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SAMPLE ENTRY

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

2 → author(s)

3 → Title in English

4 → Source

5 → Keywords

6 → Organisation where work was carried out

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

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

A01 Agriculture - General aspects

202 Singh, Aunrudh K.; Maharishi Dayanand University. Rohtak (India). Department of Genetices. Probable agricultural biodiversity heritage sites in India: X. The Bundelkhand region. Asian Agri-History (India). (Jul-Sep 2011) v.15 (3) p.(197-197) KEYWORDS: BIODIVERSITY.

The Bundelkhand region of central India, lying south of the Yamuna river, between the fertile Gangetic plains and the highlands of central Madhya Pradesh and Chhattisgarh, has a unique terrain that has undergone an ecological succession from predominant forestland to grassland, because of acute ecological degradation (deforestation and erosion of top soil). Most people of the region are involved in agriculture or related activities from ancient times. The flora of the region is rich in grasses as well as valuable herbs. To overcome the problems of short rainfall period, and the difficult terrain that limits rainwater harvest, the local people and the successive dynasties of rulers had the foresight of developing suitable structures for rainwater harvesting, including in-situ and ex-situstrategies. In the alleviation of poverty, tackling the problems of low productivity, and in responding to the changing climate and theedaphic scenario, the region can be credited for the successful integration of pastoral economy with traditional agriculture. The region has judiciously exploited the changing climatic patterns toevolve genetic diversity in crop species, suited to the changing scenario. Culturally, the region has a rich heritage and is known for its numerous forts, palaces, and temples. Khajuraho, with a large group of medieval temples exhibiting exquisite and intricate stone sculptures, has been listed as a UNESCO World Heritage Site. For these reasons, the region is being proposed as another National Agricultural Biodiversity Heritage Site, and the present article discusses the supporting features in brief.

203 Bhagowari, Ranjan Raktim; Nagaland University. Medziphema (India). School of Agricultural Sciences and Rural Development. Department of GeneticsChangkija, Sapu; Nagaland University. Medziphema (India). School of Agricultural Sciences and Rural Development. Department of Genetics. Consumable bamboo shoot species and their traditional ways of consumption in the foothills of Dimapur district of Nagaland. Asian Agri-History (India). (Jul-Sep 2011) v.15 (3) p.199-209 KEYWORDS: CONSUMPTION. BAMBOO SHOOTS. HIGHLANDS. NAGALAND.

Since time immemorial, juvenile tender bamboo shoots are being used for consumption in a variety of ways in the Northeastern states of India. The state of Nagaland, which is also a part of Indo-Burma (Myanmar) center of origin of several crops, is rich in bamboo genetic diversity. Diversity in consumable bamboo shoot species is frequently encountered in the state. On the other hand, the discovery of two entirely new bamboo species Bambusa nagalandeana and B. alemtemshii also reflects the rich biological diversity with respect to bamboos in the state. The present survey based investigation was carried out in the foothills of Dimapur district of Nagaland in order to gather information on species level diversity of consumable bamboo shoots together with the traditional consumption methods in the area. It was recorded that in the foothill areas of Dimapur district mostly Dendrocalamus hamiltonii, D. giganteus, D. hookerii, D. sikkimensis, and Melocanna baccifera are utilized for consumption. Moreover to a lesser extent, B. balcooa and B. tulda were also used by the local consumers. Information on traditional consumption methods together with processing, fermentation, and storage of the food products was studied with particular reference to four major Naga tribes of the area – Ao, Sema, Lotha, and Angami. Different types of

fermentation methods recorded in the study reflected the rich knowledge base of the tribes in the safe fermentation of food products. Moreover, different successful storage methods were used by the traditional consumers for off-season consumption. Bamboo shoots are importantsources of a number of dietary nutrients like free amino acids, proteins, carbohydrate, vitamin C, phenolic acids, and phytosterols and also a rich source of dietary fibers. In contrast to all these positive qualities, scientific evidence on presence of a few anti-thyroid compounds in young bamboo shoots has been reported. Research to modify the bad effect of these anti-thyroid compounds is the need of the hour, as bamboo shoots are otherwise good sources of important nutrients.

B50 History

204 Singh, Aunrudh K.; World Noni Research Foundation. Perungudi (India) Petter, PI. World Noni Research Foundation. Perungudi (India) Singh, Kirti. World Noni Research Foundation. Perungudi (India). Noni (Morinada citrifolia) the wonder plant : history and future perspective. Asian Agri-History (India). (Jul-Sep 2011) v.15 (3) p.211-229 KEYWORDS: HISTORY.

Presently the distribution is pantropical. Thought, it is a shy plant, yet it persists well even under adverse conditions. All parts of the plant have traditional and/or modern uses. Roots and bark are for dyes and medicine; trunks for firewood and tools; and leaves and fruits for food medicine. Agriculturally, it is well suited forintercropping within traditional agroforestry subsistence farming systems. A renewed interest in studying botanicals that were used intraditional healing systems has brought Noni in the forefront for further bio-prospecting and use. Scientific studies have shown thatNoni consists of more than 160 phytochemicals with potential to stimulate the immune system, purify the blood, inhibit tumor growth, regulate proper cell function, regenerate damaged cells etc. in light of the developments, the present article discusses in detail, thehistory, botany, origin and distribution, potential use, and future perspective of Noni plant in agriculture as a crop to supplementfood, nutraceuticals for health care and a medicine for curing arange of diseases, and in production of large number of other by-products, thereby increasing farmers' income and human wellness.

205 Shrivastava, Ashok K.; Indian Institute of Sugarcane Research. Lucknow (India). Division of Plant Physiology and BiocheistrySolomon, D.S.; ndian Institute of Sugarcane Research. Lucknow (India). Division of Plant Physiology and Biocheistry. Origin of sugarcane : a Pauranic Perspective. Asian Agri-History (India). (Jul-Sep 2011) v.15(3) p.243-245 KEYWORDS: SUGARCANE. PROVENANCE.

206 Tiwari, Lalit; Ministry of Health & Femily Welfare. Ghaziabad (India). Homoeopathic Pharmacopoeia Laboratory.Pande, P.C.; Kumaon University. Almora (India). Department of Botany. Traditional animal husbandry practices of central Himalaya. Asian Agri-History (India). (Oct-Dec 2011) v.15(4) p.263-281 KEYWORDS: ANIMAL HUSBANDRY. TRADITIONAL FARMING. HIMALAYAN REGION.

Central Himalaya covers the state of Uttarakhand in North India.Livestock occupies a very important in human life in Uttarakhand Himalaya and is an integral part of agriculture-based economy of the state. More than 70% if the rural population of Uttarakhand Himalaya depends upon animals for their economical needs. Majority of the families adopted cattle

and buffalo livestock rearing pattern because these animals were thought to provide direct/indirect income through sale of milk, domestic consumption of milk, and use of dung as farmyard manure. The present paper deals with the traditional animal husbandry practices of Uttarakhand Himalaya.

207 Ahuja, S.C.; CCS Haryana Agricultural University. Kaithal (India). College of Agriculture.Ahuja, Sidharth; New Delhi (India). Vardhman Mahavir Medical College.Ahuja, Uma; CCS Haryana AgriculturalUniversity. Kaithal (India). College of Agriculture. Bottle gourd –history, uses and folkore. Asian Agri-History (India). (Oct-Dec 2011)v.15(4) p.283-302 KEYWORDS: HISTORY.

The bottle gourd (Lagenaria siceraria), belonging to the family Cucurbitaceae, is grown worldwide in the tropical climates of Africa, Asia, the Americas, and Europe Human utilization of the gourd dates back to thousands of years, and it was long prized as a container before the advent of pottery. This paper discusses the history of bottle gourd, as well as its varied functional, ritualistic, and symbolic uses among various tribes in different countries. Its uses range from food and medicine, and as containers, artifacts, andmusical instruments. It has been in use as a vegetable in India since2,000 BCE. It is part and parcel of the culture of the hill tribesKarbi and Jhasi in Assam (India), as it plays a key role of social ceremonies and rites of passage, as also in the offering of rice beer to gods and deities, and to serve guests. The offer and acceptance ofa bottle gourd as a gift is sufficient to declare a couple'sengagement among the Karbis. It forms an integral part and essential evident through the local phrases around the plant. It is a symbol of longevity and good luck in China. The number of decorated bottlegourd containers denotes the social status of a Hausa tribesperson inNigeria, and form an essential or indispensable part of a bride's dowry. The bottle gourd has been for a long time considered as originated and domesticated in Africa. Recent studies have revealed its origin and native home in Asia.

208 Datar, N. Mandar; Agharkar Reserach Institute. Maharashtra (India). Salelkar, D. Prakash; Goa (India). Lakshminarasimhan, P.;Botanical survey of India. West Bangal (India). Central National Herbarium. Eco-traditions of people living around bhagwan mahavir national park in Goa. Asian Agri-History (India). (Oct-Dec 2011) v.15(4) p.303-313 KEYWORDS: NATIONAL PARKS.

Bhagwan Mahavir National Park is the only national park in Goain West India. People living in the vicinity have harmonious relationships with the national park, which is evident from the direct and indirect dependence of people on the park and their urgeto protect the forests. Their culture and traditions have enabled them to protect the ecological endowments. This communication discusses these mutualistic relationships between the people and the antinational park.

209 Shrivastava, K. Ashok; Indian institute of Sugarcane research. Lucknow (India). Division of Plant Physiology and Biochemistry. Sawnani, Anita; Indian institute of Sugarcane research. Lucknow (India). Division of Plant Physiology and Biochemistry.Shukla S.P.; Indian institute of Sugarcane research. Lucknow (India). Division of Plant Physiology and Biochemistry. Sugarcane varieties in ancient India. Asian Agri-History (India). (Oct-Dec 2011) v.15(4) p. 323-325 KEYWORDS: SUGARCANE. VARIETIES.

210 Tiwari, R.S.; Jaipur (India). Recovery from Die-back disease ofa Darjeeling tea clone in organic cultivation. Asian Agri-History (India). (Oct-Dec 2011) v.15(4) p. 327-330 KEYWORDS: DIEBACK. ORGANIC DISEASES. CULTIVATION.

211 Kohli, Y.P.; Gorakhpur (India). Indigenous crop protection practices of Tribes in Arunachal Pradesh. Asian Agri-History (India) . (Oct-Dec 2011) v.15(4) p. 331-334 KEYWORDS: INDIGENOUS KNOWLEDGE. PLANT PROTECTION. ARUNACHAL PRADESH.

F01 Crop husbandry

212 Roy, S; Bangladesh Institute of Nuclear Agriculture,Mymensingh (Bangladesh). Islam, M. A.; Bangladesh Agricultural University, Mymensingh (Bangaladesh) Sarkar, A.; International Center for Agricultural Research in the Dry Areas, New Delhi (India). Malek, M. A.; Bangladesh Institute of Nuclear Agriculture,Mymensingh (Bangladesh). Rafii, M. Y.; University Putra Malaysia, Selangor (Malaysia). Institute of Tropical AgricultureIsmail, M. Y.;University Putra Malaysia, Selangor (Malaysia). Institute of Tropical AgricultureMondal, M. M. A.; Bangladesh Institute of Nuclear Agriculture, Mymensingh (Bangladesh). Agronomic performance of lentil accessions in lentil growing areas of Bangladesh. Legume Research(India). (Dec 2012) v. 35(4) p.303-311 KEYWORDS: LENTILS. GENOTYPEENVIRONMENT INTERACTION. GENOTYPES. BANGLADESH.

Development of high yielding and stable varieties of lentil is akey researchable issue in Bangladesh. In this endeavour, 110 lentil accessions were evaluated during 2006–07 and 2007–08 cropping seasons at Ishurdi and Magura, two representative lentil growing areas in Bangladesh. The analysis of variance showed highly significant differences among genotypes, environments and genotype environments, thus indicating substantial variability among genotypes for days to first Dowering, days to maturity, number of pods per plant and seed yield per plot. Among four environments, Ishurdi 2006–07 was the most fuvorable and Magma 2006–07 was the least yielding. Biplot analysis provided information on wide and specific adaptation. Accessions ILL7656, ILL2532, N1M-134, 40-50134-5, ILL.8605-2 and ILL2581 exhibited higher mean seed yield and performed stability across environments. Accession ILL5150 was the best performer for Ishurdi region and accession ILL4605 was the best performer for Magura region. Considering yield potential, early maturity andwider/specific adaptability, four accessions namely ILL5150, ILL2532,ILL7656 and ILL4605 were identified as the best performer andBLx98006-3 was the earliest. These precious accessions may serve askey donms as parents for use in breeding programmes to develop highyielding varieties or may be used directly as varieties forcommercial cultivation in Bangladesh.

213 Mihailovic, Vojislav; Institute of Field and Vegetable Crops,Novi Sad, (Serbia). Forage Crops DepartmentMikic, Aeksandar;Institute of Field and Vegetable Crops, Novi Sad, (Serbia). Forage Crops DepartmentCupina, Branko; Institute of Field and VegetableCrops, Novi Sad, (Serbia). Forage Crops DepartmentKrstic, Djordje;Institute of Field and Vegetable Crops, Novi Sad, (Serbia). ForageCrops DepartmentAntanasovic, Svetlana; Institute of Field andVegetable Crops, Novi Sad, (Serbia). Forage Crops DepartmentRadojevic , Vuk; Institute of Field and Vegetable Crops, Novi Sad, (Serbia). Forage Crops Department. Forage yields and forage yield components ingrass pea (Lathyrus Satlvus L). Legume Research (India). (Feb 2013) v. 36(1) p.67-69 KEYWORDS: FORAGING. YIELDS. LATHYRUS SATIVUS. LATHYRUS.

Grass pea (Lathyrus sativus L) is a grain and forage legumecrop. A small-plot trial was carried out from 2004 to 2006,comprising ten grass pea accessions from the Annual Forage LegumesCollection of the Institute of Field and Vegetable Crops in Novi Sad,Serbia. PL 114615 had the highest green forage yield (50.7 t ha-1),while Le Cambou had the highest hay yield (9.0 t ha-1). Green forageyield (t ha-1) was highly correlated with number of internodes (T =0.947 and T = 0.820), while hay yield (t ha-1) was highly correlatedwith green forage yields (T = 0.835 and T = 0.898). Grass pea has conside Table potential to produce high yields of green forage andhay under conditions in Serbia, especially its northern province ofVojvodina with its rich chemozem soils.

F04 Fertilizing

214 Kumhar, Mukesh Kumar; S. D. Agricultural University,Banaskantha (India). C. P. College of AgriculturePatel, I.C.; S. D.Agricultural University, Banaskantha (India). C. P. College of Agriculture Ali, Shaukat; S. D. Agricultural University, Banaskantha (India). C. P. College of Agriculture. Integrated nutrient management in clusterbean (Cyamopsis Tetragonoloba L. Taubert). Legume Research (India). (Dec 2012) v. 35(4) p.350-353 KEYWORDS: CYAMOPSIS PSORALIOIDES. VEGETABLE CROPS. UREA. RHIZOBIUM. A field experiment was conducted on loamy sand soil of duringkharif 2008. Among the different treatments, application of 100% RONthrough Urea + Rhizobium + PSB recorded significantly higher plant height at harvest (104.7 cm), number of nodules/plant at 50 DAS (23.5), green weight of nodule/plant at 50 DAS (96.0 mg), number of pods/plant at harvest (31.1), seed yield/plant (10.12 g), 100-seedweight (5.87 g), dry matter/plant at harvest (31.74 g), Seed yield (910 kg/hal and Stover yield (2737 kg/ha), over rest of thetreatments. The highest net return (t9631/ha) and BCR (2.13) wererecorded with the application of 100% RON through Urea + Rhizobium + PSB.

215 Singh, Ravindra; AmarSingh (P.G.) College, Bulandshahr (India). Malik, Jitendra Kumar; AmarSingh (P.G.) College, Bulandshahr (India).Thenua, O.V.S.; National Rsearch Centre on Seed Spices, TabiliAjmer (India).Jat, H.S.; CSSRI, Karnal (India). Effect of phosphorusand bio-fertilizer on productivity, nutrient uptake and economics ofpigeonpea (Cajanus Cajan) + mungbean (Phaseolus Radiatus) intercropping system. Legume Research (India). (Feb 2013) v. 36(1) p.41-48 KEYWORDS: BIOFERTILIZERS. INTERCROPPING. MUNG BEANS. VIGNA RADIATA RADIATA. VIGNA RADIATA. NUTRIENT UPTAKE. PRODUCTIVITY. PHOSPHORUS. FERTILIZATION. FERTILIZERS. CAJANUS CAJAN. CAJANUS. PIGEON PEAS.

Field experiments were carried out from 2005–06 to 2006–07 atLakhaoti, Bulandshahr (U.P.) to evaluate the performance of intercropping system with phosphorus fertilization and bio-fertilizer application. The pigeonpea equivalent yield of 1.45t/ha and 1.75t/ha was recorded in intercropping system over sole pigeonpea (1.24 and 1.48 t/ha) during 2005–06 and 2006–07, respectively. The intercropping of mungbean in pigeonpea gave an additional grain yieldof mungbean 0.24 and 0.26 t/ha, whereas, pigeonpea also producedsimilar yield (1.19 and 1.44 t/ha) in combination during 2005 and 2006 respectively, which resulted in higher pigeonpea equivalent yield over sole crops of both pigeonpea and mungbean. Application of 40 and 80 kg P2O5/ha and inoculation of Rhizobium and Rhizobium + PSBdid not affect the yields of both the crops significantly. Application of 40 and 80 kg P2O5/ha being at par recordedsignificantly higher nutrient uptake (N and P2O5) over no phosphorus in both the crops. Seed inoculation with Rhizobium + PSB recorded significantly higher

nutrient uptake (N and P2O5) over Rhizobium alone and un-inoculation in both the crops. Pigeonpea + mungbeanintercropping system fetched significantly higher net returns (Rs. 19,034 and 23,249/ha) and B: C ratio (2.40 and 2.81) over sole pigeonpea and mungbean during the respective years. The lowest B:C ratio were observed with sole mungbean (1.16 and 1.15) followed by sole pigeonpea (2.13 and 2.55) in the year 2005 and 2006 respectively. Net returns of Rs. 16586 and 19703 were recorded with 40 kg P2O5/ha, whereas, Rs. 16586 and 19703 was observed with 80 kg P2O5/ha. Rhizobium + PSB inoculation recorded higher net returns (Rs. 17953 and 20,901) and B: C ratio (2.37 and 2.63) in both the years.The economic optimum dose of phosphorus was found lower (44.14 and 51.96 kg P2O5/ha)in intercropping system than sole pigeonpea (46.54and 67.02 kg P2O5/ha) during the respective years as pigeonpea getsome mutual cooperation from the intercropped mungbean crop.

216 Kumawat, Pramod Kumar; MPUA&T, Udaipur (India). Rajasthan College of Agriculture, Department of AgronomyTiwari, R. C.; MPUA&T, Udaipur (India). Rajasthan College of Agriculture, Department of AgronomyGolada, Shankar Lal; MPUA&T, Udaipur (India). Rajasthan College of Agriculture, Department of AgronomyGodara, A. S.; MPUA&T,Udaipur (India). Rajasthan College of Agriculture, Department of AgronomyGarhwal, Rajendra Singh; Directorate of Groundnut Research,Junagadh (India) Choudhary, Ramniwas; ARS Anand Agriculture University,Dhandhuka (India). Effect of phosphorus sources, levels and biofertilizers on yield attributes, yield and economics of black gram (Phaseows Mungo L.). Legume Research (India). (Feb 2013) v. 36(1) p.70-73 KEYWORDS: BIOFERTILIZERS. URD. VIGNA MUNGO. PHOSPHORUS. YIELDS.

An experiment was carried out during kharif season of 2009 Itconsisted of thirteen treatment combinations comprising of two phosphorus levels (20 and 40 kg P2O5 ha -1), three phosphorussources (DAP, SSP and PROM), two biofertilizers (PSB and Rhizobium)and one absolute control. The experiment was conducted in factorialrandomized block design and it was replicated three times. Toevaluate the effect of phosphorus sources, levels and biofertilizerson black gram. Among the different sources of phosphorus DAP producesignificantly higher pods plant l (46.02), grain pods -1 (8.20), 1000 grain weight (40.63gm) and seed weight podol (0.83gm), seed (10.20 qha -1), haulm (21.40 q ha -1) and biological (31.61 q ha -1)yields. Further, DAP also recorded highest net returns (Rs. 25112.60ha -1) with benefit cost ratio of 2.77. Similar trend also observedin case of phosphorus levels. Application of 40 kg P2O5 ha -1 gave significantly higher yield attributes, seed (10.65 q ha- 1), haulm(23.00 q ha-1), biological (33.66 q ha -1) yields, net returns (Rs. 26315.54 ha -1) and benefit cost ratio (2.80) over 20 kg P2O5 ha -1 and control. Seed inoculation with PSB markedly enhanced yield attributes, seed yield, (10.11 q ha -1), haulm (20.88 q ha -1),biological (30.98 q ha -1) yields net return (Rs 24529.87 ha -1)with benefit cost ratio 2.65 over Rhizobium and control of black gram. With regards to interaction effects application of 40 kg P2O5 though DAP along with PSB brought significant effect on seed yield onBlack gram.

217 Ramawtar; S.K. Rajasthan Agricultural University,Jobner (India). S.K.N. College of AgricultureShivran, A.C.; S.K.Rajasthan Agricultural University, Jobner (India). S.K.N. College ofAgricultureYadav, B.L.; S.K. Rajasthan Agricultural University,Jobner (India). S.K.N. College of Agriculture. Effect of NP fertilizers, vermicompost and sulphur on growth, yield and quality ofclusterbean [Cymopsis Tetragonoloba (L.)]and their residual effect ongrain yield of

succeeding whea t[Triticumaestivum(L)]. Legume Research(India). (Feb 2013) v. 36(1) p.74-78 KEYWORDS: CYAMOPSISPSORALIOIDES. NPK FERTILIZERS. FERTILIZERS. SULPHUR. COMPOSTING. OLIGOCHAETA. WHEATS. TRITICUM. YIELDS.

A field experiment was conducted during 2004–05 and 2005–06 at Agricultural Research Station, Durgapura, Jaipur to study the effect of NP fertilizers, vermicompost and sulphur on growth, yieldattributes, yield and quality of clusterbean [Cymopsis tetragonoloba (L.) Taub.] and residual effect of NP fertilizers, vermicompost andsulphur on grain yield of succeeding wheat [Triticum aestivum (L.) emend. Bori & Paol.]. Application of NP fertilizers up to 75% of RDF(15 kg N + 30 kg P2O5/ha) recorded significantly higher seed yield, gum content and gum yield by 46.99 and 14.88, 11.06 and 5.26 and63.53 and 20.29 per cent over control and 50% of RDF, respectively.Vermicompost application 2.0 t/ha significantly increased the yieldattributes of clusterbean viz., pods per plant, seeds per pod, pod length and test weight and seed, straw and biological yields ofclusterbean over vermicompost 1.0 t/ha. Further, the successive increase in sulphur up to 40 kg S/ha recorded significantly higher seed and straw yields of clusterbean. The combined application of NP fertilizers 75% of RDF and vermicompost 2.0 t/ha significantly improved the pods per plant and seed yield of clusterbean. The 100% of RDF, vermicompost 2.0 t/ha and sulphur 60 kg S/ha applied toclusterbean recorded significantly higher grain yield of succeeding wheat crop by 21.54, 12.04 and 21.09 over control, respectively.

218 Kumar, Anil; Indian Agricultural Research Institute, New Delhi (India). Division of Soil Science and Agricultural Chemistry Singhal, S.K.; Indian Agricultural Research Institute, New Delhi (India). Division of Soil Science and Agricultural Chemistry Singh, Vinay; Indian Agricultural Research Institute, New Delhi(India). Division of Soil Science and Agricultural Chemistry Kumar, Neeraj; Indian Agricultural Research Institute, New Delhi (India). Division of Soil Science and Agricultural Chemistry Sharma, V.K.; Indian Agricultural Research Institute, New Delhi (India). Division of Soil Science and Agricultural Chemistry. Impact of rock-phosphate enriched pressmud and biogass swrry on yield, hosphorus nutrition and utilization by soybean (Glycine Max) in a typic hapwstept. Legume Research (India). (Feb 2013) v. 36(1)p.79-83 KEYWORDS: BIOGAS. SLURRY. FARMYARD MANURE. PHOSPHORUS. SOYBEANS. GLYCINE MAX.

Rock phosphate enriched biogas slurry and pressmud alone and in combination with DAP in different ratios (1:3, 1:1 and 3:1) on phosphate basis were evaluated in field with soybean cv. DS-9814 at the institute farm on a sandy loam soil during kharif season of the year 2007 in relation to yield, P uptake, P use efficiency by crop and relative agronomic effectiveness. Increasing levels of P, irrespective of P sources (DAP or manures) significantly enhanced thegrain and stover yield and total P uptake by soybean. Among the various ratios of DAP and manures (RPEBGS, RPEPMC and FYM)combination (1:3, 1:1 and 3:1) applied at 80 kg P2O5 ha -1 , 3:1 ratio performed the highest follows by 1:1 ratio in respect of yield and P utilization. The per cent P utilization in 3:1 ratio (DAP+RPEBGS) recorded the highest value 19.09. Among the various P sourcestried, the performance of DAP was the best followed by RPEBGS andRPEPMC in terms of dry matter yield, P uptake and utilization by soybean. Among manures RPEBGS gave higher relative agronomiceffectiveness in terms of grain yield (84.13%) and total P uptake (86%) at 80 kg Pps ha -1 which was further improved with the combinedapplication of DAP and organic source of Pin 3:1 ratio (95.04 and97.7%).

219 Singh, G.P.; ICAR Research Complex for NEH Region, Umiam (India). Singh, P. L.; Nagaland University, Medziphema (India). Panwar, A. S.; ICAR Research Complex for NEH Region, Umiam (India).Seed yield, quality and nutrient uptake of groundnut (ArachisHypogaea) as affected by integrated nutrient management in mid hillaltitude of Meghalaya, India. Legume Research (India). (Apr 2013) v. 36(2) p.147-152 KEYWORDS: GROUNDNUTS. ARACHIS HYPOGAEA. NUTRIENT UPTAKE. RHIZOBIUM. YIELDS. MEGHALAYA.

A field experiment was conducted during khanfseasons of 2005 and 2006 to study the effect of bio-organics and inorganic sources of nutrient supply on quality seed production of groundnut in midhill altitude of Meghalaya. Treatments comprised off our biofertilizers andseven organo-inorganic sources of nutrient supply were tested in split-plot design with three replications. Maximum seed yield and seed quality were recorded with combined inoculation of Rhizobium +PSM followed by individual inoculation of Rhizobium and PSM. Application of lime 500 kg/ha + FYM 10 tonnes/ha + 50% NPK recordedhighest seed yield and seed quality attributes. Seed inoculation withRhizobium + PSM in the presence of lime + FYM and 50% NPK improved seed yield and nutrient uptake of groundnut. Highest net return and benefit cost ratio was observed with combined application ofRhizobium + PSM and lime + FYM + 50% NPK.

220 Aziz, M. A.; SKUAST, Srinagar (India). Krishi Vigyan KendraAli, Tahir; SKUAST, Srinagar(India). Krishi Vigyan KendraAezum, Amees T.; SKUAST, Srinagar (India). Krishi Vigyan KendraChesti, M.H.; SKUAST, Srinagar (India). Krishi Vigyan KendraPeer, Q.J.A.; SKUAST, Srinagar (India). Krishi Vigyan Kendra. Effect of nutrient management on lysine and linoleic acid content of soybean [Glycine Max (L.) Merill]. Legume Research (India). (Apr 2013) v. 36(2) p.158-161 KEYWORDS: BIOFERTILIZERS. LINOLEIC ACID. LYSINE. SOYBEANS. QUALITY. GLYCINE MAX.

A field experiment was conducted at KVK, Srinagar during two consecutive kharif seasons (2008–09 and 2009–10) to study the effect of nutrient management on lysine and linoleic acid content of soybean (Glycine max L). Eghteen treatment combinations viz,thre elevels of recommended fertilizers (50, 75 and 100% RDF) three levels of organic manures (Control, FYM 0 t ha-1 and Dalweed0 t ha-1) and two levels of biofertilizers (Control and dual inoculation with Rhizobium + PSB (phosphate solublising bacteria) in randomised complete block design were replicated thrice. Among inorganic fertilizers lysine content was found significantly superior with the application of 75%recommended fertilizers over other levels, while linoleic acidcontent increased significantly with increasing levels of recommendedfertilizers. Among organic manures, FYM application proved significantly superior to Dalweed. Dual inoculation with Rhizobium+PSB significantly improved the lysine and linoleic acid content ofsoyabean over control.

221 Vekaria, G.B.; Junagadh Agricultural University,Targhadia (India). Dry Farming Research StationTalpada, M.M.; Junagadh Agricultural University, Targhadia (India). Dry Farming ResearchStationSutaria, G.S.; Junagadh Agricultural University,Targhadia (India). Dry Farming Research StationAkbari, K.N.; Junagadh Agricultural University, Targhadia (India). Dry Farming ResearchStation. Effect of foliar nutrition of potassium nitrate on thegrowth and yield of greengram (Vigna Radiata L.). Legume Research (India). (Apr 2013) v. 36(2) p.162-164 KEYWORDS: POTASSIUM. GROWTH. YIELDS. MUNG BEANS. VIGNA RADIATA RADIATA.

A field experiment was conducted during rainy (kharif) season of2000 to 2003 for successive four years to study the effect of foliar nutrition of potassium nitrate (4 levels: 0.2, 0.4, 0.6 and 0.8%) along with water spray (control) on greengram var. K851 on Vertic Ustocrepts soils at Dry Farming Research Station, Targhadia (Gujarat). Foliar application of potassium nitrate was significantly affected the relative water content (RWC) at 10 days after flowering(OAF). The higher values of RWC at maturity, pod growth rate (PGR), crop growth rate (CGR) and partitioning percentage were recorded dueto foliar application of potassium nitrate as compared to water spray only. Foliar application of potassium nitrate 0.4% significantly increased grain yield by 18.4 per cent as compared to water spray only and also gave higher economic benefits of Rs. 2043/ha over that of water spray.

222 Thesiya, N. M.; Navsari Agricultural University, Waghai (India). Krishi Vigyan KendraChovatia, P. K.; Navsari Agricultural University, Waghai (India). Krishi Vigyan KendraKikani, V. L.; Navsari Agricultural University, Waghai (India). Krishi Vigyan Kendra. Effect of potassium and sulphuron growth and yield of black gram [Vigna Mungo (L.) Hepper]under rainfed condition. Legume Research (India). (Jun 2013) v. 36(3) p.255-258 KEYWORDS: URD. VIGNA MUNGO. POTASSIUM. SULPHUR. YIELDS.

An experiment was conducted during the kharif season of the year2003 to study the effect of potassium and sulphur on growth and yield of black gram (Vigna mungo L. Hepper) under rainfed condition. There was a significant effect of potash and sulphur levels on plant height, number of branches per plant, number of pods per plant, length of pod, 100-grain weight, straw yield and grain yield. Significantly the highest grain yield (9.17 q ha -1) and straw (18.28 q ha -1) yield was recorded under 20 kg K2O ha -1 , which was at par with 40 kg K2O ha -1 in case of grain yield. Application of sulphur at 30 kg S ha -1 (S2) registered significantly the highest grain (9.19 q ha -1) and straw (18.06 q ha -1) yield. Combined application of 20 kg K2O ha -1 along with 30 kg S ha -1 recorded significant increase in respect of yield attributes and yield.

223 Sahay, Neha; Raja Balwant Singh College Bichpuri, Agra (India). Department of Agricultural Chemistry and Soil ScienceSingh, S.P.; IARI, New Delhi (India)Sharma, V. K.; Raja Balwant Singh College Bichpuri, Agra(India). Department of Agricultural Chemistry and Soil Science. Effect of cobalt and potassium application on growth, yieldand nutrient uptake in lentil (Lens culinaris. L.). Legume Research (India). (Jun 2013) v. 36(3) p.259-262 KEYWORDS: COBALT. GROWTH. LENTILS. LENS CULINARIS. NUTRIENTS. POTASSIUM. YIELDS.

A field experiment was conducted during rabi seasons of2008–2009 and 2009–10 to study the effect of potassium and cobaltapplication on growth, yield and nutrient uptake in lentil. Theresults revealed that the plant height, branches/plant, dry matteraccumulation, pods per plant, test weight, grain and straw yield oflentil and protein content increased significantly up to 90 kg K2O ha -1 . However, yields at tributes and yield at 60 and 90 kg K2O ha -1were statistically on par. On the other hand, growth and yield attributes and yield (grain and straw) increased up to 4 kg Co ha -1and thereafter, declined at 8 kg Co ha -1 . The protein content in lentil grain improved appreciably when crop was fertilized with 90 kg K2O and 8 kg Co ha -1 over respective controls. The uptake of K and Co in lentil grain and straw increased significantly with increasinglevels of K and Co. The uptake of N and P by lentil grain and strawincreased with graded levels of cobalt up to 4 kg ha -1 . On theother hand, there wasa gradual decrease in S uptake with cobalt levels. Potassium application tended to increase the uptake of N, Pand S by the crop significantly over control.

224 Daur, Ihsanullah; King Abdulaziz University, Jeddah (SaudiArabia). Environment & Arid Land AgricultureTatar, Özgür; KingAbdulaziz University, Jeddah (Saudi Arabia). Environment & Arid Land Agriculture. Effects of gypsum and brassinolide on soil properties, and berseem (Trifolium alexandrinum L.) growth, yield and chemicalcomposition grown on saline soil. Legume Research (India). (Aug 2013)v. 36(4) p.306-311 KEYWORDS: TRIFOLIUM ALEXANDRINUM. BRASSINOSTEROIDS. CROP YIELD. FERTILIZERS. GYPSUM. SALINITY.

This study evaluated the effect of gypsum and brassinolide (Br)application on soil properties and berseem (Trifolium alexandrinum L.) growth and yield during two subsequent growing seasons (2008/09 and 2009/10). A randomized complete block experimental design with a split-plot arrangement was used, where gypsum (0 and 5 t ha-;1) was included as a main-plot factor and Br (0, 0.1, 0.2, and 0.3 mg L-;1 of water) was included as a subplot factor. It was found that gypsum reduced the electrical conductivity (EC) and sodium adsorption ratio (SAR) of the soil, but did not affect soil pH. Both gypsum and Br had a significant effect on leaf chlorophyll, green and dry fodder yield, and the contents of nitrogen, phosphorus, calcium, and crude protein of berseem. However, neither treatment had a significant effect on potassium (K) levels or the neutral detergent fiber (NDF) of berseem. The findings of this study will help to improve the cultivation of berseem in saline soils and may also be applicable to other crops grown under similar conditions.

