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EFFECT OF TOBACCO *NICOTIANA RUSTICA* AGAINST CABBAGE APHID *BREVICORYNE BRASSICAE*

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ABSTRACT

A field experiment was conducted on three cabbage varieties in Amhara Region, Ethiopia for evaluating extracts of *Nicotiana rustica* against cabbage aphid *Brevicornye brassicae*. The crude extracts of leaves at 2.5, 5, 7.5 g and diazinon 60%EC were evaluated, which revealed a dose dependant effect on aphid mortality. It was observed that the local variety carried more aphids. The variety Thomas gave maximum yield at 7.5 g of the tobacco extract. It was observed that aphid abundance significantly varied with variety with local variety being more susceptible.

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POTENTIAL OF SOME INDIGENOUS FILICINOPHYTES OF MANIPUR AGAINST *PLUTELLA XYLOSTELLA* L.

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ABSTRACT

Use of plant extracts against crop pests is a traditional in NE India, but evaluation of their efficacy against major crop pests are lacking. In this context, aqueous extract of fresh leaves of eight species of filicinophytic ferns of Manipur were evaluated against diamond back moth (DBM), *Plutella xylostella* L. in cabbage. Based on the parameters studied viz., leaf consumption, larval mortality, larval- and pupal duration, larval- and pupal growth, pupation success, adult emergence, growth index and degree of protection imparted to cabbage leaves against the attack of DBM larvae, it was observed that aqueous extract of *Diplazium esculentum* was the most effective. *D. esculentum* caused highest mortality of DBM larvae with least consumption of leaves leading to maximum protection. This fern species has some other desirable attributes in relation to life parameters of DBM.

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EFFICACY OF NEWER AND NEONICOTINOID INSECTICIDES AGAINST WHITEFLY *BEMISIA TABACI* ON VEGETABLES

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Whitefly *Bemisia tabaci* (Gennadius) is an important sucking insect pest of vegetables and against this pest fifteen insecticides belonging to neonicotinoid, organophosphate, synthetic pyrethroid and new green chemistries were evaluated. The evaluation was done with laboratory and field collected populations with leaf dip bioassay. Significant variations in the susceptibility of the two populations were observed, and the population collected from field was less susceptible to the neonicotinoid, organophosphate and synthetic pyrethroids. The newer insecticides like flonicamid 50WG, spirotetramate 15OD, diafenthiuron 50WP, sulfoxaflor 240SC, cyantraniliprole 10OD, flupyridifurone 200SL and spiromesifen 22.9SC proved to be the most effective against field collected population (mortality of 100,100,97.78, 96.30, 87.92, 78.89 and 66.03%, respectively), as compared to neonicotinoid and conventional insecticides. These newer molecules with novel mode of action could be used as an effective alternative for neonicotinoids against whitefly in vegetables crops.

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SEASONAL INCIDENCE AND MANAGEMENT OF ONION THRIPS *THRIPS TABACI* L. ON MARIGOLD

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ABSTRACT

Studies were conducted on the seasonal incidence of *Thrips tabaci* L. during 2014-15 at the University Research Farm, Sher-e-Kashmir University of Agricultural Sciences and Technology-Jammu. The incidence of *T. tabaci* was 0.68 thrips plant^{-1} in the 7th standard week and reached its maximum 3.49 thrips plant^{-1} in the 12th standard week. The mean maximum temperature (r = 0.721) and minimum temperature (r = 0.768**) had positive but highly significant effect on thrips population. The mean relative humidity (morning) (r = -0.627*) and rainfall (r = -0.393*) had negative significant effect, while as mean relative humidity (evening) (r = -0.502) had negative effect. The evaluation of efficacy of insecticides against *T. tabaci* revealed that thiamethoxam 25EC (0.100%) was the most effective followed by imidacloprid 200SL (0.008%), methyl-o-demeton 25EC (0.030%), carbosulfan 250EC (0.003%), neem oil 5% (0.050%), novaluron 10EC (0.100%) and bifenthrin 10EC (0.050%).**

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EFFECTS OF HOSTS, TEMPERATURE AND HUMIDITY ON THE BIOLOGY OF *LOCASTRA MUSCOSALIS* WALKER (LEPIDOPTERA: PYRALIDAE)

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ABSTRACT

The effect of availability of host plant, temperature and humidity were studied on the biology and seasonal history of *Locastra muscosalis* Walker (Lepidoptera: Pyralidae). Among the three hosts viz., Pistacia, apple and poplar evaluated, Pistacia was the most preferred host. The biology when evaluated on these hosts revealed there are five larval instars, with their morphology being similar. However, the larval duration was maximum when reared on poplar, and fecundity was maximum with the females reared on apple. When reared at 25±1ºC, at a relative humidity of 60%, the larvae were darker than those reared under ambient conditions. Some more differences in biology were also observed.

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POPULATION DYNAMICS OF PESTS ON *JASMINUM MULTIFLORUM*

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ABSTRACT

***Jasminum multiflorum* is infested majorly by bud borers, eriophyid mite, shoot web worm and thrips. Study on the population dynamics of these focusing on their seasonal incidence, correlation and multiple regression analyses with weather factors was carried out at the Regional Horticultural Research and Extension Centre and Department of Entomology, College of Horticulture, Bengaluru. The results revealed that morning relative humidity was the best predictor of bud worm incidence with significant negative correlation. Similarly, rainfall was identified for the shoot web worm with positive correlation, maximum temperature for thrips**

with positive correlation, and both morning and evening relative humidity for eriophyid mite with negative correlation. The incidence of bud and shoot worm had no significant correlation with any of the considered weather parameters.

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EVALUATION OF TOXIC EFFECTS OF *CATHARANTHUS ROSEUS* L. EXTRACT IN *DROSOPHILA MELANOGASTER* M. WITH WING CONTOUR BIOASSAY

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ABSTRACT

An attempt was made to evaluate the toxic effects of *Catharanthus roseus* extract in *Drosophila melanogaster* using wing contour bioassay. The battery toxicity assays helped to demonstrate the chemotactic behavioral response of the intoxicated *D. melanogaster* larvae. Wing contour bioassay results showed that both dose and exposure time governs the toxicity effects in *D. melanogaster* larvae. The wing traits showed sound variation in lower dose than in 1.5mg/ml. In higher dose the organism refuses to feed the intoxicated medium and fail to move because of the paralyzing action of the *C. roseus* bioactive compounds. There was a slight decrease in the wing length and width and the vein intersection points showed slight tendency of dextral rotation. Hence the current study results clearly reveal that higher doses of ethnopharmaceuticals can cause a very strong impact which is similar to that of xenobiotics on organisms.

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REPELLENT AND REPRODUCTIVE INHIBITORY EFFECTS OF *STRYCHNOS NUXVOMICA* L. AND *LEPIDIUM SATIVUM* L. AGAINST *SITOPHILUS ORYZAE* (L.) (COLEOPTERA: CURCULIONIDAE)

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ABSTRACT

In order to use eco friendly alternatives to chemical insecticides for the management of rice weevil *Sitophilus oryzae* L., hexane, ethyl acetate and methanol plant extracts from the leaves of *Strychnos nuxvomica* L., *Lepidium sativum* L. and *Azadirachta indica* A. Juss. were evaluated for

repellent (area preference method) and reproductive inhibitory activities. Results showed that all the plant extracts were repellent at doses between 78.4 and 235.8 µg/cm^2 after 1, 6, 24, 48 and 72 h exposure. In repellency tests, hexane and ethyl acetate extracts of *A. indica* (>90.0%) followed by *L. sativum* (87.3%) were found to be the most effective compared to the extracts of *S. nuxvomica* at 235.8 µg/cm^2. In majority of the plant extracts, the per cent repellency increases from 6 to 24 h and then decreases gradually whereas in neem extracts the repellent activity exists even after 72 h. All the plant extracts significantly reduced F_1 progeny emergence compared to untreated control. At 7.5%w/w, ethyl acetate extract of *S. nuxvomica* (96.3%), and hexane extract of *L. sativum* (95.3%) effectively suppressed the F_1 progeny production followed by hexane and methanol extracts of *A. indica* (94.2%, 90.5%), respectively. The present work indicated that the plant extracts from Indian origin were potential grain protectants against *S. oryzae*.

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TOXICITY OF INSECTICIDES TO *PLUTELLA XYLOSTELLA* (L.) AS INFLUENCED BY THE SEX OF LARVAE

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ABSTRACT

Diamond back moth, *Plutella xylostella* L., the most destructive pest of Brassica vegetables, has developed field resistance to all major classes of insecticides. In the present study, the known larval sexual dimorphic character of *P. xylostella* was exploited to evaluate variability in toxicity of insecticides. Amongst the conventional insecticides, cypermethrin's LC_{50} value (a.i.) was 19.22 ppm (in male) and 28.42 ppm (in female), respectively. Likewise with chlorpyriphos it was 14.69 and 28.81 ppm, respectively. Similar variations with sexes of larvae were observed with thiodicarb and indoxacarb. Amongst the newer insecticides, emamectin benzoate gave an LC_{50} of 0.84 ppm (male) and 0.90 ppm (female), while it was 0.29 ppm and 0.22 ppm, respectively with flubendiamide; with chlorantraniliprole it was lower (0.11 ppm in male), and higher of 0.15 ppm (in female). With spinosad it was an LC_{50} of 0.51 ppm and 0.40 ppm, in male and female, respectively. Cypermethrin, chlorpyriphos, thiodicarb, indoxacarb, emamectin benzoate and chlorantraniliprole registered lower LC_{50} values against male larvae, whereas, flubendiamide and spinosad registered higher LC_{50} values against female larvae. However, these LC_{50} values were statistically at par indicating no significance in sexes as regards toxicity of insecticides.

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REPRODUCTIVE POTENTIAL OF PARTHENOGENETIC *BEMISIA TABACI* WITH DIFFERENT BACTERIAL ENDOSYMBIONTS

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ABSTRACT

***Bemisia tabaci* is a polyphagous agricultural pest and it has varied genetic groups harboring different bacterial endosymbionts. Many studies had revealed the reproductive potential of *B. tabaci* with different endosymbionts. But a comparative study showing the effects of endosymbionts on parthenogenetically reproducing (without mating) whiteflies resulting in only male progenies have not been conducted. This study evaluates the role of a secondary endosymbionts *Arsenophonus* on the life parameters of parthenogenetically reproducing Asia II genetic group with and without *Arsenophonus* (A^+ and A^-). The results revealed that A^- females had increased fecundity and nymphal developmental time and longevity. Thus, it is demonstrated that parthenogenetically reproducing A^+ whiteflies have lesser fitness as compared to A^- whiteflies.**

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POPULATION DYNAMICS OF *BEMISIA TABACI* IN OKRA

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ABSTRACT

Studies on population dynamics of whitefly *Bemisia tabaci* on okra crop in Delhi revealed two distinct peaks during 2015 (MSW 30, 21.67 whitefly/ 3 leaves and MSW 36, 17.33 whitefly/ 3 leaves, respectively) and 2016 (MSW 32, 19.67 whitefly/ 3 leaves and MSW 36, 14.67 whitefly/ 3 leaves, respectively). The observations revealed that rainfall (with correlation coefficients of -0.493 and -0.678** during 2015 and 2016, respectively) as the most important predictor of population among the abiotic factors evaluated. Both the generalist predators (biotic factors) were found highly correlated and well fitted in the prediction models. Results also revealed that rainfall, coccinellids and spider population jointly had a significant impact on *B. tabaci* population buildup in okra. Validation tests for the prediction models showed that the optimized prediction model $Y= 27.86413 + 0.04872(X_5) - 3.1155(X_7)$ ($R^2= 0.766^{**}$) and $Y= 21.72667 + 0.0209(X_5) - 3.48292(X_7) + 1.26738(X_8)$ ($R^2=0.781^{*}$) predicted *B. tabaci* population reasonably well. These models could be used for decision making in IPM, but subject to validation to improve their predictability.**

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SEASONAL OCCURRENCE OF ARTHROPODS AND INFLUENCE OF BIOTIC FACTORS ON APHIDS IN AONLA *EMBLICA OFFICINALIS* GAERTN IN EASTERN UTTAR PRADESH

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ABSTRACT

Indian gooseberry or *aonla* (*Emblica officinalis* Gaertn) is considered as a wonder fruit crop due to its medicinal and therapeutic properties from the ancient time in India. Owing to its versatile nature and adaptability to diverse soils and climatic conditions, *aonla* cultivation moved from forest confine to commercial production. A total of 31 and 28 arthropods were recorded, respectively, at various growth stages of *aonla* during 2013 and 2014 under prevailing agroclimatic conditions of eastern Uttar Pradesh. The arthropods observed grouped on the basis of their occurrence and period of activity at various growth stages. The natural enemies like coccinellids, syrphids, spiders, honey bees and black ants were also observed. The population of lady bird beetles, syrphid fly and spiders was found to be positively correlated to the population of aphid.

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MANAGEMENT OF WHITE GRUB *HOLOTRICHIA CONSANGUINEA* BLANCHARD IN PEARL MILLET BY SEED TREATMENT

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ABSTRACT

The study on management of white grub *Holotrichia consanguinea*) in pearl millet by seed treatment of new insecticide molecules was conducted at the Research Farm, Rajasthan Agricultural Research Institute (RARI), Durgapura, Jaipur, during *kharif* 2014 and 2015. The maximum protection over control, minimum plant damage and maximum yield was obtained through seed treatment with clothianidin 50 WDG @ 10 g/ kg seed followed by clothianidin 50 WDG @ 7 g/kg seed. The net income benefit cost ratio was maximum with imidacloprid 600FS @12 ml/ kg seed (24.80).

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BACTERIAL ENDOSYMBIONTS IN LIFE STAGES OF ASIA II-1 GENETIC GROUP OF *BEMISIA TABACI*

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ABSTRACT

Bacterial endosymbionts are present in majority of the agricultural pests and provide various physiological and ecological traits to its host. The beneficial traits are responsible for the success of these host insects in utilization of their plant hosts, in developing resistance to insecticides and in transmitting viruses as vectors. This study reveals the identification and localization of various bacterial endosymbionts, both primary (*Portiera*) and secondary (*Wolbachia*, *Rickettsia* and *Arsenophonus*) in the life stages of Asia II genetic group of whitefly *Bemisia tabaci* (Gennadius) deploying diagnostic polymerase chain reaction and technique of fluorescence *in situ* hybridization (FISH). The observation on the localization of bacterial endosymbionts was prominent in specialized cells called bacteriocytes in all the life stages of whitefly among the nymphs and adults.

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SEASONAL INCIDENCE OF *CALOPEPLA LEAYANA* LATR. (COLEOPTERA: CHRYSOMELIDAE) ON *GMELINA ARBOREA* AND ITS MANAGEMENT IN ARUNACHAL PRADESH

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ABSTRACT

The incidence of *Gmelina* defoliator, *Calopepla leayana* Latr., was studied on *Gmelina arborea* Roxb., during 2011 and 2012 at Pasighat, Arunachal Pradesh. The incidence was low during winter and gradually increased from March with highest infestation being during June to September. The activity of hibernating beetle started in March- April and increased as climate warmed up. The infestation exhibited positive correlation with rainfall, RH, maximum and minimum temperature. For its management, among biopesticides, *Melia azedarach* fermented leaves' extract was the best and was on par with cypermethrin and chlorpyriphos.

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SCREENING OF GREEN GRAM (*VIGNA RADIATA*) CULTIVARS AGAINST PULSE BEETLE (*CALLOSOBRUCHUS* SPP.)

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ABSTRACT

Evaluation of 100 cultivars of green gram *Vigna radiata* (L.) Wilczeck under no choice condition against three species of pulse beetle viz. *Callosobruchus maculatus* F., *C. analis* F., and *C. chinensis* L. was undertaken. Observations on the number of eggs laid on grain surface, emergence and mean development period (MDP) under storage conditions at 27±1.5℃ and 60% RH were made. On the basis of growth index value, out of 100 cultivars, 15 cultivars were selected for each species of bruchid. The results led to selection of five cultivars each as resistant, least susceptible and most susceptible ones.

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FOLIAGE FEEDING PESTS ON POTATO IN NORTHERN KASHMIR

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ABSTRACT

Observations were undertaken at Baramulla, Kupwara and Bandipora districts for two cropping seasons in 2011 and 2012. Incidence of insect pests revealed that foliage feeding pests appeared in 1st to 2nd week of May and attained peak in June in plains and midhills. Whereas, at high hills the pests appeared by the end of May to 1st week of June with peak incidence being from June to 1st week of July. The overall incidence was 57.77% at Yarikha (Baramulla) and Budnambal (Kupwara) followed by 23.33% at Gurez (Bandipora) in case of flea beetle. The least incidence (7.77%) was at Sumbal (Bandipora) for semilooper, which were absent at Budnambal (Kupwara) and Gurez (Bandipora). Pooled means revealed maximum severity (20.56%) for flea beetle (Scale 2) and the least at 5.06% (Scale-1) was observed at Yarikha (Baramulla); it was 24.81% and maximum (Scale 2) at Budnambal (Kupwara). 11.03% incidence for semilooper was the lowest (Scale 1) at Handwara (Kupwara) and 18.12% for flea beetle (Scale 1) at Gurez (Bandipora). It was 5.12% for semilooper as lowest (Scale 1) at Ajas location of Bandipora district.

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THE GENUS *EARIAS* (LEPIDOPTERA: NOLIDAE) ASSOCIATED WITH VEGETABLES FROM KARNATAKA

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ABSTRACT

A taxonomic account of species of the genus *Earias* Fabricius is provided. Three species viz., *E. cupreoviridis* Walker, *E. insulana* Boisduval and *E. vitella* Fabricius are redescribed for their morphological characters including genitalia along with a key.

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EFFICACY OF SPINETORAM AGAINST GREEN SEMILOOPER *CHRYSODEIXIS ACUTA* WALKER INFESTING SOYBEAN

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ABSTRACT

The field efficacy of spinetoram 12SC in two doses i.e. 375 and 450 ml/ha was evaluated along with other insecticides against green semilooper, *Chrysodeixis acuta* (Walker) infesting soybean during *kharif* 2011 and 2012. Application of spinetoram 12SC @ 450 ml/ha was found most effective (0.62 larvae/ m row length-mrl) followed by 0.73 larvae/ mrl with chlorantraniliprole 20SC @ 100 ml/ha and 0.89 larvae/ mrl in triazophos 40EC @ 800 ml/ha as compared to untreated control (3.67 larvae/ mrl). Maximum seed yield (2143 kg/ha) was obtained with spinetoram 12SC @ 450 ml/ ha followed by 1999 kg/ha in triazophos 40EC @ 800 ml/ha and 1978 kg/ha in profenophos 50EC @ 1250 ml/ ha as compared to 1495 kg/ha in control.

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MANGO FRUIT BORER *CITRIPESTIS EUTRAPHERA* (MEYRICK) IN SOUTH GUJARAT: NEED FOR DOMESTIC QUARANTINE

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ABSTRACT

An indigenous restricted fruit borer *Citripestis eutraphera* (Meyrick) (Lepidoptera: Pyralidae) was observed in south Gujarat causing extensive damage. Surveillance conducted in 2015 and 2016 at the Agriculture Experimental Station, NAU, Paria and farmers' fields revealed 5-45% infestation. Population dynamics with correlation studies revealed that sunshine hours influence its incidence in a positive manner (r= 0.673) whereas, rainfall showed a negative effect. The weather factors were observed to explain the variation in infestation to an extent of 48% and this forewarning model might provide decision support for its IPM.

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NATURAL ENEMY FAUNA OF PADDY AND HORTICULTURAL ECOSYSTEMS IN UPPER ASSAM

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ABSTRACT

Natural enemies of insect pests of rice, sugarcane, and a few selected *rabi* vegetables and their relative abundance were surveyed during 2014-15 and 2015-16. Sixteen numbers of spider species were found in rice ecosystem. Orthoptera, Coleoptera, Hemiptera, Diptera, Hymenoptera and Dermaptera were the dominant insect order as natural enemies in rice ecosystem. The common natural enemies *viz.*, were *Conocephalus longipennis* (de Haan), *Agriocnemis femina* Brauer, *Micraspis crocea* (Mulsant), *Cicindela undulate* Dejean and *C. melancholia*, predated upon different rice pests. However, larval parasitoid, *Cotesia* (*Apanteles*) *angustibasis* (Gahan) and egg parasitoid, *Trichogramma japonicum* Ashmead were more abundant in the rice ecosystem. On the other hand, *Metarhizium anisopliae* (Metchnikoff) Sorokin and *Beauveria bassiana* (Bals.- Criv.) Vuill., were the key entomopathogens observed against rice pests. In case of sugarcane, *Sturmiopsis inferens* Townsend and *Cotesia flavipes* (Cameron) were the common larval parasitoids of *Chilo infuscatellus* Snellen whereas *Cotesia flavipes* (Cameron) was the predominant one against *C. tumidicostalis* (Hampson); *Dipha aphidovora* (Meyrick), *Micromus igorotus* Banks and *Chrysoperla* spp. were the most common predators on *Ceratovacuna lanigera* Zehntner. *Spalgius epius* (Westwood) and chrysopids were observed on papaya mealybug. *Cotesia vestalis* (Haliday) parasitized the larva of cabbage butterfly, *Pieris brassicae* (L.). In cabbage, *Bhut jalakia* and okra ecosystem, *Coccinella septempunctata* (L.) and *C. transversalis* F., were the predominant predators.

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IMPACT OF ELEVATED CO_2 ON *NILAPARVATA LUGENS* (STAL), RICE CROP AND FEEDING OF *PARDOSA PSEUDOANNULATA*

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ABSTRACT

Effect of elevated CO_2 on brown plant hopper *Nilaparvata lugens* (Stal.) population was analyzed under open top chamber (OTC) at elevated CO_2 (570 ± 25 ppm) compared to ambient CO_2 (400± 25 ppm) during *kharif* 2015 and 2016. Elevated CO_2 exhibited positive effect on BPH that resulted in doubling of its population at peak incidence (120.2± 14.7 hoppers/ hill) than ambient CO_2 (61.8± 13.55 hoppers/ hill) during 2015. Similarly, during 2016, BPH peak population under elevated CO_2 was observed to be higher (149.2 ± 22.95 hoppers/ hill) than ambient CO_2 (93.2± 8.55 hoppers/ hill). Elevated CO_2 exhibited nutritive effect on uninfested rice plants through 6-8% increase in grain yield compared to ambient CO_2. However, despite the nutritive effect, rice plants under elevated CO_2 condition suffered higher yield loss (30-31.9%) due to more BPH population compared to plants grown under ambient CO_2 that had 17.7- 18.5% yield loss. Feeding behaviour of wolf spider, in relation to prey densities of 3^{rd}-4^{th} instar BPH nymphs was observed in microcosm under elevated and ambient CO_2. Under elevated CO_2, the predation rate (5.67±0.34 to 12.34±1.33 hoppers/ predator) was slightly higher than microcosm (4.67±0.33 to 10.0±1.0 hoppers/ predator).

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PATHOGENICITY OF ENTOMOPATHOGENIC BACTERIA ISOLATED FROM WHITE GRUB *BRAHMINA CORIACEA* ON ITS LIFESTAGES

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ABSTRACT

Six highly potential bacterial strains viz., *Bacillus cereus* strain CPRI14, *Psychrobacter pulmonis* strain CPRI4, *Bacillus pumilus* strain CPRI8, *Bacillus psychrodurans* strain CPRI3, *Novosphingobium capsulatum* CPRI12 and *Paenibacillus tylopili* strain CPRI7 isolated from grubs of *Brahmina coriacea* were evaluated on second and third instar grubs of *B. coriacea*. *Bacillus cereus, P. pulmonis, B. pumilus* and *B. psychrodurans* were evaluated on adult and egg

stages of *B. coriacea*. Pathogenicity tests were performed at 1.0x 10^8 cfu/ ml of broth. Mortality levels observed were 92.59% and 100% with *B. cereus* and 67.41 and 81.85% with *P. pulmonis* within 30 and 45 days, respectively. Similar trend was observed with third instar grubs and no or only few adults emerged from these. After 15 days, 83.33% beetle mortality was observed due to *B. cereus*.

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BROWN PLANT HOPPER (BPH) OUTBREAK IN RICE: ANALYSIS OF WEATHER PARAMETERS DURING OUTBREAK AND NON-OUTBREAK YEARS

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ABSTRACT

Brown plant hopper (BPH), *Nilaparvata lugens* (Stal.) population was observed to be in outbreak proportions at 542.0 and 756.9 hoppers/ hill during 2008 and 2013, respectively, compared to 2.5-62.5 hoppers/ during non-outbreak years. Weather parameters viz., total weekly rainfall (mm), weekly number of rainy days, daily morning, evening and mean relative humidity- RH (%), daily maximum, minimum and mean temperature (°C) and daily sunshine hours during 1998- 2013 were analysed. There existed maximum similarity during 2008 and 2013 with regard to weather factors, particularly number of rainy days and relative humidity; minimum temperature also did not differ significantly. Besides other factor, well distributed rainfall during June-September with more number of rainy days (> 30) that led to higher RH during 2008 and 2013 might have favoured faster multiplication of BPH, leading to its outbreak. Forecast on rainfall frequency during monsoon months can provide an important clue about likely scenario of BPH incidence.

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RELATIVE TOXICITY OF PHENOLICS AGAINST APPLE WOOLLY APHID *ERIOSOMA LANIGERUM*

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ABSTRACT

To test the relative toxicity of six phenolics a cut shoot bioassay was performed against the woolly apple aphid (WAA) *Eriosoma lanigerum* and to assess their role in resistance. The study revealed that none of the phenolics showed the toxicity compared to insecticide, imidacloprid

against both adult and nymph. The LC50 values of the phenolics against WAA adult varied from 0.714 to 2.906%. Phenolic, quercetin exhibited the highest toxicity to WAA adult with the least LC50 value of 0.720 found at par with phloridzin dihydrate (LC50, 0.720), rutin hydrate (LC50, 1.361). The least toxicity was observed with (−) - catechin (LC50, 2.906) and on par with epicatechin (LC50, 2.577) and chlorogenic acid (LC50, 1.581). The LC50 values of phenolics against nymph varied from 0.540 to 1.497%. Among phenolics the quercetin (LC50, 0.540) showed the highest toxicity against nymphs, found at par with phloridzin dihydrate (LC50, 0.592). The (−)-catechin (LC50, 1.497) showed the minimum toxicity and found on par with epicatechin (LC50, 1.309), rutin hydrate (LC50, 1.322) and chlorogenic acid (LC50, 1.471).

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REPORT OF INVASIVE PEST *TUTA ABSOLUTA* (MEYRICK) FROM *TARAI* AREA OF NORTH WESTERN HIMALAYAN REGION (UTTARAKHAND)

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ABSTRACT

The South American tomato pinworm, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) is an invasive pest of tomato and other solanaceous crops that is spreading around the world rapidly. This investigation is first reporting of this pest from *tarai* area of Uttarakhand which comes under North Western Himalayan region. A preliminary morphological observation and level of its infestation have been studied and found that this pest may infest the tomato crop in April-May grown under polyhouse condition up to 50-100% with 24.70 larva/ plant whereas its infestation in open field was 0-10% with 4.22 larva/plant.

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FAVOURABLE FACTORS FOR OUTBREAK OF RICE SWARMING CATERPILLAR IN DIBRUGARH, ASSAM

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ABSTRACT

An outbreak of rice swarming caterpillar, *Spodoptera mauritia* Boisduval occurred during *kharif*, 2012 in some parts of Dibrugarh district of Assam that caused considerable damage to rice crop in its vegetative stage. The outbreak was so severe that as high as twleve caterpillar were found at the base of rice plants in the day time during the peak period of outbreak in September and about 805 ha area of *kharif* rice was infested in Khowang and Tipling area. Moreover, mean larval population density/ m2 was observed at 36.80 during outbreak against 0.004 in non-outbreak year. Standard Precipitation Index (SPI) was studied to know whether the favourable factor as identified by the IRRI, Phillipines is playing a role. Pre-monsoon rainfall of 922.75 mm received during March - May, 2012 with intermittent dry spells was identified as the reason behind the pest buildup in alternate hosts and in nurseries of rice. SPI analysis of 35 weeks, including the outbreak period confirmed that spells of drought followed by heavy rain played the key role in outbreak. Altogether seven such favourable spells were identified during 35 weeks of study, of which six spells prevailed before the outbreak; the 1st one prevailing for 11 weeks might have played the crucial role in initiating the population buildup of the pest.

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MANAGEMENT OF BANANA LEAF AND FRUIT SCARRING BEETLE *NODOSTOMA VIRIDIPENNIS* MOTSCH IN ASSAM

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ABSTRACT

A three years field experiment was conducted at the Assam Agricultural University for evaluating the efficacy of few management strategies against banana leaf and fruit scarring beetle *Nodostoma viridipennis* on banana cv. Jahaji. Six strategies viz., foliar application of acephate @ 0.1125%, and @ 0.3%, tilling and clean cultivation+ foliar application of quinalphos @ 0.05%, tilling and clean cultivation+ foliar application of acephate @ 0.3 %, foliar application of acephate (0.11%) spray+ bunch cover with polypropylene bag, and application of *Beauveria bassiana* @10^9 cfu/ ml were evaluated along with an untreated control. Results revealed that all these significantly reduced the incidence, number of scars on leaf, fruit injury and increased the yield/ yield attributing characters. Foliar application of acephate (0.11%) spray + bunch cover with polypropylene bag was found to be the best in reducing the infestation of *N. viridipennis* and increasing the yield with the best benefit cost ratio.

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TEMPERATURE AND RELATIVE HUMIDITY ON THE BIOLOGY AND PARASITISM OF SOLENOPSIS MEALYBUG PARASITOID *AENASIUS BAMBAWALEI* (HYMENOPTERA: ENCRYTIDAE)

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ABSTRACT

Laboratory studies were conducted to find out the optimum combination of temperature and relative humidity for the development, longevity and parasitism of the parasitoid *Aenasius bambawalei* Hayat on its host *Phenacoccus solenopsis* Tinsley. The % parasitization was observed to be maximum in the treatment at 25±2^{0}C and 65±5% RH and it was the least at 20±2^{0}C and 45±5% RH. Shorter developmental period of 10 days was observed with the combined effect of 30± 2^{0}C and 45 ± 5% RH. Disregard of humidity regimes, developmental period at 20 ± 2^{0}C, 25 ± 2^{0}C and 30± 2^{0}C was found to be significantly different. In case of adult emergence, interactive effect of combination of temperature and humidity led to the least value of 24.85% at 20 ± 2^0 C and 45 ± 5% RH and maximum of 72.85% at 20 ± 2^{0}C and 65±5 % RH. The female sex ratio of *A. bambawalei* was observed to be the lowest (0.59) at 30± 2^{0}C and 45 ± 5% RH and the maximum (0.76) at 25 ± 2^{0}C and 65±5 % RH.

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FORAGING BY POLLINATORS IN PIGEONPEA

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ABSTRACT

The foraging initiation, cessation and duration/ day of the pollinators of pigeonpea were evaluated to estimate the optimum timing of pesticides application at blooming stage. The foraging initiation and cessation were observed on sunny days with normal temperature to bring out the foraging duration/ day. The longest foraging duration/ day and latest foraging cessation was of *Megachile lanata* Fabricius, and the least values for these were observed with *Xylocopa tenuiscapa* Westwood. Among pollinators of pigeonpea, *M. lanata* was the most arduous one.

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EVALUATION OF INSECTICIDES AGAINST STEM BORER AND LEAF FOLDER IN BASMATI RICE

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ABSTRACT

The field trials were carried out at PAU Krishi Vigyan Kendra, Gurdaspur during *kharif* 2015 and 2016 to evaluate the efficacy of chlorantraniliprole 20 SC, flubendiamide 480 SC, spinosad 45 SC and fipronil 80 WG @ 150, 50, 150 ml and 37.5 g/ ha, respectively against stem borers and leaf folder in *basmati* rice. All the insecticides significantly reduced the incidence of stem borers and leaf folder and minimized the yield loss. Pooled analysis indicated significant reduction in folded leaves (0.53%), dead hearts (0.91%) and white ears (1.10%) with flubendiamide @ 50 ml/ ha as compared with other insecticidal treatments. Flubendiamide was also safer to predaceous spiders and minimized the yield loss in *basmati* rice by 25%.

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EFFICACY OF INSECTICIDES AGAINST BLISTER BEETLE *MYLABRIS PHALERATA* (PALLAS) ON SOYBEAN

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ABSTRACT

The field experiment evaluated efficacy of insecticides against *Mylabris phalerata* (Pallas) with treatments viz. bifenthrin 62 g a.i./ha, lambda-cyhalothrin (encapsulated with polymers; Matadore) 24 g a.i./ha, chlorpyriphos 310 g a.i./ha+ cypermethrin 31 g a.i./ha, cypermethrin 62 g a.i./ha, neem oil 1500 ppm, permethrin 154 g a.i./ha, chlorpyriphos 173 g a.i./ha. After five days of spray, maximum efficacy was obtained from bifenthrin which was at par with lambda-cyhalothrin, permethrin, cypermethrin, chlorpyriphos+ cypermethrin and all these were significantly superior over chlorpyriphos and neem oil. After ten days of spray, maximum efficacy was again with bifenthrin which was at par with lambda-cyhalothrin, and these were significantly superior over rest of the treatments. Lambda-cyhalothrin was the effective and most lucrative.

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DIVERSITY AND ABUNDANCE OF INSECT POLLINATORS OF SWEET CHERRY *PRUNUS AVIUM* IN KASHMIR VALLEY

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ABSTRACT

The study was carried out in temperate conditions of Kashmir valley during 2013-2015. The patches of cherry crop were located in different landscape categories, and the maximum insect pollinator species richness of 45 was observed in Budgam, belonging to 5 orders, 31 families and 20 genera. Amongst these, the genus *Lasioglossum* was the most abundant flower visitor followed by the less abundant genera *Xylocopa* spp., *Andrena* spp., *Megachile* spp., *Syrphus* spp. and *Musca* spp. The maximum Simpson and Shannon diversity indices and Simpson's dominance were observed to be 8.319, 6.506 and 0.879, respectively in district Srinagar. The equitability index, Pielou's evenness, Nakamaru's richness, Menhinick's and Margalef's varied significantly across the landscapes studied. Species richness showed a corresponding and parallel increase with various indices estimated. The unequal distribution of species abundance on cherry allow the use of dominance index of Berger-Parker to express the proportion of individuals accounted for by the most abundant species (*Lasioglossum marginatum*) in each site. The mean dissimilarity coefficients of species richness were 6.57- halictid species (*Lasioglossum* spp.) exhibited hourly abundance commencing from early morning, but generally the pollinators increased in course of day, becoming maximum at mid day (χ^2=0.97, p-value≤0.05%), and decrease in afternoon (1400-1500hr) and the least was observed late afternoon (1500-1600hr). Hymenoptera was the most abundant of all the insect orders with rank (K) one and K-dominance of 0.683 followed by Diptera with rank value 2 and K-dominance value -0.958.

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SEASONAL INCIDENCE OF RICE YELLOW STEM BORER *SCIRPHOPHAGA INCERTULAS* (WALKER)

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ABSTRACT

Survey was carried out on the incidence of rice yellow stem borer *Scirpophaga incertulas* on two rice cultivars (Thanu and IT sanna) in two locations of Shivamogga district, i.e., Purle and Holehunnur areas during *kharif* 2016. Infestation in the form of dead hearts and white ear when analysed for seasonal variations, it was observed that dead hearts were maximum during the first week of August and white ears during the first week of September. Among the two locations, incidence was comparatively high in Purle area, and dead hearts and white ears were to an extent of 13.4 and 7.3% on Thanu cultivar; and it was 9.9 and 7.6% for IT (sanna) at the Holehunnur area, respectively.

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MINERAL COMPOSITION OF HAEMOLYMPH OF HONEY BEE BROOD INFESTED WITH VARROATOSIS

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OPTIMUM HEIGHT OF FOOD BAIT TRAPS FOR MELON FRUIT FLY (*BACTROCERACUCURBITAE* (COQUILLETT) IN CUCURBITS

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SCREENING OF WINTER SORGHUM GENOTYPES FOR MIDGE RESISTANCE

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CACAO TUSSOCK MOTH *ORGYIA AUSTRALIS POSTICA* WALKER IN NORTHEAST INDIA AND ITS MOLECULAR CHARACTERISATION

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POPULATION DYNAMICS OF BRINJAL SHOOT AND FRUIT BORER *LEUCINODES ORBONALIS* GUEN. IN HILL ZONE OF KARNATAKA

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