131. Kapadia, M.N.; Junagadh Agricultural University, College of Agriculture, Department of Entomology, Junagadh (India). Butani, P.G.; Junagadh Agricultural University, College of Agriculture, Department of Entomology, Junagadh (India). Jethva, D.M.; Junagadh Agricultural University, College of Agriculture, Department of Entomology, Junagadh (India). Virani, V.R.; Junagadh Agricultural University, College of Agriculture, Department of Entomology, Junagadh (India). Beria, N.N.; Junagadh Agricultural University, College of Agriculture, Department of Entomology, Junagadh (India). Management of White grub, Apogonia rauca (Feb.) in Groundnut. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.86-89 KEYWORDS: LARVAE. ARACHIS HYPOGAEA. ARACHIS. GROUNDNUTS. PEST CONTROL.

Field trial was conducted for 2 years to find out the effective management of white grub, Apogonia rauca (for 2 years) in groundnut during monsoon seasons, 2006-2008. Looking to the efficacy, yield and economics, seed treatment of chlorpyriphos 20 EC 25 ml/kg 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.

132. Panigrahi, D.; Krishi Vigyan Kendra (OUAT), Orissa (India). Chemical Seed treatment for Management of Termites in Chick pea. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.90-93 KEYWORDS: CICER ARIETINUM. ODONTOTERMES. SEED TREATMENT. ISOPTERA. CHICKPEAS. PEST CONTROL.

The results in relation to the efficacy of seed treating chemicals revealed that imidacloprid 10ml/ kg, 7ml/kg; chlorpyriphos 10ml/kg and endosulfan 10ml/kg seed resulted in significantly lower plant damage and higher grain yield over untreated control. Imidacloprid 10ml/kg seed fetched the maximum return (Rs.6352/ha) followed by imidacloprid 7ml/kg (Rs.5662/ha), chlorpyriphos 10ml/kg seed (Rs.5534/ha) and endosulfan 10ml/kg seed (Rs.4596/ha).

133. Sutaria, V.K.; Junagadh Agricultural University, Department of Entomology, Junagadh (India). Motka, M.N.; Junagadh Agricultural University, Department of Entomology, Junagadh (India). Jethva, D.M.; Junagadh Agricultural University, Department of Entomology, Junagadh (India). Ramoliya, D.R.; Junagadh Agricultural University, Department of Entomology, Junagadh (India). Field efficacy of Insecticides against Jassid, Empoasca kerri (Pruthi) in Soybean. Annals of Plant Protection Sciences

(India). (Mar 2010) v.18(1) p.94-97 KEYWORDS: EMPOASCA. GLYCINE MAX. INSECTICIDES. CICADELLIDAE. SOYBEANS.

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 0.01% (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).

134. U.S. Yadav; N.D.Univ. of Agric. & Tech., Crop Research Station. Bahraich (India). Yadav, Adbhut; N.D.Univ. of Agric. & Tech., Crop Research Station Bahraich (India). Performance of Jute cultivars against Apion corchori, Anomis sabulifera and Polyphagotarsonemus latus. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.98-100 KEYWORDS: ANOMIS. APION. CORCHORUS CAPSULARIS. POLYPHAGOTARSONEMUS LATUS. JUTE. PEST INSECTS. INFESTATION. PEST RESISTANCE.

Eight jute (Corchorus capsularis) cultivars along with standard check (Var. JRC-212. & JRC-321) were evaluated against stem weevil (Apion corchori), 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 infestation 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 JRC-321.

135. Ahmed , Tariq; University of Kashmir, Section of Entomology, P.G. Department of Zoology, Srinagar (India). Nabi, Shabnum; A.M.U., Department of Zoology, Aligarh (India). Application of Dyar’s Law to Different Hopper instars of Choroedocus illustris Walker (Orthoptera : Acrididae). Annals of Plant Protection Sciences (India) . (Mar 2010) v.18(1) p.101-103 KEYWORDS: LARVAE. ORTHOPTERA. BIOLOGICAL DEVELOPMENT.

The Dyar’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 27oC under isolated conditions and gone up to 1.309 (maximum) at 37oC under crowded conditions, while as in female hoppers, the average increase was 1.233 (minimum) at 37oC under crowded conditions and reaches up to 1.409 (maximum) at 27oC under the same crowded conditions, before they reached the adult stage. The calculated head width was found close to the observed head width.

136. Sri, I. Aruna; Agricultural College, Department of Entomology, Bapatla (India). Rao, V. Ramasubba; Agricultural College, Department of Entomology, Bapatla (India). Sekhar, P. Raja; Agricultural College, Department of Entomology, Bapatla (India). Chalam, M.S.V.; Agricultural College, Department of Entomology, Bapatla (India). Taxonomic Studies on different Lepidopteran caterpillars on Cotton, Chilli and Pulses. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.104-107 KEYWORDS: TAXONOMY. LARVAE. COTTON. CHILLIES. GRAIN LEGUMES. PEST CONTROL.

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 vitrata, 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 prolegs. For easy identification of these larvae, a taxonomic key was prepared with the help of line diagrams of thoracic and abdominal segments.

137. Geroh, Monika; CCS Haryana Arigcultural University, Departments of Zoology and Aquaculture. Hisar (India). Gulati, Rachna; CCS Haryana Arigcultural University, Department of Entomology. Hissar (India). Sharma, S.S.; CCS Haryana Arigcultural University, Department of Entomology. Hissar (India). Kaushik, H.D.; CCS Haryana Arigcultural University, Department of Entomology. Hissar (India). Aneja, D.R.; CCS Haryana Arigcultural University, Department of Maths and Statistics. Hissar (India). 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(1) p.108-113 KEYWORDS: STRESS. TETRANYCHUS URTICAE. STETHORUS PUNCTILLUM. OKRAS.

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 cm2 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 cm2 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.

138. Kumar, Yogesh; CCS Haryana Agricultural University, Department of Entomology. Hisar (India). Kumar, Krishan; CCS Haryana Agricultural University, Department of Entomology. Hisar (India). Kaushik, H.D.; CCS Haryana Agricultural University, Department of Entomology. Hisar (India). Effect of Temperature and Relative Humidity on larval and pupal development of Greater wax moth, Galleria mellonella Linn. on two diets. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.118-122 KEYWORDS: LARVAE. GALLERIA MELLONELLA. GALLERIA. APIS MELLIFERA. APIS. RELATIVE HUMIDITY. TEMPERATURE. DIET.

Larval and pupal development of Galleria mellanella were studied at 25, 30, 35 and 40oC 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, temperatures of 40oC 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.

139. Das, Debanand; Assam Agricultural University, Krishi Vigyan Kendra, , Assam (India). Saikia, Prabal; A.A.U., Regional Agricultural Research Station, Lakhimpur (India). Indigenous technical knowledge for Management of Rice pests in Assam. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.123-126 KEYWORDS: PEST CONTROL. RICE. ASSAM. PESTS OF PLANTS. ASSAM.

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.

140. Singh, Dan; S.V.P. Univ. of Agri. & Tech., Department of Agricultural Extension, Meerut (India). Singh, D.K.; S.V.P. Univ. of Agri. & Tech., Department of Agricultural Extension, Meerut (India). Yadav, R.N.; S.V.P. Univ. of Agri. & Tech., Department of Agricultural Extension, Meerut (India). Singh, V.K.; S.V.P. Univ. of Agri. & Tech., Department of Agricultural Extension, Meerut (India). Assessment of knowledge and adoption to IPM in Rice cultivation. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.127-130 KEYWORDS: RICE. PEST CONTROL. CULTIVATION. INSECT CONTROL. TRICHODERMA HARZIANUM. TRICHODERMA. BEAUVERIA BASSIANA. SOIL TREATMENT. SEED TREATMENT. DISEASE CONTROL.

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.

141. Swamy, S.V.S. Gopala; Regional Agricultural Research Station, Lam, Guntur (India). Prasad, N.V.V.S.D.; Regional Agricultural Research Station, Lam, Guntur (India). Comparative evaluation of different Pest Management Strategies on Cotton. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.131-135 KEYWORDS: GOSSYPIUM HIRSUTUM. PEST CONTROL. COTTON.

Studies were carried out to examine the profitability of IPM vis-a-vis non-IPM farming 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.

142. Kumar, Arbind; Kisan PG College, Department of Entomology. Ghaziabad (India). Rai, Mayank Kumar; KVK, Ghaziabad (India). Singh, S.S.; GBPAU&T, KVK, Deharadun (India). Efficacy of Neem products vis-a-vis Triazophos for Management of Soybean stem borers. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.136-140 KEYWORDS: GLYCINE MAX. TRIAZOPHOS. STEM EATING INSECTS.

A field trial was conducted during kharif to find out the efficacy of neem based (neem seed water extracts (NSWE) 40 ml/lit and vanguard 5 ml/lit.) comparison with triazophos 40 EC 1.5 ml/lit, against the stem borer complex in soybean. Triazophos proved to be the most effective against the stem borers. Neem seed based products also superior, showed it over control. Maximum grain yield was obtained due to triazophos, applied at 30 , 50 and 70 days after sowing (DAS) but the benefit/ cost ratio was highest (3.03:1) in one spray of NSWE, applied at 70 DAS which was economical than the other treatments.

143. Mir , Mehraj ud din; C.C.S. University, Department of Plant Protection. Meerut (India). Gaurav, S. S.; C.C.S. University, Department of Agricultural Botany. Meerut (India). Prasad, C.S.; S.V.P. Univ. of Agri. & Tech., Biocontrol Laboratory, Modipuram, Meerut (India). Tyagi, Ashish; C.C.S. University, Department of Plant Protection. Meerut (India). Field evaluation of Bacillus thuringiensis for control of Plutella xylostella (l.) on Cauliflower. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.141-143 KEYWORDS: BACILLUS THURINGIENSIS. PLUTELLA XYLOSTELLA. PLUTELLA. INSECT CONTROL. 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 m2 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.

144. Upadhyay, Meenakshi; 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 (Fabr.). Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.144-147 KEYWORDS: RHYZOPERTHA. TRITICUM AESTIVUM. PEST INSECTS.

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 preferred and the varieties K-68, K80- 27 K-9465, PBW-343 were less preferred food for R. dominica.

145. Tyagi, Ashish; C.C.S. University, Department of Plant Protection, Meerut (India). Gaurav, S.S.; C.C.S. University, Department of Agricultural Botany. Meerut (India). Prasad, C.S.; S.V.P. Univ. of Agri. & Tech., Biocontrol Laboratory, Meerut (India). Mir, Mehraj ud din; C.C.S. University, Department of Plant Protection, Meerut (India). Efficacy and economics of Biopesticides combinations and Insecticide against Tomato fruit borer. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.148-152 KEYWORDS: BIOPESTICIDES. INSECTICIDES. BACILLUS THURINGIENSIS. BEAUVERIA BASSIANA. BEAUVERIA. HELICOVERPA ARMIGERA. TRICHOGRAMMA PRETIOSUM. TRICHOGRAMMA.

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 50,000 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.

146. Bhat, J.A.; S.K. University of Agricultural Science and Technology of Kashmir, Division of Entomology, Srinagar (India). Wani, N.A.; S.K. University of Agricultural Science and Technology of Kashmir, Division of Entomology, Srinagar (India). Mohi-ud-din, S.; S.K. University of Agricultural Science and Technology of Kashmir, Division of Entomology, Srinagar (India). Lone, G.M.; S.K. University of Agricultural Science and Technology of Kashmir, Division of Entomology, Srinagar (India). Pukhta, M.S.; S.K. University of Agricultural Science and Technology of Kashmir, Division of Entomology, Srinagar (India). Relatives virulence of local entomopathogenic fungal isolates infecting apple stem borer, Aeolesthes sarta Solsky. Annals of Plant Protection Sciences (India).

(Mar 2010) v.18(1) p.153-155 KEYWORDS: PATHOGENICITY. ENTOMOGENOUS FUNGI. INSECT DISEASES. STEM EATING INSECTS. APPLES. BEAUVERIA BASSIANA. METARHIZIUM ANISOPLIAE. METARHIZIUM. FUNGI. BEAUVERIA.

The pathogenicity of three local entomopathogenic fungal isolates, Beauveria bassiana, B. brongniartii and Metharhizium anisopliae, each at three concentrations (1 x 108. 1 x 106 and 1 x 104 conidia/ml 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.

147. Meher, H.C.; Indian Agricultural Research Institute, Divison of Nematology. New Delhi (India). Gajbhiye, V.T.; Indian Agricultural Research Institute, Divison of Agril. Chemicals. New Delhi (India). Prasad, D.; Indian Agricultural Research Institute, Divison of Nematology. New Delhi (India). Singh, G.; Indian Agricultural Research Institute, Divison of Nematology. New Delhi (India). 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(1) p.206-213 KEYWORDS: AMINO ACIDS. CICER ARIETINUM. HPLC. MELOIDOGYNE INCOGNITA. LYCOPERSICON ESCULENTUM. CHICKPEAS. TOMATOES. CHROMATOGRAPHY.

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 C18 column and UV detection and estimation at a ë (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.

148. Gupta, R.L.; I.A.R.I, Division of Agricultural Chemicals, New Delhi (India). Prasad, D.; I.A.R.I, Division of Nematology, New Delhi (India). Lakshman A., Bijul; I.A.R.I, Division of Agricultural Chemicals, New Delhi (India). Nematicidal activity of O,O-Diaryl O-Ethyl Phosphorothionates against Meloidogyne incognita. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) 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=16 ìg/ml) and also highly decreased the galls besides significantly increasing all the plant growth parameters of cowpea at lower concentration i.e. 125 ìg/ml. Its nematicidal activity was found better than triazophos, a standard nematicide.

149. Kumar, Rakesh; N.D. Univ. of Agri. & Tech., Department of Entomology, Faizabad (India). Ali, Shamshad; N.D. Univ. of Agri. & Tech., Department of Entomology, Faizabad (India). Efficacy of Botanical pesticides against Spilarctia obliqua in Sesamum indicum. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.223-224 KEYWORDS: BOTANICAL PESTICIDES. SPILOSOMA OBLIQUA. SESAMUM INDICUM. SPILOSOMA.

150. Makadia, R.R.; Junagarh Agricultural University, College of Agriculture, Department of Entomology, Junagarh (India). Kabaria, B.B.; Junagarh Agricultural University, College of Agriculture, Department of Entomology, Junagarh (India). Jethva, D.M.; Junagarh Agricultural University, College of Agriculture, Department of Entomology, Junagarh (India). Virani, V.R.; Junagarh Agricultural University, College of Agriculture, Department of Entomology, Junagarh (India). Effect of Pochonia (Verticillium) lecanii against Maconellicoccus hirsutus on Custard apple. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.224-225 KEYWORDS: VERTICILLIUM LECANII. ANNONA SQUAMOSA. ANNONA. ENTOMOGENOUS FUNGI.

151. Singh, G.; S.V. Patel Univ. of Agri & Tech., Department of Entomology. Meerut (India). Dhaka, S.S.; S.V. Patel Univ. of Agri & Tech., Department of Entomology. Meerut (India). Ali, N.; S.V. Patel Univ. of Agri & Tech., Department of Entomology. Meerut (India). Yadav, Arvind; S.V. Patel Univ. of Agri & Tech., Department of Entomology. Meerut (India). Singh, R.; S.V. Patel Univ. of Agri & Tech., Department of Entomology. Meerut (India). Efficacy of Insecticides and Bio-pesticides against Helicoverpa armigera on Vigna mungo. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.225-227 KEYWORDS: INSECTICIDES. HELICOVERPA ARMIGERA. HELICOVERPA. VIGNA MUNGO. VIGNA.

152. Bajya, D.R.; Central Institute for Cotton Research, Regional Station, Sirsa (India). Monga, D.; Central Institute for Cotton Research, Regional Station, Sirsa (India). Tyagi, M.P.; Chaudhary Charan Singh University, K.V. (PG) College, Meerut (India). Meena, B.L.; Krishi Vigyan Kendra, Rajasthan (India). Population dynamics of Helicoverpa armigera on Chick pea, Pigeon pea and Cotton in Correlation with Weather parameters. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.227-229 KEYWORDS: HELICOVERPA ARMIGERA. CHICKPEAS. PIGEON PEAS. COTTON. WEATHER.

153. Verma, T.C.; M.P.U.A.&T., Rajasthan College of Agriculture, Department of Entomology, Udaipur, (India). Swaminathan, S.; M.P.U.A.&T., Rajasthan College of Agriculture, Department of Entomology, Udaipur, (India). Meena, B.L.; SMS, Plant Protection, Krishi Vigyan Kendra, Rajsamand (India). Effect of Intercrops on incidence of Lipaphis erysimi on Mustard crop. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.229-230 KEYWORDS: LIPAPHIS ERYSIMI. MUSTARD. PEST INSECTS. INTERCROPPING.

