

## Insect growth regulators: practical use, limitations and future

Satnam Singh, Suneet Pandher, Rakesh Kumar Sharma<sup>1</sup> and Rajinder Kumar<sup>2</sup>

*Punjab Agricultural University, Regional Station, Faridkot - 151 203, India*

<sup>1</sup> PAU Regional Station, Ballowsaunkri, Punjab, <sup>2</sup>Punjab Agricultural University, Ludhiana

E-mail: satnam@pau.edu

### ABSTRACT

Compounds interfering with normal growth and development of insects are categorized under the group IGRs. The group includes moulting hormone analogues, anti moulting hormone analogues, juvenile hormone analogues, anti juvenile hormone analogues, insect neuropeptides, chitin synthesis inhibitors, chitin degradation inhibitors and sclerotization inhibitors. Exogenous applications of MHAs (Mimic<sup>®</sup>, Interprid<sup>®</sup>, Mach<sup>®</sup>, Confirm<sup>®</sup>) lead to increased titre of ecdysone which can not be metabolized or excreted rapidly to prevent hormonal imbalance resulting in moulting promotion and consequent death of insects but due to their hydrophilic nature they cannot penetrate insect cuticle, thus effective only upon digestion. JH and its analogues (Altosid<sup>®</sup>, Enstar<sup>®</sup>, Insegar<sup>®</sup>, GenTrol<sup>®</sup>, Mator<sup>®</sup>, Kabat<sup>®</sup>, Admiral<sup>®</sup>, Logic<sup>®</sup> and Aware<sup>®</sup>) result in deranged development and several deformities such as supernumerary larvae, larval-pupal, larval-adult, pupal-adult intermediates and adultoides however, low persistence and stage specificity are limiting their field use. CSIs (Applaud<sup>®</sup>, Consult<sup>®</sup>, Match<sup>®</sup>, Nomolt<sup>®</sup>, and Baycidal<sup>®</sup>) act by inhibiting chitin synthetase and cause moulting aberrations associated with several morphological abnormalities. Neuropeptides are safe and selective compounds for control of insect pests, but their heat labile nature, costlier synthesis, inability to penetrate the insect cuticle are the major constraints in their use. Alternatively, the neuropeptides genes along with chitinase gene could be the potential candidates for designing the effective biopesticides (entomopathogenic bacteria, viruses, nematodes, etc.) through genetic engineering.

**Key words:** Moulting hormone analogues, anti moulting hormone analogues, juvenile hormone analogues, anti juvenile hormone analogues, chitin synthesis inhibitors, insect neuropeptides, insect-pest management

### Organic Farming

## Nutrient supply package and varietal suitability for organic farming in rice

A. Upendra Rao\*, K.M. D. Murthy, S. Krishnam Raju, D. Adi Lakshmi and T. V. Sridhar

*Andhra Pradesh Rice Research Institute- Maruteru - 534 122, ANGR Agricultural University, Hyderabad, AP, India*

### ABSTRACT

Field experiments were conducted for two consecutive *kharif* seasons of 2007 and 2008 on Godavari alluvial soils of Maruteru, A.P. with three organic nutrient supply packages and five varieties with an objective to find an appropriate 100 per cent organic nutrient supply system and suitable variety. The pooled data of two years revealed that supply of cent per cent recommended N thorough 1/3<sup>rd</sup> each of green leaf manure + poultry manure + groundnut cake recorded significantly higher yield attributes, grain yield, higher root volume and root biomass, N and K uptake at harvest. Among varieties MTU 7029 recorded higher yield attributes, grain yield, higher root volume, root biomass, weed biomass and nitrogen and phosphorus uptake at harvest. Physical quality parameters, like hulling per cent and head rice recovery was higher in MTU 1061. Grain

quality parameters were superior in BPT 5204. Pest and disease incidence was significantly higher in BPT 5204 and MTU 7029 and were lowest in MTU 1001.

**Key words :** Organic farming, rice, nutrient supply packages

## **Agronomic evaluation of biodynamic practices for organic cultivation of basmati rice based cropping system**

D.K. Singh, Jyoti Pandey, Geeta Kaur and Anoop Kumar Dubey

*Department of Agronomy, College of Agriculture, GBPUA&T, Pantnagar – 263 145, Uttarakhand, India*  
*E-mail : dhananjayrahul@rediffmail.com*

### **ABSTRACT**

An experiment was conducted in the year 2009 - 10 and 2010 - 11 at Breeder Seed Production Center of Pantnagar to evaluate the performance of different cropping systems under biodynamic practices. The treatments were, cropping system rice - chickpea - *Sesbania* & rice - vegetable pea - maize + moong and six sub plots in split plot design. Among two cropping system rice - chickpea - *Sesbania* cropping system recorded significantly higher values for grain yield ( $3629 \text{ kg ha}^{-1}$ ), straw yield ( $5177 \text{ kg ha}^{-1}$ ), nutrient uptake and almost all macro nutrients in soil. Treatment  $T_1$  (FYM + VC + NC + EC) and  $T_5$  ( $T_1$  + BD + Panchgavya) recorded significantly higher grain yield, i.e.  $3683 \text{ kg ha}^{-1}$  and  $3144 \text{ kg ha}^{-1}$ , respectively.  $T_5$  recorded significantly higher nitrogen uptake ( $80.7 \text{ kg ha}^{-1}$ ), while  $T_1$  recorded higher values for uptake of phosphorus, potassium and sulphur (i.e.  $23.6$ ,  $95.2$  and  $18.0 \text{ kg ha}^{-1}$ , respectively). Highest organic carbon was observed in  $T_5$  treatment (1.01%), available nitrogen in  $T_4$  ( $379 \text{ kg ha}^{-1}$ ), available phosphorus and sulphur was found to be maximum in  $T_5$ . Available potassium in soil was found in  $T_1$  treatment of nutrient management.

**Key words:** Organic, biodynamic, cropping system, green manuring, nutrient uptake

## **Studies on performance of organic farming and chemical farming in rice – rice system**

\*A. Upendra Rao, K.M.D. Murthy, T.V. Sridhar and D. Srinivas

*Andhra Pradesh Rice Research Institute - Maruteru - 534 122; ANGR Agricultural University, Hyderabad, AP, India*

### **ABSTRACT**

Field experiments conducted consecutively for three years during *kharif* and *rabi* seasons on Godavari alluvial soils revealed that, application of 100 per cent recommended NPK along with  $\text{ZnSO}_4$  @ $50 \text{ kg ha}^{-1}$  resulted highest grain yield, gross return, net return and rupee per rupee invested over exclusive organic farming practices. Integrated nutrient management during *kharif* and for system application of 100 per cent recommended NPK along with  $\text{ZnSO}_4$  @ $50 \text{ kg ha}^{-1}$  during *rabi* showed more sustainability in yields among all the treatments. The organic carbon content was conspicuously increased with all the exclusive organic nutrient management practices as well as integrated use of nutrients. The status of available soil potassium was remarkably decreased in all the exclusive organic nutrient management practices and integrated nutrient management treatments.

**Key words:** Rice, organic farming, yield, sustainability, economics

## **Effect of different doses of vermicompost on gerbera cv. Red Gem.**

Madhumita Choudhury Talukdar and Luna Barooah

*Department of Horticulture, Assam Agricultural University, Jorhat-785 013, Assam, India*

#### ABSTRACT

A field study was conducted in the experimental farm of Department of Horticulture, Assam Agricultural University, Jorhat with a view to find out the effect of different doses of vermicompost on growth, flowering and sucker production of gerbera cv. Red Gem. The treatments consist of different doses of vermicompost viz. 5, 10, 15, 20, 25 and 30 t ha<sup>-1</sup> of T<sub>1</sub>, ... T<sub>6</sub> respectively, which were compared with control and NPK (recommended dose) treatment. The results of the experiment revealed that among the different treatments, application of vermicompost @15 t ha<sup>-1</sup> (T<sub>3</sub>) significantly increased the growth and flower characters and sucker production followed by vermicompost @10 t ha<sup>-1</sup> (T<sub>2</sub>) and NPK (T<sub>8</sub>). Maximum plant height (48.66 cm), number of leaves per plant (42.66), maximum leaf length (38.00 cm), minimum days to full bloom (69.26 days), number of flowers plant<sup>-1</sup> (33.00), maximum stalk length (48.00 cm), maximum size of flower (9.10 cm) and vase life (8.66 days) were observed under T<sub>3</sub> (vermi compost @15 t ha<sup>-1</sup>).

**Key words:** Vermicompost, gerbera

## Effect of climate change on the productivity of mango cv. Banganpalli under Andhra Pradesh agroclimatic conditions

A. Bhagwan, A. Kiran Kumar, K. Purushotam and A. K. Misra<sup>1</sup>

Fruit Research Station, Sangareddy, Medak, A.P., India

<sup>1</sup>Central Institute for Subtropical Horticulture, Rehmankhera, P.O. Kakori, Lucknow, U.P., India

E mail : aravabhagwan@rediffmail.com; misra\_a\_k@yahoo.co.in

#### ABSTRACT

Regular bearing mango cv. Banganpalli of Andhra Pradesh showed extremely poor and delayed flowering and progressive decrease in productivity during 2007, 2008, 2009 and 2010. The estimated period of peak flower bud differentiation under Andhra Pradesh conditions is likely to be from November to December. Maximum and minimum temperature during November to February greatly influences the productivity of mango cv. Banganpalli. The number of fruit per tree of mango cv. Banganpalli of above 20 years (age) at Fruit Research Station, Sangareddy from 2006 to 11 (6 years) were correlated with corresponding temperature during flower bud differentiation and flowering. Significantly highest number of fruit tree<sup>-1</sup> (530) was recorded during the year 2006. From 2007, the number of fruit tree<sup>-1</sup> significantly decreased till 2010. Night temperature of less than 15°C for maximum no of days has been recorded during November-January during 2006 and 2007 which is conducive for flower bud differentiation. However, during 2008, 2009 and 2010 night temperature of less than 15°C was recorded for minimum number of days during January-February resulting in to late, erratic and multiple flowering flushes and subsequently recorded lowest number of fruits tree<sup>-1</sup> compared to the year 2006. Further, during the same years the flower panicles were exposed to the more than 35°C during February resulting in poor fruit set and flower drop, which ultimately resulted in the drop of the number of fruit tree<sup>-1</sup> during 2008-10. Analysis of the temperature data showed that the shift of low night temperature of less than 15°C from November-December to January-February and subsequent sudden rise in temperature of above 35°C during February has progressively delayed the flowering and subsequently exposed the emerging flower panicle to high day temperatures might have resulted in less no of perfect flowers, poor fruit set and decrease productivity of mango cv. Banganpalli during the last 4 years.

