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HIGH ALTITUDE PAPILIONOIDEA (LEPIDOPTERA) OF AL-LAZZAB RESERVE IN SYRIA

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ABSTRACT

This paper reveals the altitudinal distribution of butterflies of Al-Lazzab reserve in Syria as inferred from the butterflies collected from March to October in 2009 and 2010. 136 had been observed of which a checklist is given. The relationship between the numbers of species and individuals and altitude was analysed. A significant relationship was observed between the altitude and the abundance and richness of butterflies. However, the diversity and evenness index yielded a semi-constant relation in altitude because of existence of a good few species at high altitudes.

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EFFECT OF BRASSICA VARIETIES ON CABBAGE APHID *BREVICORYNE BRASSICAE* L. (HOMOPTERA: APHIDIDAE)

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ABSTRACT

Cabbage aphid *Brevicornye brassicae* is a series pest of brassica crops in Ethiopia and this study evaluates the effect of seven brassica varieties on its preference and performance under greenhouse. The results revealed maximum number of aphids/ plant in *Brassica carinata* followed by *B. napus*, *B. niger* and *B. oleracea*. Shortest and longest developmental period were observed on Holeta-1 (6.4 days) and Kale (8.9 days), respectively. Likewise, the longest and shortest reproductive period were observed on *B. niger* (21.3 days) and Axana (15.7 days) respectively. Maximum fecundity was obtained with *B. niger* (79.5 nymphs/ adult) while the least was on cabbage (62.4 nymphs/ adult). The intrinsic rate of increase of *B. brassicae* was maximum with Holeta-1 (0.337days^{-1}) and the least with kale 0.239 days^{-1}. Thus cabbage aphid *B. brassicae* prefers to feed and reproduce on *B. carinata* varieties than others.

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RECORDS OF LADY BEETLES (COLEOPTERA: COCCINELLIDAE) FROM HILLY REGIONS OF NEPAL

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ABSTRACT

Twenty-six species of lady beetles (Coccinellidae) from 21 genera, 6subfamilies and 8 tribes, were observed occurring in the two hilly districts of Nepal viz., Lamjung and Kaski with Sundarbazar and Pokhara, respectively during a 13 months field survey (April 2017- May 2018). A total of 142 specimens were collected from altitudes ranging from 700- 830 amsl. Of these, 6 species viz., *Afissula expansa, Cryptogonus quadriguttatus, Cryptolaemus montrouzieri, Henosepilachna elaterii, Oenopia excellens* and *O. quadripunctata* are new distribution records for Nepal.

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POPULATION DYNAMICS OF *APION CLAVIPES* GERST ON MUNGBEAN

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ABSTRACT

***Apion clavipes* is economically important pest of mungbean in the low land of North Shewa, Ethiopia. For successful management of the pest, study on field phenology and population density is very crucial. Hence, this study which focused on evaluating the occurrence and activities of adult and immature stages of *A. clavipes*. The population fluctuation of growth stages of *A. clavipes* in line with vegetative to maturity of mungbean was undertaken in two fields during the main season of 2015. The results revealed that the adults and larva of *A. clavipes* started appearing with vegetative and pod initiation stage, respectively. The population gradually increased to grain filling stage. The peak population of adult and larva coincided with early and full grain filling stage, respectively, as it provided the substrate for oviposition and subsequent development of immature stages. Thereafter, adult and larval population gradually declined when the crop attained its maturity. Thus, lifecycle of *A. clavipes* is observed to get well synchronized with the phenology of mungbean. Consequently timing of management measures before the pest cause economic damage becomes critical for its effective IPM.**

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BIOLOGY OF INVASIVE FALL ARMY WORM *SPODOPTERA FRUGIPERDA* (J.E. SMITH) (LEPIDOPTERA: NOCTUIDAE) ON MAIZE

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ABSTRACT

The life history of fall army worm, *Spodoptera frugiperda* (J.E.Smith) was studied during June- July 2018 under laboratory conditions at the Department of Agricultural Entomology, College of Agriculture, UAHS, Shivamogga, Karnataka. Gravid female was observed laying eggs with the fecundity 1064 eggs. Incubation, total larval and pupal period were observed to be from 2-3, 14-19 and 9- 12 days, respectively. The total life cycle of male and female was observed to be 32-43 and 34-46 days, respectively. Under laboratory conditions, the larvae fed on hosts like sorghum, cabbage, tomato, groundnut and sugarcane but not on rice. The implications of the study on the off seasonal survival, host range, spread and establishment in India is discussed.

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PREVALENCE OF "R" STRAIN AND MOLECULAR DIVERSITY OF FALL ARMY WORM *SPODOPTERA FRUGIPERDA* (J.E. SMITH) (LEPIDOPTERA: NOCTUIDAE) IN INDIA

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ABSTRACT

The fall army worm (FAW) *Spodoptera frugiperda* (J.E. Smith) is an invasive pest native to Americas, and it has recently been observed invasive to India. The mtCOI based analysis of the populations of FAW from the Americas showed the prevalence of two strains viz. "R" (Rice) and "C" (Corn). Recent studies on FAW populations from Africa revealed the predominance of "R" strain that feed primarily on maize over "C" strain. To understand the prevalence of strains and molecular diversity of FAW in India, studies were made on the populations collected on maize, sweet corn, and sorghum from six states of India (Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, Madhya Pradesh and Maharashtra). The results reveal that this is the first report of the occurrence of FAW from Andhra Pradesh, Madhya Pradesh, Maharashtra, Tamil

Nadu and Telangana. mtCOI (5' & 3') based sequence analyses revealed that these populations from India aligned with "R" strain with minimal genetic diversity exhibiting no host/ location specific variations. This indicates a possible invasion by a single genetic stock of FAW in India. Further work on haplotype analysis employing different markers is necessary.

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EFFECT OF TEMPERATURE ON THE BIOLOGY AND FITNESS TRAITS OF PAPAYA MEALYBUG PARASITOID *ACEROPHAGUS PAPAYAE*

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ABSTRACT

Effect of temperature on the parasitoid *Acerophagus papayae* of papaya mealy bug *Paracoccus marginatus* was studied. The results revealed that its parasitism drastically decreased with increase in temperature. Though parasitism was noticed at all temperatures, there was a strong negative correlation, and % parasitism increased with temperature from 20 to 32°C. The peak in parasitism was at 32°C (52.7, 38.26 and 4.8%) with second, third nymphal and adult female stages, respectively. Thereafter the parasitism rate decreased with rise in temperature. The maximum parasitism was observed with the second instar nymph compared to the third instar and adult stages. Adult emergence increased with temperature till 32°C, thereafter a drastic drop was evident; emergence was maximum at 32°C with all host stages (76.8, 74.35 and 71.28% of 2nd, 3rdnymphal stages and adult female, respectively). The least emergence of adult parasitoid was at 20°C (60.9, 58.9 and 52.7% in respective host stages). The maximum developmental time (10.6 days) for *A. papayae* was found at 20°C; at 25 and 30°C it was observed to be same (7.15 and 7.0 days, respectively). The least developmental time of 5.0 days was observed at 35°C. More number of male *A. papayae* emerged from second instar of female *P. marginatus* at 30°C. The highest female to male sex ratio was noticed at 30°C (1:1.74), followed by 25°C (1:1.50).

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EFFICACY OF EXTRACTS OF *THUJA ORIENTALIS, PISTACIA KHINJUK* AND *JUGLANS REGIA* AGAINST *TRIBOLIUM CONFUSUM* AND *ORYZAEPHILUS SURINAMENSIS*

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ABSTRACT

Due to environmental hazards of chemical insecticides, plant products are gaining significance, even in stored product pests. The present study evaluates the effects of fruit extract of *Thuja orientalis,* green husks extract of *Pistacia khinjuk,* leaves and leaf extract of *Juglans regia.* Evaluation was done with adults of *Tribolium confusum* and

Oryzaephilus surinamensis **(27±1°C and 65±5%RH). Extraction was performed using methanol and contact toxicity tests revealed significant differences in the mortality, and it increased with concentration of the extract. Methanol extract of the green husks *Juglans regia* was observed to be the most toxic on *O. surinamensis*. The LC_{50} values obtained with the extracts against to *T. confusum* and *O. surinamensis* are provided.**

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POTENTIAL VECTORS OF MALARIA IN KAMAMAUNG, MYANMAR AND THEIR BIONOMICS

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ABSTRACT

Potential vectors for malaria and their bionomics were studied at the Katine Htit and Kine Taw villages from Kamamaung Township, Phapun District, Kayin State, Myanmar from May 2014 to April 2015. *Anopheles* mosquitoes were collected from fixed mosquito catching stations with Kanda net (K-net) for animal bait. Indoor, outdoor biting catches and light trap collection methods with WHO sucking tubes and larval survey were done seasonally. Head and thorax of mosquitoes were dissected to find out *Plasmodium* sporozoites in salivary gland by ELISA test for conforming potential vectors. Results revealed that the major vector *Anopheles minimus* and secondary vectors *An. culicifacies, An. maculatus, An. vagus* and *An annularis* were occurring in all seasons, although *An. minimus* was observed in high numbers during cool season. The adults of main vector *An. dirus* were observed occurring in both rainy and cool seasons in both areas.

Surveys on larvae resulted in identifying *An. dirus* in 6.4% and 5.6% of wells in Katine Htit and, 5.66% and 5.66% of wells in Kine Taw villages in the rainy and cool seasons. *An. minimus An. culicifacies, An. vagus, An. annularis* and *An. maculatus* larvae were abundantly found occurring in water and sand pools of Yunsalin creek. *Anopheles culicifacies* B, *An. minimus* A, and *An dirus* D were occurring in both the villages as observed with polytene chromosome technique. Vector incrimination study found that 1.07% of *An. minimus* was *Pf* sporozoite positive at Katine Htit village and 3.7% of *An. dirus* being Pv_{210} sporozoite positive at Kaine Taw village. *Anopheles minimus* was occurring in early midnight and *An. dirus* was observed at high density at 21:00-22:00 hr. All collected *Anopheles* mosquitoes from both villages were susceptible to DDT 4%, deltamethrin 0.05%, permethrin 0.75% and cyfluthrin 0.15%. The highest malaria parasite positive rate was found to be in July. The parasite positive status was observed throughout the year except April in both villages. This study suggests that there is active malaria transmission in the study areas and malaria control and preventive measures are necessary.

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ABIOTIC FACTORS AND ABUNDANCE OF VECTOR OF

VISCERAL LEISHMANIASIS (*PHLEBOTOMUS KANDELAKII*) IN NORTH WESTERN IRAN

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ABSTRACT

Sand flies are vectors of leishmaniasis, and of these the most important vector of visceral leishmaniasis in Iran is *Phlebotomus kandlakii*. Understanding habits and ecology of this vector is required to control and prevent disease outbreak. Hence, this study was conducted in Meshkin Shahr which is one of the main endemic area in Northwest of Iran. Four villages (2 each from polluted and non-polluted areas) were selected for observations on sand flies and ecological factors. Totally 1100 sand flies were collected, with 700 of them from polluted and 400 from unpolluted areas. Of these, 19 (4.75%) were from the east area (non-polluted) and 29 (4.14%) from the west area (polluted). The results conclude that in polluted area (west), frequency of *Ph. kandlakii* is more, and thus disease is more prevalent. The soil characteristics and the weather factors of these areas have been compared.

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EFFECT OF TEMPERATURE ON RICE WHITE BACKED PLAN THOPPER *SOGATELLA FURCIFERA*

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ABSTRACT

Influence of variable temperature combinations viz. 32 & 22°C, 32 & 24°C, 32 & 26°C, 35 & 22°C, 35 & 24°C and 35 & 26°C (maximum & minimum) maintained for 12 : 12 hours, on developmental and reproductive physiology of the white backed plant hopper, *Sogatella furcifera* (Horvath), a serious sucking insect pest of rice in Punjab was studied. The survival of nymphs caged on rice variety PR 121 maintained at combination of 32 & 24°C was observed to be significantly higher (95%) than those at 35 & 22°C and 32 & 22°C (90 and 88%, respectively) while it was minimum at 35 & 26°C (61%). The period of nymphal development was maximum (17.7 days) at combination of 32 & 22°C and minimum (9.78 days) at 35 & 26°C. Growth index, a measure of suitability of temperature for growth and development was observed to be maximum at combination of 35 & 24°C (7.57). Maximum reproductive rate (198) was observed at combination of 35 & 24°C as against 99.33 at 32 & 22°C and 129.0 at 32 & 24°C. These results suggest that an increase in mean maximum and minimum temperature might potentially enhance the numbers and generations of the *S. furcifera* that will add to its increased menace.

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ALTERNATIVE IPM STRATEGY AGAINST RICE LEAF FOLDER *CNAPHALOCROCIS MEDINALIS*

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ABSTRACT

The present study evaluated the mechanical control method in combination with chemical control as an alternative IPM strategy against rice leaf folder (RLF), *Cnaphalocrocis medinalis* in a series of 11 multilocation trials. Passing of the coir and jute ropes, forwards and then backwards, both ways while touching the crop canopy, before flowering stage of rice, proved significantly better (with 71.07 and 69.56 % opening of folded leaves, respectively) than that of the nylon rope (with 54.45% opening of folded leaves) in mechanical dislodging of larvae. The 20 m length of coir/ jute rope proved marginally superior (69.94% opened leaves) over the 30 m rope length (67.61% opened leaves) in mechanical opening of infested leaves, but both were significantly better than the 40 m rope length (52.06% opened leaves). Among the two strategies evaluated- T_1 (mechanical control during pre-flowering stage + insecticide spray during post-flowering stage) gave yield of 33.2 and 75.5 q/ ha in *basmati* and non-basmati, respectively; and T_2 (two insecticide sprays, one each during pre-flowering and post-flowering stage) gave 34.325 and 76.675 q/ ha in *basmati* and non-basmati, respectively; both these treatments were statistically at par. These differences in yield were non-significant. The results indicated that the mechanical control of passing of 20-30 m coir or jute ropes, forwards and then backwards, both ways, while touching the crop canopy, offers a promising ecofriendly IPM option against rice leaf folder during the pre-flowering stage.

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EFFECT OF CORN LEAF APHID INFESTATION ON CHLOROPHYLL AND PHOTOSYNTHESIS IN SORGHUM

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ABSTRACT

The biotic stress caused by insect pests in sorghum is the principal limiting factor for its productivity. The present study revealed that the damage caused by the corn leaf aphid *Rhopalosiphum maidis* (Fitch) resulted in reduction in chlorophyll content, fluorescence and photosynthetic rate ranging between 9.06 to 29.79%; 1.35 to 6.75 (Fv/Fm) and 6.15 to 32.30 µmol CO_2 m^{-2} sec^{-1} respectively, at different levels of infestation. These plant physiological parameters were significantly low at higher infestation (300 aphids/ plant) compared to nil, low (100 aphids/ plant) and medium (200 aphids/ plant) infestation. A

negative correlation was observed between aphid density and these physiological parameters.

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COMPATIBILITY OF INSECTICIDE AND FUNGICIDE MIXTURES AGAINST *SPODOPTERA LITURA* (F.) ON VIRGINIA TOBACCO

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ABSTRACT

Evaluation of the efficacy and compatibility of certain new insecticides with fungicides alone and in combination as mixtures against *Spodoptera litura* (F.) on flue cured Virginia (FCV) tobacco was done. Results revealed that chlorfenapyr 10 SC @0.01% and chlorantraniliprole 18.5 SC @0.055% were the most effective. In combination with the fungicides too, chlorfenapyr 10 SC @0.01% was the best demonstrating compatibility. Among the two anthranilic diamides, chlorantraniliprole 18.5 SC @0.005% revealed compatibility with certain fungicides, whereas flubendiamide 48 SC @ 0.012% was observed with reduced efficacy in almost all combinations. Even though, with regard to the physical properties and p^H all the combination treatments were stable even after two hours of preparation, their efficacy got slightly reduced except with chlorfenapyr 10 SC @0.01% and chlorantraniliprole 18.5 SC @0.005%.

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ELECTRO ANTENNOGRAPHIC RESPONSE OF RICE MOTH *CORCYRA CEPHALONICA* STAINTON TO SOME PLANT VOLATILES

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ABSTRACT

Electroantennogram (EAG) responses from male and female antennae of rice moth *Corcyra cephalonica* (Lepidoptera: Pyralidae) were observed for 18 plant volatiles at four concentrations (0.1, 1.0, 10 and 100 mg/ml). Mean EAG amplitude relative to hexanal, which was used as standard, revealed the significant differences in response to these from both male and female antennae. Among all the compounds (R)-(+)-Limonene, hexanal, cis-jasmone and acetophenone were found to be eliciting significant response from both male and female antennae.

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INCIDENCE OF *OMIODES INDICATA* (FABRICIUS) ON SOYBEAN IN RAJASTHAN

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ABSTRACT

The incidence of leaf folder *Omiodes indicata* (F.) on soybean when studied, it was observed that it began during the last week of July, 2015 and continued up to second week of October. In 2016, it began with mid-August and continued up to the second week of October. The peak incidence was in the last week of August (2015) at 12.25 larvae/5 plants when soybean was farm scaped with marigold along the borders of the crop. It was 13.00 larvae/5 plants without marigold farmscaping. During 2016, the peak incidence was during the third week of September (3.75 larvae/5 plants) when soybean was farm scaped with marigold, which increased to 4.00 larvae/5 plants without marigold farmscaping. The mean temperature and relative humidity at peak incidence was similar in both the years. The rainfall pattern had a significant influence on the population buildup i.e., lower total rainfall (397.6 mm) with a dry spell until peak population buildup (during 2015 than that during 2016- 467.5 mm) resulting in more incidence in 2015. There existed a significant positive correlation with the mean temperature only during 2015 (r= 0.60 under marigold farmscaping; r= 0.58 without marigold). The study also includes a morphological description of *O. indicata* enabling its diagnostics.

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EFFICACY OF INSECTICIDES AGAINST *BEMISIA TABACI* (GENN.) AND *SPILOSOMA OBLIQUA* (WLK.) IN BLACK GRAM

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ABSTRACT

Field experiment were carried out at the Entomology Instructional Farm, JNKVV-College of Agriculture, Rewa (M.P.) during *kharif* 2014-15 in black gram variety T-9to evaluate the efficacy of flubendiamide 39.35% SC, indoxacarb 15.8% EC, thiamethoxam 25% WG, triazophos 40% EC, monocrotophos 36% SL, thiacloprid 21.7% SC, chlorantraniliprole 18.5% SC and quinalphos 25% EC compared with untreated control. The observations on their efficacy against the Bihar hairy caterpillar *Spilosoma oblique* (Walker) and whitefly, *Bemisia tabaci* (Gennadius) revealed that thiacloprid 21.7% SC was the most effective against whitefly followed by thiamethoxam 25% WG while chlorantraniliprole 18.5% SCwas the most effective against Bihar hairy caterpillar followed by flubendiamide 39.35% SC. Flubendiamide 39.35% SC and thiacloprid 21.7% SC were the least effective against whitefly and Bihar hairy caterpillar, respectively.

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A FRUIT BASED DIET FOR MASS REARING OF MELON FLY *BACTROCERA CUCURBITAE* (DIPTERA: TEPHRITIDAE)

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ABSTRACT

In this study, a fruit based diet, which is less resource expensive, is developed for mass rearing of melon fruit fly, *Bactrocera cucurbitae*. Three types of yeasts (yeast extract, brewer's yeast and yeast autolysate) were evaluated in larval rearing medium with standardized antimicrobial agents. The diets were assessed in terms of pupal yield, larval duration, pupal weight, adult emergence, active fliers, sex ratio, fecundity and fertility. Among the fruit based diets, the diet-III with 15g of yeast extract resulted in significantly maximum pupal yield (80.93%) with pupal mass of 1.41g/100 pupae. The pupae recovered from diet-III produced 69% adults with flight ability of 74.36%. The diet supplemented with 15g of brewer's yeast resulted in 71.9% pupae recovery with 59.3% adult emergence and 69.1% adult flies. Adult flies from Diet-III gave relatively maximum number of eggs (15.84 eggs/female/day) with egg hatchability of 65.3%. With regard to other biological parameters too fly reared on Diet-III was found superior.

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ECOLOGY OF *ANACRIDIUM MELANORHODON MELANORHODON* ON *ACACIA SENEGAL* IN NORTH KORDOFAN, SUDAN

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ABSTRACT

The land use pattern in some areas of North Kordofan State, Sudan are changing from natural pasture into plantations of *Acacia Senegal*, the main producer of gum arabic. Here, the tree locust, *Anacridium melanorhodon melanorhodon* (Orthoptera: Acrididae), once considered as sporadic pest, is now being considered as a major pest jeopardising gum arabic production. This study explored such *A. senegal* plantations 35 km ex. southeast of Elobeid city, North Kordofan State during 2008- 2009. The biology and ecology of the tree locust were studied with field surveys with weekly observations. Simultaneously, laboratory experiments were also done at the Gum Arabic Research Centre in the University of Kordofan, Sudan.

Results revealed that the eggs were laid in moist soil during rainy season around mid-July. The incubation period was 40 days, after which the nymphal stages developed during August and early September. The last nymphal stage moults into fledgling adult in late September to October towards the end of the rainy season. The adults sexually mature in dry season but gonads restore activity at the onset of ensuing rainy season. The correlations of adults and nymphs' density revealed variations showing different growth levels (4.71± 1.257 and 8.20± 0.034) and (0.05± 3.636 and 0.31± 0.107), respectively. The means of population structures varied (from 0.00 to 14.0783 to 0.00 to 4.8867 in 2008 and 2009, respectively). The adult development started from mid-September to October, with males developing earlier than females. Feeding was more on the new sprouts than the leaves.

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SCREENING OF MAIZE GERMPLASM FOR RESISTANCE

AGAINST SHOOT FLY

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ABSTRACT

Twenty maize genotypes were screened for resistance against shoot fly during spring 2013 and 2014. Observations were recorded on the parameters viz., i) % plants oviposited, (ii) no of eggs laid, (iii) % dead heart formed, (iv) plant height, (v) days of oviposition, (vi) no of maggots/10 plants, and (vii) weight of maggots. Maximum % oviposition was observed in DC-2 (both years), whereas minimum was in WP-21 in spring 2013 and HKI-323 in spring 2014. The infestation level was too heavy and all the evaluated genotypes were oviposited with. Maximum eggs were laid on DC-2 and the least with HKI-1011. During 2013 and 2014, maximum % of deadheart was observed with DC-2, while the least one was with WP-21 (2013) and in HKI-1011 (2014). The maximum weight of maggot was observed with DC-2 and the least with WP-21 (2013); in 2014, it was observed with JCY-2-7 and WP-21, respectively. Thus the % plants oviposited, number of eggs laid, % deadheart formed, number recovered and weight of maggots indicates the genotype susceptibility level. These levels could be used as marker traits for resistance to shoot fly in maize.

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EVALUATION OF INSECTICIDES AGAINST MELON FRUIT FLY *BACTROCERA CUCURBITAE* COQUILLETT ON CUCUMBER

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ABSTRACT

Field evaluation of eight insecticides against melon fruit fly *Bactrocera cucurbitae* Coquillett (Diptera: Tephritidae) was carried out on cucumber. The results revealed superiority of cartap hydrochloride 50%SP @375g a.i/ha, tolfenpyrad 15%EC @150 g a.i/ha and fipronil 5%SC @50g a.i/ha sprays in suppressing fruit infestation, both by weight and on number basis. When these insecticides were applied as bait in field spray recommended doses mixed with 10% *gur* and water, maximum attraction and death of adults was observed with the cartap hydrochloride bait. The economics of the treatments revealed maximum incremental benefit of Rs 14,025/ha withcartap hydrochloride having an incremental cost benefit ratio (ICBR) of 1:3.53. This was followed by Rs 8630/ha with fipronil with an ICBR of 1:1.61.

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EVALUATION OF INSECTICIDES AGAINST *HELICOVERPA ARMIGERA* AND *SPODOPTERA LITURA* IN TOMATO

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ABSTRACT

Some insecticides were evaluated against the larvae of *Helicoverpa armigera* and *Spodoptera litura* on tomato at Bidhan Chandra Krishi Viswavidyalaya, Kalyani during 2012 to 2014 under field conditions. The treatments viz., pyridalyl 10 EC (75 and 150 g a.i./ha), indoxacarb 14.5 SC (75 and 150 g a.i./ha), chlorfenapyr 10 SC (100 and 200 g a.i./ha) and chlorpyriphos 20 EC (350 g a.i./ha) were applied twice with three replications. Pooled results revealed that pyridalyl @ 150 g a.i./ha reduced the larval population of *H. armigera* (1.05 larvae/5 plants) to an extent of 84.19% reduction. In case of *S. litura*, larval population was the least with pyridalyl @ 150 g a.i./ha (1.44 larvae/5plants, and 78.94 % reduction). It was at par with indoxacarb @ 150 g a.i./ha (1.53 larvae/5plants). Pyridalyl was also observed to be the safest as regards coccinellids and spiders, followed by indoxacarb and chlorfenapyr; and chlorpyriphos was highly toxic.

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ATTRACTANCY OF MELON FRUIT FLY (DIPTERA: TEPHRITIDAE) TO BACTERIA ISOLATED FROM GUT AND OVIPOSITOR

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ABSTRACT

Bactrocera cucurbitae is an economically important pest of cucurbitaceous vegetables. They harbour a diverse group of microorganisms as endosymbionts. Bacteria associated with the pest have the potential to be used in different pest management strategies. Laboratory cage bioassays were conducted to study the attractancy of melon fruit flies to their associated bacteria in laboratory conditions. Among the bacteria isolated from laboratory reared flies, *Providencia rettgeri* showed maximum attractancy flowed by Enterococcus faecalis in all age and sex groups of flies tested. Among the bacteria isolated from wild population of fruit flies, Klebsiella pneumoniae and Enterobacter cloacae were more attractive. All bacterial cultures attracted more female compared to male flies in the attractancy bioassay hence showing the potential to be utilized as a female targeted management strategy.

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SOURCES OF RESISTANCE AGAINST BROWN PLANTHOPPER *NILAPARVATA LUGENS* STAL.

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ABSTRACT

Fiftyeight rice genotypes comprising of released varieties, elite breeding lines and genotypes obtained from different screening nurseries were evaluated against brown planthopper under glasshouse conditions at Punjab Agricultural University, Ludhiana during *Kharif* 2015 and *Kharif* 2016. Based on two years screening, twelve entries showed resistant to moderately resistant reaction. From these, three genotypes, RP2068-303, RP2068-295 and KAUM182-1 were found to be resistant while nine other genotypes, CR3006-8-2, PAU5815-56-2, PAU5815-39-3, CT18139-8-5-1-5-1-1-M, PAU6002-32-1, PAU5815-39-2, PAU6002-32-4, IR71033-121-15-B and IR82858-B-B-2 showed resistant to moderately resistant reaction during two years of screening trial. The potential donors identified in the present study are expected to be a valuable source of BPH resistance.

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SUSCEPTIBILITY OF *ANOPHELES ARABIENSIS* PATTON TO INSECTICIDES IN SUDAN

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ABSTRACT

Malaria pose health problem around the world and Africa, including Sudan, atnd here are many methods and strategies for control. This study was conducted in Edd Al Fursan area in South Darfur State during August to October 2014, for assessing the susceptibility of the vector *Anopheles arabiensis* to DDT, malathion, deltamethrin, permethrin and bendiocarb. Study was conducted in two areas (North and South Edd Al Fursan), using a WHO protocol. The larvae were collected (*Anopheles,Aedes* and *Culex*) and sorted out in the Laboratory. *An. Arabiensis* reared in the laboratory, identified morphologically. With 2-3 days old females, the susceptibility tests were conducted for DDT 4%, malathion 5%, deltamethrin 0.05%, permethrin 0.75% and bendiocarb 0.1%. Of the collected mosquitoes 83.39% (2945) were identified as *An. arabiensis*, 12.88% as *Culex* and 3.55% as *Aedes*. About 1000 females subjected to the selected insecticides and it revealed 100% susceptibility to bendiocarb in all areas. About DDT and deltamethrin, the susceptibility ratio ranged between 99 to 100% in both areas, while malathion resulted in 99% in South and 98% in North of Edd Al Fursan. After 24 hr of exposure, *An. arabiensis* resistance to permethrin in both areas (North and South Edd Al Fursan) ranged between 97-98%.

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POPULATION DYNAMICS OF *HELICOVERPA ARMIGERA* AND *MELANAGROMYZA OBTUSA* ON PIGEONPEA

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ABSTRACT

Field experiment carried out during *kharif* 2016-17 revealed that incidence of the pigeonpea pod borer, *Helicoverpa armigera* started in the 1st week of October and reached a peak level 1.39 larvae/ five plant in the 4th week of October (at 14.80-33.50^{0}Cand RH 47.30-66.30%). Correlation coefficients between incidence and weather parameters showed that maximum temperature had a positive, and minimum temperature had negative relationship. About pod fly, *Melanagromyza obtuse* incidence began with 1st week of November and reached a peak (1.20 maggots/10 pods) in the 1st week of December (9.90-22.90^{0}C and RH 51.00-87.10%). Correlation coefficients between pod fly incidence and weather parameters showed that maximum relative humidity had a positive and minimum relative humidity besides rainfall had a negative relationship.

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OUTBREAK OF *SPODOPTERA MAURITIA* BOISDUVAL IN ASSAM

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ABSTRACT

The recent outbreak of Rice Swarming Caterpillar (RSC) during *kharif*2016 in Assam is one of the most devastating ever experienced in the state over >34,650 ha of rice across 28 districts. The outbreak was more severe in areas with monoculture of rice as found in Upper Brahmaputra Valley Zone with 7016 ha in Dibrugarh district alone. Severe deficit (>50%) of rainfall during September, 2015- March, 2016 followed by 40%excess and moderately deficit (>25%) rainfall during April-May and June-August, respectively were observed to be behind the outbreak. Rainfall analysis confirmed that spells of "drought followed by heavy rains" prevailed for about twelve months beforefavoured the outbreak. Early flood is yet another associated factor that helped in disseminating the caterpillars to new areas and magnified its severity. One "perennial hub of RSC" comprising of several flood prone villages has also been identified in the district. Identifying more of such hubs and their microecological study might help in prediction of outbreak with accuracy.

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EVALUATION OF TOMATO GENOTYPES AGAINST FRUIT BORER *HELICOVERPA ARMIGERA*

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ABSTRACT

Tomato cultivar Anand Tomato 3 (AT 3) was found resistant to *Helicoverpa armigera* (Hubner) based on egg (0.26/ 3 twigs) and larval (0.48/ 3 twigs) incidence as well as fruit damage (7.07%) andalso yielded higher (255.06 q/ ha). Among the various morphological characters, number of branches/ plant (r= 0.961, 0.961** and 0.979**) as well as number of trichomes/ cm^2 on leaf (0.778**, 0.721** and 0.768**) and calyx (0.694*, 0.611* and 0.689*) showed significant positive relationship, whereas number of**

fruits/ plant (-0.729, -0.708* and -0.752**) showed significant negative relationship with the incidence in terms of eggs, larvae and fruit damage, respectively. Similarly, significant positive association was observed between number of trichomes/ $cm^2$of corolla (0.594*) and fruit damage.**

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NUTRITIONAL VALUE OF YELLOW MEAL WORM *TENEBRIO MOLITOR* AS A FOOD SUPPLEMENT

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ABSTRACT

Insects are used as food sources and supplements due to their availability and easiness in rising. Mealworms are typically used as a pet food for fish and the birds, and these are good for their high protein content. This study determines the nutritional value and chemical composition of meal worm *Tenebrio molitor* as afresh and sun-dried larvae. The results revealed that these contained 52.14 and 60.21% protein, respectively. This protein was also rich in amino acids such as leucine, lysine, arginine and serine. Fatty acid was detected with high value of oleic, linoleic and palmitic acids. These were also observed to contain considerable amounts of vitamins and minerals. The results revealed that fresh, dried and powdered larvae could be a high-grade product to be used as a food supplement for animal and humans.

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RESIDUAL TOXICITY OF EMAMECTIN BENZOATE AND CHLORANTRANILIPROLE ON *EUPELMUS TACHARDIAE* HOWARD- A KEY PARASITOID OF LAC INSECT *KERRIA LACCA* (KERR)

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ABSTRACT

Residual response of emamectin benzoate and chlorantraniliprole against *Eupelmus tachardiae* Howard (Hymenoptera: Encyrtidae)- a key parasitoid of lac insect, *Kerria lacca* (Kerr) was assessed under laboratory conditions by exposing the adults on

residual film of insecticides. Emamectin benzoate caused 0-14.44% mortality within 1 hr of exposure, 27.5- 38.99% mortality within 3 hr, 53.61- 96.67% mortality within 18 hr and 100% mortality within 24 hr of exposure except at a very low concentration (0.00025%). Whereas, no mortality with chlorantraniliprole was observed after 1 hr of exposure and within 3 hr of exposure only 3.33 and 8.61% mortality wasat 0.0056 and 0.0074% concentration, respectively, which is the recommended dose in lac ecosystem for the management of lepidopteran pests. Within 24 hr of exposure, 30.20-65.31% mortality was observed with concentrations of chlorantraniliprole as against 19.68% in control. Based on mortality within 24 hr of exposure it can be inferred that the emamectin benzoate is relatively more toxic than the chlorantraniliprole. Relatively less toxicity of chlorantraniliprole to this parasitoid species might be attributed due to specificity of this insecticide.

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OCCURRENCE OF *DICHOMERIS ACUMINATUS* (STAUDINGER) ON SOYBEAN IN RAJASTHAN

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ABSTRACT

The alfalfa leaf tier moth, *Dichomeris acuminatus* (Staudinger, 1876) (Lepidoptera: Gelechiidae) was observed to feed soybean leaves over three crop seasons during *kharif* 2015 to 2017. Its infestation was observed along with the leaf folder *Omiodes indicata* (Fabricius) often within the same rolled/ tied leaf. This paper provides details of incidence along with interactions with weather factors in terms of population dynamics. Also, morphological characterization of the moth accomplished is given with images.

Short communications

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BIOLOGY OF SOUTH AMERICAN TOMATO LEAF MINER *TUTA ABSOLUTA* (MEYRICK) (LEPIDOPTERA: GELECHIIDAE)

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BIOLOGY OF *HEORTIA VITESSOIDES* MORE, A MAJOR INSECT PEST OF *AQUILARIA MALACCENSIS* LAMK IN NORTHEAST INDIA

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OBSERVATIONS ON PIGEONPEA POD FLY *MELANAGROMYZAOBTUSA* (MALLOCH) AND ITS PARASITOIDS

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POPULATION DYNAMICS OF GRAM POD BORER (*HELICOVERPA ARMIGERA)* ON LATE SOWN CHICKPEA

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BEHAVIOUR OF RICE YELLOW STEM BORER *SCIRPOPHAGA INCERTULAS* IN ARTIFICIAL REARING

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MANAGEMENT OF RICE WEEVIL *SITOPHILUS ORYZAE* (L.) IN STORED MAIZE USING SOLAR HEAT AND PLANT BIOPESTICIDE

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SCREENING FOR RESISTANCE IN MARIGOLD AGAINST APHID *LIPAPHIS ERYSIMI* KALT.

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A NEW SPECIES OF THE WHITEFLY GENUS *DIALEURODES* COCKERELL (ALEYRODIDAE: HEMIPTERA) FROM INDIA

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