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An investigation was carried out during 2008 to explore the utility of isozymic profIles for differentiating the indigenous species/strains of Steinemema. Esterase and catalase isozymic profiles of infective juveniles of Steinemema thermophilum (IARI-EPNl) and 2 other strains of Steinemema species, 1 each from Meghalaya (IARI-EPN-mgl) and Kerala (IARIIEPN-krl) were resolved on polyacrylamide mini slab-gel electrophoresis. Remarkable differences among the species were evident as each species exhibited a unique banding pattern of esterase based on their Rf values. Isozymic profIles of

esterase exhibited species-specifIc bands in S. thermophilum, characterized by 2 bands. Steinemema sp. (IARImgl) showed 6 species-specifIc bands at Rf 0.20, 0.30, 0.37, 0.40, 0.47, 0.77 and Steinemema sp. (IARI-EPN-krl) showed 5 at Rf 0.37,0.43,0.47,0.52 and 0.77 respectively. Isozymic profIles of catalase revealed species-specifIc 4 isozymic bands in S. thermophilum, while only I non-specifIc band in other 2 strains. The combination of enzyme phenotypes of esterase and catalase isozymic profIles from infective juveniles can be useful for preliminary differentiation of three indigenous species of Steinemema.

171. Walia, R.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Biological control - recapitualating the basic principles. Indian Journal of Nematology (India). (Dec 2009) v. 39(2) p. 129-137 KEYWORDS: BIOLOGICAL CONTROL. NEMATODA.

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Biochemical basis of nematode disease resistance was studied by analysis of the activity of three enzymes, peroxidase (PO), polyphenol oxidase (PPO), and phenylalanine ammonia lyase (PAL) in the shoot and root tissues of resistant and susceptible genotypes of wheat before and after inoculation with the cereal cyst nematode H. avenae. The biochemical studies were conducted with the parent cultivars/lines, the FI population, F2, BCI and test cross populations of the cross Raj 1482 X CCNRV1 (Raj MR1) An elevated level of enzyme activity was observed in all the inoculated plants both in the susceptible and resistant cultivars, though, the resistant cultivars have shown maximum enzyme activity in comparison to the susceptible cultivars. The root tissues had shown increased enzyme activity in comparison to the shoot tissues, irrespective of nematode inoculation. Among the three biochemical enzymes studied, PAL had shown the maximum enzyme activity, in both the shoots and roots irrespective of susceptible and resistant cultivars. Analysis of enzyme activity in the cross between Raj1482 X Raj MR1, depicted that FI generation had shown tremendous increase in the enzyme activity in all the three enzymes studied, over either of the parents. The F2 population showed lower enzyme activity in comparison to FI population. The results with BCI (test cross) and BCI population were almost at par. In comparison to phenylalanine ammonia lyase (PAL) and peroxidase (PO), Polyphenol-oxidase (PPO) did not reveal a significant difference in the control and inoculated plants irrespective of susceptible and resistant cultivar taken into consideration or the type of tissue (shoot! root) analysed.

173. Patel, H.R.; Anand Agricultural University, Anand (India). Tobacco Project). Patel, B.N.; Anand Agricultural University, Anand (India). Tobacco Project). Management of nematodes through chemicals in bidi tobacco nursery. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 148-151 KEYWORDS: TOBACCO. MANAGEMENT. CARBOSULFAN.

An experiment was carried out for management of nematodes through chemicals in bidi tobacco nursery for four years. Eight treatments viz., drenching of carbosulfan (Marshal 25EC) @ 2.5 1/113 one day prior to seeding (DPS) + 25 days after seeding (DAS), carbosulfan @ 5 l/ha (drenching), isoazophos (Miral 3G), carbofuran (Furadan 3G), sebuphos (Rugby lOG) each @ 5 kg/ha as broadcasting i DPS, dazomet (Basamid G) @ 294 kg/ha 20 DPS, soil solarazation for 15 days during April-May using clear LLDPE film of 25 IJID thickness and control were tried. Pooled results revealed that drenching of carbosulfan @ 2.5 l/ha DPS + 25 DAS and soil solarazation significantly reduced root-

knot disease and increased number of transplants of bidi tobacco as compared to control. Economics worked out for carbosulfan revealed an ICBR 1:5.50 and net realization of Rs. 2,07,728/- per ha as against ICBR 1:3.23 and net realization of Rs. 2,05,106/- per ha in case of soil solarization, a recommended treatment. Thus, carbosulfan @ 2.5 l/ha DPS + 25 DAS could be recommended to the farmers.

174. Azam, T.; Aligarh Muslim University, Aligarh (India). Dept. of Botany). Hisamuddin; Aligarh Muslim University, Aligarh (India). Dept. of Botany). Singh, S.; Aligarh Muslim University, Aligarh (India). Dept. of Botany). Efficacy of plant leaf powder and Paecilomyces lilacinus alone and combination for controlling Meloidogyne incognita on chickpea. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 152-155 KEYWORDS: PAECILOMYCES. MELOIDOGYNE INCOGNITA. CASSIA TORA. CHICKPEAS.

A pot experiment was conducted to study the efficacy of leaf powder of Cassia tora and Morus alba, (20 g each, per kg soil), along with Paecilomyces lilacinus alone & in combination against Meloidogyne incognita on chickpea. The plant growth was enhanced and the nematode population reduced in the soil amended with leaf powders. The leaf powder of C. tora was found to be more effective in suppressing gall formation on the root and nematode population in the soil than that of Morus alba. The leaf powders when applied singly failed to reduce final soil population of the nematode. Addition of P. lilacinus alone into the soil reduced nematode population and increased yield of chickpea. In comparison to only leaf powder, combinations of C. tora leaf powder and P. lilacinus were most effective in controlling M. incognita. From the data it might be concluded that a combination of leaf powder of C. tora and P. lilacinus successfully managed the root knot nematode compared to a combination of two leaf powders.

175. Bhagawati, B.; Assam Agricultural University, Jorhat (India). Dept. of Nematology). Choudhury, B.N.; Assam Agricultural University, Jorhat (India). Dept. of Nematology). Sinha, A.K.; Assam Agricultural University, Jorhat (India). Dept. of Nematology). Management of Meloidogyne incognita - Rizoctonia solani complex on Okra through bioagents. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 156-161 KEYWORDS: MELOIDOGYNE INCOGNITA. RHIZOCTONIA SOLANI. PSEUDOMONAS FLUORESCENS. TRICHODERMA HARZIANUM. OKRAS.

The experiment was conducted under pot conditions during kharif, 2007 in the net house of Assam Agricultural University, Jorhat, Assam, I~dia to manage the disease complex caused by M. incognita and R. solani on okra (Var. Parvani Kranti) using Trichoderma harzianum and Pseudomonas fluorescens. Earthen pots of 3 Kg capacity were used for the experiment. Each pot was inoculated with M. incognita (2J21 g of soil) and R. solani 0.2 %(w/w). The efficacy of the bio agents were tested both as seed treatment as well as soil application singly and in combinations and compared with a known nematicide (Carbosulfan 25 ST) and a fungicide (Carbendazim 50% WP). Both the bioagents were found to be significantly effective in reducing .the damage and increasing the growth parameters of okra as compared to the treatment inoculated with M. incognita and R. solani . However, seed treatments with either of the bioagents or both were found to be more effective as compared to soil application in reducing the pre and post emergence damping off, galls, egg masses as also nematode population and increasing the growth parameters which was comparable to the treatment with both the chemicals as seed treatment and uninoculated control. This indicate that the effectiveness of the bio-agents depend on their proper method of delivery.

176. Swain, S.; Orissa University of Agriculture and Technology, Bhubaneswar (India). Dept. of Nematology). Mahalik, J.K.; Krishi Vigyan Kendra, Rayagada (India). Routaaray, B.N.; Orissa University of Agriculture and Technology, Bhubaneswar (India). Dept. of Nematology) . Effectiveness of mutagtenic treatments in blackgram cv. Pant U-30 towards Meloidogyne incognita infection. Indian Journal of Nematology . (Dec 2009) v. 39(2) p. 162-164 KEYWORDS: MELOIDOGYNE INCOGNITA. VIGNA MUNGO. SULPHONIC ACIDS. MUTAGENICITY.

Three mutagens each at two doses/concentration were used [Gamma-rays (30 Kr and 45 Kr), EMS (0.30 and 0.45 %) and NG (0.010 and 0.015 %) with control (parent variety)] to identify root-knot nematode resistant cultures of blackgram cv. Pant U-30 (susceptible) through mutation breeding process for sustainable nematode management for safer environment.. The mutagen treated M2 population showed varying magnitude of induced variability of the characters studied. Mutagenic treatments were effective in inducing various growth characters like plant height, shoot dry weight, root length, root dry weight, flowering (50%), effective nodules per plant, pods per plant, seed weight/plant in M2 generation. The population mean and varian~e were computed and analysed. EMS (0.30 %) was more effective in inducing positive responses of 7 characters out of 8 studied followed by EMS (0.45 %), NG (0.015 %) , NG (0.010 %), Gamma-rays (45 Kr), and Gamma-rays (30 Kr).

177. Prabhu, S.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Kumar, S.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Subramanian, S.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Sundaram, S.P.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Suppressive effect of Methylobacterium fujisawaense against root-knot nematode, Meloidogyne incognita. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 165-169 KEYWORDS: MELOIDOGYNE INCOGNITA. MELOIDOGYNE. RHIZOSPHERE. JUVENILES. MATE.

Pink Pigmented Facultative Methylotrophs (PPFMs) are ubiquitous in nature found in variety of habitats including soil, dust, fresh water lake sediments, leaf surface and nodules. These organisms are capable of growing on compounds containing one carbon. These bacteria influence seed germination and seedling growth by producing plant growth regulators like zeatin and related cytokinins. They are also capable of inducing systemic resistance against various plant pathogens. Experiments were conducted under controlled conditions to study the effect of Methylobacterium fujisawaense culture filtrate on root-knot nematode Meloidogyne incognita egg hatching, juvenile mortality and penetration into roots of tomato in the present study. The results of experiments revealed that, the isolate of M. fujisawaense TNAU 14 inhibited egg hatching to the highest degree (99.6%) at 100 per cent concentration within 24h. The same isolate also caused highest mortality of M. incognita juveniles (100%) within 72h at cent per cent concentration. Besides the least (10.7%) rooJ: penetration by the infective juveniles of M. incognita in tomato was also registered by the above isolate. The PGPR, Pseudomonas fluorescens ranked next to the TNAU 14 isolate of M. fujisawaense in aU the observations made in the present study.

178. Ramakrishnan, S.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Senthilkumar, T.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Non-chemical management of root knot nematode, Meloidogyne incognita in ashwagandha (Withania somnifera Dunal.) and senna (Cassia anguistifolia Vahl.). Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 170-174 KEYWORDS: MELOIDOGYNE INCOGNITA. WITHANIA SOMNIFERA. CASSIA ANGUSTIFOLIA. NEMATODA.

Experiments were conducted for the management of root knot nematode, Meloidogyne incognita using non chemicals under controlled and field conditions in medicinal crops viz., ashwagandha (Withania somnifera) and senna (Cassia angustifolia). All the treatments comprising of bioagents, organic amendments and humic acid evaluated were effective to suppress M. incognita population and to increase the plant biomass and yield of economic parts of these crops. Among the treatments, the use of plant growth promoting rhizobcaterium, Pseudomonas fluorescens available' commercially in talc formulation (2.6 X 106 cfu g-I) at 2.5 kg ha-I as soil application recorded the lowest nematode population accompanied with highest economic yield.

179. Jothi, G.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Ramakrishnan, S.; Tamil Nadu Agricultural University, Coimbatore (India).

Dept. of Nematology). Kumar, S.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Jonathan, E.I.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Senthilkumar, P.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Effect of humic acid on hatching, longevity and mortality of Meloidogyne incognita. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 175-177 KEYWORDS: MELOIDOGYNE INCOGNITA. HUMIC ACIDS. HATCHING.

The effect of humic acid against hatching, longevity and mortality of root knot nematode, Meloidogyne incognita was investigated. The study revealed that increase in concentration of the extract of humic acid inhibited egg hatch and caused mortality of second stage juvelines of Meloidogyne incognita by 93 per cent at 0.4 per cent concentration.

180. Kumar, V.; Aligarh Muslim University, Aligarh (India). Dept. of Plant Protection). Haseem, A.; Aligarh Muslim University, Aligarh (India). Dept. of Plant Protection). Intreractive effect of Meloidogyne incognita and Rhizoctonia solani on the growth and yield of tomato. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 178-181 KEYWORDS: MELOIDOGYNE INCOGNITA. TOMATOES. GROWTH. YIELDS. RHIZOCTONIA SOLANI.

Studies were carried out under pot conditions to determine the effect of Meloidogyne incognita (4000 J2/4 kg soil) and Rhizoctonia solani (10 g mycelium mat/4 kg soil) on the disease development and yield of tomato cv. K-25. Results indicated that highest reduction in plant growth and yield parameters was observed in simultaneous inoculation followed by nematode seven days prior to fungus, fungus seven days prior to nematode, nematode alone and fungus alone, respectively. However, highest reproduction rate and root-knot index were observed in plants inoculated with the nematode alone followed by nematode prior to fungus, nematode-fungus simultaneously and fungus prior to nematode, respectively. Data also indicated that root colonization by fungus was significantly high in the presence of M. incognita as compared with the fungus alone.

181. Negi, S.; Himachal Pradesh University, Shimla (India). Dept. of Bio-Science). Kalia, D.C.; Himachal Pradesh University, Shimla (India). Dept. of Bio-Science). Walia, K.K.; Chaudhary Charan Singh University, Meerut (India). Dept. of Nematology). Walia, R.K.; Chaudhary Charan Singh University, Meerut (India). Dept. of Nematology). Bajaj, H.K.; Chaudhary Charan Singh University, Meerut (India). Dept. of Nematology). Community analysis of plant parasitic nematodes associated with Rhizosphere of Chir Pine nurseries and pine trees in natural forests of Himachal Pradesh, India. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 182-187 KEYWORDS: RHIZOSPHERE. XIPHINEMA AMERICANUM. PINUS ROXBURGHII. PINUS. PLANT NEMATODES. HIMACHAL PRADESH.

A survey was carried out in six districts of Himachal Pradesh for investigating and identifying plant parasitic nematodes associated with chir pine (Pinus roxburghii Sarg.) nurseries and pine trees (Pinus roxburghii Sarg. and P. wallichiana A. B. Jacks) in natural forests. Twenty one species of nematode parasites belonging to fifteen genera were encountered associated with rhizosphere of P . roxburghii and P. wallichiana. Xiphinema americanum was found to be the most predominant species based on prominence value foUowed by X. insigne, Paratylenchus similis, Hemicriconemoides mangiferae and Varotylus symmetricus in close association with natural pine forest. Tylenchus arcuatus and Malenchus nanellus were recorded as predominant species in the nurseries.

182. Subhashini, D.V.; Central Tobacco Research Institute, Rajamundry (India). Microbiology). Ramakrishnan, S.; Central Tobacco Research Institute, Hunsur (India). Regional Stn.). Padmaja, K.; Central Tobacco Research Institute, Rajamundry (India). Microbiology) . Effect of culture filtrates of Streptomycies spp. on the mortality and hatching of root knot nematode, Meloidogyne javanica. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 188-191 KEYWORDS: STREPTOMYCES. HATCHING. MELOIDOGYNE. MELOIDOGYNE JAVANICA.

Six isolates of Streptomyces spp. were isolated from the rhizosphere of tobacco fields in Andhra Pradesh and Karnataka. Culture filtrates of all six isolates of Streptomyces spp. showed lethal effect against M. javanica at different levels. Percentage mortality and inhibitory effect on hatching of M. javanica were directly proportional to the concentration of culture filtrates and exposure period of each fIltrate. Rate of mortality was low in the first 24h but it appreciably increased with the increase in exposure period. Different dilutions of Streptomyces culture filtrates of all the isolates were hatch inhibitors to a varying degree. Isolate 2 was found to be more effective among all isolates followed by isolate 5 in both mortality and hatching inhibition. There was a relative decrease in larval emergence with the corresponding increase in the concentration of culture filtrates.

183. Negi, S.; Himachal Pradesh University, Shimla (India). Dept. of Bio-Science). Kalia, D.C.; Himachal Pradesh University, Shimla (India). Dept. of Bio-Science). Walia, K.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Bajaj, H.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). New species of Aphelenchoides Fischer and Laimaphelenchus Fuchs (Nematoda : Aphelenchida) from Pine Twigs, Himachal Pradesh. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 192-197 KEYWORDS: PINUS. APHELENCHOIDES. PINUS ROXBURGHII.