**Key words:** *Mangifera indica*, flowering, fruit set, temperature

## Response of different combination of organic manures for production of turmeric (*Curcuma longa* L.)

S.P. Singh

AICRPS on Spices, Department of Horticulture, Tirhut College of Agriculture, Dholi, Muzaffarpur, RAU, Bihar, India

#### ABSTRACT

A field experiment was conducted during kharif season of 2007-2008 and 2009-2010 to study the effect of different combination of organic manures on growth, yield and cost : benefit ratio of turmeric (*Curcuma longa* L.). Soil application of different organic manurial combination significantly influenced the growth and yield attributes of turmeric during three year of consecutive experimentation. However, soil application FYM 30 t ha<sup>-1</sup> + vermicompost 20 q ha<sup>-1</sup> + neem oil cake 8 q ha<sup>-1</sup> produced the maximum plant height (118.06 cm), number of tillers per plant (5.22), number of leaves per tiller (13.53) and fresh projected yield (48.82 t ha<sup>-1</sup>), giving maximum profit of Rs. 3.64 per unit cost as compare to other organic manorial combination.

**Key words:** Turmeric (*Curcuma longa* L.), FYM, vermicompost, neem oil cake, yield attributes.

## Standardization of dose and time of soil application of Cultar on flowering and yield in mango cv. Banganpalli

A. Bhagwan, K. Vanajalatha, S.K. Sarkar, A. Girwani and A.K. Misra<sup>1</sup>

Fruit Research Station, Sangareddy, Medak - 502 001, Andhra Pradesh, India

<sup>1</sup>Central Institute of Subtropical Horticulture, Rehmankhera, PO. Kakori, Lucknow - 226 101, U.P., India

#### ABSTRACT

Excessive vegetative growth and poor fruit set at the time of blossoming of the mango (*Mangifera indica* L.) are identifiable cause of low yield in mango cv. Banganpalli (3-7 t ha<sup>-1</sup>) in subtropical regions of India. Even though several experiments have confirmed the promotional effects of paclobutrazol on flower induction and yield of mango tree, little is known about the exact dose and time of application of Cultar (25% paclobutrazol) with reference to cv. Banganpalli, a prominent mango variety of south India. Hence, a five year study on the effect of soil application of Cultar with different dosages (i.e. 3 ml and 5 ml m<sup>-1</sup> of canopy diameter) at different times of application before flowering (i.e. 120, 90 and 60 days before bud break) in 15 year old mango cv. Banganpalli was investigated. The experiment was conducted at Fruit Research Station, Sangareddy, A.P, India from 1999-2004, using randomized block design with 4 replications. Cultar was applied in the month of September, October and November every year corresponding to the 120, 90 and 60 days before bud break. Last week of December is the flower bud break time in southern India. Data on shoot growth, internodal length, per cent flowering, per cent perfect flowers, fruit set and yield was recorded. Pooled analysis of 5-year data revealed that 5 ml m<sup>-1</sup> diameter Cultar application significantly reduced the vegetative growth, increased percentage of shoots flowered and per cent perfect flowers as compared to

3 ml m<sup>-1</sup> diameter and untreated mango trees (cv. Banganpalli). Irrespective of the dosage of Cultar, soil application of Cultar at 120 days before bud break significantly reduced vegetative growth, increased perfect flowers, fruit set and yield over 90 and 60 days before bud break and untreated trees. Application of Cultar at either 3 or 5 ml m<sup>-1</sup> canopy diameter at 120 days before bud break equally increased the yields upto 35% over control.

**Key words:** *Mangifera indica*, Cultar, fruit set, perfect flowers, paclobutrazol, internodal length, panicle length, flowering

## Genetic variability and character association studies on post-flowering drought tolerance in Sorghum

Suvarna Patil, B. Fakrudin, Yemane Girma, Addissu Gabre, Rajkumar, Anand Khot, Y. D. Narayana and P. U. Krishnaraj

*Institute of Agri-Biotechnology, University of Agricultural Sciences, Dharwad-580 005, Karnataka, India*  
E-mail: bfakrudin@gmail.com

#### ABSTRACT

Two sorghum Recombinant Inbred Populations (RIPs) were evaluated to estimate the extent of genetic variability for the post-flowering drought tolerance at Dharwad (Karnataka) over seasons. Significant mean sum of squares were obtained in the pooled analysis of variance suggesting that, the RIPs were highly variable, therefore, would respond to selection. Pooled analyses indicated that most characters had higher phenotypic than genotypic variance estimates. Higher PCV and GCV were noticed for traits such as per cent GLA 30 DAF, per cent GLA 45 DAF and grain yield per plant, indicating selections could be made in the populations. Characters such as per cent GLA 30 DAF, per cent GLA 45 DAF, plant height and grain yield per plant responded positively to selection because of high broad sense heritability estimates. Per cent GLA 30 DAF, per cent GLA 45 DAF, total green leaf area recorded higher genetic advance and it was moderate for grain yield per plant. As the economic end product was grain yield, which was positively and significantly correlated with traits per cent GLA 15 DAF, per cent GLA 30 DAF, per cent GLA 45 DAF and total GLA. This indicates that stay-green trait have a significant grain yield advantage and can be successfully manipulated and incorporated into high yielding genetic backgrounds under post-flowering drought stress conditions.

**Key words:** Sorghum, recombinant inbred lines, post-flowering drought, genetic variability.

## Effect of different doses of irradiation on the shelf life and quality of mango cv. Dashehari stored at low temperature

A. Bhagwan, Anurag Chaturvedi, Ramesh Chander and Dilip Babu J.

*Fruit Research Station, Sangareddy, Medak - 502 001, AP, India*  
E-mail: aravabhagwan@rediffmail.com

#### ABSTRACT

Various technologies like postharvest dip in chemical and low temperature storage have been standardized for improving the post harvest shelf life and to preserve the quality of mango fruits. However, the residues of these chemicals on the mango fruits make it unacceptable to the consumers. Under low temperature storage spoilage due to rotting is common and cause serious obstacle in the export of the mango fruit from India. Under such circumstances, irradiation of mango fruits, which is safe and non invasive technology offers better alternative. Hence, Dashehari variety of mango fruits were irradiated at 0.4, 0.6, 0.8 and 1.0 kGy and stored at 12.5°C. Various physico-chemicals and quality parameters were analyzed at regular intervals. Irradiation of mango fruits at 0.6 kGy reduced the physiological loss in weight, delayed the ripening and improved the shelf life up to 28 days as compared to shelf life of 20 days in unirradiated fruits. Irradiation at both 0.6 and 0.8 kGy were equally effective in reducing the colour index. Higher doses of irradiation significantly reduced the rotting percentage. However, Irradiation of the fruits at higher doses of 1.0 KGy caused damage to the skin surface of the fruit with substantial loss in the quality. Further, Irradiation of the fruits at 0.6 kGy preserved the various quality parameters like total soluble solids, sugars and ascorbic acid content and organoleptic score even up to the end of shelf life of 28 days. The analysis of various physico-chemical parameters (quality parameters) like TSS, reducing sugars, total sugar, acidity, TSS/acid ration and ascorbic acid content indicated delayed ripening process in the fruits irradiated with 0.6 kGy. The study concluded that irradiation of mango fruits cv. Dashehari at 0.6 KGy and storing at 12.5°C not only improves the shelf life up to 28 days but also preserves the quality of the fruit.

**Keywords:** *Mangifera indica*, irradiation, physico chemical parameters, organoleptic score

Entomology

## Species composition and abundance of natural enemies of *Myzus persicae* (Sulzer) in potato agro-ecosystem in Shimla hills

Meena Thakur and V.K. Chandla

Division of Plant Protection, Central Potato Research Institute, Shimla - 171 001, Himachal Pradesh, India  
E-mail: meenauh@gmail.com

### ABSTRACT

Aphids *M. persicae* (Sulzer) are one of the most serious pests of potato crop worldwide, causing major yield and economic losses. Despite advances in integrated pest management, and frequent use of insecticides, the industry is still plagued by the insect. Adding to the problem is the fact that the peach aphid has proved to be resistant to various insecticides so there is a need to shift emphasis on biological control agents. Natural enemies could be a good option therefore, the present studies were carried out to observe the occurrence and diversity of natural enemies of green peach aphid, *M. persicae* in Shimla hills in potato and surrounding vegetation and the effect of weather parameters on their seasonal abundance. The periodical sampling of natural enemies (predators and parasitoids) associated with green peach aphid revealed the occurrence of four species of hoverflies (Hymenoptera) viz. *Episyrphus balteatus*, *Eupeodes* sp., *Scaeva pyrastris*, four species of coccinellids (Coleoptera) viz. *Coccinella septempunctata*, *Menochilus sexmaculata*, *Adalia quadrispinolata*, *Adalia decempunctata*, a neuropteran *Chrysoperla carnea* and two species of parasitoids (Hymenoptera) viz. *Aphelinus abdominalis* and *Aphidius* sp. Seasonal abundance of predators synchronized with the pest activity, maximum being during July to August. The mummification rate showed a specific increasing trend late in the season (August–September). Correlation between the natural enemy and abiotic factors revealed a positive effect on their population dynamics (except for relative humidity w.r.t parasitoids, showing negative non-significant correlation). Among the predators *C. septempunctata* and *M. sexmaculata* were most abundant therefore their feeding potential was evaluated under controlled conditions which revealed that different larval stages of *C. septempunctata* and *M. sexmaculata* fed an average of  $372.1 \pm 6.25$  and  $316.71 \pm 8.60$  aphids during the complete larval period, whereas the feeding potential of adults were  $66.3 \pm 15.2$  and  $57.0 \pm 10.0$  aphids per day, respectively.

**Key words:** Natural enemy, *Myzus persicae*, predation potential, seasonal occurrence

## Fluctuation of insect pest population in rice-rice system in Tungabhadra Project area of Karnataka

Mahabaleshwar Hegde and R. A. Balikai<sup>1</sup>

AICRP on Groundnut, Main Agricultural Research Station, University of Agricultural Sciences, Dharwad-580 005, Karnataka, India

<sup>1</sup>College of Agriculture, University of Agricultural Sciences, Dharwad-580 005, Karnataka, India  
E-mail: mghegdesrg@yahoo.co.in

### ABSTRACT

A rowing survey was undertaken from 1998 to 2006 *kharif* (June to November) season to study the fluctuating insect pest population on rice crop at Tungabhadra Project area of Karnataka, India. The surveying time was so adjusted to coincide with the peak activity period of insects. The observations were recorded on 100 hills in five fields of each village and such five villages were surveyed during every season. The virtual population count was restricted to planthoppers (brown planthoppers and white backed planthoppers), leaf folders, yellow stem borer and green leafhoppers, which are considered as devastating in rice ecosystem. The population of planthoppers was above economic threshold level in all the surveyed seasons and the very high population was recorded

during 2004. The maximum population of green leafhopper was recorded during the year 1998. The higher population of leaf folder and yellow stem borer were recorded during 2006 among the surveyed years.

**Key words:** Planthopper, leaf folder

## **Weight loss in adult drone bees and their pupae (*Apis mellifera*) by *Varroa destructor* mite infestation levels in Kashmir Valley**

Manzoor A. Paray and A.Q. Rather

*Division of Entomology, Sher-e-Kashmir University of Agricultural Sciences & Technology, Kashmir, Shalimar Campus-191 121, J & K, India*

### **ABSTRACT**

This study was carried out to determine the effect of different levels of *Varroa destructor* mite infestation (1-mite, 3-mite, 5-mite and without mite) on the body weight of adult honey bees (worker and drone bees) of *Apis mellifera* and their pupae in Kashmir Valley during the year 2008. Results revealed that uninfested drone bees weighed on average 135.14 mg and infested drone bees with 1, 3 and 5 mites weighed on an average of 127.03; 120.63 and 112.95 mg. We recorded a loss in the body weight of drone bees to the tune of 7.96; 11.07 and 160.32 per cent. Uninfested drone pupae weighed on average 96.09 mg and infested drone pupae with 1,3 and 5 mites weighed on an average 90.97; 83.58 and 76.93 mg with loss in the body weight to the tune of 5.10; 11.69 and 19.89 per cent. Studies indicated that weight loss increased with multiple infestation of an individual brood cell, especially from the red eyed pupal stage on. A significant weight loss from the brown-eyed stage on wards, and a considerable reduced body weight in the emerging adults was recorded

**Key words:** *Varroa destructor*, drone bees, drone pupae, Kashmir

## **Seasonal incidence and eco-friendly management of epilachna beetle, *Henosepilachana vigintioctopunctata* in brinjal**

N. R. Koushik and M. Manjunatha

*Department of Entomology, College of Agriculture, Navile, Shimoga - 577 204, Karnataka, India*  
*E-mail: koushik.nr@gmail.com*

### **ABSTRACT**

A field trail was conducted to study the incidence and management of *Henosepilachana vigintioctopunctata* (Fab.) in brinjal. The peak population beetle (35.33 beetles plant<sup>-1</sup>) was observed during August first fortnight, while lowest (0.53 beetles plant<sup>-1</sup>) was noticed during May second fortnight. The incidence of *Epilachna* beetle population exhibited significant positive correlation with rainfall (0.48), while it was significantly negative with minimum (-0.42) and maximum temperature (-0.53). Among the nine treatments evaluated under field conditions, higher reduction in population of epilachna beetle was observed in NSKE (5%) (62.77%). The next best treatments included NSKE (5%) + Spinosad 45SC (15 g ai ha<sup>-1</sup>) and recommended package of practices (Dimethoate 30 EC @ 1.7 ml l<sup>-1</sup> - Endosulfan 35 EC @ 2 ml l<sup>-1</sup>) with 56.13 and 51.28 per cent mortality, respectively.

**Keywords:** *Henosepilachana vigintioctopunctata*, Seasonal incidence, NSKE.

## **Screening of some indigenous plants for their insecticidal activity against stored grain pest *Callosobruchus chinensis* Linn.**

S.S. Patole

Department of Zoology, V.V. M's. S. G. Patil ASC College, Sakri - 424 304, Dist- Dhule, M. S., India  
E mail: sspatole63@gmail.com

**ABSTRACT**

In present study, the effectiveness of 50 locally available indigenous plant species from 29 families have been tested against stored grain pulse beetle, *Callosobruchus chinensis* Linn. for the period of six months. The result indicated that plants powder viz., *Acorus calamus*, *Adhatoda vasica*, *Azadirachta indica*, *Melia azedarach*, *Sphaeranthus indicus* and *Vitex nigundo* were the most effective plants in controlling pulse beetles followed by powders of *Anagallis arvensis*, *Annona squamosa*, *Duranta repens*, *Nicotiana tabacum* and *Randia dumetorum*. In contrast, rest of plants recorded least protection and was on par with untreated control.

**Key words:** *Callosobruchus chinensis*, indigenous plants, stored grain pests, pulse beetle.

## Evaluation of pearl millet hybrids and varieties for their reaction to *Peregrinus maidis*

R. A. Balikai<sup>1</sup>, D. Lakshmana<sup>2</sup> and A. K. Guggari

AICRP on Pearl Millet, Regional Agricultural Research Station, Bijapur - 586 101, Karnataka, India. <sup>1</sup>College of Agriculture, University of Agricultural Sciences, Dharwad - 580 005, Karnataka, India. <sup>2</sup>University of Agricultural Sciences, Bangalore - 580 005, Karnataka, India  
E-mail: rabalikai@gmail.com

**ABSTRACT**

Two trials consisting of advanced hybrids (11 entries) and released hybrids and varieties (10 entries) were taken up during *kharif* 2007 at the Regional Agricultural Research Station, Bijapur, Karnataka, India to know their reaction to shoot bug, *Peregrinus maidis* (Ashmead). In the first trial, significantly less percentage of plants were infested by shoot bug in JKBH-704 (10.9%) followed by KDBH-1157, GHB-558 and Vasundhara-1157 with 15.6, 20.3 and 20.6 per cent, respectively as compared to rest of the entries. The hybrid JKBH-704 recorded lower shoot bug population of 10 to 25 plant<sup>-1</sup>. The entries Vasundhara - 1157, KDBH-1157 and GHB-558 recorded medium population of 26 to 50 shoot bugs per plant. The black ant activity was significantly lowest in JKBH-704 (5.3 plant<sup>-1</sup>) followed by KDBH-1157 and Vasundhara-1157 with 20.8 and 25.5 black ants plant<sup>-1</sup>, respectively as compared to rest of the entries. Significantly highest grain yield was obtained from Vasundhara-1157 (48.44 q ha<sup>-1</sup>) followed by P-104, P-105 and KDBH-1157 with 45.49, 42.15 and 40.97 q ha<sup>-1</sup> of grain yield, respectively. In the second trial, significantly less percentage of plants were infested by shoot bug in PB-106 and ICTP-8203 (5.6%) followed by ICMV-155, Sharadha and ICMV-221 with 5.7, 5.9 and 6.4 per cent, respectively as compared to rest of the entries. The entries viz., GHB-558, Pusa-23, PB-106, Sharadha, ICMV-221 and ICTP-8203 recorded lowest shoot bug population of 10 to 25 plant<sup>-1</sup>. The black ant activity was significantly lowest in Pusa-23 (10.6 plant<sup>-1</sup>) and PB-106 followed by ICTP-8203, ICMV-221 and ICMV-155 with 15.5, 15.7 and 15.8 black ants plant<sup>-1</sup>, respectively as compared to rest of the entries. Significantly highest grain yield was obtained from PB-106 (49.31 q ha<sup>-1</sup>) followed by GHB-558 (43.06 q ha<sup>-1</sup>) as compared to rest of the entries.

**Key words:** *Peregrinus maidis*, pearl millet, advanced hybrids, released hybrids and varieties

## Bioassay methods to quantify toxicity of transgenic cotton against cotton bollworm, *Helicoverpa armigera* (Hübner)

Suneet Pandher<sup>1</sup> and V.K. Dilawari

<sup>1</sup>Punjab Agricultural University, Regional Station, Faridkot-151 203, Punjab, India  
E mail: suneet@pau.edu

#### ABSTRACT

The study was carried out to evaluate the bioassay methods (leaf mush + diet and leaf disc) for their efficacy in recording mortality of *Helicoverpa armigera* neonates on bt cotton hybrid RCH 134. Mortality was more in leaf disc method (90%) than the leaf mush method (83.3%) at 7 days interval as evident from the amount of Cry 1Ac which was found out to be at higher level in leaf disc ( $9.74 \mu\text{g g}^{-1}$ ) than the leaf mush ( $6.20 \mu\text{g g}^{-1}$ ). The treatment of leaves at  $50^{\circ}\text{C}$  to produce mush seemed to reduce toxin concentration and thus the leaf disc method proved more efficacious. Besides, sensitivity of larval instars decreased with age as supported by highest mortality in the first instars at different stages of growth of plant.

**Key words:** Transgenic cotton, *H. armigera*, bioassays, leaf disc, leaf mush

## Population dynamics of fruit flies, *Bactrocera* spp. in tomato, *Lycopersicon esculentum* Mill.

T. Boopathi

Division of Entomology, ICAR Research Complex for NEH Region, Mizoram Centre, Kolasib-796 081, Mizoram, India.

#### ABSTRACT

Population fluctuation and seasonal incidence of fruit flies, *Bactrocera* spp. on tomato crop using methyl eugenol traps revealed that four distinct peaks was noticed during second week of April (134.3), first week of May (137.7), second week of May (167.7) and first week of June (130.0). These peaks coincided with tomato fruiting period in relation to April to June months. Among abiotic factors, the maximum temperature ( $r = 0.332$ ) showed a positive correlation, while the minimum temperature, relative humidity, rainfall and rainy days had a negative correlation with trap catches of fruit flies. The abiotic factors jointly had non-significant impact on population of fruit flies. T-value of fruit flies population had a significantly positively correlated with maximum temperature (2.34), while it was significantly negatively correlated with minimum temperature (-2.22). However, the influence of relative humidity (minimum and maximum), rain fall and rainy days were found to be not significant.

**Key words:** Seasonal incidence, fruit flies, tomato, weather factors, methyl eugenol traps

## Effect of phenol contents present in plant on the incidence of the pea leafminer *Chromatomyia horticola* (Goureau) (Diptera : Agromyzidae)

Yogeeta Thakur and K.C. Sharma

Department of Entomology, Dr Y.S. Parmar University of Horticulture and Forestry, Solan-173 230, Himachal Pradesh, India

Email : thakuryogeeta@gmail.com; yogeeta\_3@yahoo.co.in

#### ABSTRACT

The pea leafminer *Chromatomyia horticola* (Goureau) is one of the highly destructive pests of pea in mid hill regions of Himachal Pradesh. The severe infestation of this pest reduces photosynthetic activities by consuming the chlorophyll content which ultimately affects the crop yield. The phenol contents have been reported to impart resistance to this pest and an inverse relation was observed between incidence of the pea leafminer and phenol contents. Three commercial varieties of pea viz. 'Arkel', 'Lincoln' and 'Azad PI' were considered for the availability of phenol contents in their foliage. It was maximum ( $341.33 \text{ mg g}^{-1}$ ) in Azad PI which was least infested by pea leafminer ( $3.14$  mines plant $^{-1}$ ) while the minimum of  $276 \text{ ppm g}^{-1}$  was found in Lincoln variety on which the leafminer population was maximum ( $9.4$  mines plant $^{-1}$ ).

**Key Words:** Phenol, pea, variety, *Chromatomyia horticola*

Plant Pathology

## Screening of rice (*Oryza sativa* L.) germplasms against *Xanthomonas oryzae* pv. *oryzae*

A.K. Singh, B.K. Sarma, P.K. Singh and R. Nandan

Institute of Agricultural Sciences, BHU Varanasi – 221 005, India.  
E-mail: anilbhu987@gmail.com

### ABSTRACT

Thirty eight rice germplasm accessions were grown in Agricultural Research Farm of Institute of Agricultural Sciences, Banaras Hindu University, Varanasi during Kharif 2010 to screen their performance against *Xanthomonas oryzae* pv. *oryzae* the causal agent of bacterial leaf blight (BLB). Out of the 38 germplasm accessions, 27 accessions (HUR 36, HUR 38B, HUR 3022, HUR 4-3, HUR 105, HUBR 40, HUBR 2-1, BPT 5204, IDR 763, MTU 7029, GR 32, Swarna Sub1, Gobindbhog, Gopalbhog, Adamchini, Shivani, HUR 38, Pant 12, Jaya 3, Kalanamak, Sonachoor, Motigold, Sonam, Super Aman, Heera, Heena and Moti 360) showed moderate resistance and 11 accessions (IR 64, IR64 Sub1, Sarjoo 52, Badshahbhog, Pant 10, Pant 16, Kanchan, Rupali, Krishna, Vijay and Shakti) showed moderate susceptibility to BLB. Among these accessions, HUR 38B and Shakti showed lowest (19.95%) and highest (34.66%) disease severity, respectively. Moderately resistant germplasm accessions were recommended for general cultivation and further use in breeding programmes.

**Key words:** Bacterial leaf blight, rice, moderately resistant, moderately susceptible

## Integrated organic management of powdery mildew disease in vegetable pea caused by *Erysiphe polygoni*

Devendra Singh Negi, J. Kumar<sup>1</sup>, Rajan Kumar Gupta<sup>2</sup> and Binita Shah

Research and Development Cell, State Research and Training Centre, Majkhali (Ranikhet) Almora (Uttarakhand Organic Commodity Board), Uttarakhand – 263 652, India

<sup>1</sup>G.B. Pant University of Agriculture and Technology, Pantnagar

<sup>2</sup>Govt. Post Graduate Autonomous College, Rishikesh

### ABSTRACT

The experiment was conducted to find out the efficacy of foliar spray of *Trichoderma harzianum*, *Pseudomonas fluorescens*, *Trichoderma virens* (Individual and combination), Biodynamic preparation (BD) – 501, CPP (Cow pat pit), Cow urine and Mycostat against powdery mildew disease (*Erysiphe polygoni*) in vegetable pea (*Pisum sativum* L.) at State Research and Training Centre for Organic Farming, Majkhali, Almora during 2007-08. Considering different parameters, Mycostat, Cow pat pit and mixture of *T. harzianum* + *P. fluorescens* showed least per cent disease incidence than other treatment and untreated control. Three foliar sprays of Mycostat indicate significant effect for disease control and disease reduction over control (PDI 6.85 in 105 days and 80.0% disease reduction over control) and produce high yield of green pods (126.6q ha<sup>-1</sup>). Three foliar sprays of CPP and combination of *T. harzianum* + *P. fluorescens* also reduced disease incidence and increased yield.

**Key words:** Pea, biodynamic preparation, cow pat pit, Mycostat, *Trichoderma harzianum*, *Pseudomonas fluorescens*

## Evaluation of advance breeding lines for multiple disease resistance in rice

Jyoti Jain, J. S. Lore, M. S. Hunjan, R. Kaur and G.S. Mangat

Rice Section, Department of Plant Breeding and Genetics, Punjab Agricultural University, Ludhiana – 141 004, Punjab, India

#### ABSTRACT

A total of 193 entries from National Screening Nursery-1 (NSN-1), 622 entries from National Screening Nursery-2 (NSN-2) and 43 entries from Donor Screening Nursery (DSN) were received from Directorate of Rice Research, Hyderabad during *khari*f 2008-09. These entries were evaluated against the prevalent pathotypes viz. PbXo-1, PbXo-5, PbXo-7 and Tar-950 of the bacterial blight pathogen (*Xanthomonas oryzae* pv. *oryzae*), sheath blight (*Rhizoctonia solani*) and brown spot (*Drechslera oryzae*) respectively under artificial inoculation conditions for multiple disease resistance. The promising entries selected during *khari*f 2008-09 were grown during *khari*f 2009-10 for further evaluations. Eleven entries showed resistant reaction to BB pathotype PbXo 1, Twelve entries to pathotype PbXo-5, Nine entries to both pathotypes PbXo-7 and Tar 950. Two DSN entries viz., VOHP 3102 and VL 30424 showed resistant reaction to all the four pathotypes whereas none was resistant to sheath blight and brown spot. Among NSN-2 entries, 29 entries were found resistant to all the four pathotypes of *Xanthomonas oryzae* pv. *oryzae*. Two genotypes, viz., IET 20796 (RP 4818-29-1-1-31-1-1-B) and 20861 (CRR 451-2921-1-1-1) were found moderately resistant to brown spot disease. These genotypes can either be released as new varieties or further utilized as donors in multiple disease resistance breeding programmes.

**Key words:** Multiple disease resistance, bacterial blight, sheath blight, brown spot, pathotypes.

## Epidemiology and management of Alternaria blight of Ber

Jyoti Jain and K. S. Verma

Rice Section, Department of Plant Breeding and Genetics, Punjab Agricultural University, Ludhiana - 141 004, Punjab, India

#### ABSTRACT

The intensity of Alternaria blight of Ber caused by *Alternaria alternata* (Fr.) Keissl. was found to vary from 27.25 to 59.75 per cent on different cultivars at Ludhiana, while at Patiala, Sangrur and Nawanshahar, the disease intensity was recorded to be 28.25, 23.20 and 20.75 per cent respectively. The disease was more severe on un-pruned trees as compare to pruned trees. The older trees were more affected by the disease as compared to younger trees. The development of the disease under field conditions showed positive correlation with average maximum and minimum temperature, maximum relative humidity and total rainfall, whereas it was negatively correlated with minimum relative humidity. The pathogen successfully survived on infected Ber leaves under both *in vivo* and *in vitro* conditions. Out of the seven test fungicides, Indofil M-45 (0.3%), Bordeaux mixture (1.0%) and Antracol (0.3%) proved most effective against Alternaria blight providing 78.79, 75.17 and 65.55 per cent disease control respectively.

**Key word :** Ber, disease intensity, disease mangement, epidemiology

## Assessment of genetic diversity of *Fusarium solani* from different agro-ecological regions of India

Rupesh Kumar Mishra, B. K. Pandey, Muthukumar M., A. K. Misra, Vijay Singh, Amita J. Mathew, Neelam Pathak and Mohd. Zeeshan

Central Institute for Subtropical Horticulture, Lucknow- 226101, U.P., India  
E-mail: rupeshkmishra@rediffmail.com

#### ABSTRACT

*Fusarium solani* is one of the causal agent of wilt disease of guava (*Psidium guajava* L.) in subtropical regions. Identification of the pathogenic isolates by microscopic and cultural characteristics is not sufficient and reliable for characterization of pathogenic isolates from guava as they are mostly influenced by environmental factors. PCR assays used such as RAPD and internal transcribed spacer (ITS) region for discrimination and also sequenced the ITS region and generated the phylogenetic relationship among *F. solani*. A phylogenetic tree based on RAPD data has been generated showing the three major clades. Additionally, specific primer used for detection of *F. solani* and all tested isolates showed positive result in PCR assay. However, three clades were obtained using the sequences of ITS region. It can be used to develop new molecular marker for identification of *F. solani*. These finding provide a new insight for molecular level discrimination of *F. solani* form different agro-ecological regions of India.

**Key words:** *Fusarium solani*, RAPD, wilt disease, ITS region, phylogenetic tree, molecular marker.

### Post-harvest Technology

## Utilization of banana agro-horti waste for production of carboxymethyl cellulase

Khan Mohd. Sarim, Neelima Garg, Devendra Kumar and Preeti Yadav, U.P., India

Central Institute for Subtropical Horticulture, Rehmankhera, P.O.Kakori, Lucknow – 226 101  
E-mail : neelimagargg@rediffmail.com

### ABSTRACT

Banana is a major cash crop of India and is cultivated all over across the country, generating large amount of agro waste including pseudostem and leaves after fruit harvest. Microbial production of enzymes using low valued agro industrial waste is gaining importance globally. Since banana is rich in cellulose, it was utilized for cellulase production. Out of the ten fungi screened for cellulase production PF4 identified as *Fusarium* sp. exhibited maximum carboxymethyl cellulase activity. Maximum production of carboxymethyl cellulase was achieved on the fifth day of fermentation ( $3.9 \text{ U ml}^{-1}$ ). pH 5 was found optimum for maximum carboxymethyl cellulase production ( $4.75 \text{ U ml}^{-1}$ ). Statistical analysis showed that fermentation temperature had significant effect on enzyme production ( $p > 0.01$ ) and maximum carboxymethyl cellulase production ( $6.90458 \text{ U ml}^{-1}$ ) was recorded at  $30^{\circ}\text{C}$ . The  $K_M$  and  $V_{max}$  values for carboxymethyl cellulase were observed to be  $0.108 \mu\text{g ml}^{-1}$  and  $0.0452\text{mM ml}^{-1} \text{ min}^{-1}$ .

**Key words :** Banana, enzyme, cellulose, *Fusarium* sp.