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EFFECT OF SILICON SOURCES AGAINST SUGARCANE EARLY SHOOT BORER *CHILO INFUSCATELLUS* SNELLEN

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ABSTRACT

Field experiments were conducted to study the effect of four silicon sources viz., rice husk ash, bagasse ash, calcium silicate and sodium metasilicate against sugarcane early shoot borer, *Chilo infuscatellus* at Poovanthi and Silaiman villages of Sivagangai and Madurai districts respectively during 2017-18. Silicon fertilizers were applied at the rate of 500 and 1000 kg ha^{-1} before planting and the pest incidence was recorded at 30, 60, 90 and 120 days after the application. The first field experiment revealed that the application of calcium silicate at 1000 and 500 kg ha^{-1} recorded minimum mean damage incidences of 4.63 per cent and 4.87 per cent respectively and was on par with bagasse ash @ 1000 kg ha^{-1} + SSB @ 2 kg ha^{-1} and 500 kg ha^{-1} + SSB @ 2 kg ha^{-1} (4.99 % and 5.28 %) followed by sodium metasilicate at 1000 and 500 kg ha^{-1} (7.14 % and 7.13 %), while the treatments with rice husk ash @ 1000 kg ha^{-1} + SSB @ 2 kg ha^{-1} and 500 kg ha^{-1} + SSB @ 2 kg ha^{-1} (6.69 % and 6.97 %) was found to be the least effective against early shoot borer. Similar trend was also noticed in the second field experiment conducted at Silaiman, Madurai district.

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EFFICACY OF *PIPER BETLE* LEAF EXTRACTS AGAINST SWEET POTATO WEEVIL *CYLAS FORMICARIUS* (F.)

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ABSTRACT

The sweet potato weevil *Cylas formicarius* (F.) is the most destructive pest of sweet potato. Insecticides used against this pest are highly toxic and hence undesirable. Deploying plant extracts is an ecofriendly alternative. In the present study, the crude leaf extracts of *Piper betle* L. were evaluated for their efficacy against the adults of *C. formicarius* at concentrations of 0.625, 1.25, 2.50, 5, 10 and 20 ppm through petri dish bioassay method. Adult mortality was calculated 24, 48 and 72 hr after exposure. Results indicate that the ethyl acetate extract of *P. betle* gave the maximum mortality; their LD_{50} and LD_{90} values were 11.78 and 17.13, 8.68 and 12.81, 6.14 and 10.94 ppm after 24, 48 and 72 hr, respectively.

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EFFECT OF SILICIC AND SALICYLIC ACIDS ON MAJOR INSECT PESTS AND THEIR NATURAL ENEMIES IN RICE

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ABSTRACT

Field, pot culture and laboratory experiments were carried out to study the effect of foliar spraying of silicic and salicylic acids against major pests of rice through inducing resistance, and their natural enemies like spiders and mirids. In the field experiment, leaf feeders and sucking insects were found significantly reduced with basal application of rice husk ash 500 kg/ha + silica solubilizing bacteria (SSB) @2 kg/ha with foliar spraying of silicic acid 0.5 %. This was followed by basal application of calcium silicate 50 kg/ha with foliar application of silicic acid 0.5%. Similarly, significantly less stem borer incidence was observed with basal application of rice husk ash 500 kg/ha + SSB 2 kg/ha with foliar spraying of silicic acid 0.5%. Spiders and mirids were significantly less with basal application of calcium silicate 50 kg/ha along with foliar application of silicic acid 0.5%. In short, significantly reduced damage by the leaf folder, stem borer and gall midge besides reduction in the population of brown plant hopper (BPH), spiny beetle, ear head bug and increased natural enemies were observed with basal application of rice husk ash 500 kg/ha + SSB 2kg/ha and foliar spraying of silicic acid 0.5%. Basal application of calcium silicate 50 kg/ha with foliar application of silicic acid 0.5% was the next best. Correlations with inferences on the biology of BPH, leaf folder and biophysical factors (silicified cells and leaf erectness and biochemical factors viz., peroxidase content and silica content) corroborated their efficacy.

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KARYOTYPIC STUDIES ON SOME PSEUDOCOCCIDS (HEMIPTERA: COCCOIDEA: PSEUDOCOCCIDAE)

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ABSTRACT

Three species of pseudococcids viz., *Phenacoccus solenopsis* (Tinsley), *Maconellicoccus hirsutus* (Green), and *Ferrisia virgata* (Cockerell) were subjected to cytological investigations with cytological techniques. These revealed a configuration of 2n= 10 in both male and females with 'Lecanoid type of genetic system' and without any identifiable sex chromosomes. Differentially stained (Giemsa, C-banded, and $AgNO_3$) female somatic chromosomal karyotypes were constructed for each of these species and used for comparison.

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ANALYSIS OF BROWN PLANT HOPPER *NILAPARVATA LUGENS* FEEDING INDUCED VOLATILES IN RICE CULTIVARS

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ABSTRACT

The Brown plant hopper (BPH) is an economically important insect pest of rice. Herbivore induced plant volatiles (HIPVs) have greater role in plant defense as repellents or feeding inhibitors or cues for natural enemies. In this study, volatiles induced after BPH infestation from susceptible (TN1) and resistant (Ptb33) rice varieties were identified using Gas Chromatography Mass Spectrophotometer (GCMS) and NIST MS 2 library. Ptb33 infested samples had defensive volatiles like stigmasterol, β-sitosterol, hexadecenoic acid, benzothiazole, phytol, nonanal with highest peak area %. In infested samples of TN1, only a few defense related volatiles like α-copaene were found. Eleven and sixteen overlapping volatiles were identified in infested and uninfested samples of TN1 and Ptb33, respectively. In addition to the host plant resistance in Ptb33 to BPH, induced volatiles provide indirect defense.

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PROTEINS AND TRYPSIN INHIBITORS IN SEEDS OF VARIOUS PLANTS

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ABSTRACT

The potential trypsin inhibitor sources were identified from seeds of ten plants, based on the reaction of trypsin with synthetic substrate Nα-Benzoyl-D, L- arginine 4- nitroanilide hydrochloride (BA*p*NA). All the tested ones contained various levels of protein (20.87 to 155.68 mg g^{-1} of seed) and trypsin inhibitor units (TIU) (245.77 to 11235.82 TIU g^{-1} seed). Among them, the Red lucky seed (*Adenanthera pavonina* L.) was identified as the richest source of trypsin inhibitor with 11235.82 TIU and 96.06 mg protein/ g of seed with specific activity of 116.97 TIU mg^{-1} protein. The next best ones the seeds of bitter gourd (*Momordica charantia* L.) and babul (*Acacia nilotica* L.) with the TIU g^{-1} seed as 9100.03 and 8690.72, protein content of 155.68 and 88.11 mg g^{-1} seed with the specific activity of 58.45 and 98.63 TIU mg^{-1} protein, respectively. This study is the first report of *Zingiber officinale* Rosc. as the source of trypsin inhibitor.

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CYTOLOGY OF STEM BORER *STROMATIUM BARBATUM* (F.) INFESTING GRAPEVINES IN MAHARASHTRA

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ABSTRACT

Stem borer *Stromatium barbatum* (F.) (Coleoptera: Cerambycidae) has emerged as a major pest in grapes in India. In the present study, the chromosome number and basis of sex differentiation of *S. barbatum* are described. Mitotic chromosome spreads were

prepared by isolating and treating the gonads with colchicine and staining with conventional Giemsa stain. Cytogenetical analysis revealed the events of chromosomal evolution. The results revealed diploid chromosome number of 2n = 18+XO in male and 2n = 18+XX in female. Presence of supernumerary chromosome in female, translocation and uncommon pairing behaviour also were observed. The differences and similarities of the sexes are brought out.

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FIELD EFFICACY OF SOME INSECTICIDES AND BIOPESTICIDES AGAINST RICE HISPA *DICLADISPA ARMIGERA* (OLIVIER)

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ABSTRACT

Field efficacy of insecticides and biopesticides was studied against rice hispa *Dicladispa armigera* (Olivier) infesting rice (cv. Kasturi Basmati) during *kharif* 2014 and 2015 at the CSK Himachal Pradesh Krishi Vishwavidyalaya, Rice and Wheat Research Centre, Malan. Application of various insecticides viz., dinotefuran 20 SG, triazophos 40 EC, chlorpyriphos 20 EC, monocrotophos 36 SL @ 200g, 500, 1250, 850 ml ha^{-1}, respectively, and biopesticides viz., *Beauveria* 10^6 spores ml^{-1}, *Melia* 5%, *Eupatorium* 5% @ 5.0, 2.5, 2.5L ha^{-1}, respectively, proved promising. Dinotefuran was the most effective, while of the biopesticides, *Beauveria* application was the best. However, maximum returns were obtained with triazophos (BCR= 8.8:1 and 8.0:1 during 2014 and 2015, respectively at the experimental farm, and 12.2:1 at farmer's field.

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BALANITES AEGYPTIACA FRUIT EXTRACT FOR MANAGING SUGARCANE WOOLLY APHID

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ABSTRACT

Sugarcane woolly aphid (*Ceratovacuna lanigera* Zehntner) is the most important pest of sugarcane, and many insecticides are employed for controlling this. This study is an attempt to find an ecofriendly alternative with sprays using the aqueous extract in cow

urine and distilled water from the fruits of *Balanites aegyptiaca*. Results revealed that all the concentrations i.e., 5, 10, 15, 20, 25 and 30% gave promising results with 100% mortality. But as the concentration increased yellowing of sugarcane leaves was observed, suggesting the use of extracts in lower concentrations.

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POPULATION DYNAMICS OF THE MUSTARD SAWFLY *ATHALIA LUGENS PROXIMA* KLUG

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ABSTRACT

The field experiments on the population dynamics of the mustard sawfly *Athalia lugens proxima* Klug were conducted in the Instructional farm of Junagadh Agricultural University, Junagadh, Gujarat in two successive *rabi* seasons of 2012-13 and 2013-14. Correlation analysis of the pooled data revealed that the maximum and minimum temperature influenced the larval population negatively; while relative humidity in the morning and evening were positively (0.5363) and negatively (-0.1120) influencing, with their mean values exhibiting negative correlation. The estimate of determination coefficients (R^2 = 0.7647) revealed that all the weather factors viz., temperature, relative humidity, sunshine hours, wind speed and rainfall had a major role on the population buildup.