Two new species of Aphelenchoides and one of Laimaphelenchus from dead twigs of Pinus roxburghii Sarg. from Himachal Pradesh, India are described and illustrated. A. depressospicularis sp. n. : Female: L = 0.60-0.75 mm; a = 32-45; b = 9.5-11.5; b' = 4.3-5.2; c = 14-19; c' = 2.0-3.4; V = 63-72; stylet = 8-11 -m; Male: L = 0.50-0.60 mm; a = 31-39; b = 8.4-10.3; b' = 4.0-5.1; c = 15-22; stylet = 8-11 -m; stylet with knobs; dorsal limb of spicule 16-19 -m long with a depression near tip. A. microspermi sp. n.: Female: L = 0.42-0.66 mm; a = 31-46; b = 7.4-10.1; b' = 3.3-4.6; c = 13-19; c' = 3.2-4.6; V = 69-75; stylet = 8-11 -m, post vulval uterine sac filled with numerous sperm. Male: L = 0.40-0.59 mm; a = 28-40; b = 7.1-10.1; b' = 3.5-4.4; c = 16-20; stylet =;: 8-10 -m; spicule = 13-15 -m; sperm small sized. Laimaphelenchus simlaensis sp. n.: Female: I-, = 0.84-1.09 mm; a = 38-46; b = 11-14; b' = 4.6-6.2; c = 21-30; c' = 2.3-3.6; V = 67-73; stylet = 11-13 -m; vagina without sclerotization; tail provided with a single stalked, sucker-like tubercle bearing 3-5 fine processes. Male: L = 0.78-1.02 mm; a = 41-48; b = 11-14; b' = 4.2-5.3; c = 23-29; c' = 2.0- 2.3; stylet = 11-13 -m; spicule = 16-18 -m, gubernaculum-like structure present.

184. Verma, K.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Goel, S.R.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Nandal, S.N.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Efficacy of fungal antagonists as seed treatment in the management of Meloidogyne javanica in cowpea. Indian Journal of Nematology (India). (Dec 2009) v. 39(2) p. 198-200 KEYWORDS: MELOIDOGYNE JAVANICA. VIGNA UNGUICULATA. TRICHODERMA VIRIDE. SEED TREATMENT. GLIOCLADIUM. COWPEAS. BIOLOGICAL CONTROL. ANTIMETABOLITES.

A screen house study was undertaken to see the efficacy of two fungal antagonists viz., Trichoderma viride and Gliocladium virens as seed treatment against root-knot nematode, M. javanica infesting cowpea. The seeds of a susceptible cowpea variety Pusa Barsati were treated with laboratory propagated fungal cultures (spores and mycelia) 5 and 109/kg seed before sowing and subsequently root-knot nematode inoculation 1.0 J2/g soil was done one week after sowing. The results indicated that the growth parameters of cowpea plants, i.e. shoot length, fresh and dry shoot and root weight, were maximum and significantly higher in plants having seed treatment with T. viride and G. virens 10 g/kg seed followed by carbosulfan seed treatment (3% a.i., w/w) as compared to their lower dose i.e. 5 g/kg seed and untreated check which showed minimum and significantly lower plant growth parameters. The results of T. viride 109/kg seed were statistically at par with 10 g dose of G. virens. Nematode multiplication in terms of number of galls and egg masses was significantly reduced in

carbosulfan followed by T. viride and G. virens 10 g/kg seed as compared to their lower dose and untreated check. Final soil population of J2, however, showed non-significant differences.

185. Sundaraju, P.; National Research Centre for Banana (ICAR), Tiruchirapalli (India). Crop Protection Lab.). Kiruthika, P.; National Research Centre for Banana (ICAR), Tiruchirapalli (India). Crop Protection Lab.). Effect of biocontrol agent, Paecilomyces lilacinus along with neemcake and botanicals for the management of Meloidogyne incognita on banana. Indian Journal of Nematology (India). (Dec 2009) v. 39(2) p. 201-206 KEYWORDS: PAECILOMYCES. BANANAS. MELOIDOGYNE INCOGNITA.

Effect of bio-control agent (Paecilomyces iilacinus), neem cake and botanicals (Tagetes erecta and Solanum torvum) against root-knot nematode, Meloidogyne incognita in cv. Robusta was tested by applying individually and in combinations under pot condition. Results revealed that all the treatments were effective in increasing the plant growth with significant reduction in nematode populations. Among the treatments, the combined application of P. iilacinus + neem cake and P. iilacinus +T. erecta (flower extracts) resulted in maximum increase of plant height (5.3 cm each), number of leaves (26.6 & 25.0), pseudostem girth (11.7cm &11.0 cm), root length (36 & 26), number of healthy roots (42 & 43), root weight (45 each), root gall index (1) and nematode population from soils (30 & 50/250cc) and roots (110 & 115/5g) compared to the maximum root gall index (5) with the nematode population from soil (1020/250 cc) and roots (1760/5g) in nematode alone- inoculated control plants. The estimation of proteins, pl1enol, peroxidase and polyphenol oxidase detected from roots and leaves showed an increase in total orth-dihydroxy phenols and enhanced activities of polyphenol oxidase and peroxidase on inoculation of M. incognita.

186. Verma, K.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Management of Meloidogyne javanica by bacterial antagonist, Pseudomonas fluorescens as seedling root dip in tomato. Indian Journal of Nematology (India). (Dec 2009) v. 39(2) p. 206-210 KEYWORDS: MELOIDOGYNE JAVANICA. TOMATOES. LYCOPERSICON ESCULENTUM. PSEUDOMONAS FLUORESCENS. BIOLOGICAL CONTROL. MICROBIAL PESTICIDES.

A preliminary screen house study was conducted to see the efficacy of a bacterial antagonist, Pseudomonas fluorescens as seedling root dip in its aqueous formulation 1.0, 2.0 and 3.0 per cent (w/v) dose/dilution. The healthy and root-knot nematode, Meloidogyne javanica infested tomato seedlings were root dipped in 1.0, 2.0 and 3.0 per cent dilutions for half an hour and then transplanted in M. javanica infested soil in 15 em pots under different set of experiments. The results obtained 45 days after transplanting revealed that root dipping of healthy (no galls) tomato seedlings was effective in enhancing plant growth as well as reducing nematode galling and fecundity at 2.0 and 3.0 per cent dilution of P. fluorescens as compared to untreated check. The per cent reduction in galling over untreated check was 32.8, 29.6 and 6.4 at 3.0, 2.0 and 1.0 per cent dilution, respectively. Similar trend was observed in respect of egg masses and final soil population of J2. Similarly, in another set of experiment, root-knot nematode infested (galled) tomato seedlings dipped in aqueous formulation of P. fluorescens indicated that as compared to healthy seedlings, root dip was not much effective in reducing nematode multiplication. The per cent reduction in galling over untreated check was 19.0, 18.0 and 9.0 at 3.0, 2.0 and 1.0 per cent dilution of P. fluorescens. Similar trend was also observed with number of egg masses and C'mal J2 population in the soil.

187. Aravind, R.; Indian Institute of Spices Research, Calicut (India). Div. of Crop Protection). Antony, D.; Indian Institute of Spices Research, Calicut (India). Div. of Crop Protection). Eapen, S.J.; Indian Institute of Spices Research, Calicut (India). Div. of Crop Protection). Kumar, A.; Indian Institute of Spices Research, Calicut (India). Div. of Crop Protection). Ramana, K.V.; Indian Institute of Spices Research, Calicut (India). Div. of Crop Protection). Isolation and evaluation of endophytic bacteria against plant parasitic nematodes infesting black pepper (Piper nigrum L.). Indian Journal of Nematology. (Dec

2009) v. 39(2) p. 211-217 KEYWORDS: BACTERIA. PIPER NIGRUM. MELOIDOGYNE INCOGNITA. BIOLOGICAL CONTROL. NEMATODA. PLANT NEMATODES.

Abundant and diverse populations of bacterial endophytes have been identified in many plants. In the present study, 80 isolates of endophytic bacteria were isolated from different varieties of black pepper (Piper nigrum L.) grown at different locations in India. Another 30, isolates were obtained from tissue cultured black pepper plants. These isolates were tentatively grouped into Badllus spp. (32 strains), pseudomonads (26 strains), Arthrobader spp. (20 strains), Micrococcus spp. (10 strains), Curtobacterium sp. (one strain), Se"atia (one strain) and twenty unidentified strains based on morphology and biochemical tests. Their nematicidal properties, when tested in an in vitro bioassay using Meloidogyne incognita juveniles, varied from 0-31.03%. Consortia of these endophytic bacteria were made and evaluated in nurseries for their nematode suppression and growth promotion in black pepper rooted cuttings. All the bacterial consortia were able to suppress nematodes, M. incognita and Radopholus sintilis, significantly. The maximum number of cuttings (243 cuttings I plant) was obtained with phorate treatment followed by treatment with consortia 1 and 4 indicating the potential of these bacteria to be nsed as nematode biological control agents.

188. Goel, S.R.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology.)Madan, V.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Chemistry). Verma, K.K.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Nandal, S.N.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Nematicidal activity of various medicinal and aromatic plants under in vitro conditions. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 218-220 KEYWORDS: SPECIES. NEMATICIDES. ROTYLENCHULUS. MELOIDOGYNE JAVANICA. DRUG PLANTS. IN VITRO.

Nematicidal efficacy of various medicinal and aromatic plants, viz., MuIhatti (Glycyrrhiza glabra L.), Ashwagandha (Withania somnifera), Senna (Cassia anguistifolia), Satawar (Asparagus racemosus) and Kalmegh (Andrographis paniculata) was evaluated in vitro against root-knot nematode, Meloidogyne javanica and reniform nematode, Rotylenchulus reniformis. Water/methanolic extracts of these plants were prepared and tested against these nematodes at the concentrations of 1:5, 1:10, 1:20, 1:40 and 1:80. Observations on the larval! nematode mortality were recorded 48 h of their exposure to the extracts. Results revealed that among the .methanolic extracts tested in vitro, Glycyrrhiza glabra (Mulhatti) and Withania somnifera (Ashwagandha) were highly effective against root-knot nematode (per cent larval mortality in case of G. glabra being 90.7 and 86.6 respectively at 1:5 and 1:10 dilutions while in case of W. somnifera being 96.1, 96.0 and 83.7 at 1:5, 1:10 and 1:20 concentrations, respectively). Against R. reniformis, methanolic extracts of Andrographis paniculata were highly effective at 1:5 concentration (per cent mortality being 84.0).

189. Kumar, S.; Indian Agricultural Research Institute, New Delhi (India). EPN Genomics Lab. Div. of Nematology). Yadav, A.; Kurukshetra University, Kurukshetra (India). Dept. of Biotechnology). Ganguly, S.; Indian Agricultural Research Institute, New Delhi (India). EPN Genomics Lab. Div. of Nematology). Esterase, superoxide dismutase and malate dehydrogenase isozymes of Indian species of Xenorhabdus, a symbiont of entomopathogenic nematodes. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 221-227 KEYWORDS: NEMATODA. SUPEROXIDE DISMUTASE. XENORHABDUS. ESTERASES. ISOENZYMES. ENTOMOGENOUS FUNGI.

Xenorhabdus - the bacterial symbiont of the entomopathogenic nematodes of the family Steinernematidae, is a member of the family Enterobacteriaceae, available for use in biological control of broad pest range of various crops as it possess extreme virulence for insect pests. In this study, we undertook the biochemical characterization of 4 native strains of Xenorhabdus on the basis of isozymic profile of Esterase, Superoxide dismutase and Malate dehydrogenase. The Isozymic patterns of esterase of 4 isolates of Xenorhabdus spp. by mini slab gel polyacrylamide electrophoresis, revealed species-

specific enzymes phenotypes for all the four strains ie. Xenorhabdus indica, IARI-Xeno-mgl, IARI-Xeno-kr and IARI-Xeno-asl, characterized by ha, :jIg four, five, four and two species- specific bands, respectively. Superoxide dismutase profiles also showed species-specific phenotypes for Xenorhabdus indica and other three strains of Xenorhabdus. In contrast, Malate dehydrogenase profiles revealed species-specific phenotypes for only Xe110rhabdus indica and IARI-Xeno-asl with four bands for each, at Rf 0.42,0.59,0.68,0.91 and at Rf 0.19,0.42,0.59,0.70 respectively. Phenotypes of IARI-Xeno-mgl and IARI-Xeno-kr remained identical with one band at Rf 0.71. The combination of esterase, superoxide dismutase and malate dehydrogenase isozymic profiles from Xenorhabdus strains were found useful for preliminary differentiation of Xenorhabdus species, which is perhaps, the first report on utility of isozymic profiles as diagnostic markers in the genus Xenorhabdus.

190. Mohanty, K.C.; Orissa University of Agriculture and Technology, Bhubaneswar (India). Dept. of Nematology). Mahapatra, S.N.; Orissa University of Agriculture and Technology, Bhubaneswar (India). Dept. of Nematology). Bio-management of Rotylenchulus reniformis in cowpea through seed treatments. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 228-229 KEYWORDS: ROTYLENCHULUS RENIFORMIS. COWPEAS. SEED TREATMENT.

191. Vyas, R.V.; Anand Agricultural University, Anand (India). Maghodia, A.B.; Anand Agricultural University, Anand (India). Patel, B.A.; Anand Agricultural University, Anand (India). Patel, D.J.; Anand Agricultural University, Anand (India). Field efficacy of entomopathogenic nematode, Steinernema riobrave and their toxins against root knot nematode, Meloidogyne spp. on Okra. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 229-231 KEYWORDS: MELOIDOGYNE. OKRAS. ENTOMOPHILIC NEMATODES.

192. Dabur, K.R.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Taya, A.S.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Nandal, S.N.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Hatching of rice - root knot nematode at different temperature levels. Indian Journal of Nematology (India). (Dec 2009) v. 39(2) p.232-233 KEYWORDS: HATCHING. TEMPERATURE. MELOIDOGYNE. RICE.

193. Patel, B.A.; Anand Agricultural University, Anand (India). Vyas, R.V.; Anand Agricultural University, Anand (India). Patel, H.R.; Anand Agricultural University, Anand (India). Patel, J.G.; Anand Agricultural University, Anand (India). Management of root knot nematodes (Meloidogyne spp.) in bitter gourd (Momordica charantia) using organic amendments. Indian Journal of Nematology (India). (Dec 2009) v. 39(2) p. 234-235 KEYWORDS: PESTS. MELOIDOGYNE. MOMORDICA CHARANTIA. ORGANIC FERTILIZERS.

194. Mohanty, K.C.; Orissa University of Agriculture and Technology, Bhubaneswar (India). Dept. of Nematology). Mahapatgra, S.N.; Orissa University of Agriculture and Technology, Bhubaneswar (India). Dept. of Nematology). Management of rice root knot nematode, Meloidogyne graminicola lby seed soaking with carbosulfan. Indian Journal of Nematology (India). (Dec 2009) v. 39(2) p. 235-236 KEYWORDS: RICE. MELOIDOGYNE GRAMINICOLA. CARBOSULFAN.

195. Dabur, K.R.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Nandal, S.N.; Chaudhary Charan Singh Haryana Agricultural University, Hisar (India). Dept. of Nematology). Assessment of yield losses due to phytonamatodes in India. Indian Journal of Nematology. (Dec 2009) v. 39(2) p.237 KEYWORDS: YIELDS. CROPS. PLANT NEMATODES.

196. Shanthi, A.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Sivakumar, M.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Devarajan, K.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Integrated management of root knot nematode, Meloidogyne incognita in chilli. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 238-239 KEYWORDS: CHILLIES. MELOIDOGYNE INCOGNITA. VEGETABLE CROPS.

197. Singh, V.K.; Sher-e-Kashmir University of Agriculture and Technology, Srinagar (India). Div. of Plant Pathology). Root knot nematode, Meloidogyne javanica on citrus in Jammu. Indian Journal of Nematology (India). (Dec 2009) v. 39(2) p. 240 KEYWORDS: MELOIDOGYNE JAVANICA. CITRUS. MELOIDOGYNE. CROPS.

198. Ramakrishnan, S.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Jonathan, E.I.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Senthilkumar, P.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Management of rice root knot nematode, Meloidogyne graminicola in nursery. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 241-242 KEYWORDS: MELOIDOGYNE GRAMINICOLA. MELOIDOGYNE. RICE. CARBOFURAN. PSEUDOMONAS.

199. Shanthi, A.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Sivakumar, M.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Devarajan, K.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Management of root knot nematode, Meloidogyne incognita in tomato by soil solarization and resistant varieties. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 243-244 KEYWORDS: MELOIDOGYNE INCOGNITA. TOMATOES. SOIL SOLARIZATION. MELOIDOGYNE.

200. Singh, V.K.; Sher-e-Kashmir University of Agriculture and Technology, Jammu (India). Div. of Plant Pathology). Occurrence of root knot nematode, Meloidogyne incognita on carrot in Jammu. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 245 KEYWORDS: CARROTS. MELOIDOGYNE. PATHOLOGY. PESTS. MELOIDOGYNE INCOGNITA.

201. Ahmad, F.; Aligarh Muslim University, Aligarh (India). Dept. of Plant Pathology and Plant Nematology). Rather, M.A.; Aligarh Muslim University, Aligarh (India). Dept. of Plant Pathology and Plant Nematology). Siddiqui, M.A.; Aligarh Muslim University, Aligarh (India). Dept. of Plant Pathology and Plant Nematology). Promising organic additives for the management of root knot nematode, Meloidogyne javanica. Indian Journal of Nematology (India). (Dec 2009) v. 39(2) p. 247-249 KEYWORDS: MELOIDOGYNE. MELOIDOGYNE JAVANICA. PESTS.

202. Kumar, S.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Prabhu, S.; Tamil Nadu Agricultural University, Coimbatore (India). Dept. of Nematology). Biological control of citrus nematode; Tylenchulus semipenetrans in citrus nursery. Indian Journal of Nematology (India). (Dec 2009) v. 39(2) p. 249-250 KEYWORDS: BIOLOGICAL CONTROL. TYLENCHULUS SEMIPENETRANS. CITRUS.

203. Das, D.K.; Krishi Vigyan Kendra, Khagaria (India). Gaur, H.S.; Indian Agricultural Research Institute, New Delhi (India). Div. of Nematology). Comparison of susceptibility and host status of available varieties of cotton. Indian Journal of Nematology. (Dec 2009) v. 39(2) p. 250-252 KEYWORDS: COTTON. GOSSYPIUM. ROTYLENCHULUS.

204. Sharma, H.K.; Indian Agricultural Research Institute, New Delhi (India). Div. of Nematology). Pankaj; Indian Agricultural Research Institute, New Delhi (India). Div. of Nematology). Singh, B.; Indian Agricultural Research Institute, New Delhi (India). Div. of Nematology). Protected cultivation and nematode problem. Indian Journal of Nematology

(India). (Jun 2009) v. 39(1) p. 1-8 KEYWORDS: CULTIVATION. NEMATODA. FUMIGANTS. VEGETABLES. INTEGRATED PEST MANAGEMENT.

Protected cultivation is an emergil)g technology for raising vegetable and ornamental crops. Due to controlled environmental condition and continuous growing of crops, the root-knot nematode (Meloidogyne spp.) has emerged as a major problem, causing enormous yield loss. The damage progressively increases if proper sanitation control measures are not followed during the polyhouse cultivation of crops. In the absence of Methyl Bromide other fumigants like metham sodium and Dazomet have been found quite effective when used under plastic mulch for single season, non-fumigants, cadusaphos and oxamyl have also been used alone or in combination to protect 3-4 crops in protected cultivation. Combined use of bioagents, neem products and dazomet have shown promise to contain the nemic population.

205. Abbas, S.A.; Jahad Sq. Agricultural and Natural Research Center, Kohgyloych va Boyreahmad Province (Iran). Dept. of Plant Protection). Gaur, H.S.; Indian Agricultural Research Institute, New Delhi (India). Div. of Nematology). Kamra, A.; Indian Agricultural Research Institute, New Delhi (India). Div. of Nematology). Comparative efficacy of neem (Azadirachta indica) seed and kernel granular formulations on Meloidogyne incognita infecting tomato. Indian Journal of Nematology (India). (Jun 2009) v. 39(1) p. 9-13 KEYWORDS: AZADIRACHTA INDICA. MELOIDOGYNE INCOGNITA. SEEDS. KERNELS. GRANULES. FORMULATIONS. TOMATOES.

Application of neem seed granules (NSG) 0.2 and 0.4% w/w and kernel granules (NSKG) 0.1,0.2 and 0.4% w/w to soil significantly reduced the root galling due to Meloidogyne incognita and population density of M. incognita J2 in soil. NSKG reduced root galling of tomato by 33.6, 44.3 and 44.6%, compared to 7.4, 32.3 and 41.9% by NSG at 0.1, 0.2 and 0.4%, w/w, respectively with a reduction in galling and decline in M. incognita J2 population in soil. The application of NSG and NSKG also improved the growth of root and shoot of the infected tomato plants.

206. Kumar, S.; Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni-Solan (India). Dept. of Entomology and Agriculture). Khanna, A.S.; Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni-Solan (India). Dept. of Entomology and Agriculture). Verma, A.K.; Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni-Solan (India). Dept. of Entomology and Agriculture). Chandel, Y.S.; Chaudhary Sawaran Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur (India). Dept. of Entomology). Jandaik, S.; Chaudhary Sawaran Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur (India). Dept. of Plant Pathology). Effect of population levels of Aphelenchoides swarupi and Aphelenchus avenae on mycedial growth of mushrooms and nematode populations. Indian Journal of Nematology (India). (Jun 2009) v. 39(1) p. 14-24 KEYWORDS: APHELENCHUS AVENAE. AGARICUS BISPORUS. NEMATODA.

An experiment was conducted to study the effects of population levels of lOt, 102 and 103 of Aphelenchoides swarupi and Aphelenchus avenae inoculated at casing time on mycelial growth of Agaricus bisporus, A. bitorquis and Calocybe indica at 20 and 40 days of inoculation. Nematode multiplication at 40 days of the inoculation was also recorded. Although, all mushrooms were adversely affected but impact on mycelial growth of C. indica was significantly less than that in Agaricus spp. The per cent growth of mycelium reduced significantly as the nematode inoculum increased. The mean nematode population of 39.2 x 103 and 43.8 x 103 retrieved from A. bisporus and A. bitorquis, respectively, at 40 days of casing was significantly higher than 12.4 x 103 recovered from C. indica. A. swarupi multiplied much faster (mean count of 51.1 x 103) than A. avenae having mean nematode population of 6.4 x 103. The nematode multiplication was significantly faster on Agaricus spp. than C. indica. Though nematode population increased significantly with the increase in initial population levels, their multiplication rate actually decreased significantly as initial population increased thus indicate an inverse relationship between initial population levels and multiplication rate.

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A field experiment was conducted with eight treatments comprising of farm yard manure (20tlha), vermicompost (2t/ha), Trichoderma viride (109/pit), Paecilomyces lilacinus (109/pit), neem cake (500 kglha), vine dipping in monocrotophos (at 1000ppm for 6hours), carbofuran 3G (I kg a.iJha) and untreated control in different combinations at Simanta Seed farm, Kalyani of Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal. Experimental results revealed that VD + Trichoderma viride at 10 g/pit (in two split doses) was superior to all the treatments and this was followed by VD + vermicompost at 2t/ha, vine dipping (VD) with mOllocrotophos 36SL at 1000 ppm for 6h + decomposed organic matter 20t/ha. Adoption of vine dipping in monocrotophos 36SL at 1000 ppm followed by soil inoculation of T. viride at 109 I pit once at planting and second dose at 40 days after planting reduced root galling caused by M. incognita and gave fruit yield almost double of the untreated plots. No effect of nematode attack on fruit size and weight was observed.

208. Vyas, R.V.; Anand Agricultural University, Anand (India). Dept. of Nematology). Patel, B.A.; Anand Agricultural University, Anand (India). Dept. of Nematology). Patel, B.N.; Anand Agricultural University, Anand (India). Dept. of Nematology). Patel, J.G.; Anand Agricultural University, Anand (India). Dept. of Nematology). Integrated management of root-knot nematode in brinjal under field conditions. Indian Journal of Nematology (India). (Jun 2009) v. 39(1) p. 35-37 KEYWORDS: VEGETABLES. PAECILOMYCES. ORGANIC AMENDMENTS. INTEGRATED PEST MANAGEMENT. NEMATODE CONTROL.

To manage the root-knot nematode economically and integrated experiment was planned. Result of three years trials indicated that application of Paecilomyces lilacinus 5 kg spore dust with carrier /ha [(109 conidia/g) [at the time of transplanting] + poultry manure 0 tons/ha (a week prior to transplanting) or mustard cake 2 tons/ha (a week prior to transplanting) or P. lilacinus 25 kg spore dust with carrier! ha [(109 conidia/g) [at the time of transplanting] + neem cake 2 tons/ha (a week prior to transplanting) or P. lilacinus 25 kg spore dust with carrier /ha [(109 conidia/g) [at the time of transplanting] + carbofuran 3G 2 kglha in two equal splits [one at the time of transplanting and the other after 2.5 months] improved plant growth and considerably reduced gall index and also gave higher brinjal fruit yield over control.

209. Pathak, B.; Bidhan Chandra Krishi Viswavidyalaya, Nadia (India). Dept. of Agricultural Entomology). Khan, M.R.; Bidhan Chandra Krishi Viswavidyalaya, Nadia (India). Dept. of Agricultural Entomology). Yield loss potential of foliar nematode, Aphelenchoides besseyi in Tuberose. Indian Journal of Nematology (India). (Jun 2009) v. 39(1) p. 38-40 KEYWORDS: APHELENCHOIDES BESSEYI. NEMATODA. YIELDS. FOLIAR APPLICATION.

A field experiments was conducted at Horticultural Research Station of Bidhan Chandra Krishi Viswavidyalaya, Mondouri, Nadia with two treatments viz. treated i.e. pre-soaking of bulbs in plain water for overnight + hot-water treatment at 50°C for 30 min. + three sprayings with monocrotophos 36 SL at 500 ppm at 15 days interval (repeated the same spraying in second year from March onwards) and untreated control plots (1.5x1.8m2) with ten replications to estimate the yield losses caused by the foliar nematode in tuberose under field situations. Experimental results showed that the treated plot had low nematode infestation (26%) and POI value (25%), reduction (53%) of nematode population and higher spike yield (mean 286/plot) as compared to

untreated plots (mean 207/plot). With the adoption of nematode management practice, spike yield could be saved up to 38% and that could be to the extent of 59% when loose flower yield/plot was taken in consideration.

210. Hussain, Z.; Assam Agricultural University, Jorhat (India). Dept. of Nematology). Bora, B.C.; Assam Agricultural University, Jorhat (India). Dept. of Nematology). Interrelationship of Meloidogyne incognita and Ralstonia solanacearum complex in brinjal. Indian Journal of Nematology (India). (Jun 2009) v. 39(1) p. 41-45 KEYWORDS: MELOIDOGYNE INCOGNITA. RALSTONIA SOLANACEARUM. AUBERGINES. PATHOGENICITY.

Association of pathogenic and above pathogenic levels of inoculum of both Meloidogyne incognita and Ralstonia so/anacearum increased the severity of wilt on brinjal crops as compared to associations of below pathogenic inoculum levels of both the pathogens. Inoculation of R. solanacearum alone and below pathogenic level of M. incognita could not reduce the plant growth parameters of brinjal significantly. In presence of R. solanacearum, M. incognita activities including population build up in soil and roots in brinjal crop were reduced compared to absence of the R. solanacearum.

H20 Plant Diseases

211. Singh, Vivek; S.V.B. Patel Univ. of Agri. & Tech., Department of Plant Pathology. Meerut (India). Kumar, Ravinder; S.V.B. Patel Univ. of Agri. & Tech., Department of Plant Pathology. Meerut (India). Singh, Gopal; S.V.B. Patel Univ. of Agri. & Tech., Department of Plant Pathology. Meerut (India). Prasad, C. S.; S.V.B. Patel Univ. of Agri. & Tech., Department of Plant Pathology. Meerut (India). Management of Sheath blight of Rice with Integration of Trichoderma harzianum and Pseudomonas fluorescens. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.156-158 KEYWORDS: BLIGHT. TRICHODERMA HARZIANUM. PSEUDOMONAS FLUORESCENS. MANAGEMENT. NITROGEN FERTILIZERS. PLANTING. RELATIVE HUMIDITY. ORYZA SATIVA.

The present investigation was undertaken to asses the 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. harzianum 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%).

212. R. Udhayakumar; Annamalai University, Faculty of Agriculture, Department of Plant Pathology, Annamalainagar (India). Rani, S. Usha; Annamalai University, Faculty of Agriculture, Department of Plant Pathology, Annamalainagar (India). Epidemiological and Nutritional factors on growth of Colletotrichum gloeosporioides (Penz.) Penz. and Sacc.. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.159-163 KEYWORDS: COLLETOTRICHUM. EPIDEMICS. FRUIT.

Studies were conducted to find out the favourable conditions and nutritional factors on the growth and conidial germination of C. gloeosporioides in 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 dry weight when basal medium was supplemented with manitol (79.5mm & 590.8mg) as a carbon source and ammonium nitrate (86.6mm & 680.8mg) as a nitrogen source.

213. Mishra, Versha; D.G.College, Department of Botany, Kanpur (India). Gautam, Rashmi; D.G.College, Department of Botany, Kanpur (India). Srivastava, K.C.; D.A-V. College, Department of Botany, Kanpur (India). Srivastava, Neena; Dr.Harbansrai Bachchan College, Department of Botany, (India). 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(1) p.164-166 KEYWORDS: CULTURE MEDIA. TEMPERATURE. PHYTOPHTHORA DRECHSLERI. PHYTOPHTHORA. PIGEON PEAS.

Maximum vegetative growth of pathogen was recorded on oat meal agar medium at 30^0C temperature and 6.5 pH. Sporangial germination of the pathogen started at 15^0C after 180 minutes and at 20–25^0C after 120 minutes. Maximum sporangial germination was observed at 6.5 pH in complete dark condition.

214. Basu, Amitava; Bidhan Chandra Krishi Viswa Vidyalaya, Department of Plant Pathology, Nadia (India). Maiti, Mrinmay K.; Bidhan Chandra Krishi Viswa Vidyalaya, Department of Plant Pathology, Nadia (India). Quantitative estimation of Chlorophyll, Starch and Total soluble sugar in Potato cultivars infected with Phytophthora infestans. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.167-171 KEYWORDS: CHLOROPHYLLS. STARCH. POTATOES. PHYTOPHTHORA INFESTANS.

The kinetics of accumulation of chlorophyll, total soluble 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 Kufri Ashoka 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.

215. Singh, S.P.; Bundelkhand University, Department of Botany, Jhansi (India). Agarwal, R.K.; Bundelkhand University, Department of Botany, Jhansi (India). Bhagawati, R.; Bundelkhand University, Department of Botany, Jhansi (India). 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(1) p.172-176 KEYWORDS: CICER ARIETINUM. DATES. SOWING. SCLEROTIUM (DEUTEROMYCOTINA). ROTS.

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.

216. Ram, Jeewa; Maharana Pratap University of Agriculture and Technology, Rajasthan College of Agriculture, Department of Plant Pathology, Udaipur (India). Thakore, B.B.L.; Maharana Pratap University of Agriculture and Technology, Rajasthan College of Agriculture, Department of Plant Pathology, Udaipur (India). Diversity of Pathogens causing Storage rot and Impact of Storage structures on Ginger rot. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.177-180 KEYWORDS: PATHOGENS. STORAGE STRUCTURES. GINGER. RHIZOCTONIA SOLANI. RHIZOCTONIA. ROTS. RAJASTHAN.

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.

217. Gupta, P.K.; JNKVV, Department of Plant Pathology, Jabalpur (India). Sharma, N.D.; JNKVV, Department of Plant Pathology, Jabalpur (India). Singh, Dhirendra; J.V. College Baraut, Department of Agri. Botany, Genetics & Plant Breeding, Bagpat (India). Occurrence of Cercosporoid on Medicinal plants of Madhya Pradesh. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.181-183 KEYWORDS: DRUG PLANTS. FUNGI. PLANTS. FUNGAL DISEASES. MADHYA PRADESH.

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.

218. Singh, Sushil K.; N.D. University of Agriculture & Technology, Department of Plant Pathology, Faizabad (India). Ramesh Chand; B.H.U., Institute of Agricultural Sciences, Department of Mycology & Plant Pathology, Varanasi (India). Singh, Dinesh; I.A.R.I., Division of Plant Pathology, New Delhi (India). Kumar, D.; N.D. University of Agriculture & Technology, Department of Plant Pathology, Faizabad (India). Comparative study of Leaf spot and Leaf blight symptoms of Xanthomonas campestris pv. parthenii on Parthenium. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.184-187 KEYWORDS: SPOTS. PLANT DISEASES. XANTHOMONAS CAMPESTRIS. XANTHOMONAS. PARTHENIUM. BLIGHT.

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 leaf spot strain was 40 ; as compared to leaf blight strain (8.7). Leaf spot causing strain was more virulent, host specific and with fast 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.

219. Singh, Vimla; D.U.U. Gorakhpur University, Department of Botany, Gorakhpur (India). Singh, Devendra; D.U.U. Gorakhpur University, Department of Zoology, Gorakhpur (India). Studies on Natural Transmission of Papaya ringspot virus disease in Eastern Uttar Pradesh. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.188-192 KEYWORDS: PAPAYAS. VIROSES. POTYVIRUSES. TRANSMISSIONS. SPOTS.

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.

220. Debnath, A.; U.B.K.V., Department of Plant Pathology, West Bengal (India). Bandyopadhyay, S.; U.B.K.V., Department of Plant Pathology, West Bengal (India). Dutta, S.; B.C.K.V., Department of Plant Pathology, Nadia (India). Bio-control options for management of rhizome rot and wilt disease complex of ginger in Terai agro-ecological region. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.193-196 KEYWORDS: BIOLOGICAL CONTROL. RHIZOMES. ROTS. WILTS. GINGER. PSEUDOMONAS FLUORESCENS. 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. Maximum disease reduction of 82.7 over control was found when rhizome and soil were treated with Pseudomonas fluorescens and Trichoderma Pundibari isolate combination. This treatment also produced the highest yield of 5.47 kg/plot.

221. Jain, Anju; Janta Vedic College, Department of Botany, Uttar Pradesh (India). Mohan, Jitendra; Janta Vedic College, Department of Botany, Uttar Pradesh (India). Pathogenicity of Fusarium oxysporum and Meloidogyne incognita and cumulative effects on Tomato. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.197-201 KEYWORDS: PATHOGENICITY. FUSARIUM OXYSPORUM. MELOIDOGYNE INCOGNITA. TOMATOES. WILTS.

The pathogenicity of wilt fungus Fusarium oxysporum f. sp. lycopersici and root-knot nematode Meloidogyne incognita was evaluated at different inoculum levels on tomato 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 106 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).

222. Tyagi, Suruchi; M.M.H. College, Department of Botony, Ghaziabad (India). Mishra, Vandana; M.M.H. College, Department of Botony, Ghaziabad (India). Prasad, D.; I.A.R.I., Division of Nematology, New Delhi (India). Effect of Rotylenchulus reniformis on Groundnut in presence or absence of Rhizoctonia bataticola. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.202-205 KEYWORDS: ARACHIS HYPOGAEA. MACROPHOMINA PHASEOLINA. ROTYLENCHULUS RENIFORMIS. NEMATODA. PEST INSECTS. FUNGAL DISEASES. ROTYLENCHULUS.

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 fungus 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 fungus. The

nematode reproduction rate was also observed to be lowest (4.64), when nematode and fungus inoculated simultaneously.

223. Sunaina, Singh; M.M.H. College, Department of Botany, Ghaziabad (India). Prasad, D.; I.A.R.I., Department of Nematology. New Delhi (India). Management of Rotylenchulus reniformis on Sunflower through Botanicals. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.220-222 KEYWORDS: HELIANTHUS ANNUUS. EPIDEMICS. NEMATODA. ROTYLENCHULUS RENIFORMIS. PLANT EXTRACTS.

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.

224. Bhatt, Shikha; G.B. Pant. Univ. of Agri. & Tech., College of Agriculture, Department of Entomology, Pantnagar (India). Kanaujia, K.R.; G.B. Pant. Univ. of Agri. & Tech., College of Agriculture, Department of Entomology, Pantnagar (India). Pathogenicity of Beauveria bassiana against Spilarctia obliqua and Spodoptera litura. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.235-236 KEYWORDS: PATHOGENICITY. BEAUVERIA BASSIANA. BEAUVERIA. SPILOSOMA OBLIQUA. SPODOPTERA LITURA. SPODOPTERA.

225. Dubey, Asit; D.A.V. College, Department of Botany, Kanpur (India). Tripathi, M.K.; Nehru College, Department of Botany, Chhibramau (India). Mishra, Versha; D.G. College, Department of Botany, Kanpur (India). Evaluation of Fungicides and Plant extracts for Alternaria blight Management in Malabar nut (Adhatoda vasica). Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.256-258 KEYWORDS: FUNGICIDES. PLANT EXTRACTS. ALTERNARIA. ALTERNARIA ALTERNATA. DRUG PLANTS.

226. Ved Ratan; C.S. Azad University of Agriculture & Technology, Department of Plant Pathology, Kanpur (India). Biswas, S.K.; C.S. Azad University of Agriculture & Technology, Department of Plant Pathology, Kanpur (India). Influence of Date of sowing on incidence of Dry root rot and Wilt diseases of Chick pea. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.258-259 KEYWORDS: DATES. SOWING DATE. SOWING. ROOTS. ROTS. WILTS. CHICKPEAS. FUSARIUM OXYSPORUM. MACROPHOMINA PHASEOLINA. DISEASE CONTROL.

227. Singh, Jyoti; C.S. Azad Univ. of Agri. & Tech., Project Coordinating Unit (Linseed), Kanpur, (India). Kerkhi, S.A.; C.S. Azad Univ. of Agri. & Tech., Project Coordinating Unit (Linseed), Kanpur, (India). Biological control of Alternaria blight in Linseed. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.259-261 KEYWORDS: ALTERNARIA. BLIGHT. BIOLOGICAL CONTROL. LINSEED. LEAVES.

228. Dalvi, M.B.; Regional Fruit Research Station, Vengurle, Sindhudurg (India). Patil, Pushpa D.; Regional Fruit Research Station, Vengurle, Sindhudurg (India). Raut, S.P.; Regional Fruit Research Station, Vengurle, Sindhudurg (India). Pre-harvest Fungicidal application for control of Colletotrichum gloeosporioides in Alphonso mango fruits.. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.261-262 KEYWORDS: FUNGICIDES. GLOMERELLA CINGULATA. DISEASE CONTROL. MANGOES.

229. Thakur, M.B.; R.A.U., Department of Plant Pathology, Bihar (India). Rai, R.C.; R.A.U., Department of Plant Pathology, Bihar (India). Kumar, Sanjeev; College of Agriculture, Vidisha (India). Evaluation of Plant extracts for Management of Sheath rot of Rice. Annals of Plant Protection Sciences (India). (Mar. 2010) v.18(1) p.263-264 KEYWORDS: PLANT EXTRACTS. ROTS. RICE. ANTIMICROBIAL PROPERTIES.

230. Chaliganjewar, S.D.; I.G.K.V., Department of Plant Pathology, Raipur (India). Lakpale, N.; I.G.K.V., Department of Plant Pathology, Raipur (India). Khare, N.; I.G.K.V., Department of Plant Pathology, Raipur (India). Thrimurty, V.S.; I.G.K.V., Department of Plant Pathology, Raipur (India). Effect of Medicinal plant leaf extracts against Sheath rot disease of Rice and Yield attributing characters. Annals of Plant Protection Sciences (India). (Mar. 2010) v.18(1) p.265-266 KEYWORDS: DRUG PLANTS. PLANT EXTRACTS. ROTS. RICE. YIELDS. PATHOGENS.

231. Gupta, Shailendra K.; D.D.U. Gorakhpur University, Natural Pesticide Lab, Department of Botany, Gorakhpur (India). Tripathi, S.C.; D.D.U. Gorakhpur University, Natural Pesticide Lab, Department of Botany, Gorakhpur (India). In vitro Antimycotic activity of some Angiospermic plants against Fusarium sacchari. Annals of Plant Protection Sciences (India). (Mar. 2010) v.18(1) p.267-268 KEYWORDS: FUSARIUM. FUNGAL DISEASES. PLANT EXTRACTS. ANGIOSPERMS.

232. Jain, A.K.; JNKVV, College of Agriucture, Department of Plant Pathology, Rewa (India). Gupta, A.K.; JNKVV, College of Agriucture, Department of Plant Pathology, Rewa (India). Occurrence of Banded leaf and Sheath Blight on Foxtail and Barnyard millets in Madhya Pradesh. Annals of Plant Protection Sciences (India). (Mar. 2010) v.18(1) p.268-270 KEYWORDS: MILLETS. BLIGHT. SETARIA ITALICA. MADHYA PRADESH.

233. Singh, Ratankumar; Dr. Y.S. Parmar University of Horticulture and Forestry, College of Horticulture, College of Horticulture, Department of Mycology and Plant Pathology, Solan (India). Chandel, Sunita; Dr. Y.S. Parmar University of Horticulture and Forestry, College of Horticulture, College of Horticulture, Department of Mycology and Plant Pathology, Solan (India). Sharma, Chhaya; Dr. Y.S. Parmar University of Horticulture and Forestry, College of Horticulture, Department of Biotechnology, Solan (India). Evaluation of Fungicides against Alternaria zinniae of African Marigold. Annals of Plant Protection Sciences (India). (Mar. 2010) v.18(1) p.270-272 KEYWORDS: FUNGICIDES. TAGETES. ALTERNARIA. SPOTS. BLIGHT. DISEASE CONTROL.

234. Singh, N.K.; N.D. Univ. of Agri. & Tech., Department of Plant Pathology, Faizabad (India). Screening of Mustard genotypes against Sclerotinia rot. Annals of Plant Protection Sciences (India). (Mar. 2010) v.18(1) p.272-273 KEYWORDS: TESTING. MUSTARD. GENOTYPES. SCLEROTINIA. ROTS. FUNGAL DISEASES. SCLEROTINIA SCLEROTIORUM.

235. Chaliganjewar, S.D.; I.G.K.V., Department of Plant Pathology, Raipur (India). Lakpale, N.; I.G.K.V., Department of Plant Pathology, Raipur (India). Khare, N.; I.G.K.V., Department of Plant Pathology, Raipur (India). Trimurty, V.S.; I.G.K.V., Department of Plant Pathology, Raipur (India). Evaluation of Resistance inducing agents against Sheath rot disease and Yield of Rice. Annals of Plant Protection Sciences (India). (Mar. 2010) v.18(1) p.273-274 KEYWORDS: RICE. ROTS. SAROCLADIUM. DISEASE RESISTANCE.

236. Shailbala; G.B. Pant Univ. Agric. & Tech, Sugarcane Research Centre, Kashipur (India). Managing Powdery mildew through Organic inputs for Sustaibale Capsicum production. Annals of Plant Protection Sciences (India). (Mar. 2010) v.18(1) p.275-276 KEYWORDS: MILDEWS. CAPSICUM. OIDIOPSIS. ORGANIC MATTER.

237. Katara, J.L.; Indira Gandhi Vishwavidhyalaya, Dept. of Biotechnology, Raipur (India). Sonah, H.; Indira Gandhi Vishwavidhyalaya, Dept. of Biotechnology, Raipur (India). Deshmukh, R.K.; Indira Gandhi Vishwavidhyalaya, Dept. of Biotechnology, Raipur (India). Chayrasia, Ravinder; Indira Gandhi Vishwavidhyalaya, Dept. of Biotechnology, Raipur (India). Kotasthane, A.S.; Indira Gandhi Vishwavidhyalaya, Dept. of Biotechnology, Raipur (India). Molecular analysis of QTLs associated with resistance to brown spot in rice (Oryza sativa L.). Indian Journal of Genetics and Plant Breeding (India). (Feb 2010) v.70(1) p.17-21 KEYWORDS: HELMINTHOSPORIUM. DISEASE RESISTANCE. SPOTS. QUANTITATIVE TRAIT LOCI. COCHLIOBOLUS MIYABEANUS. COCHLIOBOLUS. RICE. GLUMES. INFLORESCENCES. HAPLOIDY.

Helminthosporiosis or brown spot disease is widely distributed and is known to cause heavy yield losses in rice. In present investigation, a set of 154 doubled haploid (DH) lines derived from a cross between CT 9993-5-10-1 M and IR 62266-42-6-2 was used to identify quantitative trait loci (QTLs) for brown spot disease. DH lines along with parents were planted in two different soil environments with two replications each in RCBD and evaluated for the brown spot resistance. We have identified total 10 QTLs for brown spot resistance using MAPMAKER/QTL 1.1 distributed over the eight chromosome of rice. Out of 10 QTLs, four were consistently discovered in both the soil types. The aTL BSq4.1 and BSq11.1 located on the chromosome 4 and 11 were identified in both the environment with higher LOD score and phenotypic variance and will be good candidates for fine mapping and positional cloning studies.

238. Varalakshmi, B.; Indian Institute of Horticultural Research, Bangalore (India). Ganeshan, Girija; Indian Institute of Horticultural Research, Bangalore (India). Gopalakrishnan, C.; Indian Institute of Horticultural Research, Bangalore (India). Pushpalatha, A.; Indian Institute of Horticultural Research, Bangalore (India). Chethana, B.S.; Indian Institute of Horticultural Research, Bangalore (India). Identification of sources of resistance to alternaria leaf spot (Alternaria brassicicola), black rot (Xanthomonas campestris) and downy mildew (Peronospora parasitica) in cauliflower (Brassica oleraceae). Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.482-484 KEYWORDS: ALTERNARIA. SPOTS. XANTHOMONAS CAMPESTRIS. MILDEWS. DISEASE RESISTANCE. CAULIFLOWERS.

Forty five cauliflower germplasm and advanced breeding lines belonging to early group were screened during 2005-07 against altern aria leaf spot, black rot and downy mildew diseases. Based on the 2 years data, none of the cauliflower germplasm or advanced breeding lines was found resistant to the 3 diseases tested. However 'llHR 260-1', 'llHR 265' , 'IIHR 302' and 'llHR 305-1' were found resistant against downy mildew. Four lines, viz. 'llHR 73-3-20', 'llHR 25004-4-16-27', 'llHR264-3', 'llHR392' against alternaria leaf spot and 2 lines, viz. 'llHR 73-56' and 'IIHR 25028' against black rot were found to be moderately resistant.

239. Patankar, Nitisha V.; Indian Agricultural Research Institute, New Delhi (India). Mittal, Vishal; Indian Agricultural Research Institute, New Delhi (India). Kumar, Rajesh; Indian Agricultural Research Institute, New Delhi (India). Ramamurthy, V.V.; Indian Agricultural Research Institute, New Delhi (India). Can Psyllobora bisoctonotata and llleis cincta (Coccinellidae:Coleoptera) be advocated for biological control of powdery mildews. Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.488-90 KEYWORDS: COLEOPTERA. BIOLOGICAL CONTROL. MILDEWS. SPORES. FUNGAL SPORES.

The role of coccinellids Psyllobora bisoctonotata Mulsant and Illeis cincta Fabricius (Coccinellidae: Coleoptera) towards biological control of powdery mildews, was studied through the analysis of spores of fungi in their gut contents and faecal pellets. Spores of Phyllactinia dalbergiae and P. corylea, infesting Dalbergia sisoo and Morus alba respectively, were found in large numbers; those of Cladosporium spp, Alternaria spp and Curvularia spp, were also considerable. These spores were intact; also in germinating condition in the gut and faecal pellets, revealing that these beetles being projected as biological control agents, in fact enhance the spread and pathogenicity of

fungi. Advocating these beetles as biological control agents of powdery mildews needs to be done cautiously.

H60 Weeds and Weed Control

240. Bahar, Fayaz Ahmed; SK University of Agricultural Sciences and Technology, Kashmir (India). Singh, K.N.; SK University of Agricultural Sciences and Technology, Kashmir (India). Malik, M.A.; SK University of Agricultural Sciences and Technology, Kashmir (India). Integrated weed management in maize (Zea mays) under different nitrogen levels. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.641-44 KEYWORDS: AZOTOBACTER. MAIZE. NITROGEN. POLYETHYLENE. YIELDS.

A field experiment was conducted in Kashmir during rainy (kharif) season of 2004 and 2005 to study the effect of integrated weed management of maize (Zea mays L.) as influenced by different rates of nitrogen levels. The results revealed significant increase in grain yield and growth characters, like plant height, leaf area index and dry matter accumulation with N120 + Azotobacter (F4) than N90 (F1) treatment during both the years. Silking was two days earlier in N120 + Azotobacter than N90 (F1) treatment. Polyethylene mulch (W5) being at par with straw mulch (W4) resulted in significantly higher grain (5.12 tonnes/ha) yield of maize than weedy check (1.36 tonnes/ha). Uncontrolled weed growth caused 73.41% reduction in grain yield of maize. N120 + Azotobacter (F4) recorded significantly higher uptake of N, P and K in maize plant than the lower fertility level of N90 (F1). Significantly higher uptake of N, P and K by maize was observed with all the weed control measures than weedy check (W1) during both the years.

J10 Handling, Transport, Storage and Protecion of Agricultural Products

241. Kumar, Rajiv; ICAR Research Complex for NEH Region, Meghalaya (India). De, L.C.; ICAR Research Complex for NEH Region, Meghalaya (India). Roy, A.R.; ICAR Research Complex for NEH Region, Meghalaya (India). Verma, Med Ram; ICAR Research Complex for NEH Region, Meghalaya (India). Effect of different holding solutions on post-harvest life of gladiolus (Gladiolus hybridus). Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.604-07 KEYWORDS: CUT FLOWERS. GLADIOLUS. SPIKES. KEEPING QUALITY. POSTHARVEST DECAY.

A study was conducted during 2006-07 to prolong the postharvest life of gladiolus using different holding solutions. Six holding solutions, viz tap water (control), 4% sucrose, 4% sucrose + 8-HQC (250 ppm), 4% sucrose + acetyl salicylic acid (Aspirin) (200 ppm), 4% sucrose + Al2(SO4)3 (200 ppm) and 4% sucrose + 0.1% ZnSO4 were used to prolong the post-harvest life of ‘Pusa Jyotsana’ gladiolus using completely randomized design with 7 replications. Holding solutions significantly affected the change in fresh weight over initial fresh weight. On 3rd day in vase, maximum increase in fresh weight (16.87 g and 15.07 g) respectively was recorded in tap water and 4% sucrose + 8-HQC (250ppm). On 5th day in vase, maximum increase in fresh weight (18.66 g and 18.07 g) respectively of spike was recorded in holding solution of 4% sucrose + acetyl salicylic acid (200 ppm) and 4% sucrose + 8-HQC (250 ppm). Minimum loss in fresh weight (–5.73 g) of spike at senescence was observed in holding solution of 4% sucrose + acetyl salicylic acid (200 ppm). Significantly, maximum solution uptake by the spike was observed in tap water (52.85 ml and 72.28 ml,respectively) on 3rd day and 5th day in vase while, maximum solution uptake (129.42 ml) was recorded in holding solution containing 4% sucrose + acetyl salicylic acid (200 ppm) followed by 4% sucrose + 8-HQC (250 ppm) at senescence stage. Holding solution of 4% sucrose + 8-HQC (250 ppm), significantly improved the diameter of 1st(10.14 cm) and 3rd (9.50 cm) floret, whereas, the longevity of first florets (4.43 days), effective useful life (10.14 days)and vase life (13.14 days) were recorded in 4% sucrose + 8-HQC (250 ppm). Number of fully opened florets was found maximum (4.57 and 5.00, respectively) with 4% sucrose + 8-HQC (250 ppm) on 5th and 7th day in vase.

242. Sankar, V.; Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore (India). Veeraragavathatham, D.; Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore (India). Kannan, M.; Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore (India). Effect of organic farming practices on post harvest storage life and organoleptic quality of yellow onion (Allium cepa). Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.608-14 KEYWORDS: ORGANIC AGRICULTURE. ORGANOLEPTIC PROPERTIES. ONIONS. KEEPING QUALITY.

An experiment was conducted during 2002–04 at Coimbatore to study the post-harvest storage life and organo-leptic quality of onion (Allium cepa L.) The results revealed that the total storage loss of stored yellow onion bulbs increased steadily as the period of storage was extended. The organic treatment combination of M1S2 (3% panchakavya + 50% farmyard manure + 50% poultry manure) registered the lowest total loss 42.65 and 45.78% in ‘Phule Suvarna’ during crop I and crop II respectively at 120 days after storage. The inorganic treatment consisting of 100% recommended dose of NPK fertilizers (M4S10) significantly varied from organic treatment and exhibited the highest total losses in both crops. A similar kind of response was observed in sprouting and rotting per cent also. With respect to organoleptic quality, all organically nourished treatments, particularly poultry manure combination were superior, imparted better taste, flavour and texture and had higher score than inorganic fertilizer treatments. Overall acceptability was not significantly different among various treatment combinations and these attribute was acceptable in all treatments.

243. Prasad, Niranjan; Indian Institute of Natural Resins and Gums, Ranchi (India). Pandey, S.K.; Indian Institute of Natural Resins and Gums, Ranchi (India). Drying characteristics of seedlac. Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.458-460 KEYWORDS: DRYING. GUM RESINS. MOISTURE CONTENT. ENVIRONMENTAL FACTORS. ENVIRONMENT. SEED. LAC.

A study was conducted during 2006 to determine the drying characteristics of scedlac for developing a suitable drier from the existented already. Driers available for different commodities could be modified to suit seedlac drying requirements. Drying characteristics of seedlac, essential for drier design have not been determined so far. Drying characteristics of the seedlac have been determined at different temperatures (40, 45, 50 and 55°C) and different drying layer thickness (1, 1.5, 2.0 and 2.5 cm). The drying characteristics were also determined under different ambient conditions, ie drying sun and shade drying with and without raking. The dried seedlac samples were drawn at the end of each experiment and quality parameters, i.e. moisture content (d.b.), fluidity (flow), heat polymerisation time (life) and colour index were determined.

P10 Water Resources and Management

244. Balaganvi, Subhas; University of Agricultural Sciences, AICRP on Salt -affected Soils, Agricultural Research Station, Karnataka (India). Ravishankar, G.; University of Agricultural Sciences, AICRP on Salt -affected Soils, Agricultural Research Station, Karnataka (India). Hebbara, M.; University of Agricultural Sciences, AICRP on Salt -affected Soils, Agricultural Research Station, Karnataka (India). Mastanreddy, B.G.; University of Agricultural Sciences, AICRP on Salt -affected Soils, Agricultural Research Station, Karnataka (India). Joshi, V.R.; University of Agricultural Sciences, AICRP on Salt -affected Soils, Agricultural Research Station, Karnataka (India). Land and rainwater management of sunflower (Helianthus annuus) cultivation in saline Vertisols. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.651-53 KEYWORDS: RAINWATER. WATER MANAGEMENT. CULTIVATION. HELIANTHUS ANNUUS.

A field experiment was carried out for three years during 2003–06, to evaluate the effect of different in-situ rain water harvesting practices and land layouts on sunflower crop performance, moisture conservation and soil salinity under the saline soils at Agricultural Research Station Gangavathi, Karnataka. Pooled data of 3 years revealed

significantly higher sunflower yield (0.97 tonnes/ha) in tied ridges and furrows (followed by ridges and furrows (0.93 tonnes /ha). Highest gross returns (Rs 21 303/ha), net returns (Rs 11 644/ha) and benefit:cost ratio (2.18) was recorded in tied ridges and furrows. Highest moisture content of 35.7, 35.5 and 35.3% was observed at the germination stage in tied ridges and furrows in all the 3 years. Maximum decrease in soil salinity to the extent of 27.6, 32.6 and 43.3% compared to initial was observed in tied ridges at germination stage due to leaching of salts by the harvested rainwater.

245. Vashisht, Bharat Bhushan; Punjab Agricultural University, Regional Research Station for Kandi Area, Ballowal (India). Sidhu, B.S; Punjab Agricultural University, Regional Research Station for Kandi Area, Ballowal (India). Sarlach, R.S.; Punjab Agricultural University, Regional Research Station for Kandi Area, Ballowal (India). Sheoran, P.; Punjab Agricultural University, Regional Research Station for Kandi Area, Ballowal (India). Effect of Spacing and Soil Stirring on Fresh leaf Yield and Water expense Components of Aloe vera (Aloe barbadensis) in the Rainfed Shivaliks of Punjab. Indian Journal of Dryland Agricultural Reserach and Development (India). (June 2009) v.24(1) p.30-33 KEYWORDS: SPACING. WATER MANAGEMENT. ALOE BARBADENSIS. PUNJAB. SOIL TEXTURE. SANDY SOILS. LEAVES. YIELDS.

The chronic shortage of water is the major problem in the Shiwaliks, locally known as Kandi area. Agro- climatically, Shiwaliks are considered highly suitable for plantation and high value crops on account of favourable wheather and adaphic factors. The aloe vera is known for its medicinal properties from the ancient time in India. A field experiment was conducted on a sandy loam soils during 2005-06 to study the effect of spacing and soil stirring on fresh leaf yield and water expense components of aloe vera under rainfed conditions. Six spacing levels with ane without soil stirring were tested in randomized block design with three replications. Spacing and soil stirring have, significant effect on the fresh leaf yield and number of fresh leaves per plant counted after one year of plantation. The number of fresh leaves per plant were found maximum in the treatments where spacing of 60X45 cm and minimun under the treatments where spacing of 45X45 cm was kept. The average yield on fresh weight basis was founr maximum in the plots where spacing of 60x45 cm followed by 60x60 cm and 45x45 cm with and without soil stirrin was kept. The water expense efficiency was also higher (268 kg ha-1 cm-1) under the treatments where the soil stirrin and closer spacing of 60x45 cm was done.

246. Mandal, D.; Central Soil and Water Conservation Research and Training Institute, Dehradun (India). Singh, Ratan; Central Soil and Water Conservation Research and Training Institute, Dehradun (India). Dhyani, S.K.; Central Soil and Water Conservation Research and Training Institute, Dehradun (India). Dhyani, B.L.; Central Soil and Water Conservation Research and Training Institute, Dehradun (India). Sindhwal, N.S.; Central Soil and Water Conservation Research and Training Institute, Dehradun (India). Management of environmental risks in the hill and mountain agro-ecosystem: Development of environmental suitability index. Indian Journal of Soil Conservation (India). (Dec 2009) v.37(3) p.206-216 KEYWORDS: ENVIRONMENTAL MANAGEMENT. AGROECOSYSTEMS. SUSTAINABILITY.

Land use decisions should be based on comprehensive and quantified assessments of the biophysical, environmental and socio-economic factors. Sustainable land use should have maximum suitability and minimum vulnerability. Hence, from the perspective of sustainability, an environmental suitability index (ESI) was developed in this study under hill and mountainous watershed to serve as most environmental friendly answer for the two key questions in land use planning; viz., what areas can be opened up for agricultural land and what landuse and management practices can be adopted. Land Suitability Index (LSI) for cropping was derived based on soil site rating. Erosion Tolerance Index (ETI) was established from the integration of soil loss tolerance (T-value) and average annual soil loss (A) and Environmental Suitability Index (ESI) was then generated from a convex combination of LSI and ETI. Land suitability index (LSI) provided the answer for the former question without considering the risks associated with it. Hence, a comparative analysis of the different methods such as Environment

Suitability Index (ESI), site suitability methods of FAO and its modified form proposed by NBSS&LUP, Nagpur have been tried to address the issue of maximum suitability and minimum vulnerability. The study indicated that the normal site suitability criteria always provided under-estimation for marginal suitable category (ESI<0.3). For moderately suitable category (ESI=0.4–0.6) the land area in the watershed matched with normal site suitability for upland paddy (131 ha) and wheat (131 ha). In case of moderately suitable category about 135 ha was qualified as per ESI estimation. Qualitative approach (as per the FAO and it's modified form) resulted an over-estimation for soybean and pulses and under-estimation for maize and minor millets. The three categories of the land in the watershed were further analyzed for identifying soil constraints and suggesting suitable soil management strategies for each landuse type to minimize the risks factors. The strategies include the synchronizations of time of sowing of pulse crops with the onset of monsoon; diversified land use through agri-horti, silvipastoral systems and restocking through planting and protecting the forest areas in the watershed. This approach will provide information concerning landuse options whereby the landuse distribution can be optimized for improving ecological soil functions.

P31 Soil Surveys and Mapping

247. Mandal, C.; National Bureau of Soil Survey and Land Use Planning, Nagpur (India). Mandal, D.K.; National Bureau of Soil Survey and Land Use Planning, Nagpur (India). Rice soils suitability assessment of Jagdalpur district. Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.479-480 KEYWORDS: RICE. SOIL. LAND SUITABILITY. YIELDS.

Low rice yield of Jagdalpur district in contrast with congenial agro-edaphic environment necessitates in depth assessment of agro-climatic suitability of rice-growing soils. To ascertain the cause, a GIS-based investigation was undertaken through analysis of SRM data base at 1:250000 scale, FAO-based crop suitability criteria and crop yield model. The analysis of landform and soil resources revealed that 50% of the soils are deep Alfisols, 14% are Inceptisols and 13% are shallow Entisols. The Alfisols occupy lowlying areas on gentle to very gentle sloping valleys where as Inceptisols and Entisols occupy mainly on hills, escarpments and low plateau surfaces. Rice suitability assessment indicates that 76096 ha (36.9%) is highly suitable and 16 064 ha (7.79%) is moderately suitable and 42 275 ha (20.5%) is marginally suitable for rice, whereas 25 365 ha and 50731 ha lands are temporarily or permanently not suitable for rice. The yield computation model reveals that potential yield of rice-growing areas varies from 3.0 to 7.6 tonneslha, indicating huge rice production potential remains untapped which needs to be exploited through cultivation of suitable rice genotype on suitable rice soils to increase the rice productivity. The marginally suitable areas can be diverted to fruit crops, like mango, cashew and aromatic plants, like jamrosa, vetivera, patchouli and Eucalyptus to increase the overall land productivity of the rice growing areas of the district.

P33 Soil Chemistry and Physics

248. Sandal, Sanjeev K.; CSK Himachal Pradesh Agricultural University, Palampur (India). Datt, Naveen; CSK Himachal Pradesh Agricultural University, Palampur (India). Sharma, R.P.; CSK Himachal Pradesh Agricultural University, Palampur (India). Sankhyan, N.K.; CSK Himachal Pradesh Agricultural University, Palampur (India). Bhushan, Lav; CSK Himachal Pradesh Agricultural University, Palampur (India). Effect of resource conservation technologies with common weed biomass and fertilizer levels on soil moisture content, productivity and nutrient content and uptake of maize (Zea mays) in wet temperate zone of Himachal Pradesh. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(7) p.545-548 KEYWORDS: FERTILIZERS. GROWTH. SOIL WATER CONTENT. NUTRIENT AVAILABILITY. MAIZE. BIOMASS.

Field experiments were conducted during 2005-06 for evaluating the effects of RCTs and nutrient levels on plant growth, yields and nutrient uptake of rainfed maize in wet

temperate zone of Himachal Pradesh. The treatments comprised moisture conservation practices {conventional tillage (CT), conventional tillage + mulch (M+CT) and minimum tillage + mulch (M+MT) and 2 fertilizer levels (50 and 100% of recommended dose of NPK). Results indicated that application of Lantana camera L. and Eupatorium odenoforum L. etc as mulch 25-30 days before sowing of maize recharged the seed zone moisture. Sowing succeeding maize with minimum tillage + mulch material conserved higher soil moisture which might have lead to optimum seedling emergence, better root and shoot growth consequently higher grain, stover yields, B.C ratio and N uptake in comparison to conventional tillage + mulch and conventional tillage. Application of 100% of recommended NPK significantly increased the plant growth, grain and stover yields with reduction in B.C ratio over 50% RDF. A build-up was recorded in available K content however, available N and P decreased slightly.

249. Ch. Srinivasarao; Central Research Institute for Dryland Agriculture, Santoshnagar, (India). Rao, K.V.; Central Research Institute for Dryland Agriculture, Santoshnagar, (India). Chary, G.R.; Central Research Institute for Dryland Agriculture, Santoshnagar, (India). Vittal, K.P.R; Central Research Institute for Dryland Agriculture, Santoshnagar, (India). Sahrawat, K.L.; Global Theme-Agroecosystems, ICRISAT, Andhra Pradesh (India). Kundu, Sumanta; Global Theme-Agroecosystems, ICRISAT, Andhra Pradesh (India). Water Retention Characteristics of Various Soil Types under Diverse Rainfed Production Systems of India. Indian Journal of Dryland Agricultural Reserach and Development (India). (June 2009) v.24(1) p.1-7 KEYWORDS: HYGROSCOPICITY. SOIL TYPES. SOIL CHEMICOPHYSICAL PROPERTIES. SOIL.

The relationships of soil water retention at 1/3 and 15 bar and available water content with soil physicochemical properties were studied in 147 soil samples collected from 21 profiles from rainfed regions of the country. In general Vertisols and Vertic sub-groups showed higher water retention at 1/3 and 15 bars, and available water content. A number of profiles showed an increasing trend in water retention with increase in soil depth. Reduction in water retention from 1/3 bar to 15 bar was greater in Inceptisols/Entisols, Alfisols/Oxisols and Aridisols than in Vertisols. Amount of clay and CEC showed significant positive correlation, while sand showed negative correlation with soil water retention. The relationships between organic carbon and water retention in surface soils were non- significant. Multiple regression analysis for pooled soils (n=147) showed that EC, CaCOv sand, clay and CEC contributed to the variations in available water in soil.

250. Sharma K.L.; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Subbaiah, K.; AICRP Dryland Agriculture, Agricultural Research Station, Kovilpatti (India). Jawahar, D.; AICRP Dryland Agriculture, Agricultural Research Station, Kovilpatti (India). Solaiappan, U.; AICRP Dryland Agriculture, Agricultural Research Station, Kovilpatti (India). Subramanian, V.; AICRP Dryland Agriculture, Agricultural Research Station, Kovilpatti (India). Mishra, P. K.; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Venkateswarlu, B.; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Grace, J. Kusuma; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Korwar, G.R; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Sankar, G. Maruthi; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Chary, G. Ravindra; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Gajbhiye, Pravin N; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Madhavi, M.; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Mandai, U.K.; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Srinivas, K.; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Ch. Srinivasarao; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Ramachandran, Kausalya; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). K. Usha Rani; Central Research Institute for Dryland Agriculture, Santhoshnagar (India). Soil Quality Assessment under Long-term Soil and Nutrient Management Practices in Vertisols of Kovilpatti. Indian Journal of Dryland Agricultural

Reserach and Development (India). (June 2009) v.24(1) p.8-19 KEYWORDS: VERTISOLS. NUTRIENTS. SOIL CHEMICOPHYSICAL PROPERTIES. INORGANIC FERTILIZERS. SOIL FERTILITY. SOIL. SOIL IMPROVEMENT. NUTRIENT AVAILABILITY.

In order to assess the impact of integrated nutrient management (INM) treatments on soil quality, two ongoing long-tenn experiments at Kovilpatti centre of All India Coordinated Research Project for Dryland Agriculture were adopted. Under each experiment, 19 soil quality indicators were assessed. In experiment 1, the key soil quality indicators identified and their per cent contributions towards soil quality were: electrical conductivity (19%), available N (23%), P (18%), S (8%), microbial biomass carbon (MBC) (10%) and labile carbon (22%). The relative order of performance of INM treatments in terms of soil quality and their soil quality index (SQI) values were: T5: 40 kg N ha-1 + 20 kg P ha-1 + 25 kg ZnS04 ha-1 (2.80) = T4: 50% N (urea) + 50% N as farm residue (2.69) = T3: Farm Yard Manure (FYM) to meet 20 kg N ha-1 + 10 kg P ha-I (2.65) = T2: 40 kg N + 20 kg P ha-1 (2.49) = T6: Farmers method (FYM 5 t ha-') (2.44) = Tl: Control (2.26). In experiment 2, the key soil quality indicators identified and their per cent contributions towards soil quality were: P (20%), S (16%), Fe (22%), Mn (10%), MBC (8%) and bulk density (24%). The order of superiority of the INM treatments in terms of soil quality along with their SQI values was: T5: 40 kg N ha-1 as FYM + 20 kg P ha-1 as SSP (1.93) > T3: 40 kg N as urea + 20 kg P ha-1 as SSP (1.85) = T6: 20 kg N as urea + 20 kg N ha-' as FYM + 10 kg P ha-1 as SSP (1.75) = T7: 20 kg N as urea + 20 kg N ha-1 as FYM + 20 kg P ha-1 as SSP (1.72) = T2: 40 kg N as urea (1.65) = T4: 40 kg N ha-1 as FYM (1.63) > Tl: Control (1.38).

251. Reddy, M. Malla; Regional Agricultural Research Station, Warangal (India). Padmaja, B.; Regional Agricultural Research Station, Warangal (India). Rao, L. Jalapathi; Regional Agricultural Research Station, Warangal (India). Influence of Drought Management Practices on Growth and Yield of Pigeonpea. Indian Journal of Dryland Agricultural Reserach and Development (India). (Jun 2009) v.24(1) p.63-66 KEYWORDS: DROUGHT. MANAGEMENT. PIGEONS. GROWTH. YIELDS. SEED TREATMENT. FOLIAR APPLICATION.

A field experiment was carried out for two years during Kharif 2004 and 2005 at Regional Agricultural Research Station, Warangal on clay loam soil to know the influence of agronomic practices and foliar spray of chemicals in pigeonpea under moisture stress conditions. Ten treatments comprising of seed treatment with chemicals before sowing (2), spraying of chemicals at flower bud initiation stage (2), adoption of agronomic practices (3), integrated nutrient management (1) and application of chemical fertilizers (2) were laid out in randomized block design with three replications. Drought management practices significantly influenced the yield attributes, yield and net returns in pigeonpea. Significantly higher yield and net returns were observed with application ofRDF along with seed soaking of pigeonpea before sowing for 2 hours with KH2P04 or CaCl2 during both the years. There is no significant difference between foliar fertilization of 2% urea and 2% KCl in producing yield. Cultural mulch or opening shallow furrows between two pigeonpea rows has produced at par yields to nutrient management alone during both the years. However, higher available soil moisture (%) was observed with the cultural mulch or opening shallow furrows between two rows of pigeonpea during both the years.

252. Burman, D.; Indian Grassland Fodder Research Institute, Jhansi (India). Gill, A.S.; Indian Grassland Fodder Research Institute, Jhansi (India). Baig, M.J.; Indian Grassland Fodder Research Institute, Jhansi (India). Prasad, J.V.N.S.; Indian Grassland Fodder Research Institute, Jhansi (India). Interaction between Dalhergia sissoo boundary Plantation and Food-fodder Crop Sequence under Rainfed Agro-ecosystem. Indian Journal of Dryland Agricultural Reserach and Development (India). (Jun 2009) v.24(1) p.67-74 KEYWORDS: TREES. PLANTATIONS. CROPPING SYSTEMS. FORAGE. SORGHUM. BARLEY.

An investigation was carried out to study the impact of Dalbergia sissoo boundary plantation on the soil properties and productivity of sorghum (fodder) - barley (grain)

crop sequence under rainfed condition in semi-arid region of India. The soil moisture content up to 60 cm soil depth in rabi (dry & winter) season was found to increase with the increase in distance from the tree-line and it was greater on the northern side than on southern side. A decreasing trend was observed for organic carbon and available N, P and K content in the surface soil (01-15 cm) with increasing distance from the tree base. The green fodder yield of sorghum in Kharif(rainy) season was significantly reduced up to 5 m and 3m distances on the northern and southern sides of the boundary plantation, respectively. Average reduction in fodder production in association with Dalbergia sissoo trees was 23.0% on northern side and 15.6% on southern side of the tree line. Tree shading was responsible for reduction in yield of sorghum. Intercropping of barley with trees in rabi season caused 23.2% and 18.5% decrease in average grain yield in the northern and southern directions, respectively. Competition for growth resources like water and sunlight between trees and barley resulted in decreased grain yield up to 6m on northern and 4m on the southern side of the boundary plantation.

P34 Soil Biology

253. Wali, Pardeep; S.K. University of Agricultural & Technology (SKUAST), Jammu (India). Abrol, Vikas; S.K. University of Agricultural & Technology (SKUAST), Jammu (India). Mondal, A.K.; S.K. University of Agricultural & Technology (SKUAST), Jammu (India). Sharma, Vikas; S.K. University of Agricultural & Technology (SKUAST), Jammu (India). Distribution and Status of Inorganic forms of Nitrogen in Subtropical Agroclimatic Zone of Jammu & Kashmir State. Indian Journal of Dryland Agricultural Reserach and Development (India). (June 2009) v.24(1) p.24-29 KEYWORDS: NITROGEN. SUBTROPICAL ZONES. AGROCLIMATIC ZONES. JAMMU AND KASHMIR.

Nitrogen status of soils of subtropical region of Jammu and Kashmir (J&K) state was evaluated by studying both surface and profile samples from different locations. In surface soil samples, the total N ranged from 460 to 1830 ppm, available N 75.43 to 599 kgha-', NH/- N 5.40 to 30.10 ppm and (N02- and N03-) - N 2.80 to 16 ppm. In general, the depth wise distribution of different forms ofN showed a decreasing trend with increasing depth. C:N ratio ranged from 4.19 to 13.77 and mostly narrowed with increasing depth. pH did not show any significant relationship with any form of N. Organic carbon gave a significant positive correlation with all forms of N in both surface and profile samples. Clay content did not show a significant relationship with different N forms but showed a positive relationship with total N in surface soil samples.

254. Kotur, S.C.; Indian Institute of Horticultural Research, Bangalore (India). Spatial and temporal distribution of root activity of Annona squamosa ('Sugar apple') and A. reticulata ('Bullock's Heart') seedlings and their grafts with 'Arka Sahan' scion using isotopic technique. Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.422-425 KEYWORDS: SPATIAL DISTRIBUTION. ANNONA SQUAMOSA. ANNONA. ROOTSTOCKS. GRAFT COMPATIBILITY. ROOTS. SEEDLINGS. ANNONA RETICULATA. SOIL INJECTION.

In 4-year-old healthy trees of Annona squamosa L. and A. reticulata L. seedlings and in situ grafts with 'Arka Sahan', an inter-specific hybrid of A. atemoya [A. cherimola Mill.xA. squamosa] and A. squamosa raised on a red sandy loam (Typic Haplustalf), A. squamosa showed significantly higher intensity of root activity (18 138 dpm/g dry matter) compared to A. reticulata (15 880). Similarly, the seedlings showed higher intensity (20 625) compared to that of the grafts (13 394) owing to dilution of the isotope in the volumetric biomass of the tree. A. squamosa showed a smaller volume of the plant (5.724 and 27.328 m3 in seedling and graft, respectively) compared to that of A. reticulata (19.406 and 30.536 m3). On an overall basis, the intensity of root activity increased from 15 826 dpm/g during early rainy season to the highest of 23 435 during late rainy season. Winter showed a drastic reduction of root activity (9 809) which significantly inqeased to 18 967 during summer. This trend was highly pronounced in A. squamosa but during winter, between seedlings and grafts, the intensity of root activity was at par (9 416 and 9 742, respectively). In A. reticulata however, early rainy season

showed the highest intensity of 19 921 dpm/g which progressively declined to 10 039 during winter. The former showed an intensity of 20 624 dpm/g dry matter while the latter, 13 394. Root activity distribution showed that during early rainy season, the active roots were predominantly surface oriented in both seedlings and grafts (61.6-68.2%). From late rainy to summer season, the root activity distribution tended to be well-distributed throughout the rooting volume. The root activity distribution of A. reticulata tree closely conformed to that of A. squamosa. The grafts of both the species showed a relatively uniform distribution of active roots throughout the year compared to the seedlings that may promote a better anchorage, drought tolerance and utilization of native soil moisture and nutrients from the rooting volume.

P35 Soil Fertility

255. Sharma, Anil; All India Coordinated Research Project for Dryland Agriculture Sub-Centre, Dryland Research Sub-Station, Jammu (India). Jalali, V.K.; All India Coordinated Research Project for Dryland Agriculture Sub-Centre, Dryland Research Sub-Station, Jammu (India). Sharma, V.; All India Coordinated Research Project for Dryland Agriculture Sub-Centre, Dryland Research Sub-Station, Jammu (India). Sharma, K.L.; Central Research Institute for Dryland Agriculture, Santoshnagar (India). Distribution of available Potassium in soils of Rainfed areas Representing different Agro climatic Zones of Jammu and Kashmir. Indian Journal of Dryland Agricultural Reserach and Development (India). (Jun 2009) v.24(1) p.39-44 KEYWORDS: AGROCLIMATIC ZONES. SOIL CHEMICOPHYSICAL PROPERTIES. SANDY SOILS. JAMMU AND KASHMIR. POTASSIUM.

Soil samples from thirty profiles (depth wise) from rain fed areas representing three agro-climatic zones (viz. sub-tropical, intermediate and temperate zone) of extreme north-west India were collected and analyzed for physical and chemical characteristics and available K content. Soils were slightly acidic to basic in nature and the texture varied from sandy loam to clay loam. The organic carbon content of the soils was in the range of 0.30 to 1.08 per cent. The available potassium ranged from 47 to 187 mg kg' I in the surface and 32 to 155 mg kg'l in sub-surface soils. The available K content in the soils was in the order temperate intermediate sub-tropical zone soils. The range of this form of K in the soils under investigation varied between 32 to 85, 48 to 139 and 99 to 187 mg kg'l in sub-tropical, intermediate and temperate zone soils, respectively. A decreasing trend in available K with increasing depth was observed in all the thirty soils under study. Available K was positively and significantly correlated to organic carbon (r = 0.814** in surface and r =0.707** in sub-surface soils), silt (r = 0.477** in surface and r = 0.409** in sub- surface soil), clay (r = 0.551 ** in surface and r = 0.536** in sub-surface soil) and CEC (r = 0.732** in surface and r = 0.652** in sub-surface soil) and was negatively but significantly correlated to sand content (r = -0.547** in surface and r = -0.515** in sub-surface soil).

256. Patel, K.P.; Anand Agricultural University, Micronutrient Project (ICAR), Anand (India). Patel, G.J; Anand Agricultural University, Micronutrient Project (ICAR), Anand (India). Patel, K.C.; Anand Agricultural University, Micronutrient Project (ICAR), Anand (India). Rammani, V.P.; Anand Agricultural University, Micronutrient Project (ICAR), Anand (India). Patel, P.M.; Anand Agricultural University, Micronutrient Project (ICAR), Anand (India). Patel, U.M; Anand Agricultural University, Micronutrient Project (ICAR), Anand (India). Effect of Multi-Micronutrient Application on Yield and their uptake by Maize (Zea mays L.) of Middle Gujarat Region. Indian Journal of Dryland Agricultural Reserach and Development (India). (Jun 2009) v.24(1) p.45-51 KEYWORDS: MICRONUTRIENT FERTILIZERS. YIELDS. MAIZE. GUJARAT. SOIL. ZINC. IRON. NUTRIENT DEFICIENCIES.

A field experiment was conducted on fine loamy soil having marginal Fe status at Main Maize Research Station, Godhra (dist. Panchmahals) of middle Gujarat agroclimatic zone-III for studying the efficacy of multi- micronutrient mixture in improving crop production of maize. The grain and fodder yields as well as yields attributes of maize

were higher under the treatment of 1 % foliar spray of multimicronutrient mixture having Fe-6%, Mn- 1%, Zn- 4% Cu- 0.3% and B-0.5% equivalent to Gujarat govt. notified grade-II (for Fe-deficiency) at 30, 45 and 60 DAS. Also soil application of micronutrient mixture grade having Fe-2%, Mn-0.5%, Zn-5% Cu- 0.5% and B-0.5% equivalent to govt. notified general grade of soil application at the time of sowing as a basal dose was found equally beneficial in iocreasing yield and uptake of micronutrients by maize.

257. Kundu, Sumanta; Central Research Institute for Dryland Agriculture, Santoshnagar, (India). Gajbhiye, P.N.; Central Research Institute for Dryland Agriculture, Santoshnagar, (India). Ch. Srinivasarao; Central Research Institute for Dryland Agriculture, Santoshnagar, (India). Bheemaiah, G.; Central Research Institute for Dryland Agriculture, Santoshnagar, (India). Effect of Integrated Nutrient Management on Yield Attributes, Yield, Nutrient Uptake and Economics of Growing Maize in Tamarind-based Cropping System. Indian Journal of Dryland Agricultural Reserach and Development (India). (Jun 2009) v.24(1) p.81-86 KEYWORDS: NUTRIENT UPTAKE. MAIZE. TAMARINDUS INDICA. CROPPING SYSTEMS. YIELDS. GREEN MANURES. FARMYARD MANURE. SOIL FERTILITY.

Maize (cv. KH-517) was grown under seven-year-old tamarind (cv. PKM-1) plantation besides its sale cropping with different integrated nutrient management options viz. application of farm yard manure and subabul (Leucaena leucocephala L.) green leaf manure in conjunction with inorganic fertilizers and also with inorganic fertilizers (NPK) only. Maize dry matter production, yield components, grain yield, harvest index and nutrient uptake were reduced when grown in association with tamarind. Higher dry matter production (7615 kg ha-1), cob length (13.1 em), cob weight (114.1 g), 282 grains/cob, grain weight/cob (63.1 g), grain yield (2819 kg ha-1), harvest index (36.3 %), 117 kg ha-1 Nand 100.2 kg ha-1 K uptake was recorded when maize crop grown as sole cropping. Higher gross return of Rs. 17380 ha-1, net returns of Rs. 9895 ha-1 and benefit cost ratio of 1.32 were found in intercropping situation. Further, application of green leaf manure of subabul with recommended dose of 120 kg N ha-1 resulted dry matter production (7608 kg ha-1), cob length (13.4 em), cob weight (121.2 g), 319 grains/cob, grain weight/cob (67.4 g), grain yield (2728 kg ha-1), stover yield (5081 kg ha-1) harvest index (34.6 %),123.7 kg ha-1 N, 30.8 kg ha-I P and 102 kg ha-1 K uptake along with Rs. 17538 and 9953 ha-1 gross and net return respectively and BC ratio of 1.31 which were significantly higher than application of 120 kg N ha-1 alone through urea or combination of 10 t ha-1 FYM with 120 kg N ha-1 or its lower dose which indicated that organic and fertilizer N combinations reduce the cost of production of maize through minimizing the use of fertilizers which in turn help to sustain the soil health and productivity.

258. Sondhia, Shobha; National Reserach Centre for Weed Science, Jabalpur (India). Persistence and leaching of sulfosulfuron in wheat (Triticum aestivum). Indian Journal of Agricultural Sciences (India). (Jun 2009) v.79(6) p.484-847 KEYWORDS: LEACHING. WHEATS. RESIDUES.

An experiment was conducted during winter season of 2005-06 at Jabalpur to evaluate persistence and leaching of sulfosulfuron in wheat (Triticum aestivum L. emend. Fiori & Paol.) in surface and sub-surface soil under field condition. Sulfosulfuron was applied as post-emergence at 25, 50 and 100 g/ha application rates to control weeds. Initial concentration of sulfosulfuron residues in the surface soil (0-15 cm) were 0.229, 0.967, 1.038 Ilg/g, which dissipated to 0.003,0.002 and 0.005 Ilg/g at 25,50 and 100 g/ha doses, respectively by day 100 day. However, at 0 days after spraying residues in sub-surface soil were 0.136 to 0.012 Ilg/g in 25 g/ha dose, 0.233 to 0.055 Ilg/g in 50 g/ha dose and 0.374, to 0.065 Ilg/g in 100 g/ha dose. Residues were below the detection limit «0.001 Ilg/g) in 25 g/ha. Sulfosulfuron residues were not detected after 200 days in surface and sub-surface soils in all the doses. Residues of sulfosulfuron were significantly higher in surface soil at higher dose as compared to sub-surface soil at lower dose up to 150 days. Sulfosulfuron dissipated at faster rate in 25 g/a dose as

compared to 100 g/ha dose and indicated higher persistence of sulfosulfuron residues in soil at high dose. Results also indicated movement of sulfosulfuron from surface soil to sub-surface soil by irrigation water. Thus there is a risk of groundwater contamination and phytotoxic effect of subsequent crops at higher doses of sulfosulfuron.

P36 Soil Erosion, Conservation and Reclamation

259. Panigrahi, Dwitirkishna; Directorate of CAD and PIM, Dept of Water resources, Bhubaneswar (India). Acharya, Milu; Directorate of CAD and PIM, Dept of Water resources, Bhubaneswar (India). Senapati, Prafulla Chandra; Directorate of CAD and PIM, Dept of Water resources, Bhubaneswar (India). Estimation of Soil Loss from Croplands of Kandhamal Plateau in Orissa. Indian Journal of Dryland Agricultural Reserach and Development (India). (Jun 2009) v.24(1) p.52-56 KEYWORDS: EROSION. UNIVERSITIES. ORISSA. FARMLAND. LAND DEGRADATION.

The soil erosion from croplands of the Kandhamala plateau region of Orissa was determined using the Universal Soil Loss Equation (USLE). The erosivity factor (R) of USLE was found to be very high at 799. About 12627 thousand tonnes of topsoil was found to be lost from the cultivable areas at the rate of94.23 t ha-t, every year. A major percentage (22.66%) of soil loss to the tune of 2861.12 thousand tonnes occurs from the uncovered fallow land alone at the rate of 191.25 t ha-1. Concentrated high rainfall in monsoon period with sufficient surface gradient and uncovered crop fields were observed to be the major causes of land degradation in the area.

260. Mane, M.S.; Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (India). Mahadkar, U.V.; Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (India). Ayare, B.L.; Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (India). Thorat, T.N.; Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (India). Performance of mechanical soil conservation measures in cashew plantation grown on steep slopes of Konkan. Indian Journal of Soil Conservation (India). (Dec 2009) v.37(3) p.181-184 KEYWORDS: SOIL CONSERVATION. RUNOFF. CASHEWS. EROSION CONTROL. EROSION.

An investigation was carried out during 2002 to 2004 at Rukhi watershed of Konkan region of Western Maharashtra, to study the effect of different mechanical soil conservation measures like staggered trenches (3 m x 0.5 m x 0.5 m), half moon terraces (1.50 m dia.), continuous contour trench (0.50 m x 0.30 m), continuous contour trench (0.50 m x 0.60 m) and stone bund. The runoff and soil loss were also recorded. The prominent horticulture crop of cashew (Cv. Vengurla-4) was taken at a spacing of 7 m x 7 m. The vertical interval of 1.5 m was maintained in case of different soil conservation measures while the area of 0.1 ha was maintained under each treatment. The data on average runoff and soil loss during the years 2002 to 2004 on annual basis revealed that runoff (mm) was highest through control treatment (134.97) and lowest in CCT of 0.60 m depth (18.29). The performance of cashew in stone bunding (T6), staggered trenches (T2) and CCT of 0.60 m depth (T5) was superior over rest of the treatments. The treatment of CCT of 0.60 m depth showed its superiority in reducing runoff and soil loss, hence it was recommended as best soil conservation practice on area having 7 to 8 per cent slope in this region.

P40 Meteorology and Climatology

261. Panda, R.K.; Central Soil and Water Conservation Research & Training Institute, Koraput (India). Naik, B.S.; Central Soil and Water Conservation Research & Training Institute, Koraput (India). Gore, K.P.; Central Soil and Water Conservation Research & Training Institute, Koraput (India). Mishra, P.K.; Central Soil and Water Conservation Research & Training Institute, Koraput (India). Jakhar, P.; Central Soil and Water Conservation Research & Training Institute, Koraput (India). Gowda, H.; Central Soil and Water Conservation Research & Training Institute, Koraput (India). Use of probability Distribution models in Rainfall Analysis for Postmonsoon Crop Planning in Eastern ghat Region of Orissa. Indian Journal of Dryland Agricultural Reserach and Development

(India). (Jun 2009) v.24(1) p.75-80 KEYWORDS: RAIN. WATER HARVESTING. WATER MANAGEMENT.

An attempt is made to use selected probability distribution functions for analyzing rainfall of Koraput district of Orissa for judicious crop planning. The data indicated that (1969 - 2007), mean maximum of 391.8 mm rainfall was observed during the month of August, whereas 29th week (July 15 - July 21) experienced maximum of 110.9 mm. Rainfall variability of less than 100% is observed during 26th to 35th and 37th to 39th weeks and similarly during May to October variability remained less than 100% implying uniform wetness period. Three probability distribution models viz. two and three parameter Gamma distribution and Log Pearson Type III functions were found to be best fitted to the weekly, monthly and annually rainfall data series. Two parameter or three parameter Gamma distribution functions were found best fitted to the rainfall data series except January and March and paired t test revealed that there is no difference between the observed and thoretical distributed values. Through water balance analysis, it is found that there is only 4.3 mm rainfall available during Rabi season at 70% probaility level. Thus, judicious planning for conservation of the Rabi crop. An attempt is also made to explore possibility of conserving 50% of surplus rainwater in excavated pond. It is deduced that a suitable combination of crops like wheat + tomato, wheat + potato, tomato + bean and potato + cabbage can be successfully grown by the farmers during rabi season from the harvested water.

262. Kothari, A.K.; Dryland Farming Research Station, Bhilwara (India). Jain, P.M.; Dryland Farming Research Station, Bhilwara (India). Kumar, Virendra; Dryland Farming Research Station, Bhilwara (India). Analysis of weekly rainfall data using onset of monsoon approach for micro level crop planning. Indian Journal of Soil Conservation (India). (Dec 2009) v.37(3) p.164-171 KEYWORDS: RAIN. MONSOON CLIMATE. WATER BALANCE. CROP YIELD.

Information on intervening critical dry spell and availability of surplus water is required for rainwater management in crop planning. Conventionally, probabilities of dry spells are computed for different standard meteorological weeks without consideration of the onset of monsoon in each year and information for crop growth period is assumed based on normal week of onset of monsoon. This approach has been compared with a rational approach called "Onset of monsoon approach" wherein the weekly rainfall data are arranged by considering onset of monsoon as datum in each year. Weekly rainfall data of Bhilwara district in Rajasthan state for a period of 45 years have been used for this analysis. Considerable difference has been observed in the initial and conditional probability of intervening dry spells due to these two approaches but the new approach has been found more rational as compared to conventional approach. Therefore, it has been adopted for analysis of dry spells and availability of surplus water at tehsil level in the district. The onset of monsoon was observed earliest in 22nd week and latest in 31st week in the district. The analysis of dry spells reveals that probability of dry spell is highest (> 75%) during late crop growth period (10th week from onset of monsoon). On the contrary, surplus water (20 mm) is available during initial to mid crop growth season (5th to 9th week of monsoon season). The probability of 100 mm surplus water during crop season ranges from 47 to 96 per cent at Asind and Mandalgarh, respectively. Suitable rainwater management practices and crop planning at micro (Tehsil) level have been suggested for efficient utilization of rainfall.

263. Mishra, Sudisht; North-Eastern Regional Institute of Science and Technology, Itanagar (India). Deodhar, S.V; SSVPS, B.S. Deore College of Engineering Deopur, Dhule (India). Crop water requirement at Narpatganj in Kosi command area of Bihar. Indian Journal of Soil Conservation (India). (Dec 2009) v.37(3) p.175-180 KEYWORDS: WATER REQUIREMENTS. CROPS. EVAPOTRANSPIRATION. BIHAR.

Crop water requirement (CRW) is the depth of water needed to meet the water loss through evapotranspiration (ETc) of a disease free crop, growing in large fields under non-restricting conditions of soil, water and fertility and achieving full production potential under the given growing environment. To estimate ETc, climatological methods

have been suggested by Penman, 1948. Under the present study, evapotranspiration has been computed for agro-climatic conditions of Narpatganj in Kosi command area of Bihar by Penman method modified by Doorenbos and Pruitt (1977) and verified by Penman-Monteith method (Allen et al. 1998). It is observed to be maximum (94.71 mm) during 10th fortnight and minimum (26.52 mm) during 1st fortnight of the year with a variation of 12.88% and 9.34% (Penman-Monteith method) and average variation of 10.21%. Based on FAO guidelines, crop coefficients (Kc) and crop water requirements have also been computed on fortnightly basis for existing and potential crops of the region. Crop coefficient value was maximum (1.18) for wheat crop followed by 1.15 for tomato crop during the first fortnight. Average fortnightly irrigation requirement has been observed to be 27.4 mm/fortnight (maximum) for chilli crop with crop duration extending between 22nd to 5th fortnights. This is based on assured expected fortnightly minimum rainfall at 70% probability level.

264. Pal, D.K.; National Bureau of Soil Survey and Land Use Planning, Nagpur (India). Mandal, D.K.; National Bureau of Soil Survey and Land Use Planning, Nagpur (India). Bhattacharyya, T.; National Bureau of Soil Survey and Land Use Planning, Nagpur (India). Mandal, C.; National Bureau of Soil Survey and Land Use Planning, Nagpur (India). Sarkar, Dipak; National Bureau of Soil Survey and Land Use Planning, Nagpur (India). Revisiting the agro-ecological zones for crop evaluation. Indian Journal of Genetics and Plant Breeding (India). (Nov 2009) v.69(4) p.315-318 KEYWORDS: CROP PERFORMANCE.

Food and nutritional security on sustainable basis are the major challenges of the 21st Century. The domestic production needs to be increased % for cereals and pulses and 0.6% per annum for oilseed to meet the projected demand by the year 2030. The speed of the expansion of irrigation potential of 140 m ha is very tardy at present. Irrigation has been possible in only 83 m ha upto 2005–06. Improving the efficiency of water under rainfed situation holds a promise to increase the productivity. Frontline demonstration results showed a large gap between farmers’ yield and achievable yield. This gap can be filled considerably by adopting a sustainable management approach of natural resources. It requires knowledge of sound agronomic principles, broader understanding of constraints and interaction of biotic and abiotic stresses in developing crop genetic bases for diversifying production while ensuring the efficiency of resource use. Under rainfed conditions, the yield of deep-rooted crops in cracking clay soils (Vertisols) depends primarily on the amount of rain entered and stored at depth in soil profile, and the extent to which this soil water is released during the crop growth. Recent research results obtained at NBSS&LUP [16, 17, 19] indicate that both retention and release of soil water are governed by the nature and content of clay minerals, and also by the nature of exchangeable cations. In arid and semi-arid environment the subsoils become sodic due to accelerated rate of formation and accumulation of pedogenic CaCO3. This process impairs the sHC. Therefore, it has become imperative to revise the AESR boundaries incorporating revised LGP estimates based on soil properties. AESR map is a useful tool to plan the crop suitability based on length of growing period. The revision of LGP estimates involving the influence of drainage related soil properties might provide a better insight into the AESRs. It might also involve revising AESR boundaries to bring the latest soil, climate information generated during the last 20 years.

Q70 Processing of Agricultural Wastes

265. Shukla, Livleen; Indian Agricultural Research Institute, New Delhi (India). Tyagi, S.P.; Indian Agricultural Research Institute, New Delhi (India). Kumar, Jitendra; Indian Agricultural Research Institute. New Delhi (India). Carbon nitrogen and phosphorus dynamics during vermicomposting of paddy straw inoculated with lignocellulolytic fungi. Indian Journal of Agricultural Sciences (India). (Aug 2009) v.79(8) p.658-61 KEYWORDS: CARBON. NITROGEN. PHOSPHORUS. COMPOSTING. ASPERGILLUS AWAMORI. ASPERGILLUS. EISENIA FOETIDA.

Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off farm inputs. Vermicompost was prepared in cemented pits of size 2m×1.5m×1.5 m method using paddy straw as a substrate with Eisenia foetida an efficient earthworm and cellulolytic fungus Aspergillus awamori, a lignocellulolytic fungus was inoculated 300 g/tonne paddy straw to hasten, the composting process and optimum moisture (60 to 70%) was maintained throughout the composting period. The initial C/N ratio 128.6 in uninoculated paddy straw dropped markedly and ranged 51.5 to 15.2 in different treatment after 60 days of composting. Maximum reduction of 16.8% over the initial 48.9% in uninoculated control was observed after 60 days in the treatment where paddy straw was inoculated with a combination of E. foetida and A. awamori whereas the reduction in the control was only 26.8% over initial and 0.38% in uninoculated control. The C/N ratio of paddy straw with E. foetida and A. awamori was observed 15.2 after 60 days which indicated a significant parameter for the maturity of compost. Available P also increased significantly from initial value of 107 ppm in inoculated control to 166.3 ppm in the treatment where paddy straw was inoculated with A. awamori and E. foetida. Therefore realizing the maximum benefits by using A. awamori with E. foetida for making vermicompost with paddy straw as a substrate needs to be adopted. This ecofriendly technology is practically feasible, economically attractive and safe for environment.

266. Narolia, R.S.; College of Agriculture, Rajasthan Agricultural University, Bikaner (India). Poonia, B.L.; College of Agriculture, Rajasthan Agricultural University, Bikaner (India). Yadav, R.S.; College of Agriculture, Rajasthan Agricultural University, Bikaner (India). Effect of vermicompost and inorganic fertilizers on productivity of pearl millet (Pennisetum glaucum). Indian Journal of Agricultural Sciences (India). (July 2009) v.79(7) p.506-509 KEYWORDS: COMPOSTING. FERTILIZERS. PENNISETUM GLAUCUM. PRODUCTIVITY. INORGANIC FERTILIZERS. GROWTH. YIELDS. NUTRIENT UPTAKE. ECONOMICS.

An experiment was conducted during rainy seasons of 2003 and 2004 at college of agriculture, Bikaner to study the effect of vermicompost and inorganic fertilizers on productivity of pearl millet [Pennisetum glaucum (L.) R.Br.Emend stunz]. Results of study revealed that plant height, dry matter accumulation at harvest, total number of tillers at 40 DAS, yield attributes, seed and stover yields, harvest index, nutrient uptake (N, P and K) by grain and stover, net returns and B:C ratio increased significantly due to drilling of vermicompost 2 tonnes/ha over control where as its drilling 1 tonne/ha remain statistically at par with soil incorporation 2 tonnes/ha. Maximum and significantly higher growth parameters, yield attributes, yield, HI, nutrient uptake, net return and B:C ratio were recorded due to application of 90 kg N + 45 kg P205/ha as compared to control (N0Po)-.

267. Jha, M.K.; Uttar Banga Krishi Viswavidyalaya, Pundibari, Coochbehar (India). Jana, J.C.; Uttar Banga Krishi Viswavidyalaya, Pundibari, Coochbehar (India). Evaluation of vermicompost and farmyard manure in integrated nutrient management of spinach (Beta vulgaris var. bengalensis). Indian Journal of Agricultural Sciences (India). (July 2009) v.79(7) p.538-541 KEYWORDS: COMPOSTING. FARMYARD MANURE. NUTRIENTS. SPINACH.

Application of 10 tonnes/ha of vermicompost along with 100% recommended dose of NPK gave the significantly highest value for all growth, green and seed yield and quality parameters of 'All Green' palak (Beta vulgaris var.bengalensis Hort). It gave maximum number of leaves at flower stalk initiation (20.77), fresh green yield (5.45 tonnes/ha), and seed yield (9.60 tonnes/ha). Performance of vermicompost was better in all the cases over the farmyard manure when it was applied alone or combined with 100 or 50% of recommended inorganic fertilizers. Due to high price of vermicompost, the net returns and benefit: cost ratio of the treatments with vermicompost were relatively low in spite of high green and seed yield and gross return when compared with that of

farmyard manure. Application of organic manures in combination with higher levels of inorganic fertilizers increased fresh green yield as well as seed yield/ha. For all cases of yield-attributing parameters sole application of vermicompost also performed better the sole application of farmyard manure.

268. Mahto, T.P.; Tirhut College of Agriculture, Department of Entomology & Agril. Zoology, Muzaffarpur (India). Yadav, R.P.; Tirhut College of Agriculture, Department of Entomology & Agril. Zoology, Muzaffarpur (India). Compatibility of Beauveria bassiana Balsamo with Vermicomposts from Oilcake based feed mixtures. Annals of Plant Protection Sciences (India). (Mar 2010) v.18(1) p.114-117 KEYWORDS: BEAUVERIA BASSIANA. COMPOSTING. ENTOMOGENOUS FUNGI. INSECT DISEASES.

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.

Q80 Packaging

269. Bhuvaneswari, S.; Indian Institute of Horticultural Research, Hessaraghatta (India). Rao, K.P. Gopalakrishna; Indian Institute of Horticultural Research, Hessaraghatta (India). Standardization of corrugated fibre board boxes for packaging and transportation of tomatoes (Lycopersicon esculentum). Indian Journal of Agricultural Sciences (India). (July 2009) v.79(7) p.542-544 KEYWORDS: FIBREBOARDS. PACKAGING. CONTAINERS. TRANSPORT. TOMATOES. ROAD TRANSPORT.

'All Round' tomato harvested in turning stage was packed in 5- and 7-ply corrugated fibre board (CFB) boxes of 3 different sizes, viz. (i) 300 mmx200mmx200 mm, (ii) 300mmx250mmx300mm, and (iii) 400mmx300mmx300mm with 5, 10 and 20 kg capacity having 25 mm diameter 1 hole on each side, respectively. Tomatoes packed in CFB boxes of 5- and 7-ply of size 400 mmx325 mmx250mm showed higher damage (24.35% and 22.35%) compared to (15.04-13.25%) for size 300mmx200 mmx200mm and (18.98-15.65%) for size 300mmx250mmx300mm. In road transportation studies 6% bruising damage and 2% cracking damage were observed in CFB box packed tomatoes while transported in truck covering a distance of 300 km. This study revealed that 7-ply CFB box of 300mmx250mmx300mm size having 10 kg capacity with paper pieces as cushioning material inside could be used for packaging and transportation of tomatoes.

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