225 Kumawat, S.R.; S.K.N. College of Agriculture, Jobner (India). Department of Soil Science and Agricultural ChemistryYadav, B.L.; S.K.N. College of Agriculture, Jobner (India). Department of Soil Science and Agricultural Chemistry. Sodicity tolerance of fenugreek (Trigonella foenumgraecum L.) as influenced by application of zinc and vermicompost. Legume Research (India). (Aug 2013) v. 36(4) p.312-317 KEYWORDS: TRIGONELLA FOENUM GRAECUM. FERTILIZERS. COMPOSTING. OLIGOCHAETA. ZINC.

A pot experiment was conducted with fenugreek as test crop in rabi season at 2008–09 to evaluate the effect of different levels of RSC waters viz., 0, 2.5, 5.0 and 7.5 mmoL-;1, zinc viz., 0,10 and 20 mg kg-;1 with and without vermicompost on soil properties, yield of seed and sodicity tolerance of fenugreek. With increasing level of RSC, ECe, OC and DTPA-Zn decreased significantly while, pH and ESP of soil increased significantly. Seed yield decreased significantly with increasing level of RSC and maximum reduction was observed with 7.5 mmol L-;1. The Na/K, Na+ K/Ca and Na/Ca ratios increased while, Ca/Mg ratio decreased significantly in seed. Application of zinc and vermicompsot significantly increased the seed yield, soil DTPA-Zn and organic carbon while, Na/K, Na+ K/Ca and Na/Ca ratios in seed decreased significantly, however, the Ca/Mg ratio increased significantly.

226 Mirshekari, Bahram; Islamic Azad University, Tabriz (Iran). Tabriz Branch, Department of Agronomy and Plant Breeding. Spraying of soybeans with nitrogenous fertilizers at earlier flowering stage: An ecofriendly fertilization management system to improve crop yield. Legume Research (India). (Aug 2013) v. 36(4) p.318-322 KEYWORDS: CHLOROPHYLLS. FERTILIZERS. SOYBEANS. GLYCINE MAX.

The experiment was conducted to study the effect of nitrogenous fertilizers on soybean leaf senescence and crop yield at Islamic Azad University of Tabriz, Iran. The experiment was carried out as a split-split plot based on randomized complete block design in three replications with three treatments viz., two soybean cultivars (L17 and Zan), nitrogen fertilizers (urea and ammonium nitrate) and rate of nitrogen (15, 25 and 35 kg ha-;1). The

stepwise regression analysis was carried out to test the significance of the independent variables affecting the seed yield as a dependent variable. Application of 15, 25 and 35 kg N ha-;1 delayed nearly 2, 6 and 10 days in the leaf fall, respectively. With increasing of nitrogen rate, leaf chlorophyl content index increased significantly, compared to the check plots. Seed yield in cv. L17 treated with nitrate ammonium and cv. Zan treated with urea could be increased upto 6700 and 5100 kg ha-;1, respectively. The multiple regression equation indicated that among the independent variables tested, the leaf senescence time and leaf chlorophyl content index showed a significant positive effect (P 0.05) on seed yield. Soybean farmers could improve seed yield of L17 and Zan cultivars by leaves spraying of 25 kg ha-;1 ammonium nitrate or urea at earlier floweringstage, and consequently reduce nitrogen fertilizer amount, which could prove immensely useful in nutrition management in sustainableagricultural systems.

227 Malik, Jitendra Kumar; Amar Singh (P.G.) College,Lakhaoti (India)Singh, Ravindra; NRC on Seed Spices, Ajmer (India) Thenua, O.V.S.; Amar Singh (P.G.) College, Lakhaoti (India)Kumar,Anil; IASRI, Pusa, New Delhi (India). Response of pigeonpea (Cajanuscajan) + mungbean (Phaseolus radiatus) intercropping system tophosphorus and biofertilizers. Legume Research (India). (Aug 2013) v.36(4) p.323-330 KEYWORDS: CROP MANAGEMENT. CROPPING SYSTEMS.BIOFERTILIZERS. INTERCROPPING. MUNG BEANS. VIGNA RADIATA RADIATA. PHOSPHORUS. PIGEON PEAS.

A field investigation was carried out during the kharif seasonof 2005–06 and 2006–07. Present study revealed that inter cropping ofmungbean did not show adverse effect on the growth attributes, yield attributes and yield of pigeonpea. Phosphorus application 40 and 80 kg P2O5/ha and seed inoculation with Rhizobium and Rhizobium +Phosphorus Solubalizing Bacteria (PSB) significantly improved growthand yield attributes and grain yield of pigeonpea and pigeonpea +mungbean inter-cropping system. Cropping system (intercropping)markedly recorded higher pigeonpea equivalent yield (1451 and 1751 kg/ha) oversole pigeonpea (1235 and 1476 kg/ha) in both the years,respectively. The intercropping of mungbean in pigeonpea did not affect grain yield of pigeonpea (1194 and 1443 kg/ha) and instead gave an additional grain yield of mungbean (237 and 256 kg/ha). Thisadditional grain yield of mungbean along with pigeonpea grain yieldsignificantly produced higher pigeonpea equivalent yield (1451 and1719 kg/ha) oversole pigeonpea as well as sole mungbean. The pigeonpea + mungbean intercropping system recorded significantlyhigher organic carbon in soil over sole pigeonpea. The phosphorus applied to crops markedly enhanced organic carbon, available P and Kcontent of soil after the harvest of pigeonpea and mungbean.

228 Bhattacharjya, Sudeshna; G. B. Pant University of Agriculture &Technology, Pantnagar (India). Department of Soil ScienceChandra, Ramesh; G. B. Pant University of Agriculture & Technology, Pantnagar (India). Department of Soil Science. Effect of inoculation methods of Mesorhizobium ciceri and PGPR in chickpea (Cicer areietinum L.) on symbiotic traits, yields, nutrient uptake and soilproperties.Legume Research (India). (Aug 2013) v. 36(4) p.331-337KEYWORDS: CHICKPEAS. CICER ARIETINUM. INOCULATION. YIELDS.

Inoculation effects of Mesorhizobium ciceri (CH-1233) and PGPR (Pseudomonas sp., LK-884) alone and in combinations with different methods (seed treatment, furrows application by mixing with soil and vermicompost) in chickpea (Cicerarietinum L.) were compared during rabi season of 2008–09 at Pantnagar. Mesorhizobium sp. and PGPR alone

inoculation significantly increased nodule number, by 44.3 and 34.4, nodule dry weight, by 46.1 and 33.2%, and plant dry weight, by 33.6 and 42.4%, over uninoculated control. Their co-inoculantion gave significant increases in nodule number of 16.5% over PGPR alone and in odule dry weight of 36.4% over Mesorhizobium sp. Alone inoculation. This treatment also significantly improved the plant dryweight by 11.5% over Mesorhizobium sp. alone inoculation.Mesorhizobium sp. alone recorded significant increase in grain yield of 11.8% and PGPR alone in grain and straw yields of 15.3 and 14.9%over uninoculated control. Their dual inoculation resulted insignificant increase only in straw yield of 16.6% over Mesorhizobiumsp. alone. Co- inoculation of Mesorhizobium sp. and PGPR also significantly increased N uptake by straw and available P,dehydrogenase activity (DHA) and microbial biomass carbon (MBC) insoil over Mesorhizobium sp. alone inoculation.Inoculants applied in furrows mixing with soil and vermicompost resulted in betternodulation than seed treatment. These treatments also recorded significantly more N uptake of 17.7 and 14.5% and P uptake of 12.5 and 16.0% by straw over seed treatment, respectively. Application ofinoculants in furrows by mixing with soil was better than that mixingwith vermicompost by recording significantly more available P, DHA and MBC in soil than seed treatment.

F06 Irrigation

229 Pranusha; Acharya N.G. Ranga Agricultural University,Tirupati (India). S. V. Agricultural CollegeRajeswari, Raja; Acharya N.G. Ranga Agricultural University, Tirupati (India). S. V.Agricultural CollegeSudhakar, P.; Acharya N.G. Ranga Agricultural University, Tirupati (India). Institute of Frontier Technology, RARS, Latha, P.; Acharya N.G. Ranga Agricultural University, Tirupati(India). S. V. Agricultural CollegeReddy, Mohan; Acharya N.G. Ranga Agricultural University, Tirupati(India). S. V. Agricultural College. Evaluation of groundnut genotypes for intrinsic thermo tolerance under imposed temperature stress conditions. Legume Research (India). (Dec 2012) v. 35(4) p.345-349 KEYWORDS: HEAT. EFFICIENCY.WATER USE. CLIMATIC CHANGE. GREENHOUSE EFFECT.

A field experiment was conducted at Regional agriculturalresearch tation, Tirupati during kharif 2010 with 15 groundnutprerelease and released groundnut genotypes. Thermo tolerance ofthese genotypes across the important growth phenophases were measuredusing reliable traits viz., Relative injury to the cell membranes andChlorophyll fluorescence ratio (Fv/Fm) of photosystem II. The results clearly indicate that groundnut is susceptible to high cellulardamage due to high temperature stress at pod maturity stage compared to the flowering and pegging stages. The genotypes TCGS-991 recorded low mean membrane injury (10.08%), high chloroplast activity (0.540)with highest pod yield of 2037.8 Kg/ha followed by TCGS 969, TCGS1043. These entries possess high potential to maintain themostabiltyunder high temperature conditions and also produced higher pod yield. Among the other entries, Greeshma and TCGS-894 recorded highest thermo stability of cellular membranes and chloroplast activity withmoderate yields. These genotypes can be recommended to hightemperature conditions or may be used as potential donor source in resistance breeding programs for developing varieties in pursuit ofglobal warming.

230 Vijaylaxm; Indian Institute of Pulses Research, Kanpur (India).Division of Basic Science. Effect of high temperature on growth,biomass and yield of field pea genotypes. Legume Research (India). (Jun 2013) v. 36(3) p.250-254 KEYWORDS: IRRIGATION. PEAS. HEAT. MEMBRANES. YIELDS.

A field experiment was conducted during rabi (winter) season of 2008–09 and 2009–10. Fifteen field pea genotypes were sown undernormal and late seeded condition and the crop was irrigated. Crop wasmonitored for membrane stability index at podding, plant height at podding, total biological yield, and seed yield and harvest index.The observed parameters showed significant variation for seedingdates, genotypes and their interactive effects. Under late seeded condition crop was exposed to high temperature during flowering andseed filling stages. Which induced reduction in mean membranestability index (28.8%), plant height (60.2%) total biomass yield(61.7%), seed yield (68.9%) and harvest index (19.3%). The mean yield stability index was 80.7%. On the basis of minimum reduction inobserved traits, genotypes KPF 103, DMR 15, IPFD 4–6, were found tobe having comparatively higher amount of resistance towards high temperature stress. IPFD 99-7, IPFD 3–17, IPFD 2–6, IPFD 1–10, HUDP 16 and DPR 13 were adjudged to moderately resistant for hightemperature stress as they were having more than 75.0% yieldstability index.

F08 Cropping patterns and systems

231 Vijaylaxmi; Indian Institute of Pulses Research, Kanpur(India).Division of Physiology, Biochemistry and Microbiology. Seed yield of mungbean under late seeding: effect of phenological days and drymatier distribution. Legume Research (India). (Dec 2012) v. 35(4)p.332-336 KEYWORDS: MUNG BEANS. VIGNA RADIATA RADIATA. PHENOLOGY. SOWING. SOWING DATE.

In order to ascertain the effect of phenology and dry matter distribution in different plant parts on seed yield of mungbean under late seeding condition, sixteen mungbean genotypes were planted during 2nd week of September and phemology dry matter buildup and itsdistribution amongst plant parts were studied. With correlation and path analysis it was concluded that mungbean yield under late seeding condition is highly influenced by seed filling period and dry matter allocation in leaves during flowering as well at maturity.

232 Azad, M. A. K.; Bangladesh Agricultural University Campus,Mymensingh (Bangladesh). Bangladesh Institute of Nuclear Agriculture (BINA)Alam, M. S.; Bangladesh Agricultural University Campus, Mymensingh (Bangladesh). Bangladesh Institute of Nuclear Agriculture (BINA)Hamid, M. A.; Bangladesh Agricultural University Campus,Mymensingh (Bangladesh). Bangladesh Institute of Nuclear Agriculture (BINA). Modification of salt tolerance level in groundnut (ArachisHypogaea L.) through induced mutation. Legume Research (India). (Jun2013) v. 36(3) p.224-233 KEYWORDS: CROPPING SYSTEMS. WATERRESOURCES. GROUNDNUTS. INDUCED MUTATION. MUTANTS. ARACHIS HYPOGAEA.

Three experiments were carried out in pots under glass houseconditions of Bangladesh Institute of Nuclear Agriculture (BINA) 123.214to assess tolerance levels of groundnut mutant genotypes/mutant varities to salinity stress. The first experiment assessed salinity levels based on reduction in shoot biomass under 8 desi siemen per meter (dS/m) salinity imposed during flowering till harvest stages of 41 mutants, 4 mutant varieties and 5 non mutant varieties including the parent of the mutants and mutant varieties. Based on the result of the first experiment 22 mutants/varieties with higher, moderate and lower shoot biomass reductions were further screened based on pod number and pod weight under the same salinity level and growth stages. t was observed that the mutants and mutant varieties attained different levels of salinity tolerance in contrast to to their parent Dacca-1 which was highly sensitive. From the third experiment, it was also revealed that the tolerant

mutant/variety accumulated increased total sugar contents to that of unstressed control treatment when exposed to salinity stresses during flowering and pod filling stages and free amino acid during pod filling stage, helped maintaining turgor of guard cell and intake of CO2 through opened stomata. This CO2 in presence of undamaged chloroplast helped maintaining photosynthesis and mobilization of assimilates to reproductive organs, particularly kernel. Finally, it was concluded that it is possible to modify salinity tolerance level of a sensitive groundnut through induced mutation by directly irradiating its seed or seeds of mutant(s) derived from it.

233 Mohan, H.M.; University of Agricultural Sciences, Dharwad (India). College of Agriculture, Department of Agronomy Chittapur, B.M.; University of Agricultural Sciences, Raichur (India) Hiremath, S.M.; University of Agricultural Sciences, Dharwad (India). College of Agriculture, Department of Agronomy. Evaluation of ricebean and frenchbean as intercrops with maize under different row proportions in the peninsular region. Legume Research (India). (Aug 2013) v. 36(4) p.338-343 KEYWORDS: CROP MANAGEMENT. CROPPING SYSTEMS. ECONOMICS. INTERCROPPING. RESOURCE MANAGEMENT. VIGNA UMBELLATA.SOYBEANS. YIELDS.

Ricebean and Frenchbean being non-conventional crops in the peninsular region an experiment was conducted to evaluate the possibility of growing these legumes and their suitability for intercropping with predominant cereal, maize in 1:1 and 1:2 row proportions along with recommended check maize + soybean at Main Agricultural Research Station, Dharwad representing Northern transitional zone of Karnataka. Intercropping of maize + frenchbean grown in 1:2 row proportion produced higher maize equivalent yield (8068 kg ha-;1) and assured more income (Rs. 29 054/- ha-;1) while, ricebean was comparable to maize + soybean inproductivity. Maize + soybean had significantly higher protein output(851 kg ha-;1) than other systems. Intercropping of grain legumes also ensured better utilization of resources viz., land, soil moisture, nutrients and light.

F30 Plant genetics and breeding

234 Ram, R.B.; Babasaheb Bhimrao Ambedkar University. Lucknow (India) Lata, Rubee; Babasaheb Bhimrao Ambedkar University. Lucknow (India) Meena, M.L. Babasaheb Bhimrao Ambedkar University. Lucknow (India). Conservation of floral biodiversity of himalayan mountain regions with special reference to orchids. Asian Agri-History (India) . (Jul-Sep 2011) v.15 (3) p.231-241 KEYWORDS: BIODIVERSITY. HIMALAYAN REGION.

India is one of the largest reservoirs of orchid genetic resource in the world. But this genetic wealth of the country isvanishing at an alarming rate due to destruction, and shrinkage of natural habitats. There is immediate need to take up various conservation measures on scientific lines so that these geneticresources of orchids are conserved for utilization in future.

235 Suthar, K. P.; Anand Agricultural University, Anand (India). B.A. College of AgricultureBhatnagar, R.; Anand AgriculturalUniversity, Anand (India). B. A. College of AgricultureShukla, Y. M.;Anand Agricultural University, Anand (India). B. A. College ofAgricultureSuthar, V. P.; Anand Agricultural University, Anand (India). B. A. College of AgricultureKadam, S. D.; AnandAgricultural University, Anand (India). B. A. College of AgriculturePatel, N. J.; Anand Agricultural University, Anand (India).B. A.College of

Agriculture. Genetic diversity assessment in chickpea genotypes using STMS. Legume Research (India). (Dec 2012) v. 35(4)p.285-293 KEYWORDS: CICER ARIETINUM. CHICKPEAS. GENETIC VARIATION.

Sequence Tagged Microsatellite Markers (STMS) were employed toassess the genetic diversity in chickpea (Cicer arietinum L.), the third most important grain legume crop in the world. STMS analysis with eleven microsatellites markers of 24 chickpea genotypes amplified total 49 alleles. The average numbers of alleles per locus was 4.45, whereas effective numbers of alleles was 3.23. The elevenprimer pairs amplified single loci producing a minimum of 3 (NCPGR51)and maximum of 6 (NCPGR41, NCPGR90) alleles. The mean Polymorphic Information Content (PIC) value from all tested microsatellite was 0.68. Highest PIC value (0.77) was observed for two primers viz. NCPGR21 and NCPGR90 but the primer NCPGR90 showed highest Shannon's information index (1.61), hence it was found more informative. The Unweighted Pair Group Method with Arithmetic Averages (UPGMA) based dendrogram showed two major clusters and distinguished all the genotypes. The highest genetic diversity was observed between KAK-2 and Dahod Yellow. The microsatellites could successfully detect intraspecific genetic diversity in chickpea. The divergent genotypes may be further used in breeding programmes.

236 John, K.; Acharya N.G. Ranga Agricultural University, Tirupati (India). Regional Agricultural Research StationReddy, P. Raghava; Acharya N.G. Ranga Agricultural University, Hyderabad (India).Reddy, K. Hariprasad; Acharya N.G. Ranga Agricultural University, Tirupati (India). Regional Agricultural Research StationSudhakar, P.; Acharya N.G. Ranga Agricultural University, Tirupati (India). Regional Agricultural Research StationReddy, N.P. Eswar; Acharya N.G. Ranga Agricultural University, Tirupati (India). Regional Agricultural Research Station. Estimates of genetic parameters for morphological, physiological, yield and yield attributes for moisture stress tolerance in groundnut (ArachisHypogaea L.). Legume Research (India). (Dec 2012) v. 35(4) p.312-319 KEYWORDS: GROUNDNUTS. ARACHIS HYPOGAEA. GENETIC PARAMETERS. GENETICS. MOISTURE CONTENT. YIELDS.

Among parents, TPT-4 showed the highest per se performance for nwnber of well-filled and mature pods per plant, shelling per cent, sound mature kernel per cent, 100-kernel weight, kernel yield perplant and pod yield perplant. The genotypes, ICGV-99029 for number of primary branches per plant, number of secondary branches perplant, transpiration rate, dry haulms yield per plant and harvest index, K-1375 for specific leaf area and water use efficiency and TCGS-647 for specific leaf weight exhibited the highest per se performance. Among Fts, TPT-4 x ICGV-99029 produced more nwnber of primary branches per plant, number of well-filled and mature pods per plant, shelling per cent, dry haulms yield per plant, kernel yield per plant and pod yield per plant. High heritability and high geneticadvance as percent of mean was recorded for number of well-filled and mature pods per plant, high heritability and moderate genetic advance as per cent of mean observed for days to 50% flowering. Moderate heritability and high genetic advance as per cent of mean was showed for water use efficiency and dry haulms yield per plant, whereasmoderate heritability and moderate GAM was recorded for plant height,harvest index and kernel yield per plant and low heritability andmoderate GAM for number of primary branches per plant and stomatalconductance indicating the importance of additive gene effects,selection for such characters may be rewarding.

237 Jain, S. K.; S. D. Agricultural University, Deesa (India).Sorghum Research StationPatel, P. R,; Dantiwada Agricultural University, Radhanpur (India). Dry Land Agricultural Research Station. Stability analysis for seed yield and their component traits in breeding lines of guar (Cyamopsis Tetragonoloba L.). Legume Research (India). (Dec 2012) v. 35(4) p.327-331 KEYWORDS: STATISTICAL METHODS. GENOTYPES. CYAMOPSIS PSORALIOIDES. CYAMOPSIS.

Seed yield performances and stability indices were calculatedfor thirteen genotypes of cluster bean evaluated for two years(2008–09 and 2009–10) at two locations in North Gujarat to identifyphenotypically stable genotypes for seed yield and its component traits. Pooled analysis of variance for stability in the performance of different genotypes of guar were highly significant for all the characters viz., days to 50% flowering, days to 75% maturity, pods per plant, plant height, and seed yield except pod length and seeds per pod. The G X E interaction for all the characters were significant and the significant mean square due to environment (linear) indicated the existence of the real genotypic differences in the characters for regression over the environmental mean. The genotypes namely GAUG-0309, GAUG-0416, GAUG-0513 and GAUG-0522 werefound stable for earliness and they can be directly used for breeding for earliness. For improvement of seed yield, the genotypes viz.,GAUG-0309 and GAUG- 0511 were the most stable under rainfed situation.

238 Kumar, Abhishek; Sam Higginbottom Institute of Agriculture,Technology and Sciences, Allahabad (India). Department of Genetics and Plant BreedingBabu, G. Suresh; Sam Higginbottom Institute ofAgriculture, Technology and Sciences, Allahabad (India). Department of Genetics and Plant BreedingLavanya, G. Roopa; Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad (India). Department of Genetics and Plant Breeding. Character association and path analysis in early segregating population in chickpea (Cicer Arietinuml.). Legume Research (India). (Dec 2012) v. 35(4) p.337-340 KEYWORDS: GENETIC VARIATION. HERITABILITY. GENETIC GAIN. CHICKPEAS. CICER ARIETINUM.

An experiment was conducted to estimate the genetic variability, character association and path analysis in early segregating population in chickpea. High genotypic and phenotypic coefficient of variation was observed for 100 seed weight followed by seed yield/plant and plant height. Hundred seed weight followed by harvest index, pods/plant and seed yield/plant exhibited high estimates of heritability (bs) as well as genetic advance. Correlation coefficient analysis revealed that seed yield/plant exhibited significant and positive correlation with harvest index, 100 seed weight and number of pods/plant at both phenotypic and genotypic level. Directselection for 100 seed weight and number of pods could be helpful inthe improvement of chickpea breeding. Path analysis indicated that plant height, days to 50% flowering and number of pods/plant had high direct effect on seed yield at both phenotypic and genotypic levels.Thus these characters may serve as effective selection criterion for yield improvement in chickpea.

239 Jha, Uday Chand; G.B. Pant University of Agriculture & Technology, Pantnagar (India). Department of Genetics and Plant BreedingSingh, D. P.; G.B. Pant University of Agriculture & Technology, Pantnagar (India). Department of Genetics and Plant BreedingLavanya, G. Roopa; Sam Higginbottom Institute of Agriculture, Technology and Science, Deemed University, Allahabad (India). Allahabad School of Agriculture. Assessment of genetic variability and correlation of important yield related traits in chickpea (Cicer Arietinum L.).

Legume Research (India). (Dec 2012) v. 35(4) p.341-344 KEYWORDS: HERITABILITY. GENETIC VARIATION. CHICKPEAS. VEGETABLES. CICER ARIETINUM. CHICKPEAS.

Thirty chickpea genotypes were studied for seed yield and its components for estimating genetic variability and correlation co-efficient. Analysis of variance for seed yield and its componentshowed significant differences among the genotypes for all nine traits. Highly significant and positive genotypic association betweenprimary branches/plant and pods/plant, plant height and days to maturity, days to maturity and pods/plant, seeds/pod and days to 50% flowering, days to maturity and seed yield/plant and similarly 100 seed weight and seed yield/plant were found. Highly significant and negative genotypic correlation between primary branches/plant and plant height; primary branches/plant and plant width; primary branches/plant and days to 50% flowering; primary branches/plant and days to maturity; plant height and plant width; plant height and pods/plant; seeds/pod and 100 seed weight; days to 50% flowering and 100 seed weight were observed. The correlation between 100 seed weight and seed yield showed highest correlation coefficient 0.681. This 100 seed weight may be an important criterion for seed yield improvement in chickpea.

240 Subbiah, A.; Tamil Nadu Agricultural University,Periyakulam (India). Horticultural College and Research InstitutePrabhu, M.; Tamil Nadu Agricultural University, Periyakulam (India). Horticultural College and Research InstituteRajangam, J.; Tamil Nadu Agricultural University, Periyakulam (India). Horticultural Collegeand Research InstituteJagadeesan, R.; Tamil Nadu Agricultural University, Periyakulam(India). Horticultural College and ResearchInstituteAnbu, S.; Tamil Nadu Agricultural University, Periyakulam (India). Horticultural College and Research Institute. Genetic analysis of vegetable cowpea[Vigna Unguiculata (L.) Walp.]. Legume Research (India). (Feb 2013) v. 36(1) p.1-9 KEYWORDS: ADDITIVES. GENETIC GAIN. HERITABILITY. QUALITY. SEGREGATION. YIELDS. COWPEAS. VIGNA UNGUICULATA.

The present investigation on crop improvement of vegetable cowpea was conducted at Horticultural College and Research Institute,Periyakulam. Among the 24 crosses were made by Line x Tester analysis, 12 elite crosses were advanced to F2 generation to identify the best segregants. Based on the evaluation of F2 crosses, 6 elite crosses were advanced to F2 generation. The genetic analysis of the F2 and F3 segregating generations was attempted by assessing the Pv,Gv, PCv, GCv, h 2 and genetic advance among the segregatingpopulations of F2 and F3. The phenotypic variance and genotypic variance was found high in all the crosses. The cross L5T1 exhibiteda high PCv, GCv, GA and h 2 for number of pods, pod yield, pod length and crude fibre content in both F2 and Fa generations. From thepresent study it was concluded that both additive and dominancevariance control the expression of traits in breeding of vegetable cowpea.

241 Singh, D. P.; R. S. S. and Organic Production Certificatiln Agency, Suratgarh (Indian).Sharma, S. P.; Maharana Pratap University of Agricultureand Technology, Udaipur(India). Department of PlantBreeding and GeneticsLal, Mohan; CSSRI, Karnal (India). Division ofCrop ImprovementRanwah, . B. R.; Maharana Pratap University of Agricultureand Technology, Udaipur (India). Department of PlantBreeding and GeneticsSharma, Vimal; Maharana Pratap University of Agricultureand Technology, Udaipur (India). Department of Plant Breeding and Genetics. Induction of genetic variability for polygenictraits through physical and chemical mutagens in cowpea[Vigna Unguiculata (L.) Walp]. Legume Research

(India). (Feb 2013) v. 36(1) p.10-14 KEYWORDS: GENETIC VARIATION. INDUCED MUTATION. PROTEIN CONTENT. COWPEAS. VIGNA UNGUICULATA.

An investigation was carried out to estimate the geneticvariability induced through physical and chemical mutagens in cowpea.The seed of cowpea variety RC 19 were treated with gamma rays and ethyl methane sulphonate (EMS), in M2 generation indicatingsignificant differences in the mean value of treated population The mean values for plant height, number of primary branches, number of pods, number of grains, 100-seed weight and seed yield reduced significantly with increasing concentration of both the mutagens. Protein content and biological yield increase significantly with increasing doses of both the mutagens. The study revealed that magnitude of phenotypic coefficient of variation was distinctly high for plant height, number. of pods per plant, seed yield per plant, biological yield, harvest index and protein content. Phenotypic coefficient of variation was higher then genotypic coefficient of variation except in protein content for family EMS 0.1%. The gap between GCV and PCV was narrow which reflect lesser degree of environmental influence on the genotypic variability.

242 Saharan, Vinod; M.P. University of Agriculture & Technology,Udaipur (India). Department of Molecular Biology and Biotechnology Meena, Vikas; M.P. University of Agriculture & Technology, Udaipur (India). Department of Molecular Biology and Biotechnology Jain, H. K.; M.P. University of Agriculture & Technology,Udaipur (India). Department of Molecular Biology and Biotechnology Yadav, Ram C.; CCS Haryana Agricultural University, Hissar (India). Deptt. of Molecular Biology and Biotechnology. Stable GUS gene expression in three chickpea varieties viz., pratap-1 dahod yellow and GNG-469. Legume Research (India). (Feb 2013) v. 36(1) p.15-20 KEYWORDS: AGROBACTERIUM. AGROBACTERIUM TUMEFACIENS. EPICOTYLS. CHICKPEAS. CICER ARIETINUM.

High frequency stable GUS gene expression has been achieved in three chickpea varieties. Standardized regeneration protocol from epicotyl explant has been used for regeneration of transformed GUSexpressing shoots of chickpea. Agrobacterium tumefaciensstrain EHA 105 containing vector pCAMBIA 2301 and strain LB 4404 harboring pBI121 were used in present study. Infection time (15 min.),co-cultivation duration (72 hrs.), acetosyringone (200 µM) were found to be optimum for transient and stable GUS gene expression via pCAMBIA vector. Maximum percentage of stable GUS gene expression was recorded 33.3% in microshoots of Pratap-1, followed by 19.0% inmicroshoots of GNG-469. Efforts have been made to perform PCR for regenerated microshoots to confirmed stable GUS and npt-II geneintegration in transformed microshoots. Present protocols developed for popular local varieties of chickpea can be used for transfers of genes for varietal improvement programme.

243 Singh, VIjayata; CCS Haryana Agricultural University, Hisar (India).Yadav, Ram Kumar; CCS Haryana Agricultural University, Hisar(India).Yadav, Rajesh; CCS Haryana Agricultural University, Hisar (India).Malik, R. S.; CCS Haryana Agricultural University, Hisar (India).Yadav, Neelam R.; CCS Haryana Agricultural University, Hisar (India).Singh, Jogendra; Central Soil Salinity Research Institute, Karnal (India). Stability analysis in mung bean[vigna radiata (L) wilczek]for nutritional quality and seed yield. Legume Research (India). (Feb 2013) v. 36(1) p.56-61 KEYWORDS: IRON. MUNG BEANS. VIGNA RADIATA RADIATA. SEED. STABILITY. ZINC.

Pooled analysis ofvariance indicated highly significantdifferences for genotypes (G), environment (E) and G X Einteraction. The partitioning of Gx Einteraction into linearand non-linearcomponents indicated that both predictable and llllpredictable components shared the interaction. Three stabiliyparameters (Mean, b and S2di) were computed to judge the suitable and superior genotype.The deviation from regression for majority of thegenotypes was highly significant revealing the unpredictable response of these genotypes and better suitability for sites with better environments. On the basis of these parameters, three genotypes MH565, SML 668 and ML 776 with higher performance for seed yield, protein, iron and zinc content and highly significant deviation from linearity may be recommended for better environment.

244 Adesoye, A. I.; University of Ibadan, (Nigeria),Department of BotanyOgunremi, C.O.; University of Ibadan, (Nigeria), Department of BotanyAina, O.O.; Joseph Ayo BabalolaUniversity, (Nigeria). Department of Crop Science and Production. Genetic variation and heritabiuty of seedung traits in african locust bean-parkla biglobosa (Jacq.) r.br. ex g. don. LegumeResearch (India).(April 2013) v. 36(2) p.89-97 KEYWORDS: ECOTYPES. GENETIC VARIATION. HERITABILITY. STATISTICAL METHODS. CAROBS. SOWING. PARKIA BIGLOBOSA. PARKIA.

Twenty nine accessions of Parkia biglobosa collected across seven agro-ecological zones of Nigeria were studied for genetic variability, correlation and principal component analysis forthirteen important seedling traits. These were also classified using cluster analysis. Wide variations were observed for all the characters indicating diverse geneticnature of the base population. The traits had high genotypic and phenotypic coefficient of variation. The estimates of PCV were higher than for GCV and ECV for nine characters, suggesting that these characters were relatively much influenced by the environment. High GCV estimates were observed for number of secondary leaves (NSL), average plant height (PH), and root fresh weight (RIW). Heritability was generally low with only NSland PH having above fifty percent. These traits also had very high genetic advance values indicating that they are under the control of additive gene effects and may assist in identification of superior genotypes at early seedling stage. Significant positive correlationwas found between PHand Cataphyll length (CL); also between CL,Number of leaves (NL), Number of primary leaves (NPL), and NSL The first four principal components accounted for 84.55% of the total variation. Cluster analysis based on PCA grouped accessions into three clusters. Cluster 1 comprised of accessions predominantly from the Derived Savanna. Clusters 2 and 3 had a mixture of accessions from various zones.

245 Punia, S.S.; Agricultural Research Station, Ummedganj (India). Ram, Baldev; Agricultural Research Station, Ummedganj (India). Koli, N.R.; Agricultural Research Station, Ummedganj (India). Ranwha, B.R.; Agricultural Research Station, Ummedganj (India). Maloo, S.R.; Agricultural Research Station, Ummedganj(India). Genetic studies in relation to yield and its components in field pea (Pisum Satlvum L.). Legume Research (India). (April 2013) v. 36(2) p.98-104 KEYWORDS: PEAS. PISUM SATIVUM. GENES. YIELD COMPONENTS.

The experimental material comprised 21 hybrids generated bycrossing seven diverse varieties of field pea (Pisum sativum L) indiallel mating design. The set of 21 hybrids and parents were evaluated inrandomized block design with three replications to study the gene action foryield and its attributing traits. The component analysis indicated preponderanceof non-additive gene action in the inheritance of aD the traits studied. Thevalue of H2/4H1 was

less than .25 for all thecharacters studied indicating the asymmetrical distribution of positive andnegative alleles in the parents. The ratio(4DH1) 0.5 +F/(4DH1) 0.5 -F was greaterthan unity for days to flowering, days to maturity, number of pods per plant,number of seeds per pod, seed yield per plant and harvest index indicatingpresence of excess of dominant genes in the parents. The graphical analysisindicated importance of partial dominance and positions of parental arrays inthe graphs were scattered suggesting parental diversity for the various traits studied.

246 Pratap, Aditya; Indian Council of Agricultural Research, New Delhi (India). Gupta, Debjyoti Sen; Indian Council of Agricultural Research, New Delhi (India). Singh, B.B.; International Center for Agricultural Research in the Dry Areas, Syria (Syria). Kumar, Shiv; Indian Institute of Pulses Research, Kanpur (India). Division of Physiology, Biochemistry and Microbiology. Development of super early genotypes in greengram [Vigna Radiata (L.) Wilczek]. Legume Research (India). (April 2013) v. 36(2) p.105-110 KEYWORDS: GERMPLASM. MUNG BEANS. VIGNA RADIATA RADIATA. GENOTYPES.

Greengram [Vigna radiata (L) Wilczek] also known as mungbean in South Asia, is an important pulse crop of the Vigna group. Among the major production constraints, terminal heat stress during summer season and pre-harvest sprouting during rainy season considerably reduce its productivity. If the crop duration of greengram is shortened by 10–15 days without significant yield penalty, the losses caused by these stresses can be avoided in its major production base. Two extra short duration genotypes of greengram were developed at Indian Institute of Pulses Research, Kanpur which matured significantly early (45–48 days) during summer as well as rainy seasons as compared to 60–65 days of the earliest maturing check varieties (PDMI39 and Sona Yellow). The genotype IPM 205-7 was developed from the cross ‘IPM 2–1 x EC 398889'and IPM 409-4from lsquo;PDM 288 x IPM 3– 1' following the pedigree method of selection. Both the genotypes showed resistance to mungbean yellowmosaic India virus (MYMlV) and have been registered with NBPGR asINGR11043 and INGR11044, respedively. The major morphologicalcharacteristics of these genotypes are short and erect plants, dark green ovate leaves, light yellow flowers, small black pods onmaturity, and shining green seeds. These genotypes can be directly released as cultivars after their adaptation test and can also be useful donors for earliness and MYMIV resistance.

247 Vishnuvardhan, K. Mohan; Regional Agricultural Research Station, Tirupati (India). Dept. of Genetics and Plant BreedingVasanthi, R.P.; Regional Agricultural Research Station,Tirupati (India). Dept. of Genetics and Plant BreedingReddy, K. Hariprasad; Regional Agricultural Research Station, Tirupati(India).Dept. of Genetics and Plant Breeding. Genetic variability studies for yield, yield atiributes and resistance to fouar diseases in groundnut (Arachis Hypogaeal). Legume Research (India). (April 2013) v. 36(2) p.111-115 KEYWORDS: GENETIC VARIATION. HERITABILITY. GENETIC GAIN. GROUNDNUTS. ARACHIS HYPOGAEA.

Eight parents and their 28 cross combinations (crossed in an 8 X 8 diallel fashion without reciprocals) of groundnut were evaluated in randomized block design with three replications for variability, heritability and genetic advance during kharif 2009. Observations on sixteen characters were recorded. Analysis of variance revealed highly significant differences among the genotypes for all the characters studied. High GCV accompanied by high heritability and high GAM were obtained for number of secondary branches per plant,percentage of leaves affected by foliar diseases per plant and numberof immature pods per plant indicating

predominant role of additivegene action and amenability for phenotypic selection in early generations. Rust severity, number of mature pods per plant and pod yield per plant recorded high GCV and moderate heritability and GAM. Moderate Gcv, moderate to low heritability and GAM were registered for number of primary branches per plant, kernel weight per plant,shelling out-tum, late leaf spot and harvest index indicating that additive and non-additive gene actions have a role in theirinheritance and phenotypic selection would be effective to someextent. Days to 50 per cent flowering, days to maturity, plant height at harvest and sound mature kernel percentage recorded low GCV, high to moderate heritability and low GAM indicating larger role of non-additive gene action and selection would be effective in later segregating generations.

248 Akram, Mohd; Indian Institute of Pulses Research,Kanpur (India). Division of Crop ProtectionNaimuddin; Indian Instituteof Pulses Research, Kanpur (India). Division of Crop Protection. Coat protein gene sequence based diagnosis of groundnut bud necrosis virus infection in rajmash. Legume Research (India). (Apr 2013) v. 36(2)p.138-141 KEYWORDS: GENES. GROUNDNUTS. ARACHIS HYPOGAEA. MICROBIAL PROTEINS. NUCLEOTIDE SEQUENCE.

A disease of rajmash characterized by chlorotic spots with irregular margins, veinal necrosis and slight distortion of leaf lamina was observed during post-rainy season (rabi) of 2009–10, 2010– 1 and 2011–12. Plants infected at early stage remained stunted and finally collapsed. Disease incidence was between 4–5% indifferent fields. The causal virus was successfully sap transmitted from field infected plants to healthy plants of rajmash. The identity of the virus as Groundnut bud necrosis virus (GBNV) was confirmed byreverse transcription-polymerase chain reaction using primer pair(HRP26/HRP28) specific to the coat protein (CP) gene of the GBNv. Complete CP gene of rajmash isolate of GBNV was 831 nucleotides long.Sequence analysis of the CP gene revealed that the rajmash isolateunder study (JN662492) shared maximum identity (98%) at both nucleotide as well as amino acids levels with GBNV-[Mung_ND] (AY871098) and GBNV-[Hya_Mah] (AY882004). The phylogenetic relationship analysis revealed that the present isolate of GBNVclustered with other isolates of GBNV. Thus, the virus causing disease in rajmash at Kanpur was identified as an isolate of GBNV and has been designated as GBNV-[Frb-KNP]. Full sequence of the CP gene of GBNV isolate infecting Phaseolus vulgaris is being reported here for the first time.

249 Mondal, M. M. A.; University Putra Malasia, Serdang (Malasia). Puteh, A. B.; University Putra Malasia, Serdang (Malasia). Malek, M. A.; Bangladesh Institute of Nudear Agriculture,Mymensingh (Bangladesh). Kahir , A.K.M. Rafayatul; Bangladesh Institute of Nudear Agriculture, Mymensingh (Bangladesh). Floweringpattern and reproductive efficiency in lentil. Legume Research (India). (Apr 2013) v. 36(2) p.153-157 KEYWORDS: FLOWERING. LENTILS. LENS CULINARIS. REPRODUCTIVE PERFORMANCE. YIELDS.

An experiment was conducted to investigate flower production, flowering pattern, reproductive efficiency and their relationship with seed yield in fifteen lentil mutants/cultivars. The experimentwas laid out in a randomized complete block design with three replicates. Results of the study revealed that the high yielding genotypes produced higher number of flowers, having longer flowering duration than the low yielding ones. It was also appeared that thehigh yielding genotypes had higher rate of flower production than the low yielding ones. However, low yielding genotypes had higher reproductive efficiency than high yielding ones with few exceptions. Seed yield had significant positive

correlation with pod and flower number whereas negative relation was noted with reproductive efficiency. This aspect may be considered for future plant breeding programme of lentil yield improvement.

250 Sharma, H. K.; G. B. Pant University of Agriculture andTechnology, Pantnagar (India). Department of Genetics and Plant BreedingSingh, D. P.; G. B. Pant University of Agriculture andTechnology, Pantnagar (India). Department of Genetics and PlantBreedingKumar, Arvind; G. B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Genetics and PlantBreedingShrotria, P.K.; G. B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Genetics and Plant Breeding. Evaluation of F4 progenies emanated from an interspecifichybridization of mungbean and blackgram. Legume Research (India). (Jun 2013) v. 36(3) p.191-199 KEYWORDS: VEGETABLE LEGUMES. MUNG BEANS. VIGNA RADIATA RADIATA. PROGENY.

A total of 100 F4 progenies (87 mungbean type and 13 blackgram type) of a wide cross between mungbean (cv BDYR-1) and blackgram (cv DPU 88-1) were evaluated in augmented block design. A wide spectrum of variability was observed for all the characters except for days tofirst flower. Progeny No.70 was significantly superior over best check for days to first flower, pods/cluster, pod length and seeds/pod. Character association unveiled highly significant and positive association of grain yield with pods/cluster and pods/plant. Metroglyph and index score analysis broadly divided 100 progenies into nine groups across pods/plant and grain yield/plant. Maximumnumbers of progenies (60) and maximum variability for different yieldcontributing characters were found in fifth group. Based on SDS –PAGE analysis dendrogram divided 33 genotypes (31 progenies and two parents) into eleven clusters at 85% similarity and the Jaccard's similarity coefficients ranged from 0.26 to 0.96.

251 Singh, Vinod; NDUAT, Faizabad (India). Department of Geneticsand Plant BreedingSingh, R. J.; NDUAT, Faizabad(India). Department ofGenetics and Plant BreedingChauhan, M. P.; NDUAT, Faizabad (India). Department of Genetics and Plant Breeding. Combining ability analysis for some agronomically important traits in pea under disease protected and unprotected conditions. Legume Research (India). (Jun 2013) v. 36(3) p.200-207 KEYWORDS: PLANT DISEASES. COMBINING ABILITY. KIDNEY BEANS. PEAS. PISUM SATIVUM. PEAS.

The combining ability analysis of sixty F1s in fieldpea between 20 lines and 3 testers alongwith their parent indicated revealed non additive gene action for seed yield and other agronomic charactersstudied, both under disease protected and disease unprotected experimentation in fieldpea. The parents PG-3, EC-324110, TARA, NIC-11236, HFP-4, Pant P-5, Pusa-10 and HUDP-15 were identified as promising genotype for hybridization programme. EC-324110 x Rachna for disease protected condition and NIC-11236 x HUDP-15 for disease unprotected condition where as HFP-4 x LFP-326, both for the above conditions appeared the best cross combination for seed yield per plant and other yield attributes.

252 Suneetha, N.; Acharya NG Ranga Agricultural University, Tirupati (India). Regional Agricultural Research StationVasanthi, R. P.; Acharya NG Ranga Agricultural University, Tirupati (India). Regional Agricultural Research StationSudhakar, P.; Acharya NG RangaAgricultural University, Tirupati (India). Regional Agricultural Research StationReddy, K. Raja; Acharya NG Ranga Agricultural University, Tirupati (India). Regional Agricultural Research Station.Genetic diversity analysis among released and pre-release cultures in

groundnut. Legume Research (India). (Jun 2013) v. 36(3) p.208-213 KEYWORDS: GROUNDNUTS. ARACHIS HYPOGAEA. NUTS. YIELDS.BIODIVERSITY.

Diversity analysis among released/prerelease groundnut cultures was carried out to assess the genetic relationship which helps in thedocumentation of the differences in the context of intellectual property rights and to identify diverse parents for use in hybridization programme for improvement of yield and other desirable traits i.e. drought resistance and foliar disease resistance etc. Twentynine released and pre-release groundnut genotypes were grown during kharif season with protective irrigation in randomized block design with three replications. Data on morphological, yield and yield attributes were recorded. Diversity was analysed throughMahalanobis's D2 analysis. Twentynine genotypes were grouped intonine clusters.Clustering pattern showed relationship with pedigree and place of breeding. Maximum contribution to diversity was by harvest index, days to emergence and length of main axis and minimum contribution was by number of mature pods per plant.

253 Jayamani, P.; Tamil Nadu Agricultural University,Coimbatore (India). Department of Pulses, Centre for Plant Breeding and GeneticsSathya ,M.; Tamil Nadu Agricultural University,Coimbatore (India). Department of Pulses, Centre for Plant Breedingand Genetics. Genetic diversity in pod characters of blackgram (VignaMungo l. Hepper). Legume Research (India). (Jun 2013) v. 36(3) p. 220-223 KEYWORDS: URD. VEGETABLE LEGUMES. BIODIVERSITY. VIGNA MUNGO. GENOTYPES.

Blackgram (Vigna mungo L. Hepper) is an important pulse crop, which is widely cultivated and consumed in India. Utilization of divergent parents in hybridization results in promising recombinants. Divergence analysis among fifty genotypes for pod characteristics was carried out using Mahalanobis D2 statistics. The genotypes were grouped into 10 clusters. The contribution of number of pods per plant was the maximum (25.71%) followed by pod length (21.63%). Themaximum intercluster distance was observed between cluster I and X(D2 = 325.96). The maximum intracluster distance was reported in cluster I (D2 = 8.11). Based on cluster mean and divergence, it wasconcluded that the hybridization between genotypes in cluster I (P 9,P 133 and P 133/3) and X (P 133/83) could produce desirablerecombinants for grain yield.

254 Valenciano, J.B.; University of León, León (Spain). Department of Agrarian Engineering and SciencesBoto, J.A.; University of León,León (Spain).Department of Agrarian Engineering and SciencesReinoso, B.; University of León, León (Spain). Department of Agrarian Engineering and SciencesMarcelo , V.; University of León,León (Spain). Department of Agrarian Engineering and Sciences. Agromorphological characterisation and preliminary evaluation of chickpea (Cicer Arietinum L.) conserved on farms in León province (Spain). Legume Research (India). (Jun 2013) v. 36(3) p.245-249 KEYWORDS: PLANT ANATOMY. PLANT HABIT. HARVEST INDEX. CHICKPEAS. CICER ARIETINUM. CHICKPEAS. YIELDS.

Chickpea is a traditional crop in the province of León (north-west Spain), where there are a wide range of cultivatedvarieties which are considered heterogeneous mixtures of genotypes.The aim of this research was to conduct a morphological andagricultural assessment of 119 chickpea ecotypes. The study was carried out in 2009 and 2010, using chickpeas collected in 2008 fromtraditional farms in the province of León. The results obtained showed differences in growth habit and plant height, as well as in seed characteristics and in yields. This preliminary assessment hasenabled us to select 9 ecotypes presenting exceptional yield,aptitude for mechanisation and/or grain characteristics.

255 Ceyhan, Ercan; Selçuk University,Konya (Turkey). Department ofField Crops, Faculty of AgricultureKahraman, Ali; Selçuk University,Konya (Turkey). Department of Field Crops, Faculty of Agriculture. Genetic analysis of yield and some characters in peas. Legume Research (India). (Aug 2013) v. 36(4) p.273-279 KEYWORDS: PEAS. VEGETABLES. PISUM SATIVUM. YIELDS. GENETIC PARAMETERS.

In this research, the genetic structure was investigated byusing the Jinks-Hayman analysis type in terms of agronomicalcharacteristics of the parents and their crosses which were evaluatedfrom 5 X 5 reciprocal diallele pea population. The means of investigated characteristics was done by using variance. According tothe results of diallele analysis, the variance of additive gene wasfound nonsignificant for all the investigated characteristics. Thevariance of dominance was found significant for all thecharacteristics except 100 seed weight. There were the effect ofdominance for all the characteristics in accordance with D-H1difference. Genetic variance components inpopulation and interjacentrate estimating and regression graphic analysis for Wr and Vr values were made for whole characteristics. The analysis for some agronomic characteristics showed that the population had a sufficient level ofgenetically variation. Additionally, the recessive genes had more effects on plant height and seed per plant, dominant genes had moreeffects on number of pods, seed per pod, 100 seed weight and seedyield in population.

256 Hariprasanna, K.; Directorate of Groundnut Research, Junagadh(India). Lal, Chuni; Directorate of Groundnut Research, Junagadh (India). Radhakrishnan, T.; Directorate of Groundnut Research, Junagadh (India). Gor, H.K.; Directorate of Groundnut Research, Junagadh (India) Chikani, B.M.; Directorate of Groundnut Research, Junagadh (India). Performance of confectionery groundnut cultures of ICRISAT at Junagadh, India. Legume Research (India). (Aug 2013) v. 36(4) p.280-283 KEYWORDS: PLANT NUTRITION. GROUNDNUTS. ARACHIS HYPOGAEA. CONFECTIONERY. LIPID CONTENT.

Development of genotypes suitable for confectionery purposes is one of the important breeding objectives in groundnut. Various physical and chemical traits apart from nutritional factors of the groundnut seed determine the confectionery quality and identification of appropriate donors is a pre-requisite. Seventeen confectionery type groundnut selections developed at ICRISAT were evaluated for twoyears to identify superior genotypes with better performance todifferent traits at Junagadh conditions for the next cycle ofcrossing programme.Genotypes ICGV 90212 and ICGV 97051 were found promising for kernel yield. For improvement of seed size ICGV 91089,ICGV 90210 and ICGV 91099 can act as donor parents, while ICGV 89214 can contribute to seed size improvement coupled with higher yield.

257 Li, Y.S.; University of the Chinese Academy of Science,Beijing (China) Du, M.; Chinese Academy of Sciences, Harbin(China). Northeast Institute of Geography and Agroecology, Key Laboratory ofMollisol AgroecologyZhang, Q.Y.; Chinese Academy of Sciences,Harbin(China). Northeast Institute of Geography and Agroecology, Key Laboratory of Mollisol AgroecologyHashemi, M.; University ofMassachusetts, Amherst(USA). Stockbridge School of AgricultureLiu, X.B.; Chinese Academy of Sciences, Harbin(China). Northeast Institute of Geography and Agroecology, Key Laboratory of Mollisol Agroecology Hebert, S.J.; University of Massachusetts, Amherst(USA). Stockbridge School of Agriculture. Correlation and path coefficient analysis foryield components of vegetable soybean in north-east China.

LegumeResearch (India). (Aug 2013) v. 36(4) p.284- 288 KEYWORDS: VARIETIES. SOYBEANS. GLYCINE MAX. YIELDS. CHINA.

Correlation coefficients and path coefficients of fresh podyield and yield components of vegetable soybean were investigated in2010.Thirty vegetable soybean genotypes were grown at the rate of 28plants m-;2 in a randomized complete block design with threereplications in field condition in Northeast China. The results showed that fresh pod yield was positively correlated with 3-seed pod per plant (0.81%), 2-seed pod per plant (0.76%), 2-seed pod width(0.59%) and 100-fresh seed weight (0.47%), and negativelycorrelated with plant height (-0.75%) and 2-seedpod length(-0.64%). Path coefficient analysis also revealed that 3-seedpod per plant (0.58) had the greatest direct positive effect on fresh pod yield, followed by 2-seed pod per plant (0.56), 2-seed pod width(0.31), and 100 fresh seed weight (0.23), whereas plant height(-0.36) and 2-seed length (-0.35) had negative directeffect on fresh pod yield. It was concluded that more considerations should be given to the number of seed pod per plant, 2-seed pod width, 100-fresh seed weight, plant height, and 2-seed pod length when selecting higher fresh pod yield of vegetable soybean.

258 Choudhary, Sharda; National Research Centre on Seed Spices,Ajmer(India). Meena, R.S.; National Research Centre on Seed Spices,Ajmer(India)Singh, Ravindra; National Research Centre on Seed Spices,Ajmer(India). Vishal, M.K.; National Research Centre on Seed Spices, Ajmer(India). Choudhary, Vibha; National Research Centre on SeedSpices, Ajmer(India.) Panwar, Alka; National Research Centre on Seed Spices, Ajmer(India). Assessment of genetic diversity among Indian fenugreek (Trigoiella foenum-graecum L.) varieties usingmorphological and RAPD markers. Legume Research (India). (Aug 2013) v. 36(4) p.289-298 KEYWORDS: GENETIC MARKERS. RAPD. TRIGONELLAFOENUM GRAECUM.

The study was conducted to reveal genetic variability among the released varieties of fenugreek from different regions of India using morphological and molecular markers. Seventeen varieties were evaluated for important characteristics like plant height, test weight, total weight, yield per plant, pod length, pod per plant, pod per axis, petiole length and 50% flowering. In this study, Random Amplified Polymorphic DNA (RAPD) markers were used to assess genetic diversity wherein fifteen polymorphic primers showed a 57.66% polymorphism. All the varieties were classified into two major clusters viz., cluster-Iand cluster-II, cluster-Iis further divided into five sub clusters containing twelve varieties namely Hisar Suvarna, Hisar Sonali, Rajendra Kranti, Hisar Mukta, Hisar Madhavi, AM-2, GM-2, AM-1, Azad Methi, CO-2, RMT-143 and RMT-351 showing genetic similarity irrespective of their geographical distribution. Cluster-II contains five varieties viz., Lam Selection, RMT-1, RMT-305, RMT-303 and Pant Ragini. In morphological analysis fewvarieties did not follow the pattern of RAPD analysis indicatingtheir phenotypic characters to be influenced by the environmental factors.Morphological dendrogram also showed two major clusters and Pant Ragini was found to branch out distinctly confirming itsuniqueness from all other varieties.

259 Kumar, K. Pravin; Agricultural College &Research Institute,Madurai(India). Department of Plant Breeding and GeneticsKumar, R.Nathish; Agricultural College &Research Institute, Madurai (India). Department of Plant Breeding and Genetics Muneeswari,; Agricultural College & Research Institute, Madurai(India). Department of Plant Breeding and Genetics Nagajothi, T.; Agricultural College & ResearchInstitute, Madurai(India). Department of Plant Breeding and Genetics Lamror, Rajesh; Agricultural College & Research Institute, Madurai

(India). Department of Plant Breeding and GeneticsKumari, R.Usha; Agricultural College &Research Institute, Madurai(India). Department of Plant Breeding and Genetics. Morphological and geneticvariation studies in cowpea genotypes [Vigna unguiculata (L.)] Walp. Legume Research (India). (Aug 2013) v. 36(4) p.351-354 KEYWORDS: GENETIC VARIATION. COWPEAS. GERMPLASM.GENOTYPES. VIGNA UNGUICULATA.

Phenotypic coefficient of variation (PCV) and genotypiccoefficient of variation (GCV), heritability in broad sense andgenetic advance as percent of mean were studied for ten quantitativecharacters in 40 genotypes of cowpea (Vigna unguiculata L.Walp)originated from different sources. Based on the analysis, it was observed that seed yield and number of clusters had high PCV, GCV,heritability and genetic advance as percent of mean, which suggestedthat direct selection for these traits would be fruitful in geneticimprovement of cowpea. Also the correlation coefficients at phenotypic and genotypic levels were carried with the differentcharacters of cowpea. The study revealed that the seed yield per plant showed significant and positive association with plant height,number of clusters, number of pods, pod length and number of seedsper pod while it was negatively correlated with primary branches and100 seed weight. Morphological variations on flower colour, seed colour and seed size releaved that much variations were present in these characters. Seed colour ranged from buff, tan, cream, white, mottled, brown, dark brown and black. Flower colour viz., white,yellow, light violet, dark violet, shades were found in the genotypes studied.

260 Gedam, A.H.; Marathwada Agriculture University, Parbhani(India). Department of Agricultural Botany Jadhav, A.B.; Marathwada Agriculture University, Parbhani (India). Department of Agricultural BotanyBagade, A.B.; Marathwada Agriculture University, Parbhani(India). Department of Agricultural BotanyMadrap, I.A.;Marathwada Agriculture University, Parbhani(India). Department ofAgricultural Botany. Identification of heterotic hybrids for seed yield and its attributing traits in pigeonpea. Legume Research(India).(Aug 2013) v. 36(4) p.355-358 KEYWORDS: HETEROSIS. PIGEONPEAS. CAJANUS CAJAN. YIELDS.

Heterosis for seed yield and its components were estimated in 40crosses obtained by crossing 4 female lines with ten male testers in LXT fashion. BSMR-736 and ICPH-2671 were used as standard checks. The analysis of variance revealed significant differences among the parents and hybrids for all the characters studied. Non-additive gene effects were predominant for all the characters, except for days to 50% flowering. The crosses ICPL-3406 x BSMR-23, ICPL-20106 x ICPR-3477, ICPL-3450 x AKT-9913 were best crosses showed highheterosis overmid parents and better parent for grain yield/plantrespectively, with 144.98 and 61.31 over the standard check BSMR-736and ICPH-2671 respectively for grain yield plant.

261 Kulkarni, K P; National Research Centre on Plant Biotechnology New Delhi (India). kulkarnikpmail.comVishwakarma, C; NationalResearch Centre on Plant Biotechnology New Delhi (India). Sahoo, S P; National Research Centre on Plant Biotechnology New Delhi (India). Lima J M; National Research Centre on Plant Biotechnology New Delhi(India). Nath,M; National Research Centre on Plant Biotechnology NewDelhi (India). Dokku, P; National Research Centre on PlantBiotechnology New Delhi (India). Gacche, R.N.; S.R.T.M. University, Nanded (India). School of Life Science. Mohapatra, T; Central RiceResearch Institute, Cuttack (India). Robin, S; Tamilnadu Agricultural University, Coimbatore (India). Sarla, N; Directorate of RiceResearch, Hyderabad (India). Seshashayee, M; University Agricultural of

Sciences, Bangalore (India). Singh, A K; Indian Agricultural Research Institute, New Delhi (India). Singh, K; Punjab Agricultural University, Ludhiana (India). Singh, N K; National Research Centre on Plant Biotechnology, New Delhi (India). Sharma, R P; National Research Centre on Plant Biotechnology New Delhi (India). Phenotypic characterization and genetic analysis of dwarf and early flowering mutants of rice variety Nagina22. ORYZA (India). (Jan 2013) v.50(1)p.18-25 KEYWORDS: RICE. FLOWERING. MUTANTS.

Plant height and flowering time are two of the important traits that affect plant architecture. Efforts were made in this study to characterize morphologically the-EMS-induced dwarf and early flowering mutants of rice variety Nagina22 and to study their mode ofinheritance. Nine true breeding mutants generated earlier by EMS treatment were analysed for differences in their phenotypic characteristics recorded according to the national guidelines for Distinctness, Uniformity and Stability (DUS). The mutants exhibited variation from Nagina22 for maximum of 11 DUS characteristics to a minimum of 4 DUS descriptors, while retaining majority of the wild type features. Plant height of the dwarf mutants ranged from 69 to 101cm, while tiller number was in the range of 9 to 60. The early flowering mutants were weak in their plant stature, but flowered approximately 20–25 days earlier than Nagina22. Significant correlation among various traits of the selected mutants was observed. The mutant traits exhibited monogenic inheritance giving3:1 phenotypic segregation ratio in F2 generation. These mutants have potential usage in functional analysis of the traits and in riceimprovement programs.

F50 Plant structure

262 Rasool, Nasir; Universiti Putra Malasia, Serdang(Malasia). Institute of Advanced Technology Afzal, Sania; Universiti Putra Malasia, Serdang (Malasia). Institute of Advanced Technology Riaz, Muhammad; Universiti Putra Malasia, Serdang (Malasia). Institute of Advanced Technology Rashid, Umer; Quaid-i-Azam University, Islamabad(Pakistan). Department of Chemistry Rizwan, Komal; Universiti Putra Malasia, Serdang (Malasia). Institute of Advanced Technology Zubair, Muhammad; Universiti Putra Malasia, Serdang (Malasia). Institute of Advanced Technology Ali, Shafqat; University of Agriculture, Faisalabad (Pakistan). Department of Chemistry and Biotechnology Shahid , Muhammad; Government College University, Faisalabad (Pakistan). Department of Chemistry. Evaluation of antioxidant activity, cytotoxic studies and gc-ms profiling of matthiola incana (Stock Flower). Legume Research (India). (Feb 2013) v. 36(1) p.21-32 KEYWORDS: ANTIOXIDANTS. MATTHIOLA.TOXICITY.CHROMATOGRAPHY.

Antioxidant activity of Matthiola incana flowers extracted with different solvents like petrolewn ether, chloroform, ethyl acetate, absolute methanol, methanol water (9.5:0.5) methanol water (9:1) extracts of stock flower (Matthiola incana) were analyzed. The total phenolics content (TPC) were fOWld in the range of 0.327–1.872 mg GAF/g and total f1avonoids content (TFC) were found in the range 2.06–6.067 CEmg/g. Other parameters studied were reducing power, DPPHradical scavenging and inhibition of linoleic add per oxidation. The antioxidant activity of the Matthiola incana was also evaluated by measuring the conjugated dienes (CD), conjugated triene (CT), p-anisidine value (PAV), free fatty add (FFA) and peroxide values (PV) by using canola oil as an oxidative substrate. The n-hexhane extract was also analyzed by GC-MS. The methanolic extracts of Matthiola incana flowers showed maximum antioxidant activity. The cytotoxidty studies was also studied by

haemolytic activity of the plant extracts against the hwnan erythrocytes (RBC's) was found to be in the range of 0.91–4.47%.

263 Gautam, N. K.; National Bureau of Plant Genetics Resources, New Delhi (India). Singh, Mohar; National Bureau of Plant Genetics Resources, New Delhi (India). Khan, Z.; National Bureau of Plant Genetics Resources, New Delhi (India). Roy, Anirban; National Bureau of Plant Genetics Resources, New Delhi (India). Akhtar, Jameel; National Bureau of Plant Genetics Resources, New Delhi (India). Ram, Babu; National Bureau of Plant Genetics Resources, New Delhi (India). Assessment of lentil germplasm with respect to agromonic performance and major biotic stress. Legume Research (India). (Jun 2013) v. 36(3) p.214-219 KEYWORDS: PLANT DISEASES. PLANT ANATOMY. STRESS. EVALUATION. LENTILS.

Characterization and evaluation of lentil germplasm (Lens culinaris Medikus) collected from indigenous and exotic sources for flowering (61–123 days), maturity (108-147days), plant height (18–70.80cm), pods per plant (9–158), primary branches/plant (2–6), root-knot nematode, fungal and viral diseases revealed considerable variation for different agro-morphological traits and level of tolerance against biotic stress of both macrosperma and microsperma types. Besides exhibiting a wide range of variation in important agro-morphological traits by all the wild species, Lens nigricans and Lens ervoides emerged as valuable sources of resistance to several biotic stresses namely, Ascochyta blight, rust and powdery mildew diseases. A new germplasm line (ILL-4605) identified earlier than Precoz in flowering (55–62 days) and may prove very useful in the lentil improvement programmes for the development of varieties with bolder seeds (3.5 g/100g) and earlier maturity (110 days) as well. Such germplasm lines, which mature 20–25 days earlier than the landraces of North India will be useful and can be adopted for different cropping systems. Adoption of identified short duration, early maturing and bold seeded germplasm may help in heat and drought escape which otherwise would have resulted in abortion of flower buds and subsequently low crop yield. A range of trait specific germplasm identified for different agro-morphological characters are, early flowering (IC-560333, IC-559639, IC-560111 and IC-560148), high biomass (IC-559744, IC-559608, IC-559767 and IC-560040), high yielding (IC-398094, IC-560212, IC-560332 and IC-560206) and high number of primary branches (IC-559870, IC-318881, IC-398688 and IC-560182) might be good option under unpredictable environmental situations. Occurrence of symptoms resembling to those of virus diseases were noticed in many germplasm accessions.

F61 Plant physiology - Nutrition

264 Aniszewski, T.; University of Eastern Finland, Joensuu(Finland). Department of Biology, Research and TeachingLaboratory of Applied Botany, Biological Interaction and Ecological EngineeringYlinampa, T.A; University of Eastern Finland, Joensuu(Finland). Department of Biology, Research and Teaching Laboratory of Applied Botany, Biological Interaction and Ecological EngineeringHaikonen, J.A; University of Eastern Finland,Joensuu(Finland). Department of Biology, Research and TeachingLaboratory of Applied Botany, Biological Interaction and EcologicalEngineeringPynttari, A. S.; University of Eastern Finland, Joensuu(Finland). Department of Biology, Research and TeachingLaboratory of Applied Botany, Biological Interaction and EcologicalEngineering. Crude protein and nitrogen-free content diversity andaccelerating potential in seeds of economic legumes.Legume

Research(India). (Apr 2013) v. 36(2) p.165-173 KEYWORDS: BOTANY. VEGETABLELEGUMES. NITROGEN CONTENT. QUALITY.SEED.

31 economic legume species were studied in follow-up research.The material consisted of longterm laboratory data gathered locally,and together with a wide overview of the literature on these species(250 articles). Laboratory experiments and analysis of data reported in the global literature show the standard crude protein content andnon- nitrogen content of legume species. Overall, crude protein content ranged from 18mg 100mg 1 dm to over 40mg 100mg 1 dm among thelegumes studied. The highly bred species Glycine max, Lupinus albus,Lupinus luteus and Lupinus mutabilis formed a distinct group with amean of over 30mg crude protein in 100mg dm of seed. A less wellknownlegume, Psophocarpus tetragonolobus, also had high seed crude proteincontent The nitrogen free proportion of seeds is dependent on crudeprotein content and these values thus correlate negatively. They canbe used as indicator sof the seed quality and seed breeding potentialof economic legumes.

F62 Plant physiology - Growth and development

265 Vasishtha, Hina; Indian Institute of Pulses Research, Kanpur(India). Division of Crop Physiology, Biochemistry andMicrobiologySrivastava, R. P.; Indian Institute of Pulses Research, Kanpur(India). Division of Crop Physiology, Biochemistry and Microbiology. Effect of soaking and germination on dietary hbreconstitijents of chickpea (Cicer Arietinum L.). Legume Research (India). (Apr 2013) v. 36(2) p.174-179 KEYWORDS: CELLULOSE. CHICKPEAS. CICER ARIETINUM. CHICKPEAS. DIETARY FIBRES. GERMINATION.HEMICELLULOSE. PECTINS.

Processing is an important and essential activity to enhance the digestibility of essential nutrients of chickpea. Dietary fibre playsan important role in bringing health advantages in chickpea and helps in lowering plasma cholesterol. Changes during soaking and soakingfollowed by germination (24, 48 and 72 hr) on cellulose, hemicellulose, lignin and pectin contents of four genotypes of desi type (KWH 108, JG 74, DCP 92-3 and BG 256), four genotypes of kabulitypes (KAK2, JKG 1, BG 1053, and L 550) and two genotypes of green seed type (BGD 112 and Sadabahar) of chickpeas (Cicer arietinum, L)were evaluated. Cellulose, hemicellulose and lignin increased significantly during soaking and germination of chickpeas, whereas pectin was not affected significantly during soaking and different stages of germination. The rate of changesin different genotypes for various parameters was rapid during early stages of germination.

266 Mathiyazhagan, S.; CCS Haryana Agricultural University, Hisar (India). Department of Botany and Plant Physiology, Forage Section Pahuja, S.K.; CCS Haryana Agricultural University, Hisar (India). Department of Botany and Plant Physiology, Forage Section Ahlawat, Anju; CCS Haryana Agricultural University,Hisar (India). Department of Botany and Plant Physiology, Forage Section. Regeneration in cultivated (Cyamopsis tetragonoloba L.) and wild species (C. Serrata) of guar. Legume Research (India). (Apr 2013) v. 36(2) p.180-187 KEYWORDS: CYAMOPSIS PSORALIOIDES. CALLUS. VEGETABLE LEGUMES. HYPOCOTYLS. COTYLEDONS.

Different guar cultivars and the wild species of explants such as the hypocotyls, cotyledon, and mature embryo were used for callusinduction and these explants along with cotyledonary node explantswere used for direct shoot morphogenesis. It was established that Murashige and Skoog culture medium containing 2,4-D (2.5 mg/l) and6-

benzylaminopurine (0.5 mg/l) gave the highest frequency of callusinduction using mature embryo explants in guar cultivars as well aswild species. Over 2–3 shoots per explants were observed via somatic embryogenesis on MS medium supplemented with NM 2.0 mg/l + BAP 0.5mg/l + Charcoal 3g/1)) in cultivars HG 563 and FS 277 using matureembryo as explants. Direct shoot regeneration was observed usingcotyledonary node explants in guar cultivars and its wild species onMS medium containing Kinetin (1.0 mg/l)+ BAP 0.5 (mg/l) and maximum2–3 of shoots per explants were observed on medium supplemented withKinetin (1.0 mg/l) + BAP 0.5 (mg/l) and Zeatin (1.0mg/l). No shoot regeneration was observed in cotyledon, mature embryo, hypocotylexplants of the guar cultivars and the wild species. In vitro rooting was observed on somatic embryo derived shoots on a half-strengthconcentration of Murashige and Skoog's culture medium fortified withIndole-3-butyric acid (0.5 mg/l) + charcoal (3g/1).

267 Ananthi, K.; Tamil Nadu Agricultural University,Coimbatore(India). Department of Crop PhysiologyVanangamudi, Mallika;Tamil Nadu Agricultural University, Coimbatore(India). Department of Crop Physiology. Foliar application of humic acid with brassinosteroid on chlorophyll content and yield of greengram[VignaRadiata (L.) Wilczek]. Legume Research (India). (Jun 2013) v. 36(3)p.241-244 KEYWORDS: PLANT PHYSIOLOGY. BA. BRASSINOSTEROIDS. HUMICACIDS. YIELDS. MUNG BEANS. VIGNA RADIATA RADIATA.

A field experiment was conducted at Tamil Nadu Agricultural University, Coimbatore during Kharif, 2006 to study the physiological manipulation for enhancing the productivity in green gram with valueadded liquid humic acid formulation. The growth regulators significantly influenced various physiological and biochemical parameters. The pigments responsible for photosynthesis such as Chlorophyll, total chlorophyll and yield were favourably influenced by foliar spray of 0.1% humic acid with 0.1 ppm brassinosteroidtreatment.In the present study, higher chlorophyll content and yield was observed with brassinosteroid spray followed by Benzyl Adenineand Salicylic acid applications.

268 Lal, S.; S.K.N. College of Agriculture, Jobner (India). Department of Plant Physiology Bagdi, D.L.; S.K.N. College of Agriculture, Jobner (India). Department of Plant Physiology Kakralya,B.L.; S.K.N. College of Agriculture, Jobner(India). Department of Plant PhysiologyJat, M.L.; S.K.N. College of Agriculture, Jobner(India). Department of Plant Physiology Sharma, P.C.; S.K.N.College of Agriculture, Jobner(India). Department of Plant Physiology. Role of brassinolide in alleviating the adverse effect of droughtstress on physiology, growth and yield of green gram (Vigna radiataL.) genotypes. Legume Research (India). (Aug 2013) v. 36(4) p.359-363 KEYWORDS: PLANT PHYSIOLOGY. BRASSINOSTEROIDS. MUNG BEANS. VIGNA RADIATA RADIATA. GROWTH. DROUGHT STRESS. YIELDS.

A pot experiment was conducted to study the modulation effect ofbrassinolide under water stress and drought condition on physiology, growth and yield of green gram under normal condition till anthesis stage, the plants were sprayed with Brassinolide (0.0, 0.1, 0.5 and 1.0 ppm) concentration at 25 and 35 DAS prior to imposed stress. Water stress was found to decrease significantly in the respect of photo synthetic and transpiration rate, stomatal conductance,relative water content, chlorophyll stability index, leaf area, plantheight, number of pods per plant, number of grains per pod, test weight and grain yield with a significant increase in leaf temperature and appreciable significant difference

between both thevarieties. The effect of Brassinolide was found to increase in thevalue of these parameters significantly with a decrease in leaf temperature because the effect of brassinolide was recorded toincrease in the rate of transpiration at all the stages in both thecultivars of green gram up to 1.0 ppm concentration of it.

H10 Pests of plants

269 Nath, M.; Sibsagar College, Joysagar (India). Department ofZoology.Rahman, I.; Sibsagar College, Joysagar (India). Department ofZoology. Biology of bunch caterpillar, Andraca bipunctata walker- A major insect pest of tea in north-east India. Indian Journal of Entomology (India). (Dec 2012) v.74(4) p.303-305 KEYWORDS: CAMELLIA SINENSIS. BIOLOGY. LARVAE. PEST INSECTS.

Certain aspects of the biology of Bunch caterpillar, Andraca bipunctata Walker feeding on tea Camellia sinensis was carried out in the laboratory. The incubation period was found to be 3.72±0.04 days with hatching of 71.50±1.89%. The average length and breadth of eggs were found to be 1.41±0.01 mm and 1.30±0.01 mm, respectively. The larvae pass through five instars with a total larval period of 34.14±1.96 days. Duration of pre-pupal and pupal phase was found 1.56±0.44 days and 31.70±4.03 days, respectively. The longevity of male and female was found 11.76±2.39 days and 13.17±3.40 days, respectively. The average duration of pre-oviposition, oviposition and post-oviposition periods were found to be 1.52±0.48, 3.78±1.22 and 6.02±2.84 days, respectively. The fecundity was found to be400.20±36.34 per female and total life period was 61.18±0.88 days.

270 Randhawa, H.S.; Punjab Agricultural University, Gurdaspur(India). Regional Research Station. Susceptibility of sugarcanevarieties to stalk borer, chilo auricilius dudgeon under different levels of nitrogen. Indian Journal of Entomology (India).(Dec 2012) v.74(4) p.306-309 KEYWORDS: CHILO AURICILIUS.SUGARCANE. NITROGEN.

A study on the susceptibility of promising sugarcane varieties to stalk borer, Chilo auricilius Dudgeon with different levels ofnitrogen was conducted at PAU, Regional Research Station Gurdaspurduring 2010– 11 and 2011–12. The pooled data showed that variety CoJ89 had significantly less (24.53%) incidence as compared to other twovarieties i.e. CoH 119 (29.28%) and CoJ 85 (35.15%). The incidence increased from 3.70 to 69.63% with increase in nitrogen level from 0 to 90 kg N/ac. The highest cane yield was obtained from the CoH 119 variety at 60 kg N/ac.

271 Santeshwari; Harish Chandra P.G. College, Varanasi (India). Department of Zoology. The anatomy and histology of female reproductive organs of Gonocephalum brachyelytra (kaszab) (coleoptera: tenebrionidae. Indian Journal of Entomology (India). (Dec 2012) v.74(4) p.315-318 KEYWORDS: OVIPOSITION. VITELLOGENINS.

In Gonocephalum brachyelytra (Kaszab), a pair of about 3.64 mmlong and white ovary is found. Each ovary is composed of 28 to 38 numbers of ovarioles. The ovarioles are clearly differentiated into terminal filament, germarium and vitellarium. The germarium possesses 4 to 5 developing oocytes and trpohocytes which provide nourishment to the developing oocytes. The vitellarium possesses developing oocyte, maturing oocyte and large yolky globules i.e. resorptive oocyte. Each ovariole shows release of oogonial cells aftermaturation. The yolky materials of oocyte are well developed. Thetroophocytes shows intercellular spaces. These intercellular spaces provide pathway for protein to enter into the

cytoplasmic area, andinto the nuclear region. It shows protein deposition and increase the process of mitosis and meosis. As a result active oviposition isobserved.

272 Vanitha, K.; Directorate of Cashew Research, Puttur (India). Division of Crop Protection.Karuppuchamy, P.; Tamil Nadu AgriculturalUniversity, Coimbatore (India). Department of Agricultural Entomology.Sivasubramanian, P.; Tamil Nadu Agricultural University, Coimbatore (India). Department of Agricultural Entomology. Vanilla insect pests and their natural enemies. Indian Journal of Entomology (India). (Dec 2012) v74(4) p.319-322 KEYWORDS: VANILLA PLANIFOLIA. PEST INSECTS.

A survey was conducted at major vanilla growing areas of Tamil Nadu to record the pest status of vanilla and their natural enemies. Investigations were made mainly in the vanilleries of Coimbatore and Theni districts. Out of 60 farms surveyed during ten months, only nine farms had the incidence of pest attack. A total of twelvearthropods were recorded as pests of vanilla. Almost all parts ofvanilla plant viz., stem, leaf, flower, bud, roots, pods etc were found to be attacked. Among the pests, white grubs were found to cause considerable damage followed by vanilla bug and shoot and leafwebber, while others were not at the economic level. Among thenatural enemies, parasitoids like Euplectrus sp., Glyptapanteles sp., Aprostocetus sp., Chelonus sp., and Uropoda mites were found to be associated with vanilla pests.

273 Chaudhary, H.R.; Maharana Pratap University of Agriculture and Technology, Ummedganj (India). Agricultural Research Station.Meghwal, H.P.; Maharana Pratap University of Agriculture and Technology, Ummedganj (India). Agricultural Research Station. Bioefficacy of rynaxypyr and spinosad against green semilooper, Chrysodeixis acuta walker on soybean. Indian Journal of Entomology (India). (Dec 2012) v.74(4) p.323-325 KEYWORDS: CHRYSODEIXIS INCLUDENS. INSECTICIDES.EFFICIENCY. SOYBEANS.

Four insecticides Le. Rynaxypyr 20 SC 100 and 150 ml/ha, Spinosad 45 SC 125, 162.5 and 187.5 ml/ha, Methomyl 40 SP 1.0 kg/ha and Triazophos 40 EC 800 ml/ha were evaluated for their efficacyagainst green semilooper Chrysodeixis acuta Walker (Noctuidae:Lepidoptera) at Agricultural Research Station, Ummedganj, Kota(Rajasthan) during kharif 2007 and kharif 2008. The pooled larval population of green semilooper varied from 0.46 to 3.38 per metre rowlength (mrl) and all the treatments were significantly superior overcontrol in reducing the pest population. However, minimum larval population (0.46 larva/mrl) was observed with Methomyl 40 SP 1.0kg/ha followed by Spinosad 45 SC 87.5 ml/ha (0.50 larva/mrl) as compared to untreated control (3.38 larvae/mrl). The seed yield ofsoybean varied from 952 to 1106 kg/ha in different treatments as compared to untreated control (813 kg/ha) and among the treatments, Rynaxypyr 20 SC 100 ml/ha and Triazophos 40 EC 800 ml/ha gave maximum seed yield (1106 kg). The maximum net return with highest IBCR(19.82) was obtained with Triazophos 40 EC 800 ml/ha followed by Rynaxypyr 20 SC 100 ml/ha.

274 Mishra, Mukesh Kumar; N. D.University of Agriculture andTechnology, Faizabad (India). Department of Entomology. Singh, Rudra Pratap; N. D.University of Agriculture and Technology, Faizabad(India). Department of Entomology. Sharma. R.C.; N. D.University ofAgriculture and Technology, Faizabad (India). Department ofEntomology. Identification of pigeonpea superior lines against podfly. Indian Journal of Entomology (India). (Dec 2012) v.74(4)p.326-328 KEYWORDS: CAJANUS CAJAN. TESTING.

Among the 50 pigeonpea germplasm a wide range of variation ofpod (18.33 to 47.00%) and seed (16.43 to 48.44%) damage bylepidopterus pod borers were recorded with average mean of 30.68 and31.69%, respectively. On the basis of pooled mean, two lines viz.,ICP 2514 (18.33%) and ICP 2454 (19.33%) reveal resistance against thepod damage caused by pod fly, respectively whereas, based on seeddamage ICP 2459 (16.43%) and ICP 2155(18.62%) were categorized asresistant.

275 Boopathi, T.; Tamil Nadu Agricultural University, Coimbatore(India). Department of Agricultural Entomology. Influence of weatherfactors on the population dynamics of chewing pests of lowland paddyin mizoram. Indian Journal of Entomology (India). (Dec 2012) v.74(4)p.329-335 KEYWORDS: CNAPHALOCROCIS MEDINALIS. WEATHER FORECASTING.

Chaetocnema spp. was active from the last week of August tosecond week of October with a peak level of population during firstweek of September (8.17). Monolepta signata Oliver reached peak levelof population during third week of September (5.17) followed by firstweek of September (5.00). The mean population of Chaetocnema spp. andM.signata over the season recorded was 4.53 and 2.88 beetles per 5plants, respectively. Melanitis leda ismene Cramer reached peak levelof population during first week of September (3.42).Cnaphalocrocismedinalis Guenee recorded its peak population during third week ofSeptember (0.33). The mean population of M. leda ismene and C.medinalis over the season recorded was 1.56 and 0.14 larvae per 5plants. The coefficient of determination (R2) was found to be 91%(Chaetocnema spp.), 77% (M. signata), 45% (M. leda ismene) and 87%(C. medinalis). Correlation coefficient between chewing pests andabiotic factors revealed that Chaetocnema spp. had positivesignificant correlation with maximum relative humidity (r = 0.713),while C. medinalis established negative significant correlation withmaximum temperature (r = -0.707). M. signata showed positivecorrelation with all the weather factors, whereas M. leda ismene hadpositive correlation with minimum temperature (r = 0.633) and minimumrelative humidity (r = 0.114) but was negative correlation withmaximum temperature (r = -0.301), maximum relative humidity (r = -0.262) and rainfall (r = -0.393).

276 Preetha. G.; Tamil Nadu Agricultural University, Coimbatore(india). Department of Agricultural Entomology.Stanley, J.; Tamil Nadu Agricultural University, Coimbatore (india). Department of Agricultural Entomology.Manoharan, T.; Tamil Nadu Agricultural University, Coimbatore (india). Department of Agricultural Entomology. Bioefficacy of imidacloprid 17.8 sl against cotton aphids and leafhoppers. Indian Journal of Entomology (India). (Dec2012) v.74(4) p.336-342 KEYWORDS: IMIDACLOPRID. COTTON. APHIDOIDEA. CICADELLIDAE.

A newer insecticide molecule, imidacloprid belonging tochloronicotinyl group with systemic properties was tested for its bioefficacy against major sucking pests of cotton viz., aphids andleafhoppers under field conditions and the results revealed that imidacloprid 17.8 SL at the recommended dose of 25 g a.i. ha-;1 was quite promising in reducing the population of both the pests without any phytotoxicity symptoms and produced better yield.

277 Akum, Z,; Nagaland University, Medziphema (India). Departmentof Entomology.Singh, H.K.; Nagaland University, Medziphema (India).Department of Entomology.Seyie, K.;

Nagaland University, Medziphema(India). Dept. of GPB.Singh, A.K.; Nagaland University, Medziphema (India). Department of Entomology. Biometric and forage studies onstingless bees in Nagaland. Indian Journal of Entomology (India). (Dec 2012) v.74(4)p.343-347 KEYWORDS: BIOMETRY. FLORA.

Field experiments were conducted during October 2008 toSeptember 2009 to explore and identify the stingless bee species andtheir major flora prevalent at Medziphema and Mima in Nagaland. The species differentiation was based on number of wing hooks, length of metatarsus, length and breadth of fore wing and hind wing, abdomencolours and entrance gate made of cerumen and resins. The highest/longest number of wing hooks, length of metatarsus (mm), length of fore wing (mm), breadth of fore wing (mm), length of hind wing (mm) were recorded from populations from Mima TS2 while, tongue length (mm), width of fourth tergite (mm) and total length of 3rd sternite (mm) longest were recorded from those of TS1. The foraging activity mostly occurred during February - November in Nagaland.

278 Chaudhary, Neelam; CIMMYT, New Delhi (India). Saharawat, Y.S.;Indian Grassland Fodder Research Institute, Jhansi (India).Kumar, Pradyumn; Directorate of Maize Research, New Delhi (India). IPM: Atechnology to conserve biological control agents in maize. Indian Journal of Entomology (India). (Dec 2012) v.74(4) p.348-351 KEYWORDS: INTEGRATED PEST MANAGEMENT. MAIZE. BIOLOGICAL CONTROL AGENTS.

Integrated pest management (IPM) integrating chemical and biological control measures helps in reducing pest infestation, improves yield, biodiversity and sustainability in maize crop. In current study, the IPM strategy for maize was developed and validated in the four blocks of Hoshiarpur district of Punjab. Chilo partellus was recorded as the major pest of kharif maize causing considerable economic loss. The chemical control measures destroyed the population of biological control agents. Along with other components of IPM, Trichogramma chilonis, an egg parasitoid of C. partellus was released to decimate its population in the egg stage. The number of infested plants by C. partellus in IPM field did not exceed 4% whereas in farmer's field the number of infested plants reached up to 12%. Relatively higher population of natural enemies such as spiders, coccinellids, Paederus sp. and Cotesia sp. were observed in the maize ecosystem and these contributed in controlling the pest population. The study revealed that maize yield was 66.2% more in IPM field as compared to farmers' field. Overall, in farmer participatory field trials, the study revealed that IPM helped in controlling the pest population as well improving the biodiversity by maintaining the population of biological control agents.

279 Mishra, M.K.; N.D. University of Agriculture and Technology,Faizabad (India). Department of Entomology.Sharma, R.C.; N.D.University of Agriculture and Technology, Faizabad (India). Department of Entomology. Validation of pheromone based ipm module against yellow stem borer, Scirpophaga incertulas walker in basmati ri. Indian Journal of Entomology (India). (Dec 2012) v.74(4) p.352-354 KEYWORDS: SCIRPOPHAGA INCERTULAS. INTEGRATED PESTMANAGEMENT. RICE.

Validation of integrated pest management (IPM) module against yellow stem borer (Scirpophaga incertulas Walker) in basmati was carried out at farmer's field in village Murchipur of Faizabad and compared with farmer's practices (Non-IPM) during wet seasons of 2007 and 2008. The IPM schedule with eight components viz., summer ploughing, early transplanting by 15th July, clipping of seedling tips before transplanting, recommended

doses of fertilizers(90N:40P:30K), plant spacing with 20cm x 10cm, mass trapping of yellow stem borer (YSB) with pheromone traps 20 traps ha-;1,proper drainage, and single application of cartap hydrochloride 4G (750g a.i. ha-;1) at economic threshold level showed theirsuperiority over farmer's practices. The IPM module resulted 34–39% increase in grain yield with mean increase of 36.79% over non-IPMplots. The results also proved the cost effectiveness of tested IPM module over farmer's practice with 1: 1.92 cost benefit.

280 Singh, Ramesh P.; Narendra Deva University of Agriculture andTechnology, Faizabad (India). Dept. of Entomology. Apicultural and Insect Physiological Research Laboratory,Gupta, Abhishek K.; Narendra Deva University of Agriculture and Technology, Faizabad (India). Dept. of Entomology. Apicultural and Insect Physiological Research Laboratory,. Floral dearth management by feeding sugar beet syrup in APIS mellifera. Indian Journal of Entomology (India). (Dec 2012) v.74(4) p.355-358 KEYWORDS: APIS MELLIFERA. BETA VULGARIS. SUGARBEET.

Sugarbeet (Beta vulgaris) availability coincided with floraldearth. Its syrup feeding treatments namely JS100 (100 ml juice mixedwith 100 gm sugar), JS75 (75gm sugar dissolved in 100 ml juice), JS50 (50 gm sugar dissolved in 100ml juice), JS0 (100ml juice only) andWS100 (100gm sugar dissolved in 100ml water) were applied during dearth and JS100 significantly influenced the bee colony for higher production. In treatment JS100, the brood area, multiplied bee colony and production of honey were greater than the sugar syrup. Feeding sugar beet syrup during dearth maintained the strength and brood area increase in the number of bee and brood frames.

281 Kaur, Amandeep; Punjab Agricultural University, Ludhiana(India).Department of Entomology.Singh. N.N.; B.H.U., Varanasi(India). Department of Entomology and Agricultural Zoology.Kumar, Mukesh; B.H.U., Varanasi (India). Department of Entomology andAgricultural Zoology. Persistent toxicity of insecticides on bioticpotential of Trichogramma brasiliensis ashmead (Hymenoptera: Trichogrammatidae), an egg parasitoid of tomato fruit borer. Indian Journal of Entomology (India). (Dec 2012) v.74(4) p.359-365 KEYWORDS:TRICHOGRAMMA BRASSICAE. RESIDUES. TOMATOES.

Insecticides hamper the effectiveness of Trichogrammabrasiliensis not only through direct mortality but also as a resultof sublethal effects on the parasitization capability and per centemergence.Survived females from treated leaves were later exposed tofresh radiated Corcyra cephalonica Stainton (Lepidoptera: Gelechidae)eggs. The persistent toxicity of endosulfan, monocrotophos, cypermethrin, dimethoate and neem seed kernel extract on per cent parasitization and emergence lasted for 9, 9, 5, 3 and 4 days aftertreatment, respectively. The effect of persistent toxicity onfecundity and fertility was observed from zero day after treatment.2hours of exposure period gave significantly high parasitization andemergence up to 3 days after treatment.

282 Deka, M.K.; Assam Agricultural University, Jorhat (India). Dept. of Entomology. Rajkhowa, Denisha; Assam AgriculturalUniversity, Jorhat (India). Dept. of Entomology. Borah, Liza; AssamAgricultural University, Jorhat (India). Dept. of Entomology. Effects of Pongamia pinnata and Adhatoda vasica extracts on tea mosquito bug, Helopeltis theivora waterhouse (hemiptera: miridae). Indian Journal of Entomology (India). (Dec 2012) v.74(4) p.366-368 KEYWORDS: PONGAMIA PINNATA.PLANT EXTRACTS.

Experiment carried out with the aqueous plant extracts of Pongamia pinnata and Adhatoda vasica at 10.0, 8.0, 6.0, 4.0 and 2.0%concentrations showed significant effect on growth and development of tea mosquito big Helopeltis theivora Waterhouse (Hemiptera: Miridae).The duration of nymphal instar was lengthened significantly (P=0.05) by both the extracts, of which P. pinnata had pronounced effects. Although the duration of 4th instar nymphs was prolonged most of theemerged nymphs died later due to deformities. The weight of all thenymphal instars significantly decreased and the mortality varied between 20 to 35%. The adult emergence varied from 25.30 -44.30%(male) and 28.30- 45.90% (female) with P. pinnata and 28.50–38.60% (male) and 32.50–48.72% (female) with A. vasica.

283 Kulkarni, Nitin; Tropical Forest Research Institute, Jabalpur(India). Div. of Forest Entomology.Kushwaha, Dinesh Kumar; Tropical Forest Research Institute, Jabalpur (India). Div. of Forest Entomology.Mishra, Vinod Kumar; Tropical Forest Research Institute, Jabalpur (India). Div. of Forest Entomology.Paunikar, Sanjay;Tropical Forest Research Institute, Jabalpur (India). Div. of ForestEntomology. Effect of economical modification in artificial diet of greater wax moth Galleria mellonella (Lepidoptera: pyralidae).IndianJournal of Entomology (India). (Dec 2012) v.74(4) p.369-374 KEYWORDS: GALLERIA MELLONELLA. BIOLOGICAL CONTROL. BEE BROODS. ENTOMOPHILICNEMATODES. HONEY BEES.

Economical modification has been reported in the popular artificial diet of the most commonly used fictitious host waxmoth, Galleria mellonella for mass-multiplication of entomopathogenic nematodes. The suitability of the modified artificial diet composition on the biological parameters like larval weight,duration, pupal weight, duration, fertility and overall survival and developmental period for five generations were also assessed. The investigation on detailed biology, carried out during the presentstudy indicated that replacing the honey with the honey waste has nosignificant negative effects on the larval period, larval weight, survival of the larvae, duration of pupal stage, total developmental period, pupal period and adult emergence, i.e., pupal mortality.Thus, the composition-II with modified proportions of the constituents and containing honey waste proved economical, suitableand best artificial diet for G. mellonella.Further, rearing wascontinued for five more generations on the Composition-II withcalculation of the economics in INR, which further proves that thecomposition-II can be successfully used even for commercial mass-multiplication of the galleria waxmoth larvae.

284 Singh, S.S.; G.B. Pant University of Agriculture and Technology, Dehradun (India). Krishi Vigyan Kendra.Rai, Mayank K.;K.V.K,, Ghaziabad (India).Dwivedi, S.K.; DRDO, Delhi (India).Kumar, Prabhat; H.N.B.U, Srinagar, Uttarakhand (India). Validation of ipmmodules against major pests of okra in Dehradun (Uttarakhand). Indian Journal of Entomology (India). Dec 2012 v.74 (4) p.375-378 KEYWORDS: OKRAS. INTEGRATED PEST MANAGEMENT. BEMISIA TABACI. TETRANYCHUS CINNABARINUS.

Field experiments were carried out at six locations of Vikasnagar Block of Distt. Dehradun (Uttarakhand) during kharif season of 2010 and 2011 with okra hybrid “Sonal” to find out the efficacy of different IPM modules against major pests of okra. The investigations revealed that module (M1) proved be the most effective treatment against shoot and fruit borer, Earias vittella F., yellow vein mosaic virus, Bemisia tabaci (Genn.) and red spider mite, Tetranychus cinnabarinus (Boisd.) in which lowest incidence was recorded as compared to other IPM modules during 2010 and 2011. The module M1 comprised of

hand picking and destruction of infested leaves, shoots and fruits, seed treatment with imidacloprid, application of indoxacarb, thiomethoxam, hexythiazox, deep summer ploughing and use of neem cake 250 kg/ha before sowing was the most effective. The IPM module (M2) was the next effective treatment against the major pests of okra evaluated at six locations during both the years. The maximum fruit yield was observed in module (M1) i.e. 254.00 and 232.00q/ha, respectively during 2010 and 2011 which was significantly superior over all other treatments. The studies conducted on impact of various IPM modules showed that net return wasalso higher in module (M1) which was Rs. 182340 and Rs. 165060/ha, respectively during 2010 and 2011. Based on two years studies, it is concluded that judicious use of neonicotinoids pesticides (indoxacarb, thiomethoxam, imidacloprid and hexythiazox) used inmodule (M1) along with seed treatment kept the pests population belowthe economic threshold level.

285 Srinivasa, N,; University of Agricultural Sciences, Bangalore(India). Department of Agricultural Entomology. All India Network Project on Agricultural Acarology,Gowda, C. Chinnamade; University of Agricultural Sciences, Bangalore (India). Department of Agricultural Entomology. All India Network Project on Agricultural Acarology,Mallik, B,; University of Agricultural Sciences, Bangalore (India). Department of Agricultural Entomology. All India Network Project on Agricultural Acarology,Raghavendra, P.; University of Agricultural Sciences, Bangalore (India). Department of Agricultural Entomology.All India Network Project on Agricultural Acarology,. New record ofTetranychus truncatus ehara (ACARI: Tetranychidae) as a potential pest from Karnataka. Indian Journal of Entomology (India).Dec 2012 v.74(4) p.379-383 KEYWORDS: TETRANYCHIDAE. MORUS ALBA. DNA.

Spider mite Tetranychus truncatus Ehara previously recorded from the Northwestern Himalayan regions of Jammu and Kashmir and Himachal Pradesh in 1983 on Dahlia sp. now reported as a new record from Karnataka on cultivated and wild species of Morus. A key to the species of Tetranychus from India is provided and newly recorded T. truncatus is illustrated and redescribed. The morphological identity of T. truncatus is confirmed by comparing the DNA sequences with the NCBI GenBank data base from the Asian region (Thailand). The partial genomic sequences (mitochondrial cytochrome oxidase sub unit I) and second Internal Transcribed Spacer of Tetranychus truncatus Ehara from the new record are in NCBI GenBank database bearing accession numbers, JX075249 and JX497785, respectively.

286 Naveen, N.C,; Indian Agricultural Research Institute, New Delhi (India). Div. of Entomology, NAIP Sub Project.Kumar, Dinesh; Banaras Hindu University, Varanasi (India). Department of Zoology.Alam, Wasi; Indian Agricultural Statistical Research Institute, New Delhi (India).Div. of Biometrics and Statistical Modeling.Chaubey, Rahul;University of Delhi (India). Dept. of Zoology.Subramanian, S.; University of Delhi (India). Dept. of Zoology.Raman, Rajagopal; University of Delhi (India). Dept. of Zoology. A model study integrating time dependent mortality in evaluating insecticides against Bemisia tabaci (Hemiptera: aleyrodidae). Indian Journal ofEntomology (India). Dec 2012 v.74(4) p.384-387 KEYWORDS: BEMISIA TABACI. INSECTICIDES. ALEYRODIDAE.

A bioassay and data analysis methodology integrating time –dose dependent mortality in terms of hazard rate of insecticides triazophos and imidacloprid against B. tabaci has been developed. Logrank test had been applied to test the efficacy of the twocompounds and corresponding hazard rates computed using product-limit method. LC50 of imidacloprid was

observed to be 23.50 ìg/ìl and triazophos was 0.0287 ìg/ìl from the IRAC standard bioassay and the relative toxicity of triazophos was found to be 818.8 fold higher than imidacloprid. The P-values of Logrank test showed that speed ofkilling at the dosage of 0.05 and 0.1% as well as pooled data ofmortality irrespective to the dose of triazophos is significantlyhigher (p 0.05) than that of imidacloprid. It is concluded that hazard rate or efficacy of the toxicant is dependent on not only dose but also killing speed in terms of time taken to kill. It is clearthat deployment of Logrank test with cumulative data of both concentration and time factor has an edge over IRAC method for the toxicity studies on B. tabaci.

287 Pandi, G. Guru; Indian Agricultural Research Institute, New Delhi (India). Pirasanna; Indian Agricultural Research Institute, NewDelhi (India). Paul, Bishwajeet; Indian Agricultural Research Institute, New Delhi (India). Shah, Vivek; Indian Agricultural Research Institute, New Delhi (India). Shankarganesh, K.; Indian Agricultural Research Institute, New Delhi (India). Feedingpotential and biology of coccinellid predator Cheilomenes sexmaculata (Fabricius) (Coleoptera) on aphid hosts. Indian Journal of Entomology (India). Dec 2012 v.74(4) p.388-393 KEYWORDS: MENOCHILUS SEXMACULATUS. APHIDOIDEA. BIOLOGY.

Laboratory studies were conducted to find out the consumptionrate and biology of coccinellid predator Cheilomenes sexmaculata(Fabricius), on aphid hosts, viz., Aphis craccivora Koch, Aphis gossypii Glover, Rhopalosiphum maidis (Fitch) and Lipaphis erysimi (Kaltenbach). The potential hosts, beginning with the best may be arranged as A. craccivora, A. gossypii, R. maidis, and L. erysimi in descending order. The 4th instar grubs consumed significantly more aphids when compared to 1st, 2nd and 3rd instars. The per day predation rate (number of aphids) by female beetle on A. craccivora was 37.2±3.32, followed by A. gossypii (35.2±2.22), R. maidis (31.6±2.44), and L. erysimi (23±0.94). Male could feed only 35.8±2.67 of A. craccivora, followed by 30.8±1.98 of A. gossypii, 27.8±4.28 of R. maidis, and 20.8±1.15 of L. erysimi. Male and female longevity was lowest (26.8±1.71 and 34.6±1.36 days) on L. erysimi and longest (41.6±0.98 and 48.2± 2.67 days) on A. craccivora. The decreasing order of development rate observed of C. sexmaculata was A.craccivora A. gossypii R. maidis L. erysimi.

288 Shah, Vivek; Indian Agricultural Research Institute, New Delhi(India). Div. of Entomology. Paul, Bishwajeet; Indian Agricultural Research Institute, New Delhi (India). Div. of Entomology. Pandi, G. Guru; Indian Agricultural Research Institute, New Delhi (India). Div. of Entomology. Shankarganesh, K.; Indian Agricultural Research Institute, New Delhi (India). Div. of Entomology. Relative toxicity of insecticides on larval stages of green lacewing, Chrysoperla sp. (Carnea-group) (Chrysopidae: neuroptera). Indian Journal of Entomology (India). Dec 2012 v.74(4)p.394-397 KEYWORDS: CHRYSOPERLA. INSECTICIDES. TOXICOLOGY.

Laboratory studies were conducted on the toxicity of Neembaan®, imidacloprid, acetamiprid, thiamethoxam and buprofezin on larvae of Chrysoperla sp. (carnea-group). Acetamiprid was observed to be highly toxic. Based on the LC50, the descending order of toxicity was acetamiprid (0.005), thiamethoxam (0.006), imidacloprid (0.013)buprofezin (0.241) and neembaan (50% mortality at highest concentration). Imidacloprid at field recommended dose (0.005%) caused 26.00% mortality at 24 hours after treatment. Neembaan proved to be the safest whereas, buprofezin was safe and exhibited slightharmful effect at high concentration.

289 Chang, Beso; Nagaland University, Medziphema (India). School ofAgricultural Sciences and Rural Development. Dept. of Entomology. Imtinaro, L.; Nagaland University, Medziphema (India). School of Agricultural Sciences and Rural Development. Dept. of Entomology. Neog, Pankaj; Nagaland University, Medziphema (India). School of Agricultural Sciences and Rural Development. Dept. of Entomology.Effect of ovipositional substrata on egg recovery and biochemical aspects of eri silkworm, Samia cynthia ricini (Boisduval). Indian Journal of Entomology (India). (Dec 2012) v.74(4)p.398-406 KEYWORDS: SILKWORMS. SERICULTURE.

290 Mohanasundaram, A.; Indian Institute of Natural Resins andGums, Ranchi (India). Div. of Lac Production.Sharma, K.K.; IndianInstitute of Natural Resins and Gums, Ranchi (India). Div. of Lac Production.Meena. S.C.; Indian Institute of Natural Resins and Gums, Ranchi (India). Div. of Lac Production. New record of Lawana conspersa (Walker) (Homoptera; flatidae) as a pest of lac host plants . Indian Journal of Entomology (India). (Dec 2012) v.74(4) p.399-401 KEYWORDS: LAC INSECTS. PEST CONTROL. HOST PLANTS.

291 Pathania, Mandeep; Chaudhary Sarvan Kumar Himachal Pradesh Krishi Vishvavidayalya, Palampur (India). Dept. of Entomology. Thakur,Ashok Kumar; Chaudhary Sarvan Kumar Himachal Pradesh Krishi Vishvavidayalya, Palampur (India). Dept. of Entomology. Efficacy ofinsecticides against pulse beetle, Callosobruchus chinensis (L.) on black gram seeds. Indian Journal of Entomology (India). (Dec 2012) v.74(4) p.402- 403 KEYWORDS: CALLOSOBRUCHUS CHINENSIS. CALLOSOBRUCHUSCHINENSIS. URD.

292 Meena, S.C; Indian Institute of Natural Resins and Gums, Ranchi(India). Div. of Lac Production.Sharma, K.K.; Indian Institute of Natural Resins and Gums, Ranchi (India). Div. of Lac Production. Mohanasundaram, A.; Indian Institute of Natural Resins and Gums, Ranchi (India). Div. of Lac Production.Md. Monobrullah; Indian Institute of Natural Resins and Gums, Ranchi (India). Div. of Lac Production. Icerya Aegyptiaca douglas: A new pest of Flemingia semialata and as an alternate host of Aprostocetus purpureus (cameron) in lac ecosystem. Indian Journal of Entomology (India). (Dec 2012) v.74(4) p.404-405 KEYWORDS: LAC INSECTS. KERRIA LACCA. PEST CONTROL.

293 Ameta, O.P.; Maharana Pratap University of Agriculture andTechnology. Rajasthan College of Agriculture. Department of Entomology. Udaipur (India). Sharma, U.S.; Maharana Pratap University of Agriculture and Technology. Rajasthan College of Agriculture. Department of Entomology. Udaipur (India). Jeengar, K.L.; Maharana Pratap University of Agriculture and Technology. Rajasthan College of Agriculture. Department of Entomology. Udaipur (India). Efficacy of Flubendiamide 480 SC against Pod Borers, Helicoverpa Armigera (hubner) and Maruca Testulalis (L.) In Pigeon Pea. Indian Journal ofEntomology (India). (Sep 2011) v.73 (3) p.191-195 KEYWORDS: EFFICIENCY. HELICOVERPA ARMIGERA. MARUCA VITRATA. PIGEON PEAS.

Field experiments conducted on relative efficacy offlubendiamide 480 SC at 50, 75 and 100 ml/ha along with indoxacarb14. 5SC at 500ml/ha and spinosad 45 SC at 187. 5 ml/ha against pod borers viz., Helicoverpa armigera (Hubner) and Maruca testulalis (L)in pigeon pea during 2006 and 2007 revealed that all threeinsecticides were superior in reducing the infestation. However,flubendiamide 480 SC at lOOml/ha caused significantly high reductionin larvae, recorded minimum flower and pod damage and significantlyhigh seed

yield. Insecticidal treatments did not cause adverse effects on population of natural enemies in pigeon pea.

294 Dash, D.; Orissa University of Agriculture and Technology.College of Agriculture. Department of Entomology. Bhubaneswar (India). Senapati, B.; Orissa University of Agriculture and Technology.College of Agriculture. Department of Entomology. Bhubaneswar (India). Patnaik, H.P.; Orissa University of Agriculture and Technology.College of Agriculture. Department of Entomology. Bhubaneswar (India). Influence of Rice Varieties and Plant Nutrients on the Incidence of Yellow Stem Borer, Scirpophaga Incertulas (walker) under ProtectedCondition.Indian Journal of Entomology (India). (Sep 2011) v.73 (3)p.196-200 KEYWORDS: RICE. VARIETIES. PLANT NUTRITION. STEM EATINGINSECTS. SCIRPOPHAGA INCERTULAS.

Field experiments conducted during summer, 2003–04 throughkharif 2004 to study the incidence of yellow stem borer (YSB) inresponse to rice varieties and NPK nutrient levels with and withoutZn in protected and unprotected conditions revealed that the incidence of YSB was more in kharif than in summer season. The variety Surendra sustained least damage by YSB during both theseasons. The extent of damage by YSB increased with increase in doses of NPK. The nutrient level 60: 30: 30 kg NPK/ha with ZnS04 (F3) recorded minimum borer incidence irrespective of varieties and insecticidal treatment. The insecticide ‘triazophos' also proved effective in minimizing the dead heart (DH) incidence significantly at nutrient above level F3. The moderately resistant variety Surendra treated with triazophos could be effectivelyprotected from YSB attack at reproductive stage during kharif, 2004 when the crop was raised under same nutrient level.

295 Ponnada, Udayababu; Indira Gandhi Krishi Vishwavidyalaya.Department of Entomology. Raipur (India). Pophaly, D.J. Indira Gandhi Krishi Vishwavidyalaya. Department of Entomology. Raipur (India). Shaw, S.S.; Indira Gandhi Krishi Vishwavidyalaya. Department of Entomology. Raipur (India). Ganguli, Jayalaxmi; Indira Gandhi Krishi Vishwavidyalaya. Department of Entomology. Raipur (India). Feeding and Probing Behaviour of Rice Brown Planthopper (BPH) Nilaparvata Lugens (stal.). Indian Journal of Entomology (India). (Sep 2011) v.73(3) p.201-203 KEYWORDS: FEEDING. PROBIOTICS. RICE. FULGOROIDEA. NILAPARVATA LUGENS.

Brown plant hopper (BPH) Nilaparvata lugens (Stal.) is an important pest of rice and host plant resistance is the utmost component for managing this. The feeding and probing behaviour of this pest was studied on six selected highly resistant advanced ricebreeding lines along with a resistant check (Ptb-33) and susceptible check (TN-1). After standard screening evaluation the damage score ranged between 0. 1 to 0. 5, 2. 4 and 9. 0, respectively. All selected highly resistant lines exhibited significantly lowest feeding and highest probing marks. Feeding values ranged between 4. 0 to 11. 45 mm2 per female and probe number between 30. 4 to 42. 9 per female on test seedlings.

296 Johri, P.K.; D. A. V. College. Department of Zoology. Kanpur (India). Johri, Reeta; D. A. V. College. Department of Zoology. Kanpur (India). Comparative Ovicidal Action of Seven Plant OriginInsecticides against the Eggs of Bagrada Cruciferarum (kirk.), Pieris Brassicae (L.) And Mylabris Pustulata (thunb.). Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.204-206 KEYWORDS: INSECTICIDES. PIERIS BRASSICAE.

Comparative ovicidal action of seven plant origin insecticidesviz., Abrus precatorius L. (seed-glycosides), Euphorbia nivulia L. (leaf-glycosides), Caesalpinia crista L. (seed-glycosides), Rauwolfia serpentine (L.) Benth. ex Kurz (root-alkaloids), Duranta repens L. (fruit-alkaloids), Hyoscyamus reticulates L. (seed- alkaloids) andCentratherum anthelminticum (Willd.) Kuntze (seed-oils) were studied against eggs of the Bagrada cruciferarum, Pieris brassicae andMylabris pustulata. The LCS0 values were found ranging from 0. 31% to 2. 04%, 0. 33% to 1. 26% and 0. 38% to 1. 38%, respectively. Among the botanical extracts tested, C. crista was found to be comparatively most toxic against the eggs of all the three test insects followed by C. anthelminticum. However, A. precatorius and H. reticulatus did not show significant difference, since more than 60% egg mortality was observed. Other plant extracts like R. serpentina, E. nivulia and D. repens were observed to be ineffective ovicides.The influence of varietal resistance on ovicidal activity ofbotanical extracts was not significant.

297 Abrol, D.P.; Sher-e-Kashmir University of Agricultural Sciencesand Technology. Faculty of Agriculture. Division of Entomology. Chatha (India). Foraging Behavior of Apis Florea F. On Onion. Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.207-212 KEYWORDS: FORAGING. BEHAVIOUR. APIS FLOREA. ONIONS.

Foraging behavior of insect pollinators visiting onion flowers (Alluim cepa L.) was studied in relation to five environmental variables. The dwarf honey bee Apis florea L., was the most abundant flower visitor and comprised more than 94% of the total flower visitors. Commencement of flight activity occurred when a minimum threshold of environmental variables was surpassed while the cessation was governed mainly by decline in values of light intensityand radiation. In between the commencement and cessation, the foraging population correlated significantly and positively with air temperature, light intensity, solar radiation and nectar-sugar concentration and negatively with relative humidity. Path coefficient analysis, however, revealed that direct effect of temperature was high and positive followed by light intensity and solar radiation while the direct effect of relative humidity was low and negative. The direct effect of nectar-sugar concentration was positive andnegligible. Evidently, path coefficient analysis gave a more clearpicture of effects than did the simple correlation analysis. Thestudies further revealed that the average amount of nectar and energy per umbel was significantly positively correlated with the number of bee visit. Apis florea on an average visited 1. 33+0. 41 and 6. 17±0.63 umbels and flowers/min, during different hours of the day. Furthermore, the insect pollinated plots produced significantly moreseeds with heavier weights than those isolated from insect visits.

298 Singh, Dharmendra, S.; Mahatma Gandhi Chitrakoot Gramodya Vishwavidyalaya. Faculty of Agriculture. Satna (India). Rizvi, M.A.; Mahatma Gandhi Chitrakoot Gramodya Vishwavidyalaya. Faculty of Agriculture. Satna (India). Kushwaha, H.S.; Mahatma Gandhi Chitrakoot Gramodya Vishwavidyalaya. Faculty of Agriculture. Satna (India). Role of Non-cultivated Plant Species in Carry over and Perpetuationof Helicoverpa Armigera. Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.213-218 KEYWORDS: FOREST PLANTATIONS. SPECIES. HELICOVERPA ARMIGERA. HELICOVERPA.

Regular weekly observations on the larvae of Helicoverpa armigera (Hubner) were made on various non cultivated plants in fieldcrops, outside the crops and during off seasons. Data revealed that24 species of weeds were found to harbour pest larvae. Out of these 13 weeds were suitable for carryover of larvae while 11 aided perpetuation and multiplication. Three

species of weeds viz., Datura matel, Physalis minima and Sutera glandulosa were noticed to play an important role in perpetuation of H. armigera. D. matel and P. minima were observed to harbour H. armigera larvae throughout the year, and on S. glandulosa the larvae were found feeding from mid July to November.

299 Jena, Ayashaa; Indian Agricultural Research Institute. Division of Entomology. New Delhi (India). Vidyarathi, A.S.; ndian AgriculturalResearch Institute. Division of Entomology. New Delhi (India). Ramani, R.; ndian Agricultural Research Institute. Division of Entomology.New Delhi (India). Sharma, K.K.; ndian Agricultural Research Institute. Division of Entomology. New Delhi (India). Ramamurthy, V.V.; ndian Agricultural Research Institute. Division of Entomology. New Delhi (India). An Illustrated Diagnostics of Lac Insect Kerria Lacca (kerr) as Exemplified. Through Advanced Staining and Microscopy Techniques. Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.219-226 KEYWORDS: LAC INSECTS. KERRIA LACCA. TECHNOLOGY.

A new and improved differential staining technique has been explored for the permanent mount preparation of the females of lac insect Kerria lacca (Kerr). The salient taxonomic characters had been illustrated using this technique, supplemented with the Scanning Electron Microcopy (SEM) studies. These have revealed a definite pattern of the dorsal duct cluster, stigmatic spinose setae on the brachial plate, pre-anal plate, sclerotized collar of the nuclear ducts of marginal duct cluster and six sectored anal ring not recorded earlier. Post-oral lobes, rudimentary legs and traces ofsegmentation observed on the ventral aspect adds to the knowledge on its morphology. All these are likely to have implications on itsclassification in subgenera and species.

300 Daware, D.G.; Marathwada Agricultural University. SorghumResearch Station. Parbhani (India). Ambilwarde, P.P.; Marathwada Agricultural University. Sorghum Research Station. Parbhani (India). Kamble, R.J.; Marathwada Agricultural University. Sorghum ResearchStation. Parbhani (India). Bhosle, B.B.Marathwada AgriculturalUniversity. Sorghum Research Station. Parbhani (India). Bioefficacyof Insecticides against Sorghum Shoot Fly Atherigona Soccata (rondani. Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.227-229 KEYWORDS: INSECTICIDES. SORGHUM. ATHERIGONA. ATHERIGONA SOCCATA.

Field experiments were conducted for three consecutive years 2005–2007 in kharif season to find out the effective and economical seed dresser for the management of sorghum shoot fly Atherigona soccata (Rondani) at Sorghum Research Station, Marathwada Agricultural University, Parbhani. The treatment with thiamethoxam 3. 1 g a. i./kg seed recorded significantly lowest shoot fly deadhearts (22. 66%) and gave maximum yield (3071. 59 kg/ha) which was at par with imidacloprid 8. 75 g a. i./kg seed. There were not much differences in cost benefit ratio of thiamethoxam (70 WS) 3. 1 gm a.i./kg (1: 12) and thiamethoxam 2. 10 gm a. i./kg. (1: 11). Hence, lower dose of thiamethoxam can be used effectively and economically for shoot fly management in late sown kharif sorghum.

301 Chandel, B.S.; D.B.S. College. Department of Zoology. Kanpur (India). Vajpal, Shail; D.B.S. College. Department of Zoology. Kanpur (India). Singh, Vimlesh; D.B.S. College. Department of Zoology. Kanpur (India). Bioefficacy of Plant Products against Painted Bug, Bagrada Cruciferarum Kirk. (hemiptera: Pentatomidae). Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.230-233 KEYWORDS: PLANTPRODUCTS. HETEROPTERA. HEMIPTERA. PENTATOMIDAE.

Laboratory experiments were conducted to test the seed kernels of Azadirachta indica A. Juss, seeds of Jatropha curcus Linn, leafextracts of Annona squamosa Linn., aerial parts of Adhatoda vasica Nees, Cassia torn Linn., Vitex negundo Linn., Withania somniferaDun., Acorus calamus Linn., unripe fruits of Lantana camara Linn, and roots of Saussurea lappa Clarke, against nymphs and adults of painted bug, Bagrada cruciferum Kirk, at concentrations of 0. 5, 1. 0 and 2.0%. Extracts of A. indica and Vitex negundo irrespective of concentrations were more effective, causing 80. 87 and 74. 99% mortality of nymphs and adults of B. cruciferarum whereas Saussurealappa extracts showed less effectiveness.

302 Satpute, N.S.; Dr. Panjabrao Deshmukh Krishi Vidyapeeth.Department of Entomology. Akola (India).Nagane, V.V.; Dr. PanjabraoDeshmukh Krishi Vidyapeeth. Department of Entomology. Akola (India). Barkhade U.P.; Dr. Panjabrao Deshmukh Krishi Vidyapeeth. Department of Entomology. Akola (India).Rathod, P.K.; Dr. Panjabrao Deshmukh Krishi Vidyapeeth. Department of Entomology. Akola (India). Biology of Phenacoccus Solenopsis (tinsley) on Different Hosts. IndianJournal of Entomology (India). (Sep 2011) v.73 (3) p.234-236 KEYWORDS: BIOLOGY.PHENACOCCUS.

The biology of the mealybug Phenacoccus solenopsis (Tinsley) was studied on different hosts under laboratory conditions during 2009–10 and it was found that P. solenopsis reproduced parthenogenetically with ovoviviparity. The female had three nymphal instars whereas the male also posesses a pupal stage. The total developmental period of female nymphs was 22. 5, 26 and 23. 5 days on cotton, Hibiscus (Gurhal) and sprouted potato, respectively. The longevity of an adult female varied from 10 to 13 days on cotton twigs/leaves, 11 to 14 days on hibiscus twigs/leaves and 11 to 14 days on sprouted potatoes. However, the adult winged male had a short longevity of 2. 5, 3. 2 and 3. 3 days on cotton, hibiscus and sprouted potatoes, respectively. It was found that 70 to 75% of the population wasfemales irrespective of the host plant. The fecundity was more when the mealybug was fed on Hibiscus than the other two hosts tested.

303 Mohite, A.S.; Sevadal College for Women. Department of Zoology and Research Academy. Nagpur (India). Charde, P.N.; Sevadal Collegefor Women. Department of Zoology and Research Academy. Nagpur (India). Dahegaonkar, J.S.; Sevadal College for Women. Department of Zoology and Research Academy. Nagpur (India). Dorlikar, A.V.; Sevada College for Women. Department of Zoology and Research Academy. Nagpur (India). Temperature Effects on the Rate of Development of Life Stages of Gram Pod Borer, Helicoverpa Armigera (hubner) (lepidoptera: Noctuidae). Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.237-240 KEYWORDS: TEMPERATURE. HELICOVERPA. HELICOVERPA ARMIGERA.LEPIDOPTERA. NOCTUIDAE.

Life stages of Helicoverpa armigera (Hubner) were held in constant temperatures ranging from 15°C to 30°C to determine the effect of temperature on development, oviposition and fecundity. Over the temperature range tested, developmental rate of the life history stages and oviposition period decreased as temperature increased from 15°C to 30°C. By means of linear regression, a lower developmental threshold temperature of 11. 5°C, 12. 2°C, 13. 4°C and 6. 5°C was estimated for the incubation of eggs, development of larval stage, development of pupal stage and oviposition period, respectively. A mean thermal constant of 45. 53 degree-days, 195. 98 degree-days, 142. 62 degree-days and 81. 53 degree-days above estimated lowerthreshold temperature was required for the incubation of eggs, larval development, pupal development and oviposition period, respectively.Fecundity was

positively correlated with temperature. Maximum oviposition occurred between 25°C and 27°C, however, temperatures of 30°C or higher were detrimental.

304 Rana, V.K.; Krishi Vigyan Kendra. Dr. Y.S. Parmar University of Horticulture & Forestry. Himachal Pradesh (India). Kumar, Sunil; Krishi Vigyan Kendra. Dr. Y.S. Parmar University of Horticulture & Forestry. Himachal Pradesh (India). Performance of Apis Mellifera L. Colonies in the High Hills of Himachal Pradesh. Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.241-243 KEYWORDS: PERFORMANCE TESTING. APIS MELLIFERA LIGUSTICA. HIGHLANDS. HIMACHAL PRADESH.

The wet and dry temperate zone of Himachal Pradesh depends on temperate fruits like apple, pear, cherry, almond and apricot. Due to lack of wild pollinators, orchardists are keeping honey bee colonies in their orchards. The present studies were carried out to find out whether these temperate fruits are helpful to bee colonies in respectof build up and hive gain and whether the bee colonies can be kept throughout the year. The studies were conducted at Krishi Vigyan Kendra, Kinnaur at Reckong Peo during 2007–2008. For carrying out the studies, 3 Apis mellifera L. colonies (having 8 bee frames each) were kept at the Kendra and were shifted to different bee flora available in district Kinnaur from time to time. The bee strength increased from 8 (February 2007) to 11 (May 2007) frames, owing to the temperate fruit flowering. The bee strength reduced to 6 frames in January 2008. In February 2007, the brood area was 3600 cm2 and reached 4260. 0 cm2, 5275. 0 cm2 and 5904 cm2 in March, April and May 2007, respectively. Brood area decreased after that and picked up again in September 2007 (4670. 0 cm2) and pollen area was at its peakin May (2953. 0 cm2).Bees could not get sufficient honey to be extracted from temperate fruit flowering. But in September-October there was flowering of Plectranthus and this proved very good nectar source. Thus, on an average 5. 0 kg honey was extracted per colony from the bloom of this source. The data recorded on the sugar consumption by honey bees revealed that on an average 11 kg sugar is required per colony per year in this zone and in total 22 sugar feedings (0. 5 kg each) are required per colony for the year.

305 Singh, R.N.; Banaras Hindu University. Institute ofAgricultural Sciences. Department of Entomology & AgriculturalZoology. Varanasi (India). Singh, Pratap Ajit; Banaras Hindu University. Institute of Agricultural Sciences. Department of Entomology & Agricultural Zoology. Varanasi (India). Responses of Neem Extracts on Life Stages of Yellow Mite Polyphagotarsonemus Latus (banks). Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.244-246 KEYWORDS: NEEM EXTRACTS. POLYPHAGOTARSONEMUS. POLYPHAGOTARSONEMUS LATUS. ACARINA.BANKS.

The yellow mite, Polyphagotarsonemus latus Banks is a major problem in chilli, during winter. Therefore, neem extracts, in fivedifferent forms viz, neem formulation, neem seed kernel extract (NSKE), neem leaf extracts (NLE) and neem bark extract (NBE) in their recommended doses i. e. 5 ml/lt. The neem oil at 2 ml and propargite (57% EC) were used at 3 ml/liter of water and these were evaluated for their acaricidal effect. The results indicate that neem seed kernel extract (NSKE) at 5 ml, is most effective followed by neem formulation and neem oil.

306 Maruthadurai, R.; Indian Agricultural Research Institute. Division of Entomology. Biological Control Laboratory. New Delhi(India). Gautam, R.D.; Indian Agricultural Research Institute.Division of Entomology.Biological Control Laboratory. New Delhi(India). Archna;

Indian Agricultural Research Institute. Division of Entomology.Biological Control Laboratory. New Delhi (India).Behavioural Response of Trichogramma Chilonis Ishii (hymenoptera: Trichogrammatidae) to Kairomones. Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.247-252 KEYWORDS: BEHAVIOUR.HYMENOPTERA. TRICHOGRAMMATIDAE. TRICHOGRAMMA. TRICHOGRAMMA CHILONIS. KAIROMONES.

Bioassay with hexane extracts of male and female whole body wash of hosts viz, Earias vitella and Spodoptera litura with Trichogramma chilonis revealed their kairomonal activities. Whole body extracts of male and female moths were analysed separately by gas chromatography for determining their hydrocarbon profile, which showed the presence of straight chain saturated hydrocarbons ranging from Cg to C.,. Both the host insects showed variation in number and concentration of these chemicals, which were responsible for influencing the parasitoid activity, parasitism and emergence. The foraging activity of the parasitoid as indicated by parasitoid activity index (PAI) was highest (14. 17) in S. litura male body extract at concentration Cs (10, 000 ppm) followed by (11. 50) in E. vitella female body extract at C4 (1000 ppm) by T. chilonis. Maximum percentage parasitism of (52. 22) and emergence (15. 00) was observed at highest concentration in S. litura male body extract followed by E. vitella female body extract. Highest overall response was recorded in egg cards treated with whole body wash of male and female of S. litura and E. vitella, respectively, which may be attributed to the presence of more number of favourable saturated hydrocarbons viz.; heneicosane, tricosane, pentacosane, hexacosane, octacosane, and nonacosane, as revealed by GC. Kairomonal interaction observed in the whole body extract of male and female of E. vitella were significantly different from male and female of S. litura as well as control. These favourable hydrocarbons at appropriate concentration of body extract of E. vitella female and S. litura male could be used for enhancing parasitization by T. chilonis.

307 Verma, Savita; Mahatma Gandhi Chitrakoot GramodayaVishwavidyalaya. Faculty of Agriculture. Department of Crop Sciences. Chitrakoot (India). Anandhi, P.; Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya. Faculty of Agriculture. Department of Crop Sciences.Chitrakoot (India). Srivastva, Sankar Daya; Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya. Faculty of Agriculture. Department of Crop Sciences. Chitrakoot (India).Singh, Yajuvendra; Mahatma GandhiChitrakoot Gramodaya Vishwavidyalaya. Faculty of Agriculture. Department of Crop Sciences. Chitrakoot (India). Evaluation of Key Mortality Factors and Botanicals in Brinjal Hadda Beetle, Henosepilachna Vigintioctopunctata. Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.253-257 KEYWORDS: EVOLUTION. MORTALITY. BOTANICAL GARDENS. AUBERGINES.COLEOPTERA.EPILACHNA. EPILACHNA VIGINTIOCTOPUNCTATA.

In life table studies of hadda beetle, series of age-specific mortality showed maximum mortality in the pupal stage (24. 37%) due to pupal parasitoids (Brachymeria sp.), blackening and cannibalism followed by fourth instar grub (22. 77%) due to parasitism by larval parasitoid (Pediobius foveolatus), dispersal and unknown factors. The total generation mortality was 118. 84%. In laboratory treatment, maximum mortality was recorded in nerium (10%) followed by NSKE (5%). In field studies, chlorpyriphos (0. 05%) proved more effective in reducing population (71. Hand 70. 50%) followed by nerium (10%) with 61. 19 and 63. 26%.

308 Sarmah, M.; Tocklai Experimental Station. Department of Entomology. Jorhat (India). Bhola, R.K.; Tocklai Experimental Station. Department of Entomology. Jorhat (India). Effect of Aqueous Plant Extracts on Growth and Development of Tea Mosquito Bug, Helopeltis Theivora Waterhouse. Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.258-262 KEYWORDS: PLANTS. EXTRACTS. GROWTH. ECONOMIC THEORIES. TEA. CAMELLIA SINENSIS. CULICIDAE. HETEROPTERA. HELOPELTIS.

Experiments were carried out to study the effect of aqueous plant extracts of Azadirachta indica, Acorus calamus, Xanthiumstrumarium and Polygonum hydropiper on the development of tea mosquito bug, Helopeltis theivora Waterhouse. Significant effect ondifferent developmental parameters of H. theivora was observed. The number of feeding spots produced by first instar nymphs was significantly reduced to 49. 83–109. 00 in plant extracts treatedshoots as against 202. 33–205. 67 in untreated control. However in case of adults the same was reduced to 35. 17–76. 83 at 10-2%concentration. Fecundity of H. theivora was significantly reduced to37. 50–55. 66 on the treated tea shoots with aqueous extracts of plants as against 107. 33–110. 17 in untreated shoots. The hatching percentage and adult longevity also decreased significantly. However the longevity of first instar nymph was lengthened (juvenile effect) to 2. 61-2. 97 days at 2–10% concentration.

309 Borkar, S.L.; Dr. Panjabrao Deshmukh Krishi Vidyapeeth. Department of Entomology. Akola (India). Sarode, S.V.; Dr. PanjabraoDeshmukh Krishi Vidyapeeth. Department of Entomology. Akola (India). Evaluation of Botanicals and Biopesticides in the Management of Bollworm Complex in Cotton. Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.263-269 KEYWORDS: EVOLUTION. BOTANICAL PESTICIDES.BIOPESTICIDES.MANAGEMENT. COMPLEXING. COTTON.

Evaluation of botanicals and biopesticides on the management ofcotton bollworm was carried out during 2004–05 and 2005–06 at the Department of Entomology, Dr. P D K V, Akola in a randomized block design. In all twenty treatments consisting of NSE 5%, neem oil 1%,azadirachtin 1500 ppm, CASE 5% were evaluated initially against sucking pests and continued further for evaluation against bollworm complex by scheduling the treatments viz., HaNPV 250 LE/ha, Bt 1000 g/ha and spinosad 45 SC 0. 01%. A application of NSE 5% and azadirachtin 1500 ppm followed by spinosad 45 SC as well as NSE 5% and azadirachtin 1500 ppm followed by HaNPV 250 LE/ha emerged as themost effective treatment schedules in minimizing the green fruitingbodies damage caused due to H. armigera. Similarly, the influence of NSE 5% and azadirachtin 1500 ppm followed by spinosad 45 SC and NSE 5% and azadirachtin 1500 ppm followed by Bt 1000 g/ha performed better against larval population of E. vitella damage in green fruiting damage. The treatment schedules comprising NSE 5% and azadirachtin 1500 ppm followed by spinosad 45 SC as well as Bt 1000g/ha found effective in reducing the infestation of pink bollworm in green bolls and loculi damage. The treatments containing NSE 5% and azadirachtin 1500 ppm followed by spinosad 45 SC, NSE 5% as well asazadirachtin 1500 ppm followed by Bt 1000 g/ha were found effective in recording the lowest open boll and loculi damage as well as minimum bad seed cotton due to bollworm complex at harvest. Thetreatment, NSE 5% followed by spinosad 45 SC observed as the most effective treatment as it has obtained the highest seed cotton yield.

310 Estimation of Shoot Damage in Bt and Non Bt Brinjal Hybrids Due to Brinjal Shoot and Fruit Borer (leucinodes Orbonalis Guen.). Indian Journal of Entomology (india). (Sep 2011)

v.73 (3) p.270KEYWORDS: SHOOTS. DAMAGE. AUBERGINES. HYBRIDS. LEUCINODESORBONALIS.

311 Effect of irrigation intervals on the incidence of sugarcaneearly shoot borer Chilo infuscatellus Snellen. Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.271-272 KEYWORDS: IRRIGATION. SUGARCANE. CHILO. CHILO INFUSCATELLUS.

312 Switchover of Codling Moth (cydia Pomonella L.) From Apple toApricot in Kargil, Ladakh. Indian Journal of Entomology (India).(Sep 2011) v.73 (3) p.273 KEYWORDS: VIGNA ACONITIFOLIA. CYDIA POMONELLA. APPLES. APRICOTS.

313 Life Fecundity Tables of Lemon Butterfly (papilio DemoleusLinnaeus). Indian Journal of Entomology (India). (Sep 2011) v.73 (3)p.274-275 KEYWORDS: FERTILITY. LEMONS. PAPILIO.

314 Monitoring of Yellow Stem Borer, Scirpophaga Incertulas Walker in Rice through Light and Pheromone Traps. Indian Journal ofEntomology (India). (Sep 2011) v.73 (3) p.276-278 KEYWORDS: MONITORING. STEM EATING INSECTS. SCIRPOPHAGA. SCIRPOPHAGA INCERTULAS. RICE. LIGHT.PHEROMONE TRAPS.

315 Pathogenic Effect of Xenorhabdus Nematophillus against Larvaeof the Diamond Back Moth, Plutella Xylostella (linn.). IndianJournal of Entomology (India). (Sep 2011) v.73 (3) p.279-280 KEYWORDS: LARVAE.PLUTELLA. TRYPODENDRON.

316 Age Specific Life-table of Samia Cynthia Ricini (boisd.) On Castor. Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.281-282 KEYWORDS: AGE. SAMIA. SAMIA CYNTHIA. RICINUS. PHYTOTOXINS. BEAVERS.

317 Insect Pollinators of Onion in Maharashtra. Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.283-284 KEYWORDS: INSECT CONTROL. POLLINATORS. ONIONS. MAHARASHTRA.

318 Estimation of Losses and Population Dynamics of Major Pests inDesi Cotton (gossypium Arboreum). Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.284-286 KEYWORDS: LOSSES. PESTS.COTTON. GOSSYPIUM. GOSSYPIUM ARBOREUM.

319 Weight Loss and Population Build up of Callosobruchus SpeciesComplex in Green Gram Cultivars. Indian Journal of Entomology (India). (Sep 2011) v.73 (3) p.287-289 KEYWORDS: WEIGHT. WEIGHT LOSSES. CALLOSOBRUCHUS. MUNG BEANS. VARIETIES.

320 Dabhade, P. L.; Junagadh Agricultural University,Junagadh (India). Department of EntomologyBapodra, J. G.; Junagadh Agricultural University, Junagadh (India). Department of Entomology Jethva, D. M.; Junagadh Agricultural University, Junagadh (India). Department of EntomologyRathod, R. T.; Junagadh Agricultural University, Junagadh (India). Department of EntomologyDabhi, M. V.; Junagadh Agricultural University, Junagadh (India). Department of Entomology. Estimation of yield losses due to major insect pests of groundnut in Gujarat. Legume Research (India). (Dec 2012) v. 35(4)p.354-356 KEYWORDS: GROUNDNUTS. ARACHIS HYPOGAEA. YIELDS. PESTINSECTS. INSECT DISEASES. GUJARAT.

Studies on estimation of yield losses of groundnut due to majorinsect pests revealed that the highest pod (1367 kg/ha) and fodder(2947 kg/ha) yield as well as CBR of 1: 6.51 was obtained in the plotsprayed with dimethoate 0.03%, chlorpyriphos 0.05%, profenophos 0.05%and profenophos 40%+ cypermethrin 4% % 0.044% at 15 days interval starting from 20 days after sowing till harvest of the crop. The avoidable yield loss due to major insect pests of groundnut was recorded to the tune of 48.57% in pod and 42.11% in fodder in untreated control plot. The data on yield in protected plots revealed that 94.45% additional yield in pod and 72.74% additional yield in fodder could be realized over unprotected plots.

321 Sahayaraj, K.; St. Xavier's College (Autonomous), Palayamkottai (India). Crop Protection Research CentreSelvaraj, P.; St. Xavier's College (Autonomous), Palayamkottai (India). CropProtection Research Centre. Field evaluation of three fern extractson helicoverpa armigera (Hubner) and spodoptera litura (Fab.)incidence and infestation and groundnut production. Legume Research (India). (Feb 2013) v. 36(1) p.84-86 KEYWORDS: FERNS. GROUNDNUTS. PESTS.HELICOVERPA ARMIGERA. HELICOVERPA. SPODOPTERA. SPODOPTERALITURA. NUTS.

Field efficacy of three fern extracts were evaluated for theirpesticidal property against Helicoverpa arrnigera (Hubner) and Spodoptera litura (Fab.) under groundnut field condition. The fern extracts were effective in controlling the pests at field level. The order of pesticidal efficacy was P. aquilinum H. arifolia C. parasitica. Highest population reduction was recorded in P. aquilinum treated plots followed by H. arifolia at 49 and 64 days after seedling (DASE). The highest yield was recorded in P. aquilinum (1400Kg/ha) followed by H. arifolia (1370 Kg/ha) and C. parasitica (1250 Kg/ha). The cost benefit ratio was 1:1.82, 1:1.79 and 1:1.63 for P.aquilinum, H. arifolia and C. parasitica, respectively.

322 Bisane, K.D.; Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola(India). Department of EntomologyWadaskar, R.M.; Dr. PanjabraoDeshmukh Krishi Vidyapeeth, Akola (India). Department of Entomology Deotale , R.O.; Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (India). Department of Entomology. Tritrophic interaction of helicoverpa armigera (Hubner) in major pulses ecosystem. Legume Research (India). (April 2013) v. 36(2) p.116-124 KEYWORDS: CHICKPEAS. CICER ARIETINUM. HELICOVERPA ARMIGERA. NATURAL ENEMIES. PIGEON PEAS. WEATHER REPORTS.

The seasonal incidence of Helicoverpa armigera (Hubner) and its parasitization in pigeonpea and chickpea under rainfed cropping system of Akola (MS) were assessed during 2004–05 and 2005–06. In pigeonpea ecosystem, early instar H. arrnigera larvae wereparasitized by Eriborus argenteopilosus (Cameron) to the extent of 23.5 per cent. Bracon sp. and Campoletis chlorideae (Uchida) had achieved parasitization to the extent of 14.3 and 10.2 per cent, respectively. Tachinid fly could parastize 9.4 per cent late instar larvae and 33.3 per cent H. armigera pupae. Under chickpea ecosystem,E. argenteopilosus parasitized H. armigera larvae up to 16.1 per cent and C. chlorideae registered parasitization up to 14.3 percent, whereas, Tachinid fly could inflict parasitization to the tune of 10.0 and 33.3 per cent in late larval and pupal stages, respectively.Neither larval incidence of H. armigera nor the parasitization bynatural enemies were found to have consistent significant relationship with the weather parameters. Present study revealed thatthe H. armigera incidence was more closely associated with host phenology rather than the weather parameters and the parasitization showed density dependent relationship.

323 Sharma, Rupesh; CMJ University, Shillong (India). Devi, Renu; CMJUniversity, Shillong(India). Sharma, Ramesh Kumar; CMJ University, Shillong(India). Mehla, J.C.; CMJ University, Shillong (India). Efficacy of some botanicals against pulse beetle, callosobruchus chinensis (L.) in chickpea. Legume Research (India). (Apr 2013) v. 36(2) p.125-130 KEYWORDS: CHICKPEAS. CICER ARIETINUM. COLEOPTERA. PESTS.

The pulse beetle, Ca11osobruchus chinensis (L) is the major pest of stored chickpea grain causing substantial loss in the storage. Plant products viz.neem (seed kernel powder and oil), mustard oil, groundnut oil, tunneric powder and tunneric powder mixture with mustard oil and groundnut oil were evaluated for their deterrent effect on adult mortality and emergence, oviposition and seed damage caused by C. chinensis in chickpea. All the oils gave significantly higher adult mortality as compared to untreated control. On the basis of number of eggs laid, adult emergence and seed damage except neem seed kernel powder and tunneric powder all treatments were considered as most effective against C. chinensis.

324 Sharma, Rupesh; CMJ University, Shillong (India). Devi, Renu; CMJ University, Shillong(India).Sharma, Ramesh Kumar; CMJ University, Shillong (India). Singh, Maan; CMJ University, Shillong(India). Incidence and extent of damage due to insect pests of stored chickpea cicer arietlnum (L.) in Haryana State, India. Legume Research (India). (Apr 2013) v. 36(2) p.142-146 KEYWORDS: CHICKPEAS.CICER ARIETINUM. CALLOSOBRUCHUS. CALLOSOBRUCHUS CHINENSIS. DAMAGE. STORAGE. HARYANA. INDIA.

Chickpea, Cicer arietinum (L) an important leguminous crop, is commonly cultivated in different parts of world, where it is often severely damaged in storage conditions. So, the main constraint for production of chickpea is post-harvest loss during storage. The chickpea production amounted to 75.5 percent of the total pulses production and storage was 57.9 percent of total chickpea production of suryed farmers. Five insect pests i.e. Callosobruchus chinensis (L), Tribolium castaneum (H.), Trogoderma granarium (E.), Rhizopertha dominica (E), and Sitophilus oryzae (L) were observed in stored chickpea. The present study concluded that major insect infesting chickpea was C. chinensis which reached its peak during Septmber -October and the grain damage was rated the highest during January-February (13.75%) and lowest during June-July (3.05%).

325 Kumar Ch., Anil; ANGRAU, Hyderabad. anil03agrimail.comRao, G. Ramachandra; Agricultural College, Bapatla (India). Department of Entomology.Chalam, M.S.V.; Agricultural College, Rajamundhry. Efficacy of botanicals with organic manures and fertilizers on brinjal pests. Indian Journal of Entomology (India). (Jan 2013) v.75(1)p.1-8 KEYWORDS: EPILACHNA. COMPOSTING. PONGAMIA PINNATA. ANNONA SQUAMOSA. MURRAYA KOENIGII.

Field efficacy of six botanicals in the management of major pests viz., spotted leaf beetle Epilachna vigintioctopunctata andshoot and fruit borer Leucinodes orbonalis of brinjal was evaluated in combination with vermicompost, farmyard manure and straight fertilizers as main treatments and six botanicals as sub treatments employing the split plot design. Organic manures proved to be superior when compared to the fertilizers as regards pest incidence. Vermicompost was significantly more effective as regards fruit borer infestation. NSKE 5% extract proved to be the most effective against fruit borer. Neemgold (Azadirachtin) 5ml/l, Pongamia glabra 5% leaf extract and Annona squamosa 5% leaf extract also were effective in reducing the fruit borer incidence. Murraya koenigi 5% extract and

chilli-garlic 5% extract were less effective. Significantly highest marketable yield was obtained in Neemgold (Azadirachtin) 5ml/l followed by NSKE 5%.

326 Sahoo, S. K.; Government of West Bengal, Ranibagan, Berhampore, Murshidabad (India). Pulses and Oilseeds ResearchStation.shyamalsahooahoo.co.in. Population dynamics of mustard aphid, Lipaphis erysimi Kaltenbach (hemiptera; aphididae) on Brassica germplasm. Indian Journal of Entomology (India). (Jan 2013) v.75(1)p.9-14 KEYWORDS: POPULATION DYNAMICS. LIPAPHIS ERYSIMI. BRASSICA. STATISTICAL METHODS.

Mustard aphid (Lipaphis erysimi Kaltenbach) is one of the devastating pests on rapeseed-mustard. An experiment was carried out to observe its population dynamics in relation to the abiotic factors. The appearance of aphid was observed from 52nd standard week, which disappeared after 10th standard week. The peak populationwas found from 5th to 7th standard week. It is revealed from the stepwise regression equation that except wind speed and morning relative humidity none of the weather factors alone had influence on the population build up. The combined influence of rainfall,temperature, relative humidity and wind speed increased with the R2 value of 0.707, 0.626 and 0.412 during 2009–10, 2010–11 and 2011–12, respectively.

327 Devikarani Kh; Gauhati University, Guwahati (India). Department of Zoology. devika_khahoo.co.inBhola, R.K; ManipurUniversity, Canchipur (India). Department of Life Sciences.Singh, T.K.; Manipur University, Canchipur (India). Department of Life Sciences. Effect of prey densities on the larval development of aladybird beetle,Coelophora saucia (Mulsant). Indian Journal of Entomology (India). (Jan 2013) v.75(1)p.15-18 KEYWORDS: LARVAE. APHIS CRACCIVORA. COCCINELLIDAE.

The influence of prey densities of Aphis craccivora Koch on the developmental parameters viz., predation, developmental duration, larval weight, relative growth rate, and food conversion efficiency of Coelophora saucia (Mulsant) larvae were studied in the laboratory. Total aphid consumed, larval weight, relative growth rate increasedwith increase in prey density and was maximum at the density of 60aphids/day. Developmental duration was inversely proportional with the number of aphids consumed. With longest being 5 aphids/day density and shortest at 60 aphids/day. Food conversion efficiency of the larvae was maximum at the low density of 5 aphids/day.

328 Gogoi, P.P.; Assam Agricultural University, Jorhat (India). Department of Entomology.Borah, R.K.; Assam Agricultural University, Jorhat (India). Department of Entomology. Incidence of lesser bandicoot rat, Bandicota bengalensis (gray) in rice ecosystem in the upper brahmaputra valley. Indian Journal of Entomology (India) . (Jan. 2013) v.75(1)p.19-22 KEYWORDS: BANDICOTA BENGALENSIS. RICE FIELDS. RICE.

An investigation was carried out in the rice fields at Regional Agricultural Research Station (RARS), Titabor and Instructional Cum Research (ICR) farm, Assam Agricultural University, Jorhat during Boro and Sali season in 2009–2010 and 2010–11, respectively, with aview to study the seasonal incidence, and damage by Bandicotabengalensis (Gray) in rice ecosystem. The seasonal incidence and damage of B. bengalensis were recorded at different crop growthstages viz., tillering, panicle initiation, flowering, dough and ripening stages. In both Boro and Sali season, highest LBC (28.17 and 35.67 numbers/ha) and trap index (7.12 and 9.06) were recorded inripening stage and minimum LBC (3.44 and 5.28 numbers/ha and trap index (1.57 and 2.67) were recorded in the tillering stage. Similarly, the B. bengalensis

damage in terms of per cent cut tillersincreased with the advancement of crop growth. Maximum damage (4.14 and 5.78% cut tiller) was recorded in ripening stage of both Boro and Sali rice, respectively whereas minimum damage (1.62 and 1.98% cuttiller) was recorded in the tillering stage.

329 Meghwal, H.P.; Maharana Pratap University of Agriculture and Technology, Ummedganj (India). Agricultural Research Station. Chaudhary, H.R.; Maharana Pratap University of Agriculture and Technology, Ummedganj (India). Agricultural Research Station. Bioefficacy and optimization of dose of Thiacloprid against soybean girdle beetle, Obereopsis brevis. Indian Journal of Entomology (India). (Jan. 2013) v.75(1)p.23-25 KEYWORDS: SOYBEANS. PEST CONTROL.

Thiacloprid 240 SC 500, 625 and 750 ml/ha along with profenofos 50 EC 2000 ml/ha and Triazophos 40EC 625 ml/ha were evaluated for their efficacy against girdle beetle, Obereopsis brevis Swed. (Lamiidae: Coleoptera) at Agricultural Research Station, Ummedganj, Kota during kharif 2009 and kharif 2010. Thiacloprid 240 SC 750 ml/ha was found most effective followed by profenophos 50 EC. Maximum seed yield and additional seed yield was obtained with thiacloprid 240 SC 750 ml/ha followed by profenofos 50 EC. The marginal higher net return (Rs. 13786/ha) was found with thiacloprid 240 SC 750 ml/ha followed by profenofos 50 EC.

330 Mohanta, J.; North Orissa University, Baripada (India). P. G.Dept. of Zoology. plasma.jmmail.comDey, D. G.; Udala College, Udala, Mayurbhanj (India). Department of Zoology, Udala College.Mohanty, N.; North Orissa University, Baripada (India). P. G. Dept. of Zoology. Life cycle of lac insect, Kerria lacca kerr in similipal Biosphere Reserve. Indian Journal of Entomology (India). (Jan. 2013) v.75(1)p.26-30 KEYWORDS: KERRIA LACCA. SCHLEICHERA OLEOSA. RESINS.

Lac a natural resin is secreted by a tiny scale insect, Kerria lacca Kerr. Its primary host plants such as kusum (Schleichera oleosa), palas (Butea monosperma) and ber (Zizyphus mauritiana) are available in peripheral and buffer zones of Similipal Biosphere Reserve (SBR). An attempt has been made to study its life cycle and life span in different zones of SBR. Two strains, i.e., kusmi and rangeeni of lac insect are bivoltine in nature at SBR. The longest life span of 8 months 5 days was observed in baisakhi (summer) crop and shortest life span of 3 months 16 days is seen in katki (rainy) crop of rangeeni strain on palas tree in peripheral zone. The buffer zone also showed the same trend. The life span of young ranges from 44–111 days for all the crops, strains and host plants. The life span of adult male is 2–3 days and the life span of female insect variesbetween 62–148 days for different crops. The variation of life span of male, female as well as young occurs due to temperature, host plants and strains of lac insect.

331 Jaiswal, A. K.,; Indian Institute of Natural Resin and Gums, Ranchi (India). Division of Transfer of Technology.Singh, J. P.; Indian Institute of Natural Resin and Gums, Ranchi(India). Division of Transfer of Technology.Monobrullah, Md; Indian Institute of Natural Resin and Gums, Ranchi(India). Division of Transfer of Technology.Patamajhi, P.; Indian Institute of Natural Resin and Gums, Ranchi(India). Division of Transfer of Technology. Residualtoxicity of indoxacarb and spinosad on Aprostocetus purpureus Cameron and Tachardiaephagus tachardiae howard - The parasitoids of lac insect Kerria

Lacca (KERR). Indian Journal of Entomology (India). (Jan. 2013) v.75(1)p.31-33 KEYWORDS: KERRIA LACCA. PESTICIDES. LAC INSECTS.

Laboratory evaluation of two pesticides namely indoxacarb andspinosad was carried out for their residual efficacy against adult stage of two major parasitoids associated with lac insect viz., Aprostocetus purpureus Cameron and Tachardiaephagus tachardiae Howard by residual film contact method. Indoxacarb caused 51.8, 37.5 and 32.7% mortality of A. purpureus within 6 h of treatment and 86.1, 65.6 and 67.2% mortality within 24 h, at 0.0145, 0.0073 and 0.0035% concentrations, respectively. Whereas, mortality of A. purpureus to the tune of 97.0, 100, 73.7 and 46.7% was recorded within 6 h and 100% within 24 h of treatment with spinosad at the concentrations of0.0075, 0.005, 0.0025 and 0.0012%, respectively. Similarly, spinosad caused 66.7, 76.2, 80.0, 82.1, 83.3, 86.7% mortality of T. tachardiae at 0.0006, 0.0012, 0.0025, 0.005, 0.007, 0.014% concentrations,respectively within 1 h and 100% within 4 h of treatment. Based onmortality within 24 h of treatment it can be concluded that the spinosad is more effective than indoxacarb as far as A. purpureus is concerned. The effectiveness of spinosad on both parasitoids isalmost at par and sufficient number of parasitoids died within veryshort span of time.

332 Narayanamma, V. Lakshmi; Acharya N. G. Ranga Agricultural University (India). Regional Agricultural Research Station.Reddy, K. Dharma; Acharya N. G. Ranga Agricultural University(India). Regional Agricultural Research Station.Reddy, A. Vishnuvardhan; Acharya N. G. Ranga Agricultural University(India). Regional Agricultural Research Station. Integrated pest and disease management practices in oilseeds – A critical review. Indian Journal of Entomology (India). (Jan.2013) v.75(1)p.34-56 KEYWORDS: INTEGRATED PEST MANAGEMENT.GROUNDNUTS. SOYBEANS. RAPESEED. MUSTARD. CASTOR OIL. SESAME. SAFFLOWER. LINSEED. NIGER.

Groundnut (Arachis hypogaea L.), soybean (Glycine max L.), rapeseed-mustard (Brassica spp.), sunflower (Helianthus annuus L.), castor (Ricinus communis), Sesame (Sesamum indicum L.), safflower (Carthamus tinctoris L.), linseed (Linum usitatissimum) and niger (Guizotia abyssinica (L.f.) Cass) are the major oilseed crops. Besides, abiotic factors, biotic factors especially pests and diseases account for 50% reduction in their productivity. During earlier days, the pests and diseases were controlled with traditional practices. With green revolution, insecticides are being used extensively. The misuse of the broad spectrum insecticides or thesublethal doses have led to several undesirable side effects such as,development of resistance in insect populations, pest resurgence, destruction of natural enemies, changes in dynamics of pestpopulation and contamination of environment. A possible solution for this is to adopt “Integrated Pest Management”. Differentcomponents of IPM, suggestions for successful IPM programme in oilseed crops, constraints in wide adoption of IPM in farmer's fields are discussed.

333 Kambrekar, D. N.; University of Agricultural Sciences ,Dharwad (India). Regional Agricultural Research Station. kambrekardnmail.com Biradar, A. P.; University of Agricultural Sciences ,Dharwad (India). Regional Agricultural Research Station.Kalaghatagi, S. B.; University of Agricultural Sciences ,Dharwad (India). RegionalAgricultural Research Station. Management of pomegranate aphid,Aphis punicae (passerini) with new insecticides. Indian Journal of Entomology (India). (Jan. 2013) v.75(1)p.57-61 KEYWORDS: POMEGRANATES.INSECTICIDES. MANAGEMENT.

Field evaluation of new insecticides for the management of pomegranate aphid, Aphis punicae was carried out at Bijapur-Karnataka for two years during 2010 and 2011. The study revealed that thiamethoxam 25 WG 0.2 g/l recorded highest reduction in population followed by imidacloprid 70 WG 0.3g/l. During first year, the mean reduction with thiamethoxam was 90.19 and 94.10% after first and second spay, whereas during second year, the reduction was to the extent of 91.19 and 93.42%, respectively. Similarly, during 2010, imidacloprid recorded 87.92 and 90.39% reduction in population after first and second sprays whereas during 2011 it was 89.73 and 93.42%. The trees sprayed with thiamethoxam (9105 kg/ha) and imidacloprid (9038 kg/ha) recorded highest quantity of marketable fruits. Thus thiamethoxam and imidacloprid recorded highest gross returns, net returns and maximum B:C ratio.

334 Kumawat, M. M.; Central Agricultural University, Pasighat (India), College of Horticulture and Forestry, Department of PlantProtection.kumawatmmmail.comSingh, K. Mamocha; Central Agricultural University, Pasighat (India), College of Horticultureand Forestry, Department of Plant Protection. Population dynamics and management of mango leaf cutting weevil, Deporaus marginatus pascoe in Arunachal Pradesh. Indian Journal of Entomology (India). (Jan 2013) v.75(1)p.62-67 KEYWORDS: INDIGENOUS ORGANISMS. DAMAGE. INSECTICIDES. NEEM EXTRACTS. ORGANIC MATTER.

The incidence of mango leaf cutting weevil, Deporaus marginatus P. was studied on seven cultivars of mango viz. Dashehari, Mereh, Ratul, Ramkhera, Mallika, Alphanso and Amrapali during 2010 and 2011 at Pasighat, Arunachal Pradesh. This was the first report of this pest in Arunachal Pradesh. All the cultivars were susceptible and incidence was low during winter and gradually increased from March and the highest infestation was observed during June to September. Highest incidence of 81.78% was observed in Alphanso during September 2010 and 88.96% in Mallika during September 2011. The cultivars Amrapali and Mallika recorded highest average incidence during 2010 and 2011, respectively, however, Alphanso was the least infested. The% infestation exhibited positive correlation with rainfall, RH, maximum and minimum temperature. The combined influence of abiotic factors strongly influenced the buildup of pest population. The coefficient of determination (R2) values between the pest incidenceand abiotic factors were 0.933 and 0.966 in 2010 and 2011, respectively. The organic insecticides viz. neem oil, pestoneem, M. azadirach crude extract, M. azadirach fermented leave extract, M. azadirach boiled leaves extract and fermented bamboo shoot extractwere comparable with cypermethrin. The treatment with cow urine alone and cow urine + ghee were found least effective.

335 Chaudhari, C. J.; Anand Agricultural University, Anand(India). B. A. College of Agriculture, Department of Entomology.chetan86entomail.comPatel, C. C.; Anand Agricultural University, Anand(India). B. A. College of Agriculture, Department of Entomology. Kher, H. R.; Anand Agricultural University, Anand(India). B. A. College of Agriculture, Department of Entomology.Parmar, H. P.; Anand Agricultural University, Anand(India).B. A. College of Agriculture, Department of Entomology. Resistance to aphid, Therioaphis Maculata (Buckton) in lucerne. Indian Journal of Entomology (India). (Jan 2013) v.75(1)p.68-71 KEYWORDS: PEST RESISTANCE. LUCERNE. PESTINSECTS.

A field experiment was carried out at Main Forage Research Station, Anand Agricultural University Anand, during rabi, 2009–10 to screen 27 varieties/genotypes of lucerne for resistance against aphid, Therioaphis maculata (Buckton). Each variety/genotype was sown

in Randomized Block Design with three replications in plot size of 4×3m. Ten tillers were selected randomly from each and observations were recorded early in the morning at weekly intervals. ARP-3-1, ARP-2-1 and ALP-3-4 were found moderately resistant. Studies to find out the degree of association between the aphid population with morphological and biochemical characters revealed that these were not significant except for plant height, number of tillers per meter row length and number of leaves per tiller in the first cut. Fifteen days after second cut, it was not significant except for plant height and number of leaves per tiller. Among biochemical constituents amount of chlorophyll ‘a', crude fiber and calcium showed highly significant negative correlation; chlorophyll ‘b', total chlorophyll, nitrogen and sugar content were highly significantly positively correlated with incidence of aphid population; phosphorus, crude protein and magnesium were significantly positively correlated; and potassium, dry matter and ash content were significantly negatively correlated with incidence of T. maculata.

336 Saha, Tamoghna; Bidhan Chandra Krishi Viswavidyalaya,Mohonpur(India). Department of Agricultural Entomology.tamoghnasaha1984mail.comPatil, R. K.; Bidhan Chandra Krishi Viswavidyalaya, Mohonpur(India). Department of Agricultural Entomology.Nithya, C.; Bidhan Chandra Krishi Viswavidyalaya, Mohonpur(India). Department of Agricultural Entomology. Bioefficacy of botanicals against seed weevil, Apion amplum (faust) (Apionidae: Coleoptera) in green gram. Indian Journal of Entomology (India). (Jan 2013) v.75(1) p.72-76 KEYWORDS: MUNG BEANS. MANAGEMENT. BOTANISTS. ORGANIC FERTILIZERS.

A field investigation was undertaken to determine the efficacy of certain botanicals against seed weevil, Apion amplum (Faust)(Apionidae: Coleoptera) in green gram during 2008–09 under organicecosystem. Total of ten botanicals were tested at 1%, 2%, 5% and 10% concentrations. All the botanicals were significantly better inmanaging seed weevil and increased grain yield. NSKE 5% was found to be best in reducing weevils (2.83, 1.89/plants, respectively) and lesser pod (31.33%) and seed damage (30.92%) followed by Vitex negundo 5% and Acorus calamus 5%. Treatment with NSKE 5% recordedmaximum grain yield (247.33 kg/ha). Under laboratory conditions also NSKE 5% resulted in 100% mortality compared to other treatments after5 days of treatment.

337 Mehra, Keshav; Swami Keshwanand Rajasthan Agricultural University, Bikaner(India). College of Agriculture, Department ofEntomology.keshav.mehra35mail.comSingh, Veer; Swami Keshwanand Rajasthan Agricultural University, Bikaner(India). College of Agriculture, Department of Entomology. Varietal screening of garlic against thrips, thrips Tabaci lindeman (Thysanoptera: Thripidae) in an arid ecosystem. Indian Journal of Entomology (India). (Jan 2013) v.75(1)p. 77-80 KEYWORDS: THRIPS (GENUS). GARLIC. GENOTYPES.

An experiment conducted during rabi, 2011–12 at the Research Farm, College of Agriculture, Bikaner, Rajasthan revealed that the variety JG-811 recorded maximum population of thrips while G-50 recorded the lowest. The maximum yield was recorded in the G-50 and minimum in JG-811. A negative correlation between morphological parameters of the varieties/genotypes (plant height, number of leaves per plant, bulb girth and number of cloves per bulb) with thrips population was also obseved.

338 Randhawa, H S; Punjab Agricultural University (India). RegionalResearch Station. harpals_randhawaahoo.co.inKumar, Ashok; PunjabAgricultural University (India). Regional Research StationSaini, M K; Punjab Agricultural University (India). Regional Research Station.

Bioeficacy of insecticides against Helicoverpa armigera (hubner) in kharif mungbean in Punjab. Indian Journal of Entomology (India). (Jan2013) v.75(1)p.81-83 KEYWORDS: INSECTICIDES. HELICOVERPA ARMIGERA. MUNG BEANS.

339 Magar, P. N; Dr. Panjabrao Deshmukh Krishi Vidyapeeth,Akola(India). Department of Entomology.Satpute, N. S; Dr. Panjabrao Deshmukh Krishi Vidyapeeth,Akola(India). Department of Entomology.Madankar, S. S.; Dr. Panjabrao Deshmukh Krishi Vidyapeeth,Akola(India). Department of Entomology.Md. Deshmukh, Zahurmia A.; Dr. Panjabrao Deshmukh Krishi Vidyapeeth,Akola (India). Department of Entomology. Evaluation of cotton aphid, leafhopper and Helicoverpa armigera as hosts against Chrysoperla Carnea. Indian Journal of Entomology (India). (Jan 2013) v.75(1)p.83-84 KEYWORDS: COTTON. APHIDOIDEA. CICADELLIDAE. HELICOVERPA ARMIGERA. CHRYSOPERLA CARNEA.

340 Sentimenla; Nagaland University, Nagaland(India). School of Life Sciences, department of Zoology.Bendang, A O; Nagaland University, Nagaland(India). School of Life Sciences, department of Zoology. Fluorescent compounds in the compound eyes of butterfly, Pieris brassicae and the moth, Philosamia ricini. Indian Journal ofEntomology (India). (Jan 2013) v.75(1)p.85-87 KEYWORDS: PIERISBRASSICAE. LIGHT.

341 Ahmad, Muneer; S.K. University of Agricultural Sciences and Technology, Shalimar(India).Division of Entomology. muneerentoahoo.co.inHussain, Barkat. S.K. University of Agricultural Sciences and Technology, Shalimar(India). Division of Entomology.Insect pollinators diversity of apple in Kashmir. Indian Journal of Entomology (India). (Jan 2013) v.75(1)p.87-89 KEYWORDS: INSECT DISEASES. APPLES. JAMMU AND KASHMIR.

342 Khursheed, Sheikh; CSK Himachal Pradesh Agriculture University, Palampur(India).College of Agriculture,Department ofEntomology.sheikhentomail.comRaj, Desh; CSK Himachal Pradesh Agriculture University, Palampur(India). College ofAgriculture,Department of Entomology.Ganie, Nisar A.; CSK HimachalPradesh Agriculture University, Palampur(India). College of Agriculture,Department of Entomology. Resistance to red pumpkinbeetle, Aulacophora foveicollis (LUCAS) in cucumber genotypes. Indian Journal of Entomology (India). (Jan 2013) v.75(1)p.90-93 KEYWORDS: PUMPKINS. CUCUMBERS. GENOTYPES.

H20 Plant diseases

343 Manjunath, B.; UAS, GKVK, Bangalore(India). Department of PlantPathologyJayaram, Neetha; UAS, GKVK, Bangalore(India). Department ofPlant PathologyMuniyappa, V.; UAS, GKVK, Bangalore(India). Department of Plant PathologyPrameela, H. A. UAS, GKVK, Bangalore(India). Department of Plant Pathology. Status of yellow mosaic virus and whitefly bemisia tabaci biotypes on mungbean in Southern Karnataka. Legume Research (India). (Feb 2013) v. 36(1) p.62-66 KEYWORDS: BIOTYPES. MUNG BEANS. VIGNA RADIATA RADIATA. PCR. SURVEYS.

Mungbean Yellow Mosaic Virus (MYMV) isa serious pathogen on Mungbean in southern Karnataka where the crop is grown during early kharif by making use of pre monsoon

showers. Survey of major mungbean growing areas ofSouthern Karnataka indicated the occurrence of disease ranging from 31.49 to 100 per cent. The highest average incidence (79.54%) was recorded in Turnkur district followed byChickrnagalur (59.73%), Hassan (56.57%), Shimoga (56.71%), Mysore (51.88%), Davanagere (51.09%), Chitradurga (48.11%) and Mandya district (45.58%). The RAPD analysis of whitefly samples collected in the surveyed areas has indicated the occurrence of B biotype Bemisiatabaci. The occurrence of B biotype of B. tabaci and large scale cultivation of susceptiblevarieties are implicated as the reasons for increased incidence of MYMV in these areas.

344 Singh, Gajraj; CCS Haryana Agricultural University,Hisar(India). College of AgricultureSingh, Subhadra; CCS Haryana Agricultural University, Hisar(India). College of AgricultureSheoran, O.P.; CCS Haryana Agricultural University, Hisar(India). College of Agriculture. Inheritance of mungbean yellow mosaic virus (MYMV) resistance in mungbean[Vigna Radiata (L.) Wilczek]. Legume Research (India). (Apr 2013) v. 36(2) p.131-137 KEYWORDS: INHERITANCE (ECONOMICS). MUNG BEANS. VIGNA RADIATA RADIATA. PLANT VIRUSES. Inheritance of resistance to Mungbean Yellow Mosaic Virus was studied in Fl, F2, BC1, BC2 populations of green gram involving two resistant cultivars (ML 818 and Satya) and two susceptible cultivars (SML 32 and Koppergoan) in the field. Two recessive genes were foundresponsible for MYMV resistance and cytoplasm has no role in inheritance of this disease. Additive, additive x additive, and dominance x dominance effects were negative for all the four crosses. Dominance and additive x dominance effects were positive, andadditive x dominance had the greatest magnitude of any single effectDominance variance was larger than additive variance in aU the fourcrosses. Broad sense heritabilities were high (0.81 to 0.83) in allcrosses, indicating a large genetic component for MYMV resistance.Estimates of minimun number of effective factors (gene loci)controlling resistance to MYMV also confirmed the involvement of atleast two genes. Progeny testing followed by between and withinfamily selection of resistant plants is suggested to capitalize the major and modifying genes controlling resistance to MYMV.

345 Talukdar, Akshay; Indian Agricultural Research Institute, NewDelhi (India). Division of Genetics Harish, G.D.; Indian Agricultural Research Institute, New Delhi(India). Division of Genetics Shivakumar, M.; Indian Agricultural Research Institute, New Delhi(India). Division of Genetics Kumar, B.; Indian Agricultural Research Institute, New Delhi(India). Division of Genetics Verma, K.; IndianAgricultural Research Institute, New Delhi(India). Division of GeneticsLal, S.K.; Indian Agricultural Research Institute, New Delhi(India). Division of Genetics Sapra, R.L.; Indian Agricultural Research Institute, New Delhi(India). Division of Genetics Singh, K.P.; Indian Agricultural Research Institute, New Delhi(India). Division of Genetics. Genetics of yellow mosaic virus (YMV) resistance in cultivated soybean [Glycine Max (L.) Merr.]. Legume Research (India). (Jun 2013) v.36(3) p.263-267 KEYWORDS: PLANT DISEASES. BEMISIA. BEMISIA TABACI. INHERITANCE (ECONOMICS). SOYBEANS. GLYCINE MAX.

In the present study, 100 soybean germplasm were screened forthree years (2009–2011) in New Delhi, a hot-spot for YMV disease in order to identify resistant sources. A set of 29 genotypes, mostly improved varieties of Northern India were identified with higher level of resistance consistently over the years. The inheritance of YMV resistance studied in F1 and F2 populations of three crossesinvolving two highly resistant varieties DS9712 and DS9814 and two highly susceptible genotypes JS335 and PI542044 indicated that the resistance is

dominant and is controlled by single major gene. Thechi-square test showed complete fitness to 3 resistant: 1 susceptible ratio in all the three F2 populations viz., PI542044 x DS9712, PI542044 x DS9814 and JS335 x DS9712. The findings of the study will pave the way for mapping the gene for YMV resistance with linkedmolecular marker. The segregating populations generated will act as starting materials for developing improved lines with YMV resistance.

346 Kumar, Ravinder; CCS Haryana Agricultural University,Hisar (India). Appunu, C.; Sugarcane Breeding Institute, Coimbatore(India) Mahadeviah, C.; Sugarcane Breeding Institute, Coimbatore (India). Sreenivasa, V.; Sugarcane Breeding Institute, Coimbatore (India). Waldia, R.S.; CCS Haryana Agricultural University, Hisar (India). Meena, M.R.; Sugarcane Breeding Institute, Karnal (India). Regional Centre Chhabra, M. L.; Sugarcane Breeding Institute, Karnal (India). Regional Centre. Impact of ascochyta blightdisease on the expression of biochemical compoundsin chickpea. Legume Research (India). (Jun 2013) v. 36(3) p.268-270 KEYWORDS: PLANT DISEASES. ASCOCHYTA. CHICKPEAS. PHENOLIC COMPOUNDS. CHICKPEAS. CICER ARIETINUM. CHICKPEAS.

An experiment was conducted to measure the change in the concentration of biochemical compounds viz., total phenol, flavanol and ortho-dihydric phenol and cell permeability parameter viz. electrolyte leakage in resistant (H00-256, HC-3) and susceptible (HC-1, HC-5& L-550) chickpea genotypes at six different intervals viz. 0, 2, 4, 6, 8 and 10 days of inoculation. The total phenols,flavenols and orthodihydric phenols were higher in resistant compared to susceptible genotypes at all the comparable intervals. The concentrations of total phenols and flavenol showed an increase between two to four days of inoculation, while ortho-dihydric phenolincreased up to sixth day followed by decline. The cell membrane permeability increased continuously after inoculation at all the intervalsbut the electrolyte leakageswere higher in susceptiblegenotypes.

H60 Weeds

347 Gupta, Vikas; SKUAST.Jammu(India). AICRP for DrylandAgricultureSingh, Mahender; SKUAST.Jammu(India). AICRP for DrylandAgricultureKumar, Jai; SKUAST.Jammu(India). AICRP for Dryland AgricultureKumar, Anil; SKUAST-J. Jammu and Kasmir(India). Division of AgronomySingh, B. N.; SKUAST, Jammu (India). Pulses Research Sub-Station, AICRP on ChickpeaJamwal, B. S.; SKUAST, Jammu(India). Pulses Research Sub-Station, AICRP on Chickpea. Screening of post-emergence herbicides in chickpfa (Cicer Arletinum) under rainfed conditions of Jammu. Legume Research (India). (Dec 2012) v. 35(4) p.320-326 KEYWORDS: WEED CONTROL. CHICKPEAS. CICER ARIETINUM. CHICKPEAS. HERBICIDES.

An experiment was conducted in randomized block design with twelve treatments replicated thrice during the rabi seasons of2008-09and 2009–10 in Inceptisols. The objective of the experiment was to study the effect of different post emergence (POE) herbicides to manage weeds in chickpea variety GNG 469 along with hand weeding (HW) at 25–30 and 50–55 days after sowing (DAS) and weedy check. Higher seed yield and yield attributes were obtained with 2 HW at 25–30 and 50–55 DAS and it was statistically at par with the POE application of imazathypr 40 & 25 g/ha at 30 DAS. Post emergence application of Quizalofop-ethyl 50 & 40 g/ha at 20 and 30 DAS also obtained significant values of yield and yield attributes which were superior to weedy check but the values were not at par with imazathypr treatment. Higher values of weed control efficiency (WeE) at 70 DAS (94.3%)

and at harvest (87.2%) and minimum values of weed biomass (6.54 and 7.04 g/m2 at 70 DAS and at harvest) were recorded with 2 HW at 25–30 and 50–55 DAS followed by POE application of imazathypr 40 and 25 g/ha at 30 DAS. The lowest values of yield and yield attributes and higher values of weed biomass were obtained with weedy check both at 70 DAS and at harvest.

348 Abraham, C.T.; Kerala Agricultural University Vellanikkara, Thrissur (India). College of HorticulturePrameela, P.; Kerala Agricultural University Vellanikkara, Thrissur (India). College of HorticultureLaxmi, M. Priya; Kerala Agricultural University Vellanikkara, Thrissur (India). College of Horticulture. Bioefficacy testing of fenoxaprop-p-ethyl against weeds in direct-seeded rice. Indian Journal of Weed Science (India). (Apr-Jun 2012) v. 44(2) p.92-94 KEYWORDS: WEED CONTROL. WEEDS. DIRECT SOWING. FENOXAPROP. VIGNA UMBELLATA.

The trial was conducted for two years during November–February 2006 and during December–April 2007. The treatments included fenoxaprop-p-ethyl at 47.44, 51.75, 56.06, 60.38 g/ha, cyhalofop-butyl 62.5 g/ha, Echinochloa spp. were the major weed comprising about 75% of the weed population. Echinochloa crusgalli and Echinochloa stagnina were present almost in equal proportions. Fenoxapropp-ethyl at all the tested doses was effective incontrolling Echinochloa spp. Fenoxaprop sprayed 60.38 g/ha recorded yields on par with hand weeding and standard check cyhalofop. This dose can be recommended in situations where Echinochloa spp. is a major problem.

349 Malunjkar, B.D.; Oilseeds Research Station, Jalgaon (India) Mulik, B.B.; Oilseeds Research Station, Jalgaon (India)Patil, S.C.;Oilseeds Research Station, Jalgaon (India). Evaluation ofpost-emergence herbicides in rainy season groundnut. Indian Journal of Weed Science (India). (Apr-Jun 2012) v. 44(2) p.95-97 KEYWORDS: WEED CONTROL. WEEDS. GROUNDNUTS. ARACHIS HYPOGAEA. HERBICIDES.

An experiment was conducted at Oilseeds Research Station, Jalgaon during 2007 to 2009 in order to control groundnut associated weed growing in Kharif season. An experiment was done with seventreatments of pre and post-emergence herbicides comprising weedycheek and weed free check replicated thrice in randomized blockdesign (RBD) on medium clay loam soils with pH 8.1. The various weedsobserved in groundnut field during Kharif season were, Amaranthns viridus, Parthenium hysterophorus, Acalypha indica, Cyperus rotundus, Cynodon dactylon, Phyllanthus niruri, Commelina spp., Eragrostic sp., Celosia argenia and Euphorbia sp. Among the grasses, Cynadon dactylonwas predominant and among the sedges Cyperus rotundus waspredominant. Among the different herbicides, pre-emergenceapplication of pendimethalin 1.0 kg/ha + post-emergence applicationof imazethapyr 75 gm/ha at 20 DAS recorded maximum weed controlefficiency (74%), minimum weed population (42.67/m2) and weed daymatter (185 g/m2). The same treatment combination recordedsignificantly higher dry pod yield (1997 kg/ha), gross returns(46445/ha) net returns (28705/ha) and B: C ratio 2.44.

350 Upasani, R.R.; Birsa agricultural University, Ranchi (India). Department of Agronomy Kumari, Priyanka; Birsa agricultural University, Ranchi (India). Department of Agronomy Thakur, R.; Birsa agricultural University, Ranchi (India). Department of AgronomySingh, M.K.; Birsa agricultural University, Ranchi (India). Department of Agronomy. Effect of seed rate and weed control methods on productivity and profitability of wetland rice under medium

land conditions. Indian Journal of Weed Science (India). (Apr-Jun 2012) v.44(2) p.98-100 KEYWORDS: WEED CONTROL. WEEDS. CHEMICAL CONTROL. SEED PRODUCTION. SEED. PRODUCTIVITY. RICE. SEED. SEED.

A field experiment was conducted at Ranchi, Jharkhand duringrainy seasons of 2010 and 2011 to find out the effect of seed rate and weed control methods on wet seeded rice under medium land condition. Increasing seed rate from 60 to 120 kg/ha did not influence weed density and weed dry matter at 20 and 40 DAS.Application of pyrazosulfuron 0.02 kg/ha early post-emergence reduced density of all categories of weeds. The mean reduction was 61.9 and35.3% and 66.7 and 41.9% at 20 and 40 DAS compared to butachlor and 2 hand weeding respectively. Pyrazosulfuron being similar to Almix(chlorimuron + metsulfuron) 20 g/ha recorded 70.3 and 87.0% reduced weed dry matter compared to weedy check. Application of 80 kg seed/habeing similar to 100, and 120 kg seed/ha recorded 63.0% higher grain (2.70 t/ha) and 70.9% higher straw (3.81 t/ha) yield compared to 60kg seed/ha.

351 Devendra, R.; University of Agricultural Sciences, Bangalore (India). AICRP on Weed ControlAsok, R.C.; University of Agricultural Sciences, Bangalore (India). Department of Crop PhysiologyKumar, H.G. Jalendra; University of Agricultural Sciences, Bangalore (India). Department of Crop PhysiologyManjunatha, S.B.; University of Agricultural Sciences, Bangalore (India). Department of Crop PhysiologyPrasad, T.V. Ramachandra; University of Agricultural Sciences, Bangalore (India). AICRP on Weed Control. Techniques to reduce pollution by enhancing cuticle loading and entry of herbicide. Indian Journal of Weed Science (India). (Apr-Jun 2012) v. 44(2) p.101-105 KEYWORDS: WEED CONTROL. WEEDS. ADJUVANTS. HERBICIDES.

Technique enhancing herbicide entry into the plants leads toreduction in dosage and therefore pollution. Higher density of fine droplets along with surfactant increased the herbicide entry points, than coarse droplets for same total spray volume. But fine droplets evaporate faster resulting in herbicide getting deposited as dried crystals on leaf surface. To overcome this problem, several adjuvants were tried to increase the time required for evaporation. Jaggery (2%) increased the evaporation period (27–162%) on different weed species. Dried out deposition of radioactive glyphosate from fine drops and along with TritonX 200 was more but showed enhanced glyphosate entry into the plant system. Whereas, aqueous extract (2%)of soap nut fruit (Sapindus emarginatus) which acts as bio-surfactant and antioxidant increases the time taken for drying and thereforeenhances the translocation of glyphosate to bulb of O. latifolia, which was on par with TritonX 100 surfactant (petroleum product). This approach seems to be more beneficial than increasing the dosage of herbicide per droplet.

352 Bharat, Rajeev; Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu, Jammu (India). Division of Agronomy Kachroo, Dileep; Sher-e-Kashmir University of Agricultural Sciences &Technology of Jammu, Jammu (India). Division of AgronomySharma, Rohit; Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu, Jammu (India). Division of AgronomyGupta, M.; Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu, Jammu (India). Division of AgronomySharma, Anil Kumar;Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu, Jammu (India). Division of Agronomy. Effect of differentherbicides on weed growth and yield performance of wheat. Indian Journal of Weed Science (India). (Apr-Jun 2012) v. 44(2) p.106-109 KEYWORDS: WEED CONTROL. WEEDS. GRAIN. YIELDS. HERBICIDES. WHEATS.

A field experiment was conducted at Chatha, Jammu during winter season of 2004–05 and 2005–06 to study the effect of different herbicides and its mixtures on weeds and yield of wheat (Triticum aestivum). Unchecked weeds growth caused 40.3% reduction in grain yield of wheat. Application of sulfosulfuron (25 g) + 2,4-D (500 g/ha) reduced weed population and biomass significantly and thereby caused increase in crop growth and grain yield of wheat. This was at par with tank-mix application of clodinafop (60 g) +metsulfuron-methyl (2 g/ha), isoproturon (750 g) + 2,4-D (500 g/ha) and fenoxaprop (120 g) + metribuzin (100 g/ha). Maximum grain yield was recorded in weed-free (5.05 t/ha), but the highest B:C ratio was observed with isoproturon+2,4-D (1.79). There was a significant positive correlation between N uptake by crop and grain yield ofwheat (0.99), but a negative correlation was observed between grainyield and density and N removal by weeds.

353 Kumar, Sanjay; G.B. Pant University of Agriculture & Technology, Dhakrani (India). Krishi Vigyan KendraSingh, Rohitashav; GBPUA&T, Pantnagar (India). Department of AgronomyShyam, Radhey;GBPUA&T, Pantnagar (India). Department of AgronomySingh, V.K.;GBPUA&T, Pantnagar (India). Department of Agronomy. Weed dynamics,nutrient removal and yield of wheat as influenced by weed management practices under valley conditions of Uttarakhand. Indian Journal of Weed Science (India). (Apr-Jun 2012) v. 44(2) p.110-114 KEYWORDS: WEED CONTROL. WEEDS. HERBICIDES. SOIL FERTILITY. NUTRIENT UPTAKE. WHEATS. YIELDS.

A field experiment was conducted during Rabi seasons of 2006–07 and 2007–08 at Research Farm of GBPUA&T, Krishi Vigyan Kendra Dhakrani, Dehradun to study the effect of weed control practices on weed dyanamics, nutrient uptake and yield of wheat (Triticum aestivum (L.) emend. Fiori and Paol). Results revealed that application of clodinafop-propargyl + metsulfuron-methyl (60+4 g/ha) being on at par with clodinafop propargyl + 2,4-D (60+500 g/ha) reduced the weed population significantly over weedy check (97.2%) and other weed control treatments. Clodinafop-propargyl+ metsulfuron-methyl (60+4 g/ha) applied as post-emergence (35 DAS) recorded 14.3, 15.5, 23.7, 29.5, 45.9, 47.4 and 69.7 per cent more grain yield over pendimethalin, isoproturon + metsulfosulfuron-methyl, fenoxaprop-p-ethyl + metsulfuron-methyl, fenoxaprop-p-ethyl, isoproturon, clodinafop-propargyl and weedy check, respectively. Theweeds removed the 28.7 kg of N, 13.4 kg P2O5 and 21.5 kg of K2O/ha,and reduced the wheat grain yield by 78.8% as compare to weed free conditions. Application of clodinafop-propargyl + metsulfuron-methylreduced the nutrients removal by weeds and increased its removal bywheat.

354 Pradhan, Adikant; IGKVV, Jagdalpur (India). S.G. College of Agriculture and Research StationRajput, A.S.; IGKVV, Jagdalpur (India). S.G. College of Agriculture and Research StationThakur, A.; IGKVV, Jagdalpur (India). S.G. College of Agriculture and Research Station. Effect of weed management practices on finger millet underrainfed conditions. Indian Journal of Weed Science (India). (Apr- Jun 2012) v. 44(2) p.115-117 KEYWORDS: WEED CONTROL. WEEDS. ECONOMICS. GRAIN. YIELDS.

A field experiment with 11 weed management practices includingherbicide and hand weedings was conducted at Jagdalpur during 2006 and 2007. Digitaria sangunalis, Eleusine indica and Echinochloacolona among monocots, and Celosia argentia and Spilanthes acmellaamong dicots were the major weeds. Dry weight of weeds and weed control efficiency were the lowest under weed-free condition throughout crop growth period fb weed-free up to 40 and 50 DAS, and hand weedings at 20 and 40 DAS. These treatments

also led to higher yield attributes and yields of finger millet. The highest B:C ratio (3.79) was obtained when isoproturon 0.5 kg/ha was applied as pre-emergence followed by its lower dose (0.05 kg/ha).

355 Ramachandiran, K.; Agricultural College and Research Institute, Madurai (India). Department of AgronomyBalasubramanian, R.; Agricultural College and Research Institute, Madurai (India). Department of Agronomy. Efficacy of herbicides for weed control in aerobic rice. Indian Journal of Weed Science (India). (Apr-Jun 2012) v. 44(2) p.118-121 KEYWORDS: WEED CONTROL. WEEDS. VIGNA UMBELLATA. HERBICIDES.

356 Arora, Asha; RVSKVV, Gwalior (India). College of AgricultureTomar, S.S.; RVSKVV, Gwalior (India). College of Agriculture. Effectof soil solarization on weed seed bank in soil. Indian Journal ofWeed Science (India). (Apr-Jun 2012) v. 44(2) p.122-123 KEYWORDS: WEED CONTROL. WEEDS. MULCHING. SOIL FERTILITY. SOIL. GENE BANKS.

357 Danawale, N.J.; Central Sugarcane Research Station, Padegaon (India). Sinare, B.T.; Central Sugarcane Research Station, Padegaon (India). Dhage, A.B.; Central Sugarcane Research Station, Padegaon (India). Gaikwad, D.D.; Central Sugarcane Research Station, Padegaon (India)Ombase, K.C; Central Sugarcane Research Station, Padegaon (India). Potdar, D.S.; Central Sugarcane Research Station, Padegaon (India). Efficacy of weed management practices in ratoon sugarcane. Indian Journal of Weed Science (India). (Apr-Jun 2012) v. 44(2) p.124-125 KEYWORDS: WEED CONTROL. WEEDS. CANE SUGAR. SUGARCANE. YIELDS. HERBICIDES.

358 Saquib, M.; College of Agriculture, Pune (India). Department of AgronomyBhilare, R.L.; College of Agriculture, Pune (India). Department of AgronomyThawal, D.W.; College of Agriculture, Pune (India). Department of Agronomy. Growth and productivity of wheat as influenced by weed management. Indian Journal of Weed Science (India) . (Apr-Jun 2012) v. 44(2) p.126-128 KEYWORDS: WEED CONTROL. WEEDS. HERBICIDES. GROWTH. YIELDS. WHEATS.

359 Bhadauria, Nisha; RVSKVV, Gwalior (India). College of AgricultureArora, Asha; RVSKVV, Gwalior (India). College of AgricultureYadav, K.S.; RVSKVV, Gwalior (India). College of Agriculture. Effect of weed management practices on seed yield and nutrient uptake in sesame. Indian Journal of Weed Science (India).(Apr-Jun 2012) v. 44(2) p.129-131 KEYWORDS: WEED CONTROL. WEEDS.HERBICIDES. NUTRIENT UPTAKE.

360 Deshmukh, Ghanshyam; Krishi Vigyan Kendra, Chhindwara (India). Rotary weeder for drudgery reduction of women during weeding in rice field. Indian Journal of Weed Science (India). (Apr-Jun 2012) v. 44(2) p.132-134 KEYWORDS: WEED CONTROL. WEEDS. REDUCTION. FARMEQUIPMENT. AGRICULTURAL WORKERS. WOMEN.

361 Sangeetha, C.; Tamil Nadu Agricultural University, Coimbatore (India). Department of AgronomyChinnusamy, C.; Tamil Nadu Agricultural University, Coimbatore (India). Department of Agronomy Prabhakaran, N.K.; Tamil Nadu Agricultural University, Coimbatore (India). Department of Agronomy. Efficacy of imazethapyr onproductivity of soybean and its residual effect on succeeding crops. Indian Journal of Weed Science (India).

(Apr-Jun 2012) v. 44(2) p.135-138 KEYWORDS: WEED CONTROL. WEEDS. GROWTH. RESIDUAL EFFECTS. SOYBEANS. YIELDS.

362 Kumar, Suresh; CSK Himachal Pradesh Krishi Vishvavidyalaya,Palampur (India). Forages and Grassland Management, Department of AgronomyKumar, Ashwani; CSK Himachal Pradesh Krishi Vishvavidyalaya,Palampur (India). Forages and Grassland Management, Department of AgronomyRana, S.S.; CSK Himachal Pradesh Krishi Vishvavidyalaya,Palampur (India). Forages and Grassland Management, Department of AgronomyChander, Navell; CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur (India). Forages and Grassland Management, Department of AgronomyAngiras, N.N.; CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur (India). Forages and Grassland Management, Department ofAgronomy. Integrated weed management in mustard. Indian Journal of Weed Science (India). (Jul-Sep 2012) v. 44(3) p.139-143 KEYWORDS: WEED CONTROL. WEEDS. CHEMICAL CONTROL. MUSTARD. YIELDS.

A field experiment was conducted with fourteen treatments(oxadiarzyl 0.180 kg/ha, pendimethalin 1.50 kg/ha, trifluralin 1.50 kg/ha and isoproturon 1.25 kg/ha alone and at half rate with hand weeding (HW), oxadiarzyl, pendimethalin and trifluralin each at halfrate followed by (fb) isoproturon 0.75 kg/ha (post), pendimethalin fbclodinafop each at half rate, hand weeding twice and weedy check) at Palampur during Rabi 2006–2007 and 2007–08. Phalaris minor (28.2%), Avena ludoviciana (25.2%) and Lolium temulentum (19.2%) were thepredominant grassy weeds. The broad-leaved weeds (Vicia sativa, Coronopus didymus and Anagallis arvensis) as a whole constituted26.7% of the total weed flora. Hand weeding twice and pendimethalin fb isoproturon were more effective in reducing the population of P.minor. Pendimethalin + hand weeding and hand weeding twice wereeffective against A. ludoviciana. Similarly integration of one handweeding with isoproturon and trifluralin and hand weeding twice effectively taken care of L. temulentum. Pendimethalin + isoproturon and hand weeding twice reduced N and S removal by weeds.Pendimethalin fb isoproturon and trifluralin fb isoproturon resulted in significantly higher yield attributes (silique/plant, seeds/silique, 1000-seed weight), seed yield and seed N per cent of mustard. Trifluralin + HW and pendimethalin fb isoproturon gave highergross and net returns due to weed control over othertreatments. Isoproturon resulted in highest net return per rupee invested on weed control (18.5).

363 Singh, Rohitashav; G.B.P.U.A. & T., Pantnagar (India). Department of Agronomy. Kumar, Jitendra; G.B.P.U.A. & T., Pantnagar (India). Department of AgronomyKumar, Pravendra; G.B.P.U.A. & T.,Pantnagar (India). Department of AgronomyPratap, Tej; G.B.P.U.A. &T., Pantnagar (India). Department of Agronomy. Singh, V.K.; G.B.P.U.A. & T., Pantnagar (India). Department of Agronomy. Pal, Ram; G.B.P.U.A. &T., Pantnagar (India). Department of Agronomy Panwar, Suman; G.B.P.U.A. & T., Pantnagar (India). Department of Agronomy. Effect of integrated weed management practices on sugarcane ratoon and associated weeds. Indian Journal of Weed Science (India). (Jul-Sep2012) v. 44(3) p.144-146 KEYWORDS: WEED CONTROL. WEEDS. CHEMICALCONTROL. SUGARCANE. CANE SUGAR. RATOONS. SUGAR.

A field experiment was conducted during 2008–09 and 2009–10 atG.B. Pant University of Agriculture & Technology, Pantnagar (Uttarakhand). The soil of the experimental field was clay loam texture, medium in organic carbon (0.66%), available phosphorus (27.5 kg P/ha) and potassium (243.5 kg K/ha) with pH 7.2. Experiment consisted of six treatments were laid

out in randomized block designwith four replications. In the experimental field Cyperus rotundus, Ehinochloa colona, Brachiaria reptans, Commelina benghalensis,Ipomoea spp. and Parthenium hysterophorus were major weeds in both the years. Beside these, Digitaria sanguinalis was also observed as major weed during 2009–10. Other weeds were Cleome viscosa, Corchorus acutangulus, Dactyloctenium aegyptium and phylanthus niruri. Lowestdensity as well as dry weight of total weeds were recorded under thetreatment of three hoeing at 30, 60 and 90 days after harvesting(DAH) of main crop which was at par with per-emergence application of metribuzin 0.88 kg/ha followed by (fb) hoeing at 45 DAH fb 2,4-D 1.0 kg/ha at 90 DAH. The highest cane yield was recorded with the execution of three hoeings at 30, 60 and 90 DAH treatment which was closely fb metribuzin at 0.88 kg/ha at 3 DAH fb hoeing at 45 DAH fb 2,4-D 1.0 kg/ha at 90 DAH of main crop.

364 Singh, V. Pratap; G.B. Pant University of Agriculture & Technology, Pantnagar (India). College of Agriculture, Department of AgronomySingh, S.P.; G.B. Pant University of Agriculture & Technology, Pantnagar (India). College of Agriculture, Department of Agronomy. Kumar, Abnish; G.B. Pant University of Agriculture & Technology, Pantnagar (India). College of Agriculture, Department of Agronomy. Banga, Akshita; G.B. Pant University of Agriculture &Technology, Pantnagar (India). College of Agriculture, Department of AgronomyTripathi, Neeta; G.B. Pant University of Agriculture & Technology, Pantnagar (India). College of Agriculture, Department of Agronomy. Effect of monsoon and weed management on growth and yieldof direct-seeded rice. Indian Journal of Weed Science (India). (Jul-Sep 2012) v. 44(3) p.147-150 KEYWORDS: WEED CONTROL. WEEDS. CHEMICAL CONTROL. SOWING. RICE.

A field study was conducted during 2008 and 2009 at G.B. Pant University of Agriculture and Technology, Pantnagar to evaluate theeffect of two seeding time (before and after onset of monsoon) and six methods of weed control in direct dry seeded rice. Among the weedcontrol treatments, butachlor applied 1.5 kg/ha in year 2008 and broadcasting of Sesbania knocked down by the application of 2, 4-D (brown manuring) at 30 days after sowing in 2009 recorded lowest weed dry weight. Pre-emergence application of butachlor 1.5 kg/ha yielded highest followed by the application of pretilachlor 0.5 kg/ha and broadcasting of Sesbania knock down with 2,4-D 0.5 kg/ha at 30 DASwhich were at par with each other during both the year of experimentation.

365 Patel, T.U.; Navsari Agricultural University, Navsari (India). N.M. College of Agriculture, Department of AgronomyPatel, C.L.; Navsari Agricultural University, Navsari (India). N.M. College of Agriculture, Department of Agronomy. Patel, D.D.; Navsari AgriculturalUniversity, Navsari (India). N.M. College of Agriculture, Departmentof AgronomyThanki, J.D.; Navsari Agricultural University, Navsari (India). N.M. College of Agriculture, Department of Agronomy. Arvadia, M.K.; Navsari Agricultural University, Navsari (India). N.M. College of Agriculture, Department of AgronomyVaidya, H.B.; Navsari Agricultural University, Navsari (India). N.M. College of Agriculture, Department of Agronomy. Performance of onion under weed and fertilizer management. Indian Journal of Weed Science (India). (Jul-Sep 2012) v. 44(3) p.151-158 KEYWORDS: WEED CONTROL. WEEDS. FERTILIZERS. PENDIMETHALIN. QUALITY. ONIONS. OXYFLUORFEN.

In the new alluvial soil of Navsari (Gujarat), a field experiment was conducted in Rabi season to study the yield, qualityand post harvest life of onion (Allium cepa L.) cv. ‘Gujarat Onion White-1’ as affected by weed management and fertilizerlevels during

two conjunctive years of 2008–09 and 2009–10. Weed population were decreased significantly with application of pendimethalin 1 kg/ha or oxyfluorfen 0.24 kg/ha supplement with onehand weeding at 40 DAT during both the season of investigation.Echinochloa spp., Trianthema portulacastrum, Digera arvensis. Physalis minima. and Cynodon dactylon. were found as major weeds inexperiment field. Further, pendimethalin 1.0 kg/ha followed by one hand weeding produced higher onion bulb yield of 39.3, 36.6 and 38.0t/ha during both years as well as in pooled, respectively and foundat par with oxyflourfen 0.24 kg/ha + one hand weeding at 40 DAT and weed free treatments. In pooled, increasing fertilizer rate from 75% to 125% of RDF was found effective and the higher level of fertilizer(125% RDF) gave the highest bulb yield, which was 10.52 and 19.43% more than of the F2 and F1 levels respectively. Regarding post harvest life of bulbs, weight losses (%), black mould development (%)and sprouting (%) were remained unaffected by weed management and fertilizer levels except significantly higher weight losses (%) wasobserved under weed management treatment. On the basis ofinteraction, it is inferred that the treatment combination of (pendimethalin 1 kg/ha fb one hand weeding at 40 days aftertransplanting supplement with 100% RDF) found most appropriate (39.86t/ha) and profitable not only to secure the net return of 2,69,422/ha with 7.85 BCR per unit cost of onion production but also save 25% offertilizer.

366 Sireesha, A.; ANGRAU, Rajendranagar (India). AICRP on Weed Control Rao, P.C.; ANGRAU, Rajendranagar (India). AICRP on Weed ControlRao, P.V.; ANGRAU, Rajendranagar (India). AICRP on Weed ControlSwapna, G.; ANGRAU, Rajendranagar (India). AICRP on Weed ControlRamalaxmi, Ch. S.; ANGRAU, Rajendranagar (India). AICRP onWeed Control. Movement of pendimethalin in saturated and unsaturated conditions in clay loam and sandy loam soils. Indian Journal of Weed Science (India). (Jul-Sep 2012) v. 44(3) p.159-162 KEYWORDS: WEED CONTROL. WEEDS. HERBICIDES. MOVEMENT. PENDIMETHALIN.

Movement studies were carried out using packed soil columns toknow the distribution pattern of pendimethalin in clay loam and sandyloam under saturated and unsaturated conditions. Pendimethalin was applied at 20 mg/kg of soil and the soil columns were kept for movement studies at time intervals of 1, 3, 5, 7, 15, 22 and 37 days. The soils used in the study were clay loam and sandy loam. Pendimethalin remained primarily in the top soil layers. Undersaturated conditions movement of pendimethalin was more in sandy loamas compared to clay loam. Under unsaturated conditions, pendimethalin showed more mobility in clay loam. The increase in herbicide movement was observed with increase in days. The factors that influence movement are the herbicide solubility, soil structure and texture and the amount of water passing through the soil profile influenced movement of herbicide. Pendimethalin moved up to 2025 and 5– 20 cm under unsaturated and saturated conditions at 37 days after application, respectively. In clay loam soil, under saturated and unsaturated conditions, pendimethalin moved up to 15–20 cm at 37 days after application.

367 Panotra, Narinder; Janta Vedic College, Baraut (India). Department of AgronomySingh, O.P.; Janta Vedic College, Baraut(India). Department of AgronomyKumar, Ashwani; Janta Vedic College, Baraut (India). Department of Agronomy. Effect of chemical and mechanical weed management on yield of French bean–sorghum croppingsystem. Indian Journal of Weed Science (India). (Jul-Sep 2012) v. 44(3) p.163-166 KEYWORDS: WEED CONTROL. WEEDS. CROP MANAGEMENT. CROPPING SYSTEMS. ECONOMICS. NUTRIENT UPTAKE.

A field experiment was conducted during 2003–04 and 2004–05 to develop an effective weed management practice to study the effect of weed management practice in French bean cropping system under subtropical agro-ecosystems of western Uttar Pradesh. Pre-plantingand pre-emergence application of fluchloralin 1.0 kg/ha and pendimethalin 1.0 kg/ha reduced the population of Anagallis arvensis,Melilotus alba, Melilotus indica and Phalaris minor significantly than weedy check and other herbicide treatments and resultedsignificant increase in growth and yield attributes, viz. plant height, no. of branches, dry matter accumulation, no. of pods/plantand seeds/pod, seed and straw yield of french bean. Maximum yield was recorded in fluchloralin 1.00 kg/ha and pendimethalin 1.00 kg/hatreatments with a corresponding value of 1.11 and 1.11 t/ha of French bean and 37.1 and 36.2 t/ha of fodder sorghum during both the yearsof experimentation. Application of fluchloralin 1.0 kg/ha andpendimethalin 1.0 kg/ha increased the net return of French bean significantly over weedy check, besides at B: C. ratio of 1.18 and1.12 during two cropping seasons.

368 Arvadiya, L.K.; Navsari Agricultural University, Navsari (India). ASPEE College of Horticulture and ForestryRaj, V.C.; NavsariAgricultural University, Navsari (India). N.M. College of Agriculture, Department of AgronomyPatel, T.U.; Navsari Agricultural University, Navsari (India). Soil and Water Management Research Unit Arvadia, M.K.; Navsari Agricultural University, Navsari (India). N.M. College of Agriculture, Department of AgronomyPatel, A.M.; Navsari Agricultural University, Navsari (India). N.M. College of Agriculture, Department of Agronomy. Effect of plant population andweed management practices on productivity of sweet corn. IndianJournal of Weed Science (India). (Jul-Sep 2012) v. 44(3) p.167-171 KEYWORDS: WEED CONTROL. WEEDS. CROPS. ATRAZINE. WEEDING. PENDIMETHALIN. PLANT POPULATION. SWEET CORN.

Experiment was carried out under heavy black clay soil(vertisol) at the Experimental Farm, N.M. College of Agriculture, Navsari Agricultural University, Navsari during two successiveseasons of 2007– 08 and 2008–09 to study the effect of varying plant population and weed management practices on weed flora andproductivity of sweet corn (Zea mays L. Saccharata). Weed density and biomass was significantly lower with crop population of 1,11,111plants/ha. Significantly higher green cob (9.5 t/ha) and green fodder (14.9 t/ha) yield with net return (75,779/ha) and benefit: cost ratio (5.36) was produced with plant population of 1,11,111 plants/ha andwas at par with crop population of 83,333 plant/ha. Significantly lowest weed biomass was recorded in weed free check which recorded highest yield of green cob (10.7 t/ha) and fodder (17.1 t/ha). Application of atrazine 1 kg/ha + hand weeding at 40 days aftersowing was remunerative with higher net return (88,873/ha) and benefit: cost ratio (6.72).

369 Surin, Sushma Saroj; Birsa agricultural University, Ranchi (India). Department of AgronomySingh, M.K.; Birsa agricultural University, Ranchi (India). Department of AgronomyUpasani, R.R.; Birsa agricultural University, Ranchi (India). Department of Agronomy Thakur, R.; Birsa agricultural University, Ranchi (India). Department of AgronomyPal, S.K.; Birsa agricultural University, Ranchi (India). Department of Agronomy. Productivity and profitability of rice–wheat sequence under conservation tillage. Indian Journal of Weed Science (India). (Jul-Sep 2012) v. 44(3) p.172-175 KEYWORDS: WEED CONTROL. WEEDS. CROP MANAGEMENT. CROPPING SYSTEMS. CONSERVATION TILLAGE. RICE. ECONOMICS. WHEATS.

Field experiment was conducted during 2009–10 and 2010–11 at Agronomical Research Farm of Birsa Agricultural University, Ranchi with four tillage management (zero till rice and zero till wheat; zero till rice and conventional till wheat; conventional till rice and zero till wheat and conventional till rice and conventional tillwheat) in main plot and three methods of weed control practices viz., weedy check, recommended herbicides butachlor 1.5 kg/ha pre-emergence + 2,4-D 0.5 kg/ha post-emergence for rice and isoproturon 0.75 kg/ha + 2,4-D 0.5 kg/ha post-emergence for wheat and two hand weeding (20and 40 DAS for rice and 25 and 50 DAS for wheat) in sub plot to assess the productivity and profitability of rice -wheat (cropping system under conservation tillage. Direct seeded rice–wheat sequencewith conventional tillage produced maximum rice equivalent yield 7.44 t/ha (for 3.1 t/ha rice and 3.6 t/ha wheat) and net return (58,206/ha). Among weed control, rice-wheat either with butachlor 1.5kg/ha pre- emergence + 2,4-D 0.5 kg/ha post-emergence in rice and isoproturon 0.75 kg/ha + 2,4-D 0.5 kg/ha post-emergence in wheat or, with two hand weeding in both crops produced maximum rice equivalent yield (7.4 t/ha and 7.8 t/ha) and net return (62,258/ha and 60,498/ha).

370 Singh, M.K.; Banaras Hindu University, Varanasi (India). Institute of Agricultural Sciences, Department of AgronomySingh,Ashish; Banaras Hindu University, Varanasi (India). Institute of Agricultural Sciences, Department of Agronomy. Effect of stale seedbed method and weed management on growth and yield of irrigateddirect-seeded rice. Indian Journal of Weed Science (India). (Jul-Sep2012) v. 44(3) p.176- 180 KEYWORDS: WEED CONTROL. WEEDS. CHEMICAL CONTROL. IRRIGATED RICE. IRRIGATION. CROPS.

A field experiment was conducted at Agricultural Research Farm of Banaras Hindu University, Varanasi to study the effect of methodsof rice establishment and weed management practices in irrigateddirect seeded rice. Treatment comprised of three crop establishment methods, viz. dry seeding after land preparation using stale seed bedmethod by shallow ploughing or by glyphosate 1 kg/ha, puddled wetseeded in main plot and five weed control measures in subplot, viz.weedy, hand weeding at 15 and 30 DAS, pendimethalin 1 kg/ha pre emergence followed by 2,4-D EE 500 g/ha at 30 DAS, butachlor 1 kg/hapre-emergence followed by 2,4-D 500 g/ha, fenoxaprop-p-ethyl with safener 56 g/ha 15 DAS followed by ethoxy sulfuron 18 g/ha at 20 DAS in a split plot design replicated thrice. Crop establishment methods did not influence rice growth and yield components, and yield.Irrespective of method of establishment, hand weeding twice was found to be superior in managing weeds in DSR than all sequentially applied herbicide treatments.

371 Kumar, Anil; SKUAST-J, Chatha (India). Division of Agronomy Sharma, B.C.; SKUAST-J, Chatha (India). Division of Agronomy Kumar, Jai; SKUAST-J, Chatha (India). Division of Agronomy. Integrated wed management in gladiolus. Indian Journal of Weed Science (India).(Jul-Sep 2012) v. 44(3) p.181-182 KEYWORDS: WEED CONTROL. WEEDS. GLADIOLUS. WEEDING. HERBICIDES.

A field experiment was carried out during Rabi season from 2007– 2010 at Chatha, Jammu to find out relative efficiency of weed management practices in gladiolus (Tagets erecta L.). Result revealed significant enhancement in spike yield with 2 hand weedings at 20 and 40 days after transplanting (6.05 t/ha) and pendimethalin 2 kg/ha + 1 hand weeding (5.79 t/ha), both of which were superior to weedy check (3.25 t/ha). The highest weed control efficiency (78.2%) was also achieved with 2 hand weedings, followed by

pendimethalin + hand weding 76.9%). Application of pendimethalin along with hand weeding proved to be economical.

372 Rawat, Anay; JNKVV, Jabalpur (india). College of Agriculture, Department of AgronomyChaudhary, C.S.; JNKVV, Jabalpur (india). College of Agriculture, Department of AgronomyUpadhyaya, V.B.; JNKVV, Jabalpur (india). College of Agriculture, Department of AgronomyJain, Vikas; JNKVV, Jabalpur (india). College of Agriculture, Department of Agronomy. Efficacy of bispyribac-sodium on weed flora and yield of drilled rice. Indian Journal of Weed Science (India). (Jul-Sep 2012) v. 44(3) p.183-185 KEYWORDS: WEED CONTROL. WEEDS. RICE. SODIUM. FLORA.

373 Chinnathurai, S. Jawahar; Agricultural College and Research Institute, Madurai (India). Department of AgronomyVeeramani, A.; Agricultural College and Research Institute, Madurai (India). Department of AgronomyPrema, P.; Agricultural College and Research Institute, Madurai (India). Department of Agronomy. Weed dynamics,yield and economics of pigeonpea influenced by growth promoters andmulching. Indian Journal of Weed Science (India). (Jul- Sep 2012) v.44(3) p.186-190 KEYWORDS: WEED CONTROL. WEEDS. TILLAGE. ECONOMICS. MULCHING. YIELDS.

374 Sivasubramaniam, K.; Tamil Nadu Agricultural University, Madurai (India). Agricultural College and Research Institute, Department of Seed Science and Technology Vijayalakshmi, V.; TamilNadu Agricultural University, Madurai (India). Agricultural Collegeand Research Institute, Department of Seed Science and Technology. H2O2 induced seed viability assessment of Asian spider flower. Indian Journal of Weed Science (India). (Jul-Sep 2012) v. 44(3) p.191-192KEYWORDS: WEED CONTROL. WEEDS. SEED PRODUCTION. SEEDS. VISCOSE. HYDROGEN PEROXIDE. SEED. VIABILITY.

375 Brar, Harjeet Singh; Punjab Agricultural University, Ludhiana (India). Department of AgronomyBhullar, M.S.; Punjab Agricultural University, Ludhiana (India). Department of Agronomy. Dry-seeded rice productivity in relation to sowing time, variety and weed control. Indian Journal of Weed Science (India). (Jul-Sep 2012) v. 44(3) p.193-195 KEYWORDS: WEED CONTROL. WEEDS. RICE. CROPS. SOWING. SEED PRODUCTION. VARIETIES.

376 Ramteke, S.D.; National Research Centre for Grapes, Pune (India). Department of Plant PhysiologyRajurkar, A.B.; NationalResearch Centre for Grapes, Pune (India). Department of Plant PhysiologyBhange, M.A.; National Research Centre for Grapes, Pune(India). Department of Plant PhysiologyKor, R.J.; National Research Centre for Grapes, Pune (India). Department of Plant Physiology. Chemical management of broad- leaved weeds in grapes. Indian Journal of Weed Science (India). (Jul-Sep 2012) v. 44(3) p.196-199 KEYWORDS: WEED CONTROL. WEEDS. GRAPES.HERBICIDES. VINEYARDS.

377 Kiroriwal, Ashish; Swami Keshwanand Rajasthan Agricultural University, Bikaner (India). College of AgricultureYadav, R.S.; Swami Keshwanand Rajasthan Agricultural University, Bikaner (India). College of AgricultureKumawat, Amit; Swami Keshwanand Rajasthan Agricultural University, Bikaner (India). College of Agriculture. Weed management in pearlmillet based intercropping system. Indian Journal of Weed Science (India). (Jul-Sep

2012) v. 44(3) p.200-203KEYWORDS: WEED CONTROL. WEEDS. CYAMOPSIS PSORALIOIDES. CHEMICAL CONTROL. INTERCROPPING. VIGNA ACONITIFOLIA. PENDIMETHALIN.

378 Ramachandran, A.; Agricultural College and Research Institute, Madurai (India). Department of Agronomy. Veeramani, A.; Agricultural College and Research Institute, Madurai (India). Department of Agronomy. Prema, P.; Agricultural College and Research Institute, Madurai (India). Department of Agronomy. Effect of brown manuring on weed growth, yield and economics of irrigated maize. Indian Journalof Weed Science (India). (Jul-Sep 2012) v. 44(3) p.204-206 KEYWORDS: WEED CONTROL. WEEDS. ECONOMICS. IRRIGATION. YIELDS.

379 Kumar, Jitendra; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of AgronomySingh, Dheer; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of AgronomySingh, Brijpal; R.M.P. (PG) Collage, Haridwar (India). Department of AgronomySingh, Rohitashav; G.B. PantUniversity of Agriculture and Technology, Pantnagar (India). Department of AgronomyPanwar, Suman; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Agronomy Gupta, Atul Kumar; G.B. Pant University of Agriculture andTechnology, Pantnagar (India). Department of Agronomy. Sowing time and weed management practices to enhance yield of direct-seeded rice. Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4) p.207-209 KEYWORDS: WEED CONTROL. WEEDS. CROPS. SOWING. RICE. ECONOMICS.

A field experiment was conducted during the Kharif season of 2006 and 2007 at G.B. Pant University of Agriculture and Technology, Pantnagar to find out the most effective weed control method under different sowing dates in direct-seeded unpuddled rice. Highest grain yield (2.5–2.7 t/ha) was recorded from 20 June sowing. The grain yield was the highest in mechanical weedings at 20 and 40 DAS. Pendimethalin 1.0 kg/ha + anilophos 0.4 kg/ha (pre-emergence)produced significantly higher grain yield (3.1–3.3 t/ha) over rest of the herbicidal treatments. Uncontrolled weeds reduced the grain yieldof rice by 67– 70%.

380 Pal, S.; Bidhan Chandra Krishi Viswavidyalaya, Nadia (India). Department of AgronomyGhosh, R.K.; Bidhan Chandra Krishi Viswavidyalaya, Nadia (India). Department of AgronomyBanerjee, H.; Bidhan Chandra Krishi Viswavidyalaya, Nadia (India). Department of AgronomyKundu, R.; Bidhan Chandra Krishi Viswavidyalaya, Nadia(India). Department of AgronomyAlipatra, A.; Bidhan Chandra Krishi Viswavidyalaya, Nadia (India). Department of Agronomy. Effect of pyrazosulfuron-ethyl on yield of transplanted rice. Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4) p.210-213 KEYWORDS: WEED CONTROL. WEEDS. TRANSPLANTING. RICE. YIELDS.

Efficacy of pyrazosulfuron-ethyl against weeds in transplanted rice was studied during 2008 and 2009 at Regional Research Sub-station, Chakdaha under Bidhan Chandra Krishi Viswavidyalaya,West Bengal. The experiment was laid out in randomized block designwith seven treatments replicated thrice. The major associated weeds were: Echinochloa colona, Cyperus difformis, Ammania baccifera,Ludwigia octovalvis and Monochoria vaginalis. Pyrazosulfuron-ethyl at 42.0 g/ha applied at 3 DAT was most effective in managing associated weed species and yielded maximum grain yield (3.3 t/ha) of rice with lower weed index (10.8%).

381 Bhullar, M.S.; Punjab Agricultural University, Ludhiana (India). Department of AgronomyShergill, Lovreet Singh; PunjabAgricultural University, Ludhiana (India). Department of Agronomy Kaur, Rupinder; Punjab Agricultural University, Ludhiana (India). Department of AgronomyWalia, U.S.; Punjab Agricultural University, Ludhiana (India). Department of AgronomyKaur, Tarundeep; PunjabAgricultural University, Ludhiana (India). Department of Agronomy. Bioefficacy of herbicides in relation to sowing methods in wheat. Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4)p.214-217 KEYWORDS: WEED CONTROL. WEEDS. HERBICIDES. CROPS. CHEMICAL CONTROL. TILLAGE. WHEATS.

A field experiment was conducted at Ludhiana during 2009–10 and 2010–11, study the effect of sowing methods and herbicides on weed dynamics and productivity of wheat (Triticum aestivum L.). Sowing methods, viz. bed planting, zero till, conventional till and stubbled sowing did not influence densities and dry matter accumulation of narrow-and broad-leaved weeds. Averaged over two seasons, bed planting, zero till and conventional till sowing methods recorded similar wheat grain yield and were statistically superior to stubbed sowing. Wheat grain yield under bed planting, zero till and conventional till methods was 25.4, 46.2 and 40.8% higher as compared to stubbled sowing. Among weed control, post-emergence application of carfentrazone + sulfosulfuron 45 g, metsulfuron + sulfosulfuron 30 g and fenoxaprop-pethyl + metribuzin 275 g/ha recorded complete control of all the narrow-and broad-leaved weeds. Mesosulfuron + iodosulfuron 12 g, sulfosulfuron 25 g, pinoxaden 50 g and clodinafop 60 g/ha recorded effective control of narrow-leaved weeds only. All these herbicidal treatments, except fenoxaprop-p-ethyl + metribuzin 275 g/ha, recorded significantly higher wheat grain yield as compared tounsprayed control. Fenoxaprop-p-ethyl + metribuzin was phototoxic to wheat plants and wheat grain yield was at par to weedy check.

382 Dhawan Rupa S.; CCS HAU Hisar, Haryana (India). Department of Botany and Plant PhysiologySingh Neha; CCS HAU Hisar, Haryana (India). Department of Botany and Plant PhysiologySingh Samunder; CCSHAU Hisar, Haryana (India). Department of Agronomy. Little seed canary grass resistance to sulfonyl–urea herbicides and its possible management with pendimethalin. Indian Journal of Weed Science (India) . (Oct-Dec 2012) v. 44(4) p.218-224 KEYWORDS: WEED CONTROL. WEEDS. PENDIMETHALIN. PHALARIS. METSULFURON.

In this study, response of 20 Phalaris minor Retz. (little seed canary grass) populations against sulfosulfuron and its ready–mix formulation sulfosulfuron + metsulfuron and mesosulfuron + iodosulfuron was studied. Out of 20 populations, 12 showed high resistance, 8 showed medium resitance and none were susceptible to sulfosulfuron (25 g/ha). GR50 value was in the range of 30–110 g/ha in P. minor populations tested. In wheat, it was more than 200 g/ha. Eleven populations showed resistance to ready mix formulation of sulfosulfuron + metsulfuron, 8 populations were medium R/medium S and one population was susceptible. Similarly, 11 showed resistance to ready mix formulation of mesosulfuron + iodosulfuron, 7 populations were medium R/medium S and one biotype was susceptible. GR50 values tested were in the range of 30–110 g/ha in contrast to 5 g/ha at the time of recommendation.

383 Katara, Pawan; CSK Himachal Pradesh Krish iVishvavidyalaya, Palampur (India). COA, Forages and Grassland Management, Department of AgronomyKumar, Suresh; CSK Himachal Pradesh KrishiVishvavidyalaya, Palampur (India). COA, Forages and Grassland Management, Department of AgronomyRana, S.S.; CSK Himachal Pradesh Krish

iVishvavidyalaya, Palampur (India). COA, Forages and Grassland Management, Department of AgronomyChander, Navell; CSK HimachalPradesh Krish iVishvavidyalaya, Palampur (India). COA, Forages and Grassland Management, Department of Agronomy. Combination ofpinoxaden with other herbicides against complex weed flora in wheat. Indian Journal of Weed Science (India).(Oct-Dec 2012) v. 44(4) p.225-230 KEYWORDS: WEED CONTROL. WEEDS. CHEMICAL CONTROL. METSULFURON. 2,4-D. WHEATS.

A field experiment was conducted during 2010–11 and 2011–12 to evaluate the efficacy of pinoxaden alone and in combination with other herbicides against complex weed flora in wheat. Pinoxaden 50g/ha alone and as tank mixture with and before metsulfuron-methyl 4 g/ha, carfentrazone-ethyl 20 g/ha and 2,4-D 500 g/ha was compared toisoproturon + 2,4-D, clodinafop fb 2,4-D, weed free and weedy check for weed control and grain yield. Phalaris minor and Anagallis arvensis were the major weeds constituting 59.1 and 20.8% of the total weed population during 2010–11 and 67.6 and 16.9% during2011–12, respectively. Avena ludovician, Lolium temulentum, Poa annuaand Vicia sativa were the other important weeds found in association with wheat. Weeds reduced grain yield of wheat by 39.5%. Pinoxaden + metsulfuron-methyl (50 + 4 g/ha) and pinoxaden fb metsulfuron-methyl (50 fb 4 g/ha) were comparable to weed free treatment in reducing thedensity of Phalaris minor and Anagallis arvensis. Pinoxaden alone was not effective against broad-leaved weeds, while carfentrazone, metsulfuron-methyl and 2,4-D were not effective against grasses. Combined application of pinoxaden with metsulfuron-methyl/carfentrazone (as tank mixed or as followed by) resulted in significantly lower total weed density and weed biomass. Combined application of pinoxaden with metsulfuron-methyl, carfentrazone and 2,4-D resulted in significantly higher tillers, grains/spike and 1000-seed weight and grain yield as comparable to in weed free.

384 Mundra, S.L.; Maharana Pratap University of Agriculture & Technology, Udaipur (India). Department of Agronomy Maliwal, P.L.; Maharana Pratap University of Agriculture & Technology, Udaipur (India). Department of Agronomy. Influence of quizalofop-ethyl on narrow-leaved weeds in blackgram and its residual effect on succeeding crops. Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4) p.231-234 KEYWORDS: WEED CONTROL. WEEDS. URD. CHEMICAL CONTROL. ECHINOCHLOA. RESIDUAL EFFECTS.

A field experiment was conducted at Research Farm of MPUAT,Udaipur for two consecutive years during 2008–09 and 2009–10 to evaluate the efficacy of different doses of quizalofop-ethyl as postemergences (at 4–6 leaf stage of weeds) in blackgram and residual effect thereof on succeeding Rabi crops (wheat, gram and mustard). The experiment comprising five weed control treatments, viz. quizalofopethyl at 37.5 and 50 g/ha as post-emergence, pendimethalin 750 g/ha as pre-emergence, farmers practice of two hand weedings at 20 and 35 days after sowing (DAS) and weedy check, was conducted in randomized block design with four replications. To study phytotoxicity, quizalofop-ethyl 100 g/ha was also included in addition to above treatments. In the experimental field, more than 50% weeds were dominated by Echinochloa spp. Results revealed that among the herbicidal treatments, quizalofop-ethyl 50 g/ha recorded the lowest narrow-leaved weed density and dry weight at 30 DAS and at harvest during both the years. Quizalofop-ethyl irrespective of its doses was not effective against broad-leaved weeds. The weed controlefficiency of quizalofop-ethyl 50 g/ha was 81.3% than the highest (85.6%) under two hand weedings against grassy weeds at harvest. Number of branches and pods/plant, seeds/pod and grain and stoveryields of blackgram were also superior in plots treated with quizalofop-ethyl 50

g/ha or two HW. Quizalofop-ethyl was found safeto blackgram, and did not cause any residual toxicity to succeeding crops.

385 Bhadauria, Nisha; RVSKVV, Gwalior (India). College of AgricultureYadav, K.S.; RVSKVV, Gwalior (India). College of Agriculture Rajput, R.L.; RVSKVV, Gwalior (India). College of Agriculture Singh, V.B.; RVSKVV, Gwalior (India). College of Agriculture. Integrated weed management in sesame. Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4) p.235-237 KEYWORDS: WEED CONTROL. WEEDS. HERBICIDES. SESAME. WEED CONTROL EQUIPMENT. FLORA.

A field experiment was conducted to find out the most effective control measure for weeds in sesame (Sesamum indicun L.) under rainfed condition. Result showed that two hand weeding (weed free)recorded lowest weed population and dry weight which was significantly superior over rest of the treatments. Application ofquizalofop-ethy l0.05 kg/ha + 1 HW proved most effective and also recorded lower population and dry weight of weeds followed by trifluralin 0.75 kg/ha + 1 HW and pendimethalin 0.75 kg/ha + 1 HW. Weed control efficiency and seed yield was higher under quizalofop-ethyl 0.05 kg/ha + 1 hand weeding as compared to otherweed control treatments.

386 Dhanraj; University of Agricultural Sciences, Bangalore (India). Department of Crop PhysiologyManjunatha, S.B.; University of Agricultural Sciences, Bangalore (India). Department of Crop PhysiologyShwetha, B.; University of Agricultural Sciences, Bangalore (India). Department of Crop PhysiologyDevendra, R.; University of Agricultural Sciences, Bangalore (India). Department of Crop Physiology. Relative effects of pre-treatment of ethephon, glyphosate and paraquat on glyphosate translocation and potency in control.Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4) p.238-241 KEYWORDS: WEED CONTROL. WEEDS. HERBICIDES. GLYPHOSATE. LEAVES. SENESCENCE.

Experiments were conducted to standardize duration and level of senescence required to enhance translocation of glyphosate in Cyperus rotundus. Senescence was induced by paraquat (500 g/ha) or glyphosate (1.312 kg/ha). Decrease in total chlorophyll and membrane damage was more in herbicide treatments than ethephon. Periodic leaf RWC remained unchanged in control but decreased periodically in ethephon and paraquat. Significantly higher RWC was observed at 72 h inglyphosate than paraquat. Maintenance of membrane integrity and high RWC in glyphosate at 72 h than paraquat facilitated mobility ofglyphosate. Total biomass reduction bioassay indicated that senescence induced by glyphosate (1.312 kg/ha) pre-treatment 48 hr followed by (fb) glyphosate (1.312 kg/ha) showed significantly more efficacy (7%) than pre-treatment with benzyl adenine (synthetic cytokinin) fb glyphosate which reduced efficacy by 9% compared to glyphosate alone.

387 Rao, P.C.; College of Agriculture, Rajendranagar (India). Lakshmi, Ch. S. Rama; College of Agriculture, Rajendranagar (India). Madhavi, M.; College of Agriculture, Rajendranagar (India) Swapna, G.; College of Agriculture, Rajendranagar (India) Sireesha, A.; College ofAgriculture, Rajendranagar (India). Adsorption of oxadiargyl and butachlor on soil particle size separates. Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4) p.242-246 KEYWORDS: WEED CONTROL. WEEDS. HERBICIDES. ADSORPTION. SOIL.

Study on adsorption of oxadiargyl and butachlor was carried out on soil particle size separates of four type of soils from different agroclimatic zones of Andhra Pradesh using batch equilibration technique. Irrespective of the particle size, the per cent adsorption was

more in vertisols than alfisols. Among four soils studied, maximum adsorption (59.7 ìg/g) was observed in 0.05 mm soil separate of vertisol-2, whereas minimum adsorption of 4.5 ìg/g was observed in 2 mm soil of alfisol-1. The amount adsorbed increased with increasein initial concentration and reached a plateau. The isotherms were mainly parabolic in nature with ‘S' shaped tendency. The S-shape reflected the initial resistance to the adsorption of herbicides, to overcome later by the cooperative effect of adsorbed molecules. Soil low to medium in organic carbon, has a tendency togive S-shaped isotherms on account of their hydrophilic nature as compared to soil high in organic carbon which tend to be hydrophobic. The adsorption maxima was positively and significantly correlated with organic carbon content. Freundlich ‘Kf' values which indicate the extent of binding of herbicide to the soil constituents were positively and significantly correlated with organic carbon, clay content and clay + organic carbon.

388 Khankhane, P.J.; Directorate of Weed Science Research, Maharajpur (India). Varshney, Jay G.; Directorate of Weed Science Research, Maharajpur (India) Naidu, V.S.G.R.; Directorate of Weed Science Research, Maharajpur (India). Presence of heavy metals in medicinal weed species grown at contaminated sites. Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4) p.247-250 KEYWORDS: WEED CONTROL. WEEDS. CONTAMINATION. HEAVY METALS.

Concentration of heavy metals like Cd, Pb, Ni, Co, Zn, Mn and Fe were tested in medicinal weeds growing at heavy metal contaminated site around Jabalpur during winter season of 2008. Except Vicia sativa, higher concentration of Cd was observed in weeds like Sonchus arvensis (3.07 ìg/g), Alternanthera viridis (1.56 ìg/g), Anagalis arvensis (1.5 ìg/g), Melilotus indica (1.30 ìg/g), Eclipta alba (1.14 ìg/g), Chenopodium album (1.15 ìg/g), Cichorium intybus (1.05 ìg/g), Lathyrus sativa (0.77 ìg/g). Copper concentrations in plant was higher than prescribed standard limit, viz. Amaranthus viridis (46ìg/g),Ageratum conyzoides (22 ìg/g), Polygonum persicaria (37 ìg/g), Commelina communis (30 ìg/g), Alternanthera sessilis (22 ìg/g), Solanum nigrum (22 ìg/g) and Ipomoea aquatica (21 ìg/g). Ni and Zn contents exceeded the permissible limit in shoots of Polygonum persicaria (19,265 ìg/g), Commelina communis (17,192 ìg/g), Alternanthera sessilis (14,216 ìg/g), Amaranthus viridis (17,488 ìg/g), Ipomoea aquatic (15,238 ìg/g), Heliotropicum indicum (16,89 ìg/g), Ageratum conyzoides (15,127 ìg/g), Blumea lacera (3,218 ìg/g), Solanum nigrum (16, 191 ìg/g), Convolvulus arvensis (15,125 ìg/g) and Cyperus iria (15,177 ìg/g) respectively. Calotropis procera (21 ìg/g) exhibited higher Pb concentration exceeding prescribed standard limit. Conversely, Co content was found within prescribed limit in Melilotus indica, Lathyrus sativa, Heliotropicum indicum, Cyperusiria,Convolvulus arvensis, Blumea lacera, Pb below standard limit in Hyptis suaveolens, Cichorium intybus, Lantana camara and Datura stramonium, and no Pb was detected in Alternanthera sessilis, Abutilon indicum, Xanthium strumarium, Anagalis arvensis.

389 Nongmaithem, D.; Bidhan Chandra Krishi Viswavidyalaya, Mohanpur (India). Department of AgronomyPal, D.; Bidhan Chandra Krishi Viswavidyalaya, Mohanpur (India). Department of AgronomyGhosh, R.K.; Bidhan Chandra Krishi Viswavidyalaya, Mohanpur (India). Department of Agronomy. Weed control through smothering crops and use of plant extracts as bioherbicides. Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4) p.251-254 KEYWORDS: WEED CONTROL.WEEDS.HERBICIDES. PLANT EXTRACTS.

A field experiment was conducted at BCKV, Mohanpur during the pre-Kharif season of 2010 and 2011 to observe the weed smothering ability of different crops and also to evaluate the bio-herbicidal potential of plant extracts on weeds. The study revealed that among the crops, significantly lowest population of different categories of weeds were found under black gram while highest population was recorded under sesame. Among the weed management practices, hand weeding at 20 DAS resulted in lowest population of all categories of weeds at 30 DAS. Among the botanical plant extracts, Ageratum conyzoides extract 5% (w/v) recorded lowest sedge and broad-leaved weed population while lowest grassy weed population was recorded under Ocimum sanctum extract 5% (w/v). The highest weed control efficiency was recorded under hand weeding treatment followed by fenoxaprop-p-ethyl while among the botanical plant extract, Ageratum conyzoides recorded the highest.

390 Almubarak, N.F.; University of Diyala, Iraq (Iraq). College of Agriculture Al-Calabi, F.T.; University of Baghdad, Iraq (Iraq). COA, Field Crop Department AlaAl-Janabi; General Company for Industrial Crops, Iraq (Iraq)Singh, Ishwar; Indian Institute of Sugarcane Research, Lucknow (India). Effect of herbicides on weed control and yield of sugarcane. Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4) p.255-258 KEYWORDS: WEED CONTROL. WEEDS. HERBICIDES. SUGARCANE. CANE SUGAR.

391 Jadhav, A.S.; Marathwada Krishi Vidyapeeth, Parbhani (India). Department of AgronomyGadade, G.D.; Marathwada Krishi Vidyapeeth, Parbhani (India). Department of Agronomy. Evaluation of post-emergence herbicides in soybean. Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4) p.259-260 KEYWORDS: WEED CONTROL. WEEDS. SOYBEANS. YIELDS.

392 Upadhyay, V.B.; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (India). Department of AgronomyBharti, Vimal; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (India). Department ofAgronomyRawat, Anay; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (India). Department of Agronomy. Bioefficacy of post-emergence herbicides in soybean. Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4) p.261-263 KEYWORDS: WEED CONTROL. WEEDS. HERBICIDES. SOYBEANS.

393 Shinde, K.G.; Mahatma Phule Krishi Vidyapeeth, Rahuri (India). Bhalekar, M.N.; Mahatma Phule Krishi Vidyapeeth, Rahuri (India). Patil, B.T.; Mahatma Phule Krishi Vidyapeeth, Rahuri (India). Weed management in rainy season onion. Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4) p.264-266 KEYWORDS: WEED CONTROL. WEEDS. HERBICIDES. CHEMICAL CONTROL. WEED CONTROL EQUIPMENT. ONIONS.

394 Gnanavel, I.; Annamalai University, Annamalainagar (India). Faculty of Agriculture, Department of AgronomyKathiresan, R.M.; Annamalai University, Annamalainagar (India). Faculty of Agriculture, Department of Agronomy. Integrated approach for controlling water hyacinth. Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4) p.267-269 KEYWORDS: WEED CONTROL. WEEDS. HERBICIDES. COLEUS. EICHHORNIA CRASSIPES. INSECTA. NEOCHETINA.

395 Daniel, P.S. John; Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal (India). Department of AgronomyPoonguzhalan, R.; Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal (India). Department of AgronomyMohan, R.; Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal (India). Department of Agronomy Suburayalu, E.; Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal (India). Department of Agronomy. Weed management for enhanced production of aerobic rice. Indian Journal of Weed Science (India). (Oct-Dec 2012) v. 44(4) p.270-273 KEYWORDS: WEED CONTROL. WEEDS. HERBICIDES. RICE.

P10 Water resources and management

396 Zhang, G. W.; Zhejiang Academy of Agricultural Sciences, Hangzhou(China). Institute of VegetableHu, Q. Z.; Zhejiang Academy of Agricultural Sciences, Hangzhou(China). Institute of VegetableXu, S. C.; Zhejiang Academy of Agricultural Sciences, Hangzhou(China). Institute of VegetableGong , Y. M.; Zhejiang Academy of Agricultural Sciences, Hangzhou(China). Institute of Vegetable. Polyamines Play a Positive Role in Salt Tolerant Mechanisms by Activating Antioxidant Enzymes in Roots of Vegetable Soybean. Legume Research (India). (Jun 2013) v. 36(3) p.234-240 KEYWORDS: WATER RESOURCES. WATER MANAGEMENT. ANTIOXIDANTS. POLYAMINES. VEGETABLES. SOYBEANS.

Two cultivars contrasting in NaCl tolerance were used to investigate the possible involvement of polyamines in salt tolerant mechanisms in roots of vegetable soybean. ‘Tianfeng', the salt tolerant cultivar exhibited overall higher contents of free, soluble conjugated and insoluble bound forms of polyamines (putrescine, spermidine and spermine) except for free spermidine over the salt sensitive line during the course of NaCl treatment for 15 days. Consistent with this observation, arginine decarboxylase, the essential enzyme of polyamines biosynthesis and two enzymes catalyzing breakdown of polyamines were differentially regulated between the two cultivars. Antioxidant enzymes downstream to the polyamines signaling globally showed higher activity in Tianfeng, resulting in lower contents of reactive oxygen species and malondialdehyde subsequently. These results taken together indicate that higher levels of polyamines may be important in conferring enhanced salt tolerance in roots of vegetable soybean by activating antioxidant enzymes and, therefore, attenuating oxidative damage.

P33 Soil chemistry and physics

397 Tilaki, Ghasem Ali Dianati; Tarbiat Modares University, NoorCity(Iran). Department of Rangeland Management, Faculty of NaturalResourcesGholami, Farzaneh; Tarbiat Modares University, NoorCity(Iran). Department of Rangeland Management, Faculty of NaturalResourcesBehtari, Behzad; Tarbiat Modares University, NoorCity(Iran). Department of Rangeland Management, Faculty of NaturalResourcesBezdi , Kamal Ghasemi; Tarbiat Modares University, Noor City(Iran). Department of Rangeland Management, Faculty of Natural Resources. Chemical composition and allelopathic effect of theessential oil of artemisia herba-alba asso. on seed germination andearly seedling growth of legumes and grasses species. Legume Research(India). (Feb 2013) v. 36(1) p.33-40 KEYWORDS: ALLELOPATHY. GAS CHROMATOGRAPHY. GERMINATION. LENGTH. ROOTS. SHOOTS.

There is some evidence that allelopathic interference on the

establishment of plants can be attributed to the effect of essential oils from Artemisia herba-alba. For this purpose, chemical composition essential oil and allelopathic effects of Artemisia herba-alba were evaluated to determine inhibitory or stimulatory effects of essential oils on seed germination and early seedling growth of two legumes (Medicago sativa L. and Onobrychis sativa Lam.) and three grasses (Lolium perenne L., Secale montanum Guss. And Bromus tomentellus Boiss.) in a laboratory experiment. The essentialoils of aerial parts of Artemisia herba-alba were obtained by steam distillation and analyzed by GC-MS. Seed germination test was carried out on filter paper moistened with 5 ml of dilutions of essential oilor distilled water as control. The results showed that increased essential oil concentration reduced root lengths in Medicago sativa, Onobrychis sativa and Bromus tomentellus. Also, The effects ofessential oil concentrations on seed germination show a tendency of being stimulatory effect at lower concentrations (300ppm, 500ppm) in S. montanum and inhibitory at higher concentration (700ppm) in all species except O. sativa. Percentage and speed of germination decreased with increasing essential oil concentration in grasses.However, no significant effect was seen on the two legumes species. GC -MS studies revealed that The major compounds were cis-pinocarveol(17.5%), artemisia ketone (13%), trans-sabinene hydrate (8.5%),1,8-cineole (8%) and aromadendrene (4.7%). Oxygenated monoterpenesconstituted the major fraction of the essential oil in Artemisia herba-alba. Generally, Artemisia herba-alba shows allelopathic activity with increased essential oil concentration, which was more effective on seed germination and seedling growth of grasses.

P34 Soil biology

398 Mishra, Brijesh Kumar; NRC on Seed Spices, Ajmer(India). Yadav, Virendra; MPUAT, Udaipur(India). Department of Molecular Biology and BiotechnologyVishal, M K; NRC on Seed Spices, Ajmer(India). Kant, Krishna; NRC on Seed Spices, Ajmer(India). Physiological and molecular characterization of clusterbean [Cyamopsis tetragonoloba (L.) taub] rhizobia isolated from different areas of Rajasthan, India . Legume Research (India). (Aug 2013) v. 36(4) p.299-305 KEYWORDS: SOIL BIOLOGY. CYAMOPSIS PSORALIOIDES. CYAMOPSIS. RHIZOBIUM.

Cluster bean [Cyamopsis tetragonoloba (L.) Taub, 2n= 14] is an important self-pollinated legume crop. In Rajasthan it has become very popular crop in last decade. Clusterbean nodulating bacteria are highly specific for their host plant. As these bacteria do not show any serological cross- reaction with known rhizobia species, they are unique. The present investigation was carried out by isolating bacteria nodulating cluster bean from the areas of arid and semi-arid regions of Rajasthan to identify effective and competitive strains tolerant to various abiotic stresses such as temperature, pH and salinity. A total of 15 rhizobium isolates from clusterbean nodules were characterized on the basis of cultural analysis and screened for physiological traits. Most isolates were tolerant to pH between 6.0 to 8.0, NaCl concentration between 0.5 to 3% and temperature between37 to 42°C. These rhizobial isolates were characterized by random amplified polymorphic DNA to estimate their relationship on molecularbasis and compared with their tolerance to various abiotic stresses. The rhizobial isolates from hot climatic area are having more tolerance to abiotic stress specially temperature, among these fewrhizobial isolates which are genetically similar, also are less tolerance to abiotic stress and grouped in same cluster on the dendogram.

399 Narula, Shifa; CCS Haryana Agricultural University, Hisar(India). Department of MicrobiologyAnand, R.C.; CCS HaryanaAgricultural University, Hisar(India). Department of Microbiology Dudeja, S.S.; CCS Haryana Agricultural University, Hisar(India).Department of MicrobiologyVishal; CCS Haryana Agricultural University, Hisar(India). Department of Microbiology Pathak, D.V.; CCS Haryana Agricultural University, Bawal(India). Regional Research Station. Molecular diversity of root and nodule endophytic bacteria from field pea (Pisum sativum L.). Legume Research (India). (Aug2013) v. 36(4) p.344-350 KEYWORDS: SOIL BIOLOGY. ENDOPHYTES. PEAS. LEGUMES. PISUM SATIVUM.

Endophytic bacteria from root and nodules of field pea being grown in CCS Haryana Agricultural University farm Hisar were isolated. A total of 15 endophytic bacteria from surface sterilized roots and 60 from the nodules of field pea were isolated. Out of 75 isolates, 67% in roots and 68% in nodules were gram positive. In roots 70% and in nodules 90% of the gram positive isolates was spore formers. Selected 9 endophytes from roots and 48 from nodules were used to determine molecular diversity by amplication of 16S rDNA by PCR, followed by RFLP by three restriction endonucleases Hae III, RsaI & Hinf I. Wide diversity among field pea bacterial endophyteswas observed and considering each cluster as one genotype at 80% level of similarity coefficient, thereby in CCS Haryana Agricultural University soils, 3 genotypes were present in field pea roots while17 genotypes were present in the nodules. A combined dandrogram showed that entirely a separate cluster was formed by the root endophytes as compared to nodules endophytes, which indicates that the number and type of bacterial genera enters depending upon the plant tissue and environmental conditions in field pea, besides the microbial population present in the soil.

P35 Soil fertility

400 Azad, Mohammad Abul Kalam; Bangladesh Agricultural University Campus, Mymensingh(Bangladesh). Bangladesh Institute of Nuclear Agriculture, Plant Breeding DivisionHaque, Mohammad Mozammel; Bangladesh Agricultural University, Mymensingh (Bangladesh). Department of Crop BotanyHamid, Mohammad Abdul; Bangladesh Agricultural University Campus, Mymensingh (Bangladesh). Bangladesh Institute of Nuclear Agriculture, Plant Breeding DivisionYasmine, Fahmina; Bangladesh Agricultural University Campus, Mymensingh(Bangladesh). Bangladesh Institute of Nuclear Agriculture, Plant Breeding DivisionGolder, Mohammad Abdul Wahab; Soil ResourcesDevelopment Institute, Dhaka (Bangladesh). Tolerance to salinity stress in peanut (Arachis Hypogaea L.) through osmotic adjustment and undamaged chloroplast. Legume Research (India). (Dec 2012) v. 35(4) p.271-284 KEYWORDS: TOLERANCE. GROUNDNUTS. ARACHIS HYPOGAEA. CHLOROPLASTS.

A pot experiment was conducted under glass house condition to study the mechanism of salt tolerance in peanut at Bangladesh Institute of Nuclear Agriculture, Mymensingh, during February to July 2006. Two Spanish type varieties, Dacca-l and Binacmnabadam-3, and 1 Valencia type variety, Zhingabadam with unknown tolerance were exposed to 0.4 (unstressed), 3,5, 7 and 9 dS/m doses of salinity at vegetative and flowering stages. The experiment was laid out in afactorial completely randomized design. It appeared that Binacmnabadam-3 allocated higher assimilate to kernel at both vegetative and flowering stages through maintaining total sugar and chlorophyll ‘a’ contents close to unstressed treatment, particularly at 3–5 dS/m salinity doses.

401 Ahmed, Kafeel; University of Sargodha, Sargodha(Pakistan). Department of Biological SciencesKhan, Zafar Iqbal; University of Sargodha, Sargodha(Pakistan). Department of Biological Sciences Shaheen, Muneeba; University of Sargodha, Sargodha(Pakistan). Department of Biological SciencesSeidavi, Alireza; Islamic Azad University, Rasht(Iran). Rasht Branch, Department of Animal Science. Dynamics of magnesium, copper and zinc from soil to forages grown in semiarid area in sargodha, Pakistan. Legume Research (India). (Dec 2012) v. 35(4) p.294-302 KEYWORDS: MAGNESIUM. COPPER. ZINC. SOIL. PAKISTAN.

This investigation was carried out to determine the concentrations of certain essential elements (Zn, Mg and Cu) in soil and forages from two different sites in the pasture in Sargodha, Pakistan during two consecutive seasons of the year. The purpose of this study was to evaluate the concentrations of these essential elements (Zn, Mg and Cu) in soil and forages in relation to the needs of livestock grazing therein. The results showed that mean soil and forage values of these elements generally decreased from summer to winter seasons at both sites of the pastureland. Mean forage elements were found to be lower than the requirements of livestock consuming these forages in the studied pastureland. The Cu and Zn concentrations in soil were found to be closely related to requiredlevel for forage from the soil, but Mg was higher than the requiredlevel, indicating no need of soil amendment for enhancing the level of this element in soil for forage crops. Based on these findings, it was concluded the pasture soil should be amended with Cu and Zn containing fertilizers and the ruminants feeding on those forage species should also be continually supplemented with specifically tailored mineral mixture containing these elements to avoid diseases caused by deficiency of these mineral elements.

Q01 Food science and technology

402 Singh, Vasudeva; Central Food Technological Research Institute, Mysore (India). singhva2003ahoo.co.in. Recent trends in utilization of rice and value addition to its byproducts. ORYZA (India). (Jan 2013) v.50(1)p.1-17 KEYWORDS: RICE. PASTA. BRAN. PIGMENTATION. BYPRODUCTS.

Rice is the staple food grain for majority of population in the world. In India, rice is being used in raw as well as parboiled form. In southern states of India, rice is also used in the form of ”cured rice”. From harvesting to drying, shelling and milling in raw, and parboiled form is practiced. CSIR-CFTRI has intervened in converting paddy to rice and then products. Paddy is parboiled by wet heat as well as dry heat treatments. Several properties of both rice are similar, however, some are different. Rice is also converted into different products by using parboiled rice. It is converted into expanded and popped rice. Among the latest products- noodles, diabetic rice as well as diabetic rice noodles are developed. Structure of amylopectin of rice starch is studied with gel permeation chromatography and related to behavior of cooking of rice. Energy consumption during cooking of rice by different methods have been reported. Rice is also converted into starch after removing fiber and protein, and then converted into low degree substituted acetylated starch for food applications and high degree substituted acetylated starch for the preparation of biodegradable plastics. Rice bran, an important byproduct of rice milling industry is along withhusk and broken. After defatting the bran, protein is extracted and its properties have been studied. Rice is also extruded and properties of extruded products

have been studied. Medicinal rice and their properties have been reported, and its different nature compared to normal rice is also discussed.

U30 Research methods

403 Varshneya, M.C.; Anand Agricultural University. Anand (India) Vaidya, V.B.; Anand Agricultural University. Anand (India)Panday Vyas; Anand Agricultural University. Anand (India)Shekh, A.M.; Anand Agricultural University. Anand (India) Chimote, L.D.; Anand Agricultural University. Anand (India)Damle, K.S.; Anand Agricultural University. Anand (India). Rainfall forecast of Gujarat for monsoon 2011 based on monsoon research Almanac. Asian Agri-History (India). (Jul-Sep 2011) v.15 (3) p.251-256 KEYWORDS: RAIN. MONSOON CLIMATE. FORECASTING.

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Junagadh-362001, Gujarat

38. National Research Centre for Citrus
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