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DISTRIBUTION AND HONEY PRODUCTION POTENTIAL OF *PLECTRANTHUS RUGOSUS*

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ABSTRACT

Studies at the Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu during 2015-16 analysed the distribution of *Plectranthus rugosus* Wall and its potential as a honey bee *Apis mellifera* (F.) pasturage. The physicochemical analysis of its

honey was also done. The survey indicated that *Plectranthus* was available throughout the Jammu division, with potential areas being Kisthwar, Doda and Ramban districts. In these districts surplus honey was harvested during mid-August to First week of November. The colony buildup i.e., colony strength in terms of brood, pollen and honey reserves showed a gradual increase with average honey production being 6.31±0.16 kg/colony. Unfortunately, *Plectranthus* is under threat owing to destruction by humans.

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BIOLOGY OF BLACK SOLDIER FLY *HERMETIA ILLUCENS* (L.) (DIPTERA: STRATIOMYIDAE) ON MUSKMELON FRUIT

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ABSTRACT

Life history of black soldier fly *Hermetia illucens* was studied under laboratory conditions at the Department of Agricultural Entomology, College of Agriculture, UAHS, Shivamogga Karnataka. The incubation, total larval and pupal period were observed to be from 5-7, 25-30 and 10-60 days, respectively. Fecundity was observed to be from 555-650 eggs with eggs laid in a single clutch, with hatchability being 40-70%. The total life cycle of male and female lasted for 47-106 and 57- 120 days, respectively.

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EFFECTS OF GREEN GRAM AND BLACK GRAM VARIETIES ON LIFE STAGES OF *SPODOPTERA LITURA* (F.)

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ABSTRACT

The present study evaluated the effects of varieties of green gram (*Vigna radiata*) and black gram (*Vigna mungo*) on the life stages of *Spodoptera litura* (F.). The observations on the feeding index, approximate digestibility (%), pupal weight, growth index and survival index of *S. litura* were made. The results revealed that the varieties Pusa 9531 of green gram and *Sekhar* of black gram were the most suitable for the development of *S. litura*, with maximum gained pupal weight of 321.25 mg and 333.00 mg, respectively. The least

suitable varieties were the HUME 668 (251.00mg) of green gram and TU-94-2 (312.00 mg) of black gram based on gained pupal weight.

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EFFICACY OF BOTANICALS AGAINST PULSE BEETLE *CALLOSOBRUCHUS MACULATUS* (F.) IN GREEN GRAM

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ABSTRACT

In the present study, twelve botanicals viz., *Ipomea* sp., *Ocimum sanctum* (L.), *Pongamia pinnata* (L.), *Vitex negundo* (L.), *Adhatoda* sp. (L.), *Zingiber officinale* (L.), *Allium sativum* (L.), *Curcuma longa* (L.), *Acorus calamus* (L.), *Capsicum annum* (L.), *Piper nigrum* (L.) and neem seed kernel powder were evaluated against the adults of pulse beetle *Callosobruchus maculatus* (F.) in green gram seed storage. Mortality, oviposition deterrent activity, adult emergence and seed germination were observed. All the treatments were found significantly effective, of which mixing of 1% seed powder of *P. nigrum* resulted in 100% mortality within 12 hr. Progeny development and adult emergence of 28.4 and 30.0% was obtained with 1% pod powder of *C. annum* and 1% seed powder of *P. nigrum*, respectively. It was also observed that 1% each of rhizome powder of *A. calamus*, seed powder of *P. nigrum* and pod powder of *C. annum* led to high seed viability of 97.3, 92.0 and 90.6%, respectively.

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ENHANCING THE EFFICACY OF PHEROMONE TRAP AGAINST BRINJAL SHOOT AND FRUIT BORER

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ABSTRACT

Exploiting the brinjal shoot and fruit borer (BSFB), *Leucinodes orbonalis* (Crambidae: Lepidoptera) sex attraction with monitoring and/or mass trapping approach is an ecofriendly IPM method. To improve the trapping system components, two field experiments were conducted with superior and waterless pheromone trap designs as alternative to the regular water basin trap. Results showed that the improved delta trap (patent-filed as Delta-Plus) is superior in terms of both catch efficiency and more user-friendly. The additional access vents in three combinations of dimensions and vent numbers led to significantly more moth catches. Further, the moth catches for the same amount of pheromone dispensed in the widely used cheaper funnel trap were observed to be too low, and inefficient for BSFB trapping.

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WATERLESS PHEROMONE TRAP- EFFICIENT ALTERNATIVE TO WATER BASIN TRAP FOR SUGARCANE EARLY SHOOT BORER

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ABSTRACT

For pheromone-based trapping in monitoring and/or mass trapping of the adult (moth) stage of the sugarcane early shoot borer (ESB) *Chilo infuscatellus* Snellen is done with conventional funnel trap and standard water basin trap (Delta trap). In this study an improved waterless pheromone trap (Delta Plus) has been compared in sugarcane fields at two locations. The same model with enlarged sticky gum arena, and the same design without access window, besides a smaller version of Delta Plus have also been included. The synthetic sex pheromone used was the *C. infuscatellus* ((Z)-11-Octadecen-1-ol). The results revealed the consistency and superiority of the Delta trap in terms of weekly catches. The advantage of additional access windows as an attribute in design improvement in the Delta Plus trap was also confirmed (12% incremental), and of the normal size of Delta trap over smaller size (32% incremental), amount of pheromone remaining same. The present pilot study thus confirms the potential of the newly developed waterless trap model (Delta Plus- patent filed) as it combines greater efficiency with more user-friendly than the water basin trap.

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PHEROMONE TRAPPING OF BRINJAL FRUIT AND SHOOT BORER: MALE ORIENTATION AND SPATIAL DISTRIBUTION

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ABSTRACT

Pheromone trapping is an ecofriendly management of the brinjal shoot and fruit borer, *Leucinodes orbonalis.* In the present study on orientation and distribution of male moths to the sticky arenas in a delta trap were evaluated. One-third of moths trapped were oriented towards the lure source, while the remaining two thirds were found oriented either away from or opposite to the pheromone source. This indicates the predominant tendency of the male moths to escape apparently due to overlapping close range visual or olfactory clues. This pest behaviour could be pursued to ascertain the role of olfactory versus visual stimuli in prompting the moth escape behaviour as basis for minimizing the escapes by altering the trap design suitable. The distribution of the moth catches in the length side of the sticky arena (18.0 x11.0 cm), was found to be more (62%) in the inner half section (closer to the lure source) compared to only about 38% in the outer half. This pattern of greater catches closer to lure source was also evident across the width side. The observed lower catches in sections away from lure source could provide directions to alter the dimensions of the sticky arena.

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RESISTANCE TO ACARICIDES IN *TETRANYCHUS TRUNCATUS* EHARA ON VEGETABLES

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ABSTRACT

A study was undertaken at College of Horticulture Vellanikkara, KAU to investigate the status of acaricide resistance in *Tetranychus truncates* Ehara (Prostigmata: Tetranychidae), the predominant species of spider mite infesting vegetable crops of Thrissur district, Kerala. Susceptibility of three field strains of *T. truncatus* collected from okra (VkOk1), amaranthus (VkAm3) and pumpkin (VkPm3) to three commonly used acaricides, viz., spiromesifen 240 SC, fenazaquin 10EC and diafenthiuron 50WP was evaluated in the laboratory following leaf dip bioassay in comparison with a laboratory

maintained susceptible strain (SS). Bioassay study revealed that the level of resistance varied among the strains for the acaricides evaluated. The strain VkOk1 recorded highest LC_{50} value and has developed 8 (1794.293 ppm), 13 (852.394 ppm) and 10 (1968.496 ppm) fold resistance to spiromesifen, fenazaquin and diafenthiuron, while VkAm3 recorded 7.0 (1571.021 ppm), and 5.53 (362.789 ppm) resistance to spiromesifen and fenazaquin, respectively. The strain VkPm3 showed susceptibility on par with the SS to all the acaricides evaluated. The study reports acaricide resistance in *T. truncatus* for the first time in India.

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POPULATION DYNAMICS OF MEALYBUG *PHENACOCCUS SOLENOPSIS* AND ITS NATURAL ENEMIES

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ABSTRACT

Studies revealed that brinjal (var. Shyamala) planted on 31st July 2007 inhabited maximum (33.8 adults) population of mealybug *Phenacoccus solenopsis* Tinsley, in March 2008 and the least (0.93 adults) in November 2007. There existed a positive correlation with temperature. However, when planted 14th July 2008 remained free from the mealybugs except scanty population noticed during January 2009. The other variety of brinjal (var. Vikram) planted on14th July 2008 was found negatively correlated with rainfall (-0.21). The parasitoid, *Aenasius bambawalei* Hayat, was found negatively correlated with *P. solenopsis* (-0.21) and *Promuscidea unfasciativentris* Girault (-0.12). Highest (53.73 adults) population of *P. solenopsis* was observed during November followed by October (21.13 adults) and lowest observed in December (1.3 adults) on sorrel planted in 2007. Highest (91.7 adults) population of *P. solenopsis* was observed during July followed by June (54.5 adults) and lowest was seen in December (1.3 adults) on sorrel planted in 2008. Mealybug found positively correlated with temperature in sorrel planted 10.07.2007 and 15.04.2008 Highest number of *P. unfasciativentris* were recorded in October 2008 (116 adults) on sorrel and observed negatively correlated (-0.2) with mealybugs. Okra planted 26.06.2008, recorded highest (11.08 adults) population of *P. solenopsis* during October as compared to lowest (3.4 adults) in November. It was positively correlated with temperature. Highest population of *A. bambawalei* was observed during October (23 adults) and found positively correlated with temperature (0.68) and *P. unfasciativentris* (0.11) which was highest in highest in November (26 adults). China rose recorded highest (51.82 adults) population of *P. solenopsis* in July 2008, while lowest (0.06 adults) in October 2008. Mealybug was positively correlated with temperature (0.53), relative humidity (0.67) and rainfall (0.61). Mealybug, was again found positively correlated with parasitoid, *A. bambawalei* (0.70), hyper-parasitoid, *P. unfasciativentris* (0.97) and hyper-parasitoid, *Aprostocetus purpureus* Girault (0.73).

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RP-HPLC METHODS AND QUECHERS FOR DETECTION OF INSECTICIDES IN RICE GRAINS

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ABSTRACT

In this study, methods for detection and determination of monocrotophos, deltamethrin, phosphamidon and dichlorvos had been standardized by combination of reverse phase-high performance liquid chromatography (HPLC) with modified QuEChERS method. UV-VIS detection system and the Brownlee Analytical C18 column were used for the quantification of monocrotophos and deltamethrin with an isocratic flow of 1.70 mL min^{-1} of mobile phase of acetonitrile and water (90:10, v/v). Phosphamidon and dichlorvos were separated with an isocratic flow of acetonitrile and water (70:30, v/v). The peaks of monocrotophos and deltamethrin were depicted at retention times of 0.77 min and 3.01 min and the peaks of phosphamidon and dichlorvos were found at 1.11 and 1.39 min. The recoveries found in the method were above 80% with the evaluated insecticides, when samples were fortified at 0.05, 0.10, 0.25, 0.50 and 1.00 mg kg^{-1} levels.

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WOOD-BORING LONGHORN BEETLES (COLEOPTERA: CERAMBYCIDAE) OF AGROFOREST ECOSYSTEM IN INDIA

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ABSTRACT

The members of longhorn beetles are basically phytophagous and many are wood boring causing significant damage to many plants. This study discusses 28 species of such beetles belonging to 17 tribes, 24 genera and four subfamilies of agriculturally importance. Of these 13 species belong to the Lamiinae, 12 to Cerambycinae, two of Prioninae and one of Lepturinae. These had been collected from agriculture lands, fruits and plantation

orchards. Brief descriptions of these along with synonyms, host range and distribution details are provided, of which 15 species are new reports from different states of India.

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EVALUATION OF FOLIAR *VIS-A-VIS* SOIL APPLICATION OF CERTAIN INSECTICIDES AGAINST *PHYLLOCNISTIS CITRELLA* STAINTON

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ABSTRACT

The present study is on the evaluation of the efficacy of selected insecticides viz., imidacloprid, acetamiprid, thiamethoxam, along with *Bacillus thuringiensis* and mineral oil against the citrus leaf miner *Phyllocnistis citrella* Stainton on rough lemon rootstock. Soil drenching 15 days prior to flush emergence and foliar application coinciding with flush emergence had been compared. The results indicated that soil application of neonicotinoid insecticides remained more effective against leaf miner larvae for longer duration as compared to foliar application. Soil application significantly induced more biomass.

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EFFECT OF BUPROFEZIN ON DEVELOPMENTAL STAGES OF DIAPHORINA CITRI KUWAYAMA (HEMIPTERA: LIVIIDAE)

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ABSTRACT

Effect of buprofezin (7.5, 15, 30, 75, 150 and 300 ppm each) on development of Asian citrus psyllid (ACP), *Diaphorina citri* Kuwayama was studied on *Citrus reticulata* Blanco (budlings) with different stages of citrus psylla viz., a) 1-2- and 3-4-days old eggs, b) first, third and fifth instar nymphs. The effect of IGR was dose-dependent and varied according to the age of the life stage. Mean egg hatching/plant for both 1-2- and 3-4-day old eggs were significantly low at 150 ppm and 300 ppm. First and third instars were highly susceptible than fifth instars with zero survival at 150 and 300 ppm while adult emergence ranged between 40.33 - 44.67% from fifth instar at 150 and 300 ppm during season I and II. Similarly, fecundity of adults emerged from such treatments (first and

third instar nymphs) were zero at higher concentrations of buprofezin (150 & 300ppm) while fecundity of adult females emerged from treated fifth instar nymphs released on healthy budling were nil. Hence, buprofezin may be incorporated as a management tactic in rotation with insecticides especially during flush emergence after further field evaluation as it has significant effect on growth, reproduction and survival of citrus psylla.

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MELISSOPALYNOLOGICAL INVESTIGATIONS ON SUMMER HONEY SAMPLES FROM MANDI DISTRICT, HIMACHAL PRADESH

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ABSTRACT

A total of 19 summer honey samples from Indian honey bee, *Apis cerana* F. hives located in 18 different localities of Mandi district of Himachal Pradesh were studied. The pollen samples were acetolysed and identified microscopically. The melissopalynological analysis of these samples yielded 81 pollen taxa: of these twelve pollen types were predominant as pollen sources; and 42 were secondary and 70 were important minor and minor pollen sources. These were observed distributed in over 40 plant families comprising of trees, shrubs, herbs, climbers and grasses. Based on pollen analysis, eleven honey samples were identified as unifloral, and eight classifieds as multifloral. The predominant pollen types were *Grewia optiva, Citrus* sp., *Moringa oleifera, Mangifera indica, Sapindus mukorosii, Eucalyptus* sp., *Syzygium cumini, Brassica campestris, Trifolium* sp., *Robinia pseudoacacia, Malus domestica* and *Prunus* sp. Besides entomophilous, anemophilous pollen types from *Chenopodium album, Psidium guajava, Zea mays,* poaceous and euphorbiaceous members were also observed.

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COMPARATIVE BIOLOGY OF *SPILOSOMA OBLIQUA*

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ABSTRACT

Bihar hairy caterpillar *Spilosoma obliqua* (Walker) is a polyphagous pest causing huge losses in many crops. Its comparative biology on rice bean, black gram, cowpea and cashew was evaluated in this study. This revealed that the egg period varies from 5 to 6

days, and % hatching was maximum with black gram and rice bean (92%). The least of the larval period was observed on black gram (18.32 days), as well the pupal period (7.66 days). The adult emergence was again maximum when fed on black gram (91.66%) and the least on cashew (58.33%), and similar was the case with adult longevity. The maximum sex ratio was observed with cowpea (1:2). The total life cycle on black gram, cowpea, rice bean and cashew occupied 35.65, 36.49, 38.12 and 47.07 days, respectively.

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DROSOPHILID DIVERSITY (DIPTERA: DROSOPHILIDAE) FROM SHIMLA DISTRICT, HIMACHAL PRADESH

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ABSTRACT

The present study was conducted to explore the diversity of drosophilids from Shimla district of Himachal Pradesh. A total 47 species under eleven genera viz., *Drosophila, Hirtodrosophila, Stegana, Lordiphosa, Leucophenga, Mycodrosophila, Scaptomyza, Scaptodrosophila, Impatiophila, Zaprionus*, and *Hypselothyrea* were collected. Abundance and species diversity were computed using Simpson (D), Shannon-Wiener (H), and Berger-Parker (1/d) indices. Simpson index was low at 0.029, Shannon-Wiener index was high at 3.669 and Berger-Parker index was also high at 0.613. Study reveals significant drosophilid diversity and favourable conditions for sustenance of several species.

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GENETIC DIVERSITY OF RICE LEAF FOLDER USING MITOCHONDRIAL CYTOCHROME OXIDASE 1 GENE

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ABSTRACT

Genus, *Cnaphalocrocis* spp. is an important insect pest of rice in all rice growing countries in world. More than twenty species of *Cnaphalocrocis* exists in nature throughout the

world and six have been reported from Tamil Nadu alone. The information on rice leaf folder species prevailing in Punjab is lacking. Seven populations from different regions of Punjab were collected to identify species of rice leaf folder. Mitochondrial cytochrome oxidase1 (DNA barcode region) was amplified and cloned in pGEM-T-easy vector. The nucleotide sequence of mtCOI gene were determined and analysed. The Blast analysis showed that all the populations existing in Punjab are *C. medinalis.* The genetic differences were observed among Punjab population like Moga, Hoshiarpur-2 and Sangrur-2 which has only one nucleotide difference from other populations at position 202 (A instead of G), 388 (G instead of A) and 499 (C instead of T) of DNA barcode region (mtCOI), respectively. The genetic diversity analysis with population from other parts of world revealed that population of Pakistan, India, China, Australia and Korea formed one cluster. However, Papua New Guinea population is totally different from all the populations and formed a separate cluster.

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INSECT FAUNA CAPTURED BY LIGHT TRAPPING IN NEW TOWN AREA, NORTH 24 PARGANAS, WEST BENGAL

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ABSTRACT

The present study highlights the variety and variability of light trap collected insects in the New town area, a fast-developing city situated in the North 24 Parganas district, West Bengal. Insects captured from January to June 2018 were observed belonging to five orders of Class Insecta viz., Diptera, Hemiptera, Coleoptera, Orthoptera and Lepidoptera. Of these, the most abundant with species was the Coleoptera and the least collected one being Lepidoptera.

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MANAGEMENT OF INSECT PESTS OF CABBAGE WITH INTERCROPPING AND THEIR PLANTING PATTERN

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ABSTRACT

Field experiment was conducted on the incidence of insect pests and natural enemies on cabbage, *Brassica oleracea* var. *capitate.* Seven treatments with combinations comprising of

three intercrops (fenugreek, lucerne and turnip) with two (linear and square) patterns of planting were evaluated in 2016-17 and 2017-18. Square planting of cabbage with lucerne was observed to be the most effective planting pattern with the least population of *Plutella xylostella* (0.71 and 0.33/plant), *Pieris brassicae* (21.98 and 34.95 larvae/ plant), aphids (228.25 and 186.13 aphids/plant) along with maximum occurrence of syrphids (1.94 and 1.93 maggots/plant). Also, maximum population of coccinellids of (2.65 and 3.21 grubs+ adults/plant), along with parasitization of *P. xylostella* (31.39 and 36.12%) and *P. brassicae* (32.18 and 36.20%) were observed when square planting of cabbage with turnip was followed.

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INSECTICIDAL ACTIVITY OF SWEET FLAG *ACORUS CALAMUS* AGAINST *LASIODERMA SERRICORNE* (F.) AND *CRYPTOLESTES FERRUGINEUS* (STEPHENS)

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ABSTRACT

Bioassay studies were conducted on two storage insect pests viz., cigarette beetle *Lasioderma serricorne* (L.) and rusty grain beetle *Cryptolestes ferrugineus* (Stephens) exposing them to three different package materials treated with sweet flag *Acorus calamus* 6 EC. After 36 hr of treatment (HAT), in *L. serricorne*, 20.00, 13.33 and 23.3% mortality were observed, while with *C. ferrugineus* it increased to 80.00, 73.33 and 80.00% with bags made of polypropylene, jute and in muslin cloth material, respectively. After 72 and 48 HAT 100% mortality of *L. serricorne* and *C. ferrugineus* was observed with all the three. The results revealed the potential of *A. calamus* 6 EC as a biopesticide to avoid the cross infestation of storage pests by surface treatment.

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EFFECT OF AVOCADO AND YOGURT IN DIET MEDIA ON WING LENGTH, OVARIOLE NUMBER AND PROGENY PRODUCTION OF *DROSOPHILA MELANOGASTER*

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ABSTRACT

Dietary constituents are known to have profound effect on physiological activities including reproductive fitness, fecundity and body size of the organism. In the presents study, the flies of *Drosophila melanogaster* were reared in yogurt and avocado supplemented media to understand its effect on the wing length, ovariole number and progeny production. The results showed that the wing length, ovariole number and progeny production were significantly higher in avocado+ yogurt media followed by yogurt supplemented media. This suggests that avocado and yogurt as a combination followed by yogurt alone provided required nutrients to the flies to grow larger in size and have a greater number of ovarioles and produce greater number of progeny than the flies grown in wheat- cream agar media. These results suggest that avocado and yogurt as a combination provide reproductive fitness benefits followed by yogurt media alone.

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INFLUENCE OF WEATHER ON THE PARASITOID CATCHES IN THREE RICE GROWING AGROCLIMATIC ZONES OF TAMIL NADU

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ABSTRACT

Parasitic hymenopterans play a vital role against many pests of rice regulating them naturally. The present study evaluated the influence of weather factors on such parasitic hymenopterans in rice under three agroclimatic rice zones of Tamil Nadu viz., western zone, Cauvery delta zone and high rainfall zone during 2015-16. Collections were made for 20 consecutive days in each zone. The weather data viz., maximum temperature, minimum temperature, relative humidity and rainfall were used correlated with the parasitoid population. These revealed significantly negative correlation with maximum temperature and positive one with minimum temperature, relative humidity and rainfall in the Cauvery delta zone. In the high rainfall zone, the parasitoid population exhibited positive and significant correlation with rainfall and positive but non-significant correlation with maximum temperature and relative humidity, and negative non-significant correlation with minimum temperature. The parasitoid population showed non-significant negative correlation with temperature (maximum and minimum), relative humidity and rainfall in the western zone.

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POPULATION DYNAMICS OF IMPORTANT INSECT PESTS OF SOYBEAN IN RELATION TO WEATHER PARAMETERS

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ABSTRACT

A field experiment was carried out at Instructional farm, Rajasthan College of Agriculture, Udaipur (Rajasthan State) on the population dynamics of major insect pests of soybean during *kharif* 2014 and 2015. Populations of jassids, whiteflies, semilooper and tobacco caterpillar were monitored weekly with different sampling techniques and the data generated correlated with weather parameters. The results revealed that mean population of jassids, whiteflies, semilooper and tobacco caterpillar gradually increased, reaching a peak at 35th SMW to 39th SMW and thereafter declined. The multiple linear regression analysis indicated that influence of weather parameters was 53.9% (R^2=0.532) and 91.2% (R^2=0.912) in relation to the population of jassids, 69.6% (R^2=0.696) and 92.6% (R2=0.926) with that of whitefly, 79.5% (R^2=0.795) and 91.7% (R^2=0.917) with that of semilooper and 54.2% (R^2=0.542) and 70.9% (R^2=0.709) with that of tobacco caterpillar during kharif 2014 and 2015, respectively.

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EFFICACY OF TOLFENPYRAD AGAINST RED PUMPKIN BEETLE *AULACOPHORA FOVEICOLLIS* LUCAS IN CUCUMBER

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ABSTRACT

A field experiment was conducted at the Central Research Station, Orissa University of Agriculture Technology, Bhubaneswar in RBD with nine treatments replicated thrice during *kharif*, 2016 and *rabi*, 2016-17 to evaluate the efficacy of eight pesticides viz., tolfenpyrad 15 % EC @ 150 g a.i./ha, fipronil 5 % SC @ 50 g a.i./ha, indoxacarb 14.5 % SC @ 72.5 g a.i./ha, flubendiamide 480 SC @ 78.70 g a.i. /ha, chlorantraniliprole 18.5 % SC @ 30.83 g a.i./ha, spinosad 45 % SC @ 75 g a.i./ha, cartap hydrochloride 50% SP @ 375 g a.i./ha and acephate 75% SP @ 375 g a.i./ha against the red pumpkin beetle, *Aulacophora foveicollis* Lucas on cucumber cv. "Machaar" compared with untreated control. All the insecticides evaluated were at par and significantly suppressed adult red pumpkin beetle (RPB) population up to 15 days after spraying to the extent of 77.11 to 81.59% and 75.46 to 82.59% over control during *Kharif*, 2016 and rabi, 2016-17, respectively. The leaf-dip bioassay of tolfenpyrad against RPB revealed LC_{50} of 32.88 ppm with a fiducial limit of 25.41 to 42.56 ppm.

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PREDATORY POTENTIAL OF WATER BUGS AGAINST THE FILARIAL VECTOR *CULEX QUINQUEFASCIATUS* SAY

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ABSTRACT

Three water bugs, *Laccotrephes ruber* L., *Ranatra* filiformis F. and *Diplonychus rusticus* F., are natural biological control agents of mosquito larvae, *Culex quinquefasciatus* Say. These were evaluated for their predation potential on the fourth instar larvae of *C. quinquefasciatus* Significant difference was observed as regards the predator density and time, and the results indicated that every predator act as natural biological control agent when the density of prey reached 100. Among the three predators selected, *L. ruber* was the best with maximum efficiency (79.16) followed by *D. rusticus* (61.50) and *R. filiformis* (39.16).

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BIOLOGY OF *CHEILOMENES SEXMACULATA (F.)*, A PREDATOR OF GREEN APPLE APHID IN HIMACHAL PRADESH

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ABSTRACT

Observations were made on young nursery plants and apple orchards to record the coccinellid predators of *Aphis pomi* De Geer on apple plants in Himachal Pradesh. Many species of lady bird beetles were found feeding on green apple aphid, *Aphis pomi* De Geer on the nursery plants in Mashobra locality of Shimla district and Ner Chowk locality of Mandi district. Of these coccinellids, *Cheilomenes sexmaculata* (F.) was found to be effective predator of green apple aphid. The life cycles of this predator was studied during May to August and feeding potential of its larvae and adults on green apple aphid evaluated.

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NEW RECORD OF SPIDER *NIHONHIMEA JAPONICA*

(BÖSENBERG AND STRAND) (THERIDIIDAE)

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ABSTRACT

A spider *Nihonhimea japonica* (Bösenberg and Strand, 1906) under family Theridiidae is redescribed and brought out as a new record from Kerala in this study. Two females collected from evergreen forest area in Chimmony wildlife sanctuary, Thrissur, Kerala are included in this study.

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EFFECTS OF CERTAIN INSECTICIDES ON THE PREDATOR *ORIUS INSIDIOSUS* AND ITS PREY *THRIPS PALMI*

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ABSTRACT

***Thrips palmi* is a major pest of several economically important food crops. The mirid *Orius insidiosus* is an important predator of *T. palmi* in Trinidad and several other Caribbean islands. Its biocontrol effectiveness is hampered by frequent insecticide applications. Contact and leaf residual bioassays were conducted on both *T. palmi* and *O. insidiosus* with eleven commonly applied insecticides to determine the least and most toxic insecticide(s) to *O. insidiosus* and *T. palmi*, respectively. This information forms part of an Integrated Pest Management programme for *T. palmi*. Cypermethrin+ profenaphos and chlorfenapyr were observed to be the most toxic while imidacloprid was the least toxic to *O. insidiosus* adults. Fipronil, diafenthiuron and λ-cyhalothrin were the most toxic to *T. palmi*. *Orius insidiosus* survived for the longest period when exposed to chlorfenapyr but not significantly longer than insects exposed to acetamiprid, α-cypermethrin, or dimethoate. Alpha (α)-cypermethrin caused the fastest mortality in *T. palmi* while diafenthiuron took significantly longer to cause 50% mortality compared to α-cypermethrin and abamectin. The calculated Selectivity Ratios indicated that only fipronil, λ-cyhalothrin, acetamiprid, diafenthurion and imidacloprid favoured the predator. Leaf residue bioassays indicated that abamectin had the lowest LT_{50} for both *O. insidiosus* and *T. palmi* emphasizing the fact that abamectin degraded fastest and the residues left after application had the least effect on the predator/ prey. Fipronil, λ-cyhalothrin, acetamiprid, diafenthurion, imidacloprid and abamectin might be incorporated into an IPM programme using *O. insidiosus* as a predator of *T. palmi*.**

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YIELD-INFESTATION RELATIONSHIP OF APHIDS INFESTING WHEAT AND THEIR ECONOMIC INJURY LEVELS

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ABSTRACT

The effect of aphid complex on wheat yield was studied through field experiments during *rabi* 2016-17 and 2017-18. Yield-infestation relationship was investigated on two widely cultivated wheat varieties HD-3059 and HD-3086 utilizing five regression models *viz.*, linear, semi-$\log_e$ (X), semi-$\log_e$ (Y), $\log_e$-linear and quadratic. Optimum number of sprays to get higher yield was computed to be 2 sprays between 60 to 80 DAS for both the varieties. Further, economic injury levels (EIL) were determined to be 6.3 aphids/ tiller at 60 and 14.4 at 70 DAS for HD-3059 and 34.6 at 60 and 29.3 aphids/ tiller at 70 DAS for HD-3086. These EILs will facilitate timely management practices against the pest.

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DYNAMICS OF FORAGING ACTIVITY OF APIS MELLIFERA IN KASHMIR

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ABSTRACT

Foraging behaviour in honey bee (*Apis mellifera* L.) depends on floral resource availability and diurnal patterns. This study analyses these with experiments done at the Research and Training Centre for Pollinators, Pollinisers and Pollination Management, Division of Entomology SKUAST- K, Shalimar, during March-April 2018. The results suggested that the foraging rate was highest (27.5%) in the afternoon and least (18.3%) in the evening. There was a positive correlation between the foraging and temperature in contrast to the negative ones with relative humidity, rainfall and wind speed.

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ON A COLLECTION OF BRACONIDAE FROM THREE RICE GROWING ZONES OF TAMIL NADU

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ABSTRACT

Surveys were conducted to explore the braconid fauna in rice ecosystems of Tamil Nadu during 2015-16 in three different rice growing zones viz., western zone, Cauvery delta zone and high rainfall zone. A total of 574 braconids with 18 species under 8 subfamilies were collected. Alpha and beta diversity were computed for the three zones. The diversity indices (Simpson's index, Shannon-Wiener index, Pielou's index) revealed that high rainfall zone is the most diverse zone, with Cauvery delta zone being the least diverse. *Macrocentrus philippinensis* was the dominant braconid with a relative abundance of 19.3%. On comparing the species similarities using the Jaccard's index in three zones taken in pairs, it was observed that 53% similarity existed between western and Cauvery delta zones, it was 44% between the high rainfall and Cauvery delta zones, and 50% as regards the high rainfall and western zones.

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FORENSICALLY IMPORTANT MITES ASSOCIATED WITH BEETLES FOUND ON DECOMPOSING CARRIONS

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ABSTRACT

A decomposing corpse has a rich diversity of insects, and of these most of the studies deliberate on the Diptera while the Coleoptera (beetles) stand neglected. Present study reports on the mites collected from the decomposition sites during succession studies with beetles. Three species belonging to the family Parasitidae viz., *Parasitus mustelarum* Oudemans, and *Poecilochirus* sp. collected with bait traps are included. These mites are new records of such associations of forensic importance. Deutonymphs of these carried by the silphid *Thanatophilus minutus* Kraatz and the histerid *Saprinus quadriguttatus* are described.

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HERMETIC STORAGE OF BLACK GRAM IN METAL BIN AND FLEXIBLE STORAGE BAGS

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ABSTRACT

Hermetic storage is entirely organic, requiring no chemical or biological intervention than any other technique. Studies were done with hermetically sealed black gram at 12% moisture content in metal bin, GrainPro bag and Storezo bag for 2 months, compared with woven polypropylene bags. Observations on the moisture content (%), *Callosobruchus maculatus* mortality and carbon dioxide concentration were made along with temperature and relative humidity. It was observed that the moisture content in metal bin, GrainPro bag, Storezo bag and control increased after 2 months- from 12.32 to 12.41%, 12.23 to 12.73%, 12.23 to 12.76% and 12.12 to 13.44% respectively; 95% mortality of C. *maculatus* was observed in metal bin, while GrainPro and Storezo bag resulted in 90% mortality. The CO_2 concentration in metal bin, GrainPro, Storezo and control increased from 0.03 to 15.37%, 14.83%, 15.27 % and 3.37%, respectively. Results reveal that the hermetically sealed metal bin, GrainPro bags and Storezo bags prolong the storability of black gram grains compared to the polypropylene bag.

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GENETIC DIVERSITY OF PINK BOLLWORM *PECTINOPHORA GOSSYPIELLA* (SAUNDERS) POPULATIONS

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ABSTRACT

Present study evaluates the genetic diversity of *Pectinophora gossypiella* (Saunders) populations collected from different cotton growing zones of India with RAPD-PCR analysis. RAPD decamer primers namely OPI-11 to OPI-20 was used out of which four (OPI-11- OPI-14) produced amplicon of good resolution and enough variation. A total of 153 amplicons produced out of which 118 (92%) are polymorphic bands indicating high genetic polymorphism among the *P. gossypiella* populations. The similarity coefficient values ranged from 0.20 to 0.76 for the pair-wise combination among twelve populations of *P. gossypiella*. An UPGMA dendrogram generated based on Jaccard's similarity coefficient for 12 populations grouped into two clusters. Minimum similarity (0.20) was observed between LAB and GJJ populations. The present investigation shows occurrence of high genetic polymorphism and low genetic diversity among *P. gossypiella* populations in India.

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MALE GENITALIA VARIATION IN THE LEAFHOPPER *GONIAGNATHUS (TROPICOGNATHUS) SYMPHYSIS*

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ABSTRACT

The male genitalia in the leafhopper *Goniagnathus (Tropicognathus) symphysis* Dash and Viraktamath (Hemiptera: Cicadellidae: Deltocephalinae) was studied. This revealed variations and these illustrated and described comparing with its original description.

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ENTOMOFAUNA ENHANCE THE QUALITY AND QUANTITY IN OKRA

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ABSTRACT

The observations on the most important insect pollinator of okra *Abelmoschus esculentus* (L.) Moench (Malvaceae) at Rosehill, NSW Australia revealed that the most important are the honey bees *Apis mellifera*. Bee pollination enhanced the quality and quantity in okra vegetable patches. Of a sample of 100 *A. mellifera* foragers in okra, 62 collected nectar, 21 pollen and 17 both nectar and pollen. Corresponding numbers for wild bees were 77, 13 and 10. Insect visitors to this important crop in Rosehill NSW Australia included in addition to the honey bees, other bees, butterflies and *Scoliid* spp. The mean numbers of flowers visited by the honey bees per foraging trip were: wild bees- 104, *A. mellifera* -97, and others- 44; maximum numbers of flowers visited per min by these bees were 3.1, 5.1 and 2.5, respectively. Fruit retention on flowers known to have been pollinated by the honey bees was 37-42%, while it was 25% for other insects, and with self-pollinated flowers it was 17%. Fruit quality and length were also significantly enhanced with bee pollination.

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ENTOMOPHILOUS CROPS GET BETTER FRUIT QUALITY AND YIELD: AN APPRAISAL

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ABSTRACT

Insect pollinators are a key stone process in both human managed and natural terrestrial ecosystems. Bees are very important in determining the yield and quality in crops. Solitary bees, bumble bees and honey bees are the biggest groups of insects for pollination because of their enough body hair and their behaviour patterns. Beekeeping is an important component of agriculture that promotes rural diversification and is an alternative source of income. Beekeeping provides nutritional, economic and ecological security to rural communities at the household level. This is non-land-based activity of mixed farming and does not compete with other resource demanding. Although pollination improves crop yield, there is still few studies in Punjab (India) and Sydney (Australia) that link its role to the economic benefits gained by farmers.

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ANOPHELINE VECTORS IN CAR NICOBAR ISLANDS- AN AREA WITH NEGLIGIBLE MALARIA

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ABSTRACT

Anopheline larvae exhibited seasonal variations in their abundance, with per dip density ranging from 0.013± 0.002 to 0.309± 0.088. Peak larval density coincided with high rainfall. The abundance was maximum in breeding sites viz., water storage tanks, kutcha drains, culverts and cesspools with a per dip density of 0.283± 0.070, 0.274± 0.068, 0.260± 0.137 and 0.199± 0.059, respectively. Larval density was maximum in the transient water bodies formed during the monsoon, with early instars (59.71%) being always more compared to the late instars (40.29%). Two species were identified- *An. sundaicus* (95.8%) and *An. barbirostris* (3.2%), with the former being found in a wide range of habitats, and the latter always less, which could be the reason for negligible malaria cases.

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EFFECT OF ^{60}CO GAMMA IRRADIATION ON THE LIFE STAGES OF *ORYZAEPHILUS SURINAMENSIS* (L.)

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ABSTRACT

Gamma radiation applied at five doses from 0.1- 0.5 kGy was evaluated for its effects on the eggs, larvae, pupae and adults of *Oryzaephilus surinamensis* (L.) maintained at 27±1ºC and 75±5%RH. The effect on hatching of egg, pupae formation, adult emergence and mortality were observed to be dose dependent. There was no hatching of egg, larval development and adult emergence at 0.5 kGy. One way ANOVA revealed the significance of variations, and SEm was 1.08, 1.72, 1.68 and 2.49 for hatching of egg, pupae formation, adult emergence and adult mortality, respectively.

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ENTOMOFAUNA OF SORGHUM

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ABSTRACT

Entomofaunal diversity at different growth stages (seedling, vegetative, flowering and maturity stage) of sorghum crop under irrigated condition was studied at the Tamil Nadu Agricultural University, Coimbatore, during October 2017- January 2018. Observations on pests, natural enemies and innocuous insects made at weekly intervals were analysed to bring out the alpha diversity with four standard biodiversity indices, namely, Shannon-Weaver diversity index, Simpson's dominance index, Pielou's uniformity index and Margaleff's richness index. A total of 78 species under 47 families and 11 orders were observed to be associated. The diversity and richness were observed to be more during the vegetative stage followed by maturity and flowering stages whereas the least was observed during the seedling stage.

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REARING OF *GRAPHIUM AGAMEMNON* (L.) (LEPIDOPTERA: PAPILIONIDAE)

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ABSTRACT

In this study, technique for mass rearing of of *Graphium agamemnon* (Linnaeus, 1758) (Lepidoptera: Papilionidae, Papilioninae) was developed. Instead of gravid females from the wild, larvae and eggs for initiating culture was found to be the best. The observations include: the larvae need to be reared outdoors, on potted plants as well as indoors on leaves in plastic containers, and leaves are to be kept fresh; and there is a need to provide large space for adults facilitating feeding and mating. Hand-pairing was not successful, and periodic augmenting of the culture to maintain viability are is essential. Relevant life history parameters of the laboratory reared population are included.

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IMMATURE STAGES OF *PAPILIO POLYTES* LINNAEUS (LEPIDOPTERA: PAPILIONIDAE)

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ABSTRACT

The immature stages of butterfly, the common mormon- *Papilio polytes* Linnaeus (Lepidoptera: Papilionidae) were studied at Solan, Himachal Pradesh. This butterfly is an active flier and prefers mostly gardens and human habitations. The larvae are polyphagous and observed on three plants belonging to the family Rutaceae viz., *Citrus aurantifolia* (Cristm.) Swingle, *Murraya koenigii* (L.) Sprengel and *Zanthoxylum alatum* Roxb. Some observations on its biology, and nectar host plants are included.

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MONITORING OF WHITE STEM BORER *SCIRPOPHAGA FUSCIFLUA* WITH LIGHT TRAP AND SWEEP NET

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ABSTRACT

The present study evaluates the activity of white stem borer, *Scirpophaga fusciflua* on rice in Kangra valley deploying light trap and sweep net. The results revealed that moths were active from 29th to 40th (Standard week) SW and 31st to 40th SW, in 2015-16 and 2016-17, respectively, with the peak activity being at 36th and 37th SW, respectively. The population declined thereafter with nil population subsequently. The weather parameters when correlated with population dynamics revealed a positive relationship with maximum and minimum temperature and relative humidity but a negative one with rainfall.

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EFFICACY OF INSECTICIDES AGAINST *APION CLAVIPES* GERST ON MUNGBEAN

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ABSTRACT

The experiment was conducted at Shewa Robit research site, Debre-Birhan, Ethiopia during main cropping seasons of 2015 and 2017 to determine efficacy of insecticides against *Apion clavipes* Gerst in mungbean. The results revealed that the plots sprayed with lambda cyhalothrin and deltamethrin led to the least pod infestation and seed damage, and maximum grain yield followed by profenophos and spinosad. Strong negative relationship was observed between grain yield with grain yield of adults and larvae. Considering the cost of insecticide- lambda cyhalothrin (810 ETB), and that of mungbean (23.5 ETB kg^{-1}), the economic injury levels (EIL) was calculated as 0.247 adults plant^{-1} or 2.673 larvae plant^{-1}. The EIL based on adult is more useful than larva because it is easy for sampling. These results suggest that foliar application of lambda cyhalothrin and deltamethrin will avoid economic damage followed by profenophos and spinosad. Maximum cost benefit ratios (19.96 and 17.74) were observed with lambda cyhalothrin and deltamethrin. Therefore, deltamethrin and lambda cyhalothrin could be recommended for the management of *A. clavipes*, which should be applied at pod initiation to restrain initial adult population and ten days later to control reinfestation.

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LIFE HISTORY, GROWTH AND DEVELOPMENT OF *APION CLAVIPES* GERST

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ABSTRACT

***Apion clavipes* Gerst is an important pest of mungbean in the low land of North Shewa, Ethiopia. Its biology on mungbean was studied under laboratory condition, with adults and larvae reared on potted plants in cages (18-25ºC). The results revealed a pre-oviposition period of 6.2±0.23 days and 4.17±0.17 days of oviposition. A female laid 12.4±0.69 eggs, which required 4.46±0.20 days to hatch. The freshly laid egg is oval and pale white, and larva apodous with a larval period of 15.23±0.47 days. The larvae are C shaped, wrinkled and creamy white with pale brown head. Pupation lasted for 7.96±0.17 days, with pupa being exarate, and pale cream. Female adults lived longer than male with 37.47±0.63 and 28.45±0.44 days, respectively. The weevil had a total developmental period of 27.64±0.57 and generation period of 38.02±0.54 days, showing that it can complete up to nine generations per year.**

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GONATOPUS SPP. PARASITOIDS ON RICE PLANT HOPPERS

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ABSTRACT

Present study explores the ectoparasitiods of rice plant hoppers viz., *Nilaparvata lugens* (Stål), *Sogatella furcifera* (Horváth) and *Sogatella vibix* (Haupt). It was observed that these are parasitized by drynid wasps, and when analysed for mtCO1, five sequences of parasitoids were inferred with 113 nucleotide variations, which accounted for 17% variation. All the sequences matched with those of *Gonatopus* spp.

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EVALUATION OF EFFICACY OF INSECTICIDES AGAINST THE FALL ARMY WORM SPODOPTERA FRUGIPERDA

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ABSTRACT

The fall army worm *Spodoptera frugiperda* (J.E.Smith) is an insect pest native to tropical and subtropical regions of the Americas, causing significant yield losses. The present study was done in 2017 at the Amhara Region Agricultural Research Institute (ARARI) evaluates the efficacies of certain novel insecticides against this pest. A laboratory bioassay and field experiment were conducted with 14 insecticides along with an untreated check were evaluated in a Complete Randomized Design replicated three times. From the bioassay, the chi-square test revealed that chlorpyriphos ethyl, profenophos+ lambda cyhalothrin, profenophos+ cypermethrin, spinosad and indoxacarb were the best giving maximum larva mortality. In the field experiment only profenophos+ cypermethrin and spinosad were effective giving maximum mortality of the sixth instar larva in the whorls; these were followed by profenophos+ lambda cyhalothrin and indoxacarb. Whorl application and spraying over the canopy had no significant difference. The results conclude that spraying over the canopy would be more effective against earlier larval since these could not hide in the whorl like those of the sixth instar.

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SEASONAL INCIDENCE OF *MARUCA VITRATA* F. ON COWPEA IN THE SUDANO-SAHELIAN ZONE OF NIGER

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ABSTRACT

The development and incidence of the key insect pest of cowpea (*Vigna unguiculata* L. Walp), the legume pod borer (LPB) *Maruca vitrata* F., were investigated through a light trapping and field observations during 2014 and 2015 cropping seasons. The first larvae were observed on cowpea in August, with incidence of 0.03 ± 0.03 to 2.48 ± 0.32 larvae per flower and pod, respectively. Levels and duration of cowpea infestation varied between the seasons, and the rates of precipitation: yield losses were 20.25% in 2014 and 82.32% in 2015, with 435 mm and 496 mm total rainfall, respectively. Developmental and lifecycle evaluated in the laboratory revealed a developmental period of 26.42 ±0.14 days, with adult females living for 16.38 ± 0.56 days and producing 599.74 eggs.

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EVALUATION OF INSECTICIDES AGAINST MANGO HOPPERS *AMRITODUS ATKINSONI* AND *IDIOSCOPUS CLYPEALIS*

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ABSTRACT

Field experiments were conducted during 2015-16 to evaluate the efficacy of certain insecticides against mango hoppers *Amritodus atkinsoni* and *Idioscopus clypealis*. Imidacloprid was observed to be the most effective with no leafhoppers even 21 days after application; and it was on par with thiamethoxam (0.02), acetamiprid (0.15) and carbosulfan (0.76). Buprofezin (1.23) and fipronil (1.54) were the next best. Based on fruit yield, the order of efficacy was: imidacloprid (with 75.33 kg/tree) > thiamethoxam> acetamiprid> carbosulfan >buprofezin >fipronil as against 44.50 kg/tree in untreated control.

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FUMIGANT TOXICITY OF SOME PLANT VOLATILE OILS AGAINST PULSE BEETLE *CALLOSOBRUCHUS MACULATUS*

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ABSTRACT

Fumigant toxicity of five plant volatile oils viz., ginger oil (*Zingiber officinale*), patchouli oil (*Pogostemon cablin)*, garlic oil (*Allium sativum*), cinnamon oil (*Cinnamomum zeylanicum*) and lemon oil (*Citrus limon*) were evaluated at 0.01%, 0.05%, 0.1%, 0.5% and 1.0% concentrations against the egg, larva, adult of the pulse beetle *Callosobruchus maculatus* and their effect on the oviposition was evaluated. The results revealed that the fumigant toxicity indicated by the lowest egg hatching of 10% was observed with 1.0% concentration of *C. zeylanicum* and *Z. officinale*; and also maximum larval mortality of 90% was observed. The adult mortality was 90% with *C. zeylanicum* oil at 1.0% and 72.50% with *Z. officinale* oil at 1.0%. *C. zeylanicum* and *Z. officinale* at 1.0% concentration also resulted in minimum oviposition of 3.00 and 4.25 eggs, respectively in contrast to 74 to 78 eggs in untreated control.

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EFFICACY OF TRANSGENIC TOBACCO CARRYING SYNTHETIC PLANT-PREFERRED CODON-OPTIMIZED NOVEL *Vip3Aa44* GENE TOWARDS *HELICOVERPA ARMIGERA* AND *SPODOPTERA LITURA*

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ABSTRACT

Vip3A proteins are synthesized during vegetative growth of *Bacillus thuringiensis* and are toxic against a wide range of lepidopteran insects. Since the mode of action of Vip3A toxins is different from Cry proteins, Vip3A proteins are good candidates for gene pyramiding in transgenic crops to combatdevelopmentofresistance against the currently deployed genes. A synthetic plant-preferred codon-optimized novel *vip3Aa44* gene (NCBI accession number HQ650163) was cloned into *pBINAR* plant transformation vector and tobacco explants were transformed with leaf disc co-cultivation method to evaluatetoxicity of this gene against *Helicoverpa armigera* and *Spodoptera litura*. The putative transgenics were confirmed by PCR and RT-PCR analysis. The bioassayswere performed on detached leaves from putative transgenics using lab-grown population of *H. armigera* and *S. litura*. Mortality after 72 hr ranged from 30-56% for *H. armigera* and 40-60% for *S. litura*, indicating potential of *vip3Aa44*gene against these lepidopteran pests in transgenic development.

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EFFICACY OF INSECTICIDES AGAINST MUSTARD APHID *LIPAPHIS ERYSIMI*

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ABSTRACT

Field experiment was conducted to evaluate the efficacy of insecticides against mustard aphid *Lipaphis erysimi* (Kalt.) on mustard. Significant reduction in population was obtained with imidacloprid 17.8SL followed by acetamiprid 20SP and thiamethoxam 25WG. Thus, reduction in aphid population was to an extent of 65.83% with imidacloprid 17.8SL followed by thiamethoxam 25 WG and acetamiprid 20 SP. The maximum yield

was obtained with acetamiprid followed by imidacloprid and thiamethoxam. NSKE 5% was found to be the least effective. Maximum benefit/cost ratio (5.65:1) was obtained with acetamiprid 20SP.

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SCREENING FOR RESISTANCE TO MUSTARD APHID *LIPAPHIS ERYSIM*I (KALT.)

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ABSTRACT

Screening of 22 varieties/lines of Indian mustard (*Brassica juncea* L.) for their resistance to mustard aphid, *Lipaphis erysimi* (Kalt.) was carried out at the Department of Entomology and Agricultural Zoology, Institute of Agricultural Sciences**,** Banaras Hindu University, **Varanasi. The lines NDR08-14-1, NDR08-1, MCN14-33, MCN14-31, NDR1-11, MCN14-24, MCN14-23, MCN14-27, and NDR07-2 were observed with the least aphid population and thus proved to be resistant. Variety/ lines NDR8501, MCN14-32, NDR-7, MCN14-25, MCN14-29 and VARUNA were observed to be moderately resistant, while NDRS 2010, DIVYA-33, MCN 14-30 were susceptible, with lines NDRS 9-2 and NDRS 2001-1 being highly susceptible. The maximum yield was obtained from the line NDR08-14-1 (13.14 q/ha) in comparison to the line NDRS2001-1 with the least yield (6.71 q/ha)**.

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OVARIAN DEVELOPMENT IN *BACTROCERA CUCURBITAE* COQUILLETT AS INFLUENCED BY DIET

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ABSTRACT

To enable mass rearing of the melon fly, *Bactrocera cucurbitae* Coquillett, as study was undertaken to evaluate dietary constituents comprising of honey, water, protein hydrolysate and yeast powder. Different diets were prepared consisting of protein hydrolysate (1 g, 3 g, 5 g, and 7 g) and yeast powder (5 g, 10 g, 15 g, and 20 g) mixed in 5 ml honey and water 100 ml. Of these, the two diets viz., protein hydrolysate 7 g + honey 5 ml + water 100 ml and yeast powder (10 g + honey 5 ml + water 100 ml) were found equally effective in terms of ovary development and ovarian index, when

dissected at 5th, 10th, 15th and 20th day after adult eclosion. In case of protein hydrolysate 7 g, the ovarian index was 0.38 mm^2, 1.75 mm^2, 3.57 mm^2, and 4.04 mm^2 at 5th, 10th, 15th and 20th day, respectively and in case of yeast powder 10 g the ovarian index was 0.39 mm^2, 1.77 mm^2, 3.63 mm^2, and 4.10 mm^2 at 5th, 10th, 15th and 20th day, respectively, after adult eclosion. In both the treatments, the ovary length and breadth were also significantly more in comparison to other treatments, consisting of different quantities of protein source. Thus, the diets containing 7 g protein hydrolysate and 10 g yeast powder were the most suitable diets for mass rearing of *B. cucurbitae.*

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EFFICACY OF DINOTEFURAN 20%SG AGAINST MAJOR PLANTHOPPERS OF RICE

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ABSTRACT

The efficacy of dinotefuran 20%SG was evaluated against white backed plant hopper (WBPH) and brown plant hopper (BPH) in rice during 2016 and 2017. Doses of 30, 40 and 50 g a.i. along with imidacloprid 17.8 SL and quinalphos 25 EC @ 20 and 500 g a.i. ha^{-1}, respectively were compared. The results revealed that dinotefuran @ 40 and 50 g a.i. ha^{-1} proved significantly better (1.70- 2.04 WBPH /hill; 2.02- 2.61 BPH/hill) at 5, 7 and 10 days after spray as compared to imidacloprid (2.75- 4.29 hoppers/hill); quinalphos (3.32- 4.91 hoppers/hill) and untreated control (17.78- 26.67 hoppers/hill) across all locations evaluated. The grain yield ha^{-1} was also significantly more with these treatments.

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TOXICITY OF PLANT VOLATILE OILS AGAINST *CALLOSOBRUCHUS MACULATUS*

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ABSTRACT

Five plant volatile oils were evaluated against adults of *Callosobruchus maculatus* with fumigation and contact toxicity methods. Patchouli oil gave the lowest LC_{50} value and thus the most toxic one, followed by cinnamon oil. The descending order of contact toxicity in LC_{50} values was: patchouli oil (0.033%) > cinnamon oil (0.082%) > ginger oil (0.122%) > garlic oil (0.217%) > lemon oil (0.334%). The order of relative toxicity was as: patchouli oil (10.12) > cinnamon oil (4.07) > garlic

oil (1.53) > ginger oil (1.26) > lemon oil (1.00) as revealed by the contact toxicity. As regards fumigant toxicity the order with LC_{50} values was: cinnamon oil (0.060%) > ginger oil (0.243%) > lemon oil (1.442%) > patchouli oil (8.358%) > garlic oil (187.416%). In terms of relative toxicity it was: cinnamon oil (3123.6) > ginger oil (771.25) > lemon oil (129.96) > patchouli oil (22.42) > garlic oil (1.00) with fumigation method.

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OLFACTORY RESPONSES OF BANANA PSEUDOSTEM WEEVIL *ODOIPORUS LONGICOLLIS* OLIVIER TO AGGREGATION PHEROMONE AND HOST PLANT VOLATILES

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ABSTRACT

Banana pseudostem weevil *Odoiporus longicollis* Olivier (Coleoptera: Curculionidae) is an important pest of banana. In this study, male produced aggregation pheromone was identified as 2-methy-4-heptanol (2M4H) which attracts both male and female. In order to achieve higher attraction for field trapping, an aggregation pheromone (2M4H), host plant extract (HPE) and combination of 2M4H + HPE were evaluated under laboratory conditions with wind tunnel bioassay. Maximum weevil attraction was observed in the descending order of: 2M4H + HPE > 2M4H > HPE, suggesting a better synergistic effect of host plant extract on pheromone.

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EFFICACY OF INSECTICIDES AGAINST CERAMBYCIDS IN MULBERRY

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ABSTRACT

The infestation of cerambycids especially *Apriona germari* and *Batocera rufomaculata* on mulberry in Jammu and Kashmir poses serious threat to silkworm, *Bombyx mori*. Hence, five insecticides viz., dichlorvos, endosulfan, imidacloprid, ethion, chlorpyriphos along with mixture of chlorpyriphos and cypermethrin were evaluated with injection in galleries at three doses for mortality of grubs. It was observed that the galleries formed by the larvae

got reduced with the injection of these insecticides; at 1% all were effective with dichlorvos ranking first but at 0.05% these were ineffective in causing mortality of the grubs.

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EFFICACY OF *HETERORHABDITIS INDICA* DERIVED FROM THREE HOSTS

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ABSTRACT

The efficacy in terms of virulence and longevity of the entomopathogenic nematode, *Heterorhabditis indica* produced from three hosts- *Galleria mellonella, Henosepilachna vigintioctopunctata* and *Bactrocera cucurbitae* was evaluated in this study. Application of *H. indica* progenies from different hosts to the fourth instar grubs of *H. vigintioctopunctata* showed that progenies from *G. mellonella* showed maximum efficacy with respect to virulence and longevity; it was followed by *H. vigintioctopunctata* and *B. cucurbitae*. Virulence in terms of pathogenicity and mortality and longevity (number of days of survival) were observed to be directly influenced by size of the host; and larger parents were able to produce more efficient *H. indica* offspring.

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GENETIC DIVERSITY OF *CONOGETHES* (LEPIDOPTERA: CRAMBIDAE) SPECIES COMPLEX INFESTING CASTOR AND CARDAMOM

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ABSTRACT

Genetic diversity of *Conogethes* species infesting castor and cardamom was studied using mitochondrial cytochrome oxidase I gene. Phylogenetic analysis of *Conogethes* populations collected from different locations gave results of two distinct clades. The pair-wise genetic distance analysis between the individuals varied from 0.000 to 0.076, this

indicates the presence of high genetic divergence within the *Conogethes* populations. The maximum intra-specific pair-wise distance in *Conogethes* bred on castor was 0.010 when compared to the maximum intra-specific distance of *Conogethes* bred on cardamom 0.072. The nearest neighbour distance between *Conogethes* bred on castor and cardamom was 5.23 percent, indicating wide genetic variability between two *Conogethes* populations. Two distinct phylogenetic clades and higher genetic divergence of more than 5 percent between *Conogethes* population on castor and cardamom were obtained. This clearly suggests that the variation in *Conogethes* population breeding on castor and cardamom are genetically heterogeneous and are two different species. It is now confirmed that *C. sahyadriensis* infest cardamom and *C. punctiferalis* infest castor.

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SEASONAL INCIDENCE OF WHITEFLY *BEMISIA TABACI* IN BRINJAL

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ABSTRACT

The experiment was conducted at AICRP on Water Management, VNMKV, Parbhani, to study the seasonal incidence of whitefly *Bemisia tabaci* (Genn.) on brinjal during 2nd to 13th meteorological weeks (MW) of summer 2014 and 50th to 9th meteorological weeks of summer 2015. The results indicated that the population was more from second week of January to last week of March (2nd to 13th MW) and third week of December to first week of March (50th to 9th MW). The first peak of 23.00 whitefly/ plant occurred during 7th MW (12 to 18 February) in summer 2014 and during summer 2015, the maximum population of 23.50 whitefly/ plant was observed during 6 to 12th February.

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EFFICACY OF INSECTICIDES AGAINST POMEGRANATE THRIPS *SCIRTOTHRIPS DORSALIS* (HOOD)

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ABSTRACT

A field trial was conducted to evaluate insecticides against the pomegranate thrips *Scirtothrips dorsalis* (Hood) at the Central Horticultural Nursery, Department of Horticulture VNMKV, Parbhani, Maharashtra. The insecticides evaluated include spinosad 45SC, fipronil 5SC, lamdacyhalothrin 5EC, clothianidin 50 WDG, thiamethoxam 25WG, imidacloprid 17.8SL, nitenpyram 10WSG, acetamiprid 20SG, thiacloprid 21.7SC and dinotefuran 20SG. The study revealed that all these were superior, of which the most effective was spinosad followed by fipronil and lamdacyhalothrin, and dinotefuran was the least effective, though significantly superior over control.

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EFFICACY OF INSECTICIDES AGAINST MANGO HOPPERS AND THEIR PREDATORY COCCINELLIDS

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ABSTRACT

An experiment conducted at the AICRP on Water Management, VNMKV, Parbhani, during 2014 and 2015 evaluated the efficacy of insecticides against mango hoppers *Amritodus atkinsoni* L. and their natural enemies. Amongst the eight insecticides evaluated thiamethoxam, clothianidin and dinotefuran were found to be effective against mango hopper. Flonicamid, acetamiprid and imidacloprid were found to be moderately effective, and buprofezin and dinotefuran were the least effective. Flonicamid, buprofezin and thiamethoxam were observed to be comparatively safe to lady bird beetles.

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ARCHIPS MACHLOPIS (MEYRICK) (TORTRICIDAE: LEPIDOPTERA) - OCCURRENCE ON GARLIC

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ABSTRACT

The present observations on the occurrence of *Archips machlopis* (Tortricidae: Lepidoptera) on garlic (*Allium sativum*) is a new host record and it was observed during *rabi* 2018 at Pune. Larvae were observed tying the adjacent leaves of plants and feed from within, and hence referred to as leaf-tiers. Larva has a brown prothoracic shield, and a

narrow white line that demarcates the head capsule. Adult moths cryptically coloured, forewings grey, brown, rust, or tan coloured, with wings held in a characteristic a flattened roof fashion at repose; forewings have a prominent round-pointed apex. Pupa dark brown to black with cremaster elongate and tapered, enclosed within a dense web of silk. Mild to moderate level of infestation (5-8% damage) with typical leaf-tying and scraping symptom was observed.

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EFFECT OF SORGHUM GRAIN QUALITY ON PROGENY EMERGENCE OF *SITOPHILUS ORYZAE* L. (COLEOPTERA: CURCULIONIDAE)

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ABSTRACT

In this study, 20 sorghum *Sorghum bicolor* (L.) Moench germplasm lines had been evaluated for their resistance to the stored grain pest, *Sitophilus oryzae* (L.). Observations were made on grain damage and weight loss, inhibitory effect of gut α-amylases, adult mortality and progeny emergence. The results reveal that grain weight loss and α-amylase inhibitory effect are the most significant factors that influence the progeny emergence. The resistant germplasm line IS 920 exhibited minimum grain weight loss (8.2%) and maximum α-amylase inhibitory effect resulting in significantly lesser progeny emergence along with least grain damage (17%). The inhibitory effect of enzyme inhibitors isolated from sorghum, when examined on gut α-amylase it was observed that amylase inhibitors inhibited *S. oryzae* α- amylases appreciably; maximum inhibition being for IS 920 (82.8%) indicating that these α-amylase inhibitors could be used in IPM. The two parameters viz., grain weight loss and α-amylase inhibitory effect could be relied upon for selecting the resistant genotypes against *S. oryzae* in sorghum.

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EFFECT OF HOST PLANT ON GROWTH, TISSUE PROTEINS AND GUT ENZYMES OF PINK BORER *SESAMIA INFERENS*

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ABSTRACT

In this study, pink borer *Sesamia inferens* (Walker), a polyphagous insect and a major pest on millets is explored for analysing the influence of host plants on the growth, tissue proteins and midgut digestive enzymes of their larvae. The impact of feeding on different food plants on the activity of amylase, trehalase, and invertase in the midgut of the final instar larvae were assayed *in vitro*. The results showed that the larval feeding on the five millet hosts had significant effect on body mass, with maximum body mass being achieved when larvae fed on sorghum (0.214 g). Significantly more enzyme activity of amylase was observed in the larvae fed on *finger millet.* The activity of amylase, invertase and trehalase fed on *pearl millet* was relatively low. The results indicated that the larvae of *S. inferens* had more capability to utilize *sorghum, finger millet and barnyard millet,* suggesting that these plants could become their host plants.

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LIFETABLES OF *APROAEREMA MODICELLA* DEVENTER ON SOYBEAN AND SOYBEAN INTERCROPPED WITH PIGEONPEA

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ABSTRACT

Field lifetables were prepared for determining mortality factors of leaf miner *Aproaerema modicella* Deventer on sole soybean and soybean intercropped with pigeonpea during *kharif* 2015. It was observed that the *A. modicella* completed three regular overlapping generations on sole soybean and as well on soybean intercropped with pigeonpea. Lifetable of field collected life stages revealed that late instar larval and pupal stages were the most vulnerable ones for mortality due to unknown reasons (predation and adverse climatic factors). The natural enemies viz., *Apanteles* sp. and *Goniozus* sp. also contributed some degree of mortality in larvae. Maximum larval parasitization was observed with intercropped soybean. The negative values of trend index (<1) during the second and third generations showed that the mortality factors were effective in causing decline. The generation survival rate on sole soybean was 0.65, 0.70 and 0.63 got reduced to 0.53, 0.69 and 0.62 on intercropped soybean, in the 1st, 2nd and 3rd generation, respectively. Thus, soybean intercropping with pigeonpea exhibited positive significant impact on key mortality factors of *A. modicella*.

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INCIDENCE OF THE FALL ARMY WORM *SPODOPTERA FRUGIPERDA* (J.E. SMITH) AT UDAIPUR IN MAIZE

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ABSTRACT

The fall army worm, *Spodoptera frugiperda* (J.E. Smith) incidence on maize during the monsoon season was confirmed at Udaipur, and its infestation was 19±3.35 to 20±5.59 plants/ 100 m^2. The spatial distribution pattern of the larvae was uniform or close to random, rather than aggregated. The mean crowding index ranged from 9.63 to 25.27 and the Lloyd's index was close to 1.0.

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ASSESSMENT OF LOSSES CAUSED BY SESAME LEAF WEBBER AND CAPSULE BORER *ANTIGASTRA CATALAUNALIS* (DUPONCHEL)

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ABSTRACT

A study was conducted during *kharif* seasons of 2016 and 2017 at the Chaudhary Charan Singh Haryana Agricultural University, Hisar to study the quantitative and qualitative losses by the infestation of sesame leaf webber and capsule borer, *Antigastra catalaunalis* in HT-1 and HT-2 variety of sesame. The experiment was conducted under both protected and unprotected conditions in paired plot design with three replications. Plot size was kept 2.7 x1.8 m^2 and distance between row and plant was maintained at 30 and 10 cm during each season. Pooled data of both years revealed that pod damage in both the varieties varied from 19.72 to 21.62% under unprotected condition while in protected condition it varied from 3.02 to 3.12%. Maximum yield was recorded in HT-2 (921.42 kg/ha) under protected condition while minimum yield was observed in HT-1 (521.48 kg/ha) followed by (555.27 kg/ha) under unprotected condition. Avoidable yield loss due to *A. catalaunalis* was 35.16 and 39.73% in the varieties HT-1 and HT-2, respectively after three sprays of quinalphos. Total protein and crude fat contents of seeds obtained from damaged pods were significantly lower in both varieties viz., HT-1 and HT-2 as compared to seeds obtained from undamaged pods. This is a big impact on the nutritional quality. However, fibre, ash and moisture contents were not affected to that extent. Our study ample justify that pest should be controlled in order to avoid the reduction in oil quality and quantity.

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EVALUATION OF CERTAIN NEW INSECTICIDE MOLECULES AGAINST *IDIOSCOPUS CLYPEALIS* ON MANGO CV.ALPHONSO

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ABSTRACT

This study compares the efficacy of certain new insecticide molecules with neonicotinoid and pyrethroid insecticides against the mango hopper *Idioscopus clypealis* on the cultivar Alphonso in on farm trial at Railway Kodur, YSR Kadapa District during 2015-16 and 2016-17. The results reveal that though all the treatments were significantly superior, maximum reduction in hopper population was obtained after 10, 15 and 21 days after spray with buprofezin 25SC compared to imidacloprid, thiomethoxam, lambda cyhalothrin, bifenthrin, pymetrozine thiamethoxam 12.6%+ lambda cyhalothrin 9.5 ZC, except at 1 and 7 days after spray. Thus, the results reveal that buprofezin is consistent in reducing hoppers population for a longer duration.

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BIOLOGY OF PINK PINEAPPLE MEALYBUG *DYSMICOCCUS BREVIPES* (COCKERELL)

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ABSTRACT

Biology and morphometrics of *Dysmicoccus brevipes* (Cockerell) (Hemiptera: Pseudococcidae) was studied on pineapple in the AINPAO (All India Network Project on Agricultural Ornithology) laboratory, College of Horticulture, Kerala Agricultural University, Vellanikkara. The study was conducted between November 2015 to January 2016. The life cycle was completed within 63.4±1.5 days. First instar nymphs lasted for 10.8±0.67 days while, the second instar was for 13.7±0.65 days; both these were similar except for slight variation in size; and third instar lasted for 15.6±0.58 days. Adult females lived for 23.2±0.78 days, and males were absent, with females parthenogenetic and ovoviviparous. The pre-larviposition period was 8.7±0.78 days and larviposition period lasted for 4.5±0.51, with number of nymphs/ female being 144.5±15.1.