

**MORPHOMETRICS OF *TRICHOGRAMMA* SPP.
COLLECTED FROM HARYANA AND PUNJAB
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ABSTRACT

The genus *Trichogramma* constitutes an important group of egg parasitoids. It has wide range of host insects, covering many pests of agricultural crops as well as some key insect pests of important forest trees. Amongst the biological control agents, species of *Trichogramma* are the most common. The present study, with the *Trichogramma* species collected during the four years' survey (2012-2015), across different districts of Haryana and Punjab, has led to study of nine species: *T. achaeae*, *T. agriae*, *T. breviciliata*, *T. chilonis*, *T. chilotraeae*, *T. flandersi*, *T. japonicum*, *T. plasseyensis* and *T. poliae*. Descriptions are given for these along with their detailed diagnostic characters, and additional morphometrics. Host range and distribution from Haryana and Punjab are also discussed.

**EFFECT OF SILICA ON YELLOW STEM BORER IN RICE
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ABSTRACT

The study on influence of Si applied in forms of fertilizer formulations against yellow stem borer, *Scirpophaga incertulas* Walker infesting rice through field experiment was carried out at Central Research Farm, Department of Entomology, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar during *kharif*, 2014. It was observed that foliar application of orthosilicic acid @4 ml/ l applied at 20, 35, 50 and 65 days after transplanting (DAT) was the best treatment in reducing deadheart and white ear head incidence and increased the grain yield. Higher uptake of silica established a negative correlation with stem borer incidence, whereas, the same produced a significant and positive correlation with grain yield.

**LIGHT TRAP AS A MONITORING TOOL FOR COMMON CUTWORM
SPODOPTERA LITURA (F.) IN SOYBEAN
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ABSTRACT

The population dynamics of common cutworm *Spodoptera litura* (F.) (Lepidoptera: Noctuidae) captured by light trap in soybean was studied at the Directorate of Soybean Research, Indore during 2009- 2011. In soybean, *S. litura* adults were not captured by light trap until 30th standard week. Two peaks of sudden increase of moth catches were observed on 38th and 41st standard week in 2009; 37th and 41st standard week in 2010 and 37th and 39th standard week in 2011. Moths caught/ week usually began to decrease to <3 during post soybean season. Similarly, intensity of larval population was zero until 31st standard week, and thereafter a peak on 37th standard week was observed during 2009 and 2011 seasons, and 36th standard week in 2010; subsequently, this reduced to <2 on 41st standard week. The seasonal moth catches/ light trap were significantly higher in season 2009 and 2011

compared to that in 2010. Likewise, intensity of larval population during 2010 and 2011 seasons were considerably lower than that of 2009. A significant positive correