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Organic Farming

Cutting edge research in organic farming

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ABSTRACT

Researches on organic farming going on at G.B. Pant University of Agriculture & Technology since 2004-05 to find out the effect of organic, chemical and integrated mode of cultivation on soil, environment and productivity and to develop organic package and practices for different crops and cropping system revealed that after two year of conversion period highest grain yield was recorded during 2007 to 2009, in organic input management followed by integrated. Rice produce organic mode was found to be of superior quality and liked most by the panelist followed by that produced using integrated method of farming. Milled rice produced using organic mode of farming had highest contents of carbohydrates and crude fiber and length, L/B ratio, however yield of rabi crop (wheat and vegetable pea) was also influenced by the different mode of cultivation. Highest grain yield of wheat was recorded in the year 2010-11 in integrated mode of cultivation. In case of vegetable pea maximum grain yield was recorded in organic mode of cultivation in the year 2010-11. Economic analysis of different cropping systems revealed that during the years 2006-07, 2007-08 & 2010-11, highest net return & B: C ratio was recorded in organic mode of cultivation.

Key words: Cropping system, organic farming, organic inputs, productivity, rice

Comparative performance of different varieties of wheat (*Triticum aestivum* L.) and various composts on its productivity under organic conditions

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ABSTRACT

Field experiments were conducted during *Rabi* 2008-09 and 2009-10 at Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur, India, using different organic composts. Wheat variety HPW-147 produced significantly more grain yield, i.e., 22.6 and 10.9 per cent higher during respective years of study. Among the various composts, Him-compost (HC) produced 11.6 and 17.5 per cent higher yield under irrigated conditions, while it was 34.4 and 41.9 per cent higher under rainfed conditions over FYM and Nadep compost. The performance of HC was further improved when applied in combination with vermi-compost (VC) or FYM at 50 per cent doses. HC 2.5 t + VC 5.0 t ha⁻¹ and HC 2.5 t + FYM 7.5 t ha⁻¹ resulted in 8.9 and 1.3 per cent higher yield under irrigated and 13.8 and 6.0 per cent under rainfed conditions, over HC 5.0 t ha⁻¹.

Key words: Composts, Him-compost, Vermi-compost, Nadep, wheat.

Variability, correlation of flag leaf nitrogen content and selection indices in rice (*Oryza sativa* L.)

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ABSTRACT

Seven rice varieties viz., Samba mahsuri, Polasa prabha, Jagtial samba, Nellore mahsuri, Indra, Vijetha and Prabhat crossed in diallel mating design without reciprocals expressed considerable range of variation for the traits indicating good scope for genetic improvement. The genotypic coefficient of variations (GCV) were higher for 1000 grains weight, chlorophyll content and iron content among yield components, physiological traits and quality traits, respectively. The higher GCV values for these traits suggested the possibility of yield improvement through selection. High values of broad sense heritability estimates recorded for 1000 grain weight, flag leaf nitrogen content and the milling percent indicated predominance of additive gene action in expression of these traits. All the yield contributing characters and physiological traits except chlorophyll content and specific leaf weight, exhibited significant correlation with flag leaf nitrogen content. The results revealed that ear bearing tillers plant⁻¹, number of grains panicle⁻¹ and weight of 1000 grains showed significant correlation besides their high heritability indicating the importance of these traits for selection. The hulling per cent and milling per cent exhibited highly significant correlation with yield justifying their importance for selecting genotypes with good milling recovery.

Key words : Genetic advance, correlation, GCV, PCV, Variability

Effect of organic manuring on physical properties of Theri soil

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ABSTRACT

A field experiment was conducted to evaluate the effect of different organic amendments and their combinations on various physical properties of theri soil during the year 2010-2011. The treatments included tank silt (TS), farm yard manure (FYM) and composted coir pith (CP) using groundnut crop. Results revealed that the yield of groundnut pods was 40.51 per cent higher in comparison to control plot with the combination of CP and TS (12.5 t ha⁻¹ each). The bulk density (BD) and particle density (PD) decreased in all plots compared to control. Increase in water holding capacity (WHC), pore space (PS), saturated moisture (SM), hydraulic conductivity (HC) and permeability (PE) percentage was noticed. Step wise regression performed on physical properties with yield showed that the increases in soil moisture has positive correlation with pore space. The findings revealed that the fertility and productivity of the theri soil may be improved on sustainable basis using organic farming.

Key words: Organic amendment, physical properties, theri soil, correlation, regression.

Plant Breeding and Genetics

In vitro plant regeneration of kinnow by direct organogenesis

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ABSTRACT

An efficient *in vitro* regeneration of Kinnow was established from epicotyl segments excised from seedlings cultured on a basic MS medium supplemented with various concentrations of benzyl adenine (BA) and Kinetin. The surface sterilization of the seeds with mercuric chloride (0.1%) was optimum at five minutes exposure with highest survival of 86.67 per cent. The MS medium supplemented with 1 mg l⁻¹ BAP was found to be significantly superior to all the concentrations of BAP and kinetin as well as MS basal on the shoot regeneration parameters such as time taken for shoot initiation (12.40 days) and completion (27.46 days), number of adventitious buds produced explant⁻¹ (3.74), number of shoots explants⁻¹ (3.26), shoot length (2.51 cm), leaf density (4.30 leaves shoot⁻¹), leaf size (2.03 x 1.49 cm) and the shoot regeneration percentage. The shoot regeneration parameters observed in the media supplemented with 1 mg l⁻¹ kinetin were comparable to those at BAP 1 mg l⁻¹. The most suitable combination of media and growth regulator for rooting was MS and 0.5 mg l⁻¹NAA resulting in earliest initiation of rooting (23.30 days), highest rooting percentage (91.67%) , maximum number of roots plantlet⁻¹ (3.90) and length of roots (3.16 cm) compared to other media and growth regulator combinations.

Key words: *In vitro* regeneration, Kinnow, epicotyl segments, auxins, cytokinins

Genetic divergence in Nigerian germplasm of soybean {*Glycine max*(L.) Merrill}

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ABSTRACT

A set of forty six genotypes of soybean was used for estimation of genetic diversity. On the basis of D² estimates, these genotypes were grouped into nine clusters. The maximum divergence was observed between a Nigerian Soybean line EC-528643 and PK-416, a high yielding variety of North India followed by PK-327 and PK-416 and minimum between cluster 1 having 31 genotypes (27 of those from Nigeria) and cluster 4 with EC-528677 and EC-528681. The generalized intra-cluster distance ranged from 0.00 to 4.77 and the inter-cluster distance ranged from 4.60 to 8.25. The number of pods per plant contributes the maximum (11.98%) towards the genetic divergence followed by biological yield (10.24%), days to flowering (9.75%), days to maturity (9.66%), plant height (9.56%) and 100 - seed weight (8.88%).

Keywords: Soybean, *Glycine max*, genetic divergence, cluster distance and D² analysis.

Entomology

Eco friendly approaches in the management of citrus leaf miner, *Phyllocnistis citrella* Staint (Gracillariidae: Lepidoptera)

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ABSTRACTS

The studies on efficacy of organics (cow dung+cows urine, vermiwash, NSKE and bio digester solution) and insecticides (imidacloprid, acetamaprid and dimethoate) tested against citrus leaf miner, *Phyllocnistis citrella* at Regional Agricultural Research Station, Bijapur during 2008-09 and 2009-10 revealed that acetamaprid 20 SP @ 0.25 g l⁻¹ of water, recording the lowest live mines leaf⁻¹ (1.40) followed by biodigester solution @ 1: 3 ratio and imidacloprid 17.8 SL @ 0.30 ml l⁻¹ (1.7 and 1.7 live mines leaf⁻¹, respectively) was significantly superior over all other treatments. However, the biodigester treatment of showing highest fruit yield and net returns 25.6 tones ha⁻¹ and Rs. 144780, respectively proved to be the best alternative to the insecticides in the management of citrus leaf miner.

Key words: Citrus, *Phyllocnistis citrella*, Biorationlas, Insecticides

Evaluation of IPM components against key pests of sorghum

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ABSTRACT

The field experiment conducted at Regional Agricultural Research Station, Bijapur, UAS, Dharwad during 2009-10 and 2010-11 to find out effective IPM components against the shoot fly, shoot bug and aphid infestation in *rabi* sorghum revealed that the treatments involving intercropping of chickpea (2:2) + seed treatment with imidacloprid 70 WS @ 3 g kg⁻¹ seed, seed treatment with imidacloprid 70 WS @ 3 g kg seed⁻¹ + spray of NSKE @ 5% at 45 days after emergence of crop (DAE) and seed treatment with imidacloprid 70 WS @ 3 g/kg seed⁻¹ + spray of endosulfan @ 0.07% at 45 DAE registering lower mean per cent shoot fly dead hearbs, per cent aphid index, the shoot bug population, the best IPM components higher sorghum grain equivalent yield, fodder yield and maximum net returns were rated .

Key words: Sorghum, *Atherigona soccata*, *Peregrinus maidis*, *Melanaphis sacchari*, IPM

Influence of neemazal and neemix on the life table of diamondback moth, *Plutella xylostella* at different temperatures

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ABSTRACT

Life table of *Plutella xylostella* studied under the influence of biopesticides, neemazal and neemix, at 12, 18, 22, 27, 30 and 34°C, 70 ± 5 percent relative humidity and 10:14 LD under BOD incubator conditions revealed that the larval survival and life table of *P. xylostella* under neemazal influence was significantly affected in respect to different temperature. The minimum and maximum number of egg hatching was recorded at 27°C, and 34°C, respectively. The neemazal was more effective at 34, 27 and 25°C in comparison to other temperatures. The lowest larval mortality was recorded at 12°C followed by 18, 22, 27, 30 and 34°C, respectively. However, the pattern of larval mortality varied with neemazal and neemix at different temperatures.

Key words: *P. xylostella*, life table, development, temperature

Seasonal incidence of insect pests of guava, aonla and bael trees under horti-pasture systems

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ABSTRACT

Survey of insect pests of economic importance on guava, aonla and bael trees, grown along with pastures, namely *Cenchrus ciliaris* and *Stylosanthus hamata* in the horti-pasture system of Grassland and Silvi-pasture Division of Indian Grassland and Fodder Research Institute, Jhansi during July 2009 - March 2010, revealed incidence of guava leaf and bark eating caterpillar (*Indarbella quadrinatala*) on guava and *Papilo polytes*, the common mormon on bael tree during second fortnight of August to second fortnight of October and the shoot and stem gall maker (*Betousa stylophora*) on aonla during August to first week of November with peak larval population of 15.2, 12.2 and 16.4 tree⁻¹ during first week of September, second week of September and 1st week of October, respectively. Correlation studies with weather parameters and insect incidence revealed that rainfall and minimum humidity were significantly and positively correlated with population of guava leaf and bark eating caterpillar (0.64** and 0.30*), aonla shoot and gall maker (0.52** and 0.38*) and leaf eating caterpillar of bael (0.42** and 0.32*).

Key Words: Seasonal incidence, correlation, horti-pasture, insect pests, seasonal incidence, weather parameters.

Biology of *Spodoptera litura* on chewing tobacco *in vitro*

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ABSTRACT

The study on the biology of *Spodoptera litura* (Fabricius) on chewing tobacco revealed that average incubation period was of 4.10 ± 0.32 days. Total larval development period on an average was 19.90 ± 2.33 days. The fully grown larva measures 39.45 ± 1.14 mm. The pre pupal period was 1.10 ± 0.32 days and measures 19.10 ± 1.58 mm. The pupa is elongated, oval in shape and brown in colour. The average length of pupal stage was 19.08 ± 0.96 mm and 21.18 ± 1.36 mm, in male and female with average duration of 13.00 ± 0.82 days. On an average the male and female with expanded wings measured 16.20 ± 0.84 mm and 18.60 ± 1.14 mm in length and 35.80 ± 1.92 mm and 39.20 ± 1.92 mm in breadth, respectively. The average pre-oviposition, oviposition and post-oviposition periods were of 1.42 ± 0.49 , 5.50 ± 1.38 and 1.50 ± 0.55 days, respectively. The average longevity of male and female was 6.67 ± 1.37 and 9.17 ± 1.47 days. The total life cycle completed in 45.50 ± 1.58 days in case of male and 48.20 ± 2.10 days in female.

Key words: Chewing tobacco, *Spodoptera litura*, biology.

Biophysical basis of induced resistance as influenced by bio-rational nutrient management on lepidopteran pests of soybean

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ABSTRACT

Biophysical basis of induced resistance as influenced by the nourishment in soybean grown under organic and inorganic situations that imparted resistance to the crop against lepidopteran defoliator and pod borer pests were studied in the field, during *kharif* 2010-11. Results revealed the least larval population of *Spodoptera litura* and *Thysanoplusia orichalcea* (0.08 & 2.50 larvae m⁻¹ row length) at 40 DAS and minimum pod damage

(3.32%) by *Cydia ptychora* in treatments that received 100 per cent N through organic sources. The standard check, i.e., recommended dose of fertilizers (RDF) + FYM recorded significantly higher larval density (0.17 & 3.28 larvae m⁻¹ row length at 40 DAS) and pod damage (5.86%) followed by full inorganic, natural farming and integrated nutrient management. The studies on biophysical factors showed that the plants which received 100 per cent organics had significantly lower leaf succulency (78.28%) and maximum leaf thickness (5.69 mg cm⁻²) at 45 DAS as compared to RDF + FYM (80.03% & 4.91 mg cm⁻²). There was significant positive correlation between leaf succulency and leaf area with insect activity, negative with leaf thickness and non-significant between plant height and insect activity.

Key words: Biophysical factors, induced resistance, lepidopteran pests, soybean.

Seasonal incidence of major insect pests and their natural enemies on brinjal in Shimoga, Karnataka

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ABSTRACT

The study carried out at Agricultural College, Shimoga during 2009-2010 revealed maximum activity with highest leaf hopper (*Amrasca biguttula biguttula* Ishida) population during second fortnight of April (11 three leaves⁻¹ plant⁻¹) aphid, *Aphis gossypii* Glover (23.33 three leaves⁻¹ plant⁻¹) during second fortnight of March, lacewing bug, *Urentius hystricellus* Richter during October first fortnight (9.33 three leaves⁻¹ plant⁻¹), *Epilachna* beetle (*Henosepilachna vigintioctopunctata* Fabr. (35.33 plant⁻¹) during August first fortnight. The incidence of shoot and fruit borer (*Leucinodes orbonalis* (Guen)) on shoot and fruit was maximum (22.68 and 22.7 %) during second fortnight of August and October, respectively. Among natural enemies, the incidence of predatory coccinellids was maximum (1.47 plant⁻¹) during second fortnight of March and that of spiders during first fortnight of April (1.87 plant⁻¹). Materological parameters with respect to their influence on maximum and minimum incidence of insect pests are described in detail

Keywords: Seasonal incidence, brinjal, natural enemies

Relative toxicity and efficacy of neem based products and botanicals to Asian citrus psyllid, *Diaphorina citri* Kuwayama, Blackfly, *Aleurocanthus woglumi* Ashby and leaf miner, *Phyllocnistis citrella* Stainton

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ABSTRACT

Relative toxicity of neem oil and azadirachtin (1%) along with sweet flag, *Acorus calamus* to nymphs of Asian citrus psyllid (*Diaphorina citri* Kuwayama), citrus blackfly (*Aleurocanthus woglumi* Ashby) and larvae of leaf miner (*Phyllocnistis citrella* Stainton) as against dimethoate was determined. Based on LC₅₀ values dimethoate was more toxic. However, neem oil, azadirachtin (1%) and sweet flag were 0.22, 0.41 and 0.91 times more toxic to Asian citrus psyllid nymphs, 0.17, 0.44 and 0.46 times more toxic to blackfly nymphs and 0.33, 0.66 and 0.58 times toxic to larvae of leaf miner, respectively. The field experiment conducted during 2007-09 on efficacy of botanicals viz., neem oil and azadirachtin (1%), sweet flag, neem soap and pongamia soap against Asian citrus psyllid,

blackfly and leaf miner showed that neem soap and pongamia soap followed by neem oil and azadirachtin were effective in reducing the citrus leaf miner, Asian citrus psyllid and citrus blackfly population considerably.

Key words: Relative toxicity, Efficacy, neem, botanicals, Asian citrus psyllid, citrus blackfly, leaf miner

Plant Pathology

Molecular characterization of *Rhizoctonia solani* on rice, maize and soybean in northeast India

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ABSTRACT

Fluorescopic determination of AG group, using specific primers in *Rhizoctonia solani* isolates collected from conventional and organically cultivated rice, maize and soybean crops in north east India revealed predominance of AG 1-1A and AG 1-1B anastomosis groups in isolates from conventionally cultivated rice, maize and soybean crops, respectively. Similar groups predominated in organically cultivated rice and soybean also. ITS 1-5.8S-ITS 2 nrDNA sequences of rice, maize and soybean isolates also used for phylogenetic analysis using maximum parsimony, clearly indicated the presence of AG1-1A on rice and maize and AG 1-1B on soybean. AG determination using specific primers proved that isolates from rice and maize were AG 1-1A while AG 1-1B from soybean.

Key words: *Rhizoctonia*, AG group, Phylogenetic, organic

Efficacy of fluorescent pseudomonads (Pf1) formulations in the management of sheath blight disease of rice

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ABSTRACT

The field trial revealed that the foliar spray of conventional fungicides hexaconazole and triazole (0.1%) although exhibited their superiority in managing 77.23 and 61.54 per cent incidence of sheath blight disease in rice, the seed and seedlings treatment followed by soil and foliar application of liquid formulation of bacterial bio agent, *Pseudomonas fluorescens* leading to 59.6 per cent mean disease control and grain yield (6.15 t ha⁻¹), almost at par with hexaconazole (6.4 t ha⁻¹), appeared promising.

Key Words: Rice, Sheath blight, *Rhizoctonia solani*, *Pseudomonas fluorescens*.

In-vitro evaluation of aqueous extracts of root, stem and bark of some plants against *Ralstonia solanacearum* causing bacterial wilt and brown rot of potato

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ABSTRACT

In-vitro testing of aqueous extracts of bark, root and stem of eighteen locally grown plants were carried out in the year 2009-10 in the Deptt. of Plant Pathology, Orissa University of Agriculture and Technology, Bhubaneswar-3 against *Ralstonia solanacearum* causing bacterial wilt and brown rot of potato following inhibition zone technique. It was observed that all the plant extracts exhibited antibacterial property. The maximum zone of inhibition was observed in root extracts of *Achyranthes asper* (12.03mm) followed by the root extract of *Raouwolfia serpentina* (11.66mm), bark extract of *Saraca arjuna* (10.99mm), *S.indica* (10mm). Minimum zone of inhibition was observed in *Solanum xanthocarpum* (6.31mm).

Key words: *In-vitro*, aqueous extracts, bacterial wilt.

Influence of NPK status in soil on brown spot disease incidence in rice under irrigated ecology

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ABSTRACT

Field experiments conducted during *kharif* 2005 and 2006 revealed that the brown spot (*Drechslera oryzae*) disease incidence, severity and the grain yield in rice were significantly influenced by different soil macronutrient levels. Appearance of disease symptoms delayed, the disease severity decreased and the crop yield increased with increasing levels of NPK. Nitrogen (@180 kg ha⁻¹), phosphorus and potassium @ 66 kg ha⁻¹) recorded maximum days in appearance of symptom (11, 13, 17 days) and minimum mean disease severity (25.87, 30.10, 24.56) as against 7, 7, 6 days and 48.83, 49.73 and 43.46 per cent in the control (0 kg), respectively under artificially inoculated conditions. Potassium played a significant role in delaying the appearance of the symptoms and decreasing disease severity. The grain yield decreased significantly with decreasing levels of potassium. A combination of FYM and nitrogen in the form of urea was better in the management of the disease than nitrogen (urea) applied alone. Grain yields obtained from a combination of FYM and nitrogen (15t ha⁻¹=80kg N ha⁻¹) and nitrogen alone @ 120 kg N ha⁻¹ were at par with each other.

Key Words: Brown spot, Rice, *Drechslera oryzae*, Nitrogen, Phosphorus, Potassium, Farmyard Manure

Weed Management

Effect of land configuration and weed management on microbial population of soil in Onion (*Allium cepa* L.)

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ABSTRACT

The field experiment conducted to examine the effect of different land configuration and weed management practices on microbial population of soil in onion (*Allium cepa* L.) during *rabi* 2006-07 and 2007-08 revealed significantly higher population of bacteria, actinomycetes and fungi in flat and raised bed planting with rice straw incorporation treatments than without rice straw. Similarly, highest microbial population in control plots as compared to those with herbicidal treatments was also observed. Decrease in viable counts of bacteria, actinomycetes and fungi after 15 days spray than against at zero day after spray was observed. Thereafter, the microbial population started to regain and

an increase was observed in counts, indicating reduced toxicity, probably due to degradation of herbicidal chemicals.

Key words: Land configuration, Microbial population, Onion, Productivity, Weed management

Post Harvest Technology

Efficacy of wrapping materials in reducing postharvest decay loss of banana fruits

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ABSTRACT

The effect of different wrapping materials on postharvest decay loss of banana fruits under ambient conditions (17-25°C & RH 70-80%) was studied. Results revealed that postharvest decay loss can be minimized significantly through proper wrapping of fruits during storage. Fruits wrapped with newspaper exhibited low per cent of decay loss upto 15 days of storage. In general, the fruit loss due to fungal attack increased with increasing duration of storage.

Key words: Banana, postharvest, decay, wrapping materials.

Development of foxtail millet based *kurkure* under optimized extruder conditions

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ABSTRACT

Foxtail millet is assumed to be native of china and considered as one of the oldest cultivated crop in the world. It is rich in crude fiber and protein content which are very important for consumers to have a nutritious development. Hence, a study was conducted to develop *ready-to-eat* millet based *kurkure type* product using foxtail millet grits and maize grits (BS 18 mesh) using hot extrusion technique. Three blend ratios of foxtail millet (@ 50, 60 & 70%) and maize (@ 50, 40 & 30%) were tried in the twin screw extruder. The expansion ratio, water solubility index, water absorption index, bulk and true density and sensory attributes of extrudates were determined. Based on various quality parameters of extrudates and for foxtail millet studied, the best millet and maize ratio was 60:40. With twin screw extruder, it was possible to get good quality *ready-to-eat kurkure type* expanded products from foxtail millet based blends at barrel temperature of 110°C and screw speed of 350 to 400 rpm.

Key words: Extrusion, foxtail millet, twin screw extruder, *ready-to-eat*, physical parameter.

Short Communication

Integrated nutrient management in wheat under late sown condition

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ABSTRACT

The experiment carried out at Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar during 2010-11 revealed the highest values of growth and yield attributes of wheat crop viz., plant height at harvest (68.9 cm), effective tillers per meter row length (55), ear head length (8.10 cm), number of grains per ear head (34.20), grain (33.58 q) and straw yield (50.14 q) as well as the benefit : cost ratio (1.92) with the application of castor cake along with 125.0 per cent RDF + Zn (T₁₁) and was superior over rest but significantly at par with 125% RDF + Zn + FYM; RDF + Zn + CC and 125% RDF + CC. Besides, the nitrogen, phosphorus, potash and zinc uptake by wheat crop were recorded to be higher under these treatments (T₁₁ and T₅) and followed the similar pattern to yield response. On the other hand, the application of 125.0 per cent RDF along with Zn or FYM (T₁₂) appreciably improved the soil fertility status with respect to available nitrogen, phosphorus, potash and zinc in the soil after harvest of wheat crop.

Key words: Castor cake, FYM, Late Sown Wheat and Zinc

Yield maximization of hybrid rice (*Oryza sativa*. L.) through integrated nutrient management

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ABSTRACT

The field experiment laid out in randomized complete block design (RCBD) with ten treatments in three replications revealed that application of 75% of recommended NPK through inorganic + FYM @ 10 t ha⁻¹ + BGA (blue green algae) @ 15 kg ha⁻¹ recorded significantly higher plant height, no. of tillers/ha and the yield.

Key words: Organic, Inorganic, INM, Hybrid rice, BGA.

Response of bone meal, fish meal and phosphorus fertilizer on lentil (*Lens esculenta* Moench.) growth and grain yield

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ABSTRACT

The field experiment conducted during the Rabi season of 2011 at Central Research Farm, SHIATS, Allahabad to study response of different organic and inorganic sources of phosphorus on growth and yield of lentil (*Lens esculenta* Moench.) indicated that application of 75% of recommended doze of phosphorus through SSP and 25% through fish meal ha⁻¹ recorded significantly higher plant height (39.6 cm), no. of branches plant⁻¹ (16.6), dry weight as well as the grain (1722 kg ha⁻¹) and straw yield (2743 kg ha⁻¹).

Key words: Lentil, bone meal, fish meal

Efficacy of *Bacillus thuringiensis* var. *kurstaki* against *Helicoverpa armigera*

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Key words : Efficacy, *Bacillus thuringiensis* var. *Kurstoki*, formulation, *Helicoverpa armigera*.0

Effect of cow urine on bacterial disease of honey bee, *Apis mellifera* L.

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Evaluation of different fungi as mycoparasite for eco-friendly management of soybean rust (*Phakopsora pachyrhizi*)

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Key words: *Phakopsora pachyrhizi*, *Trichothecium roseum*, soybean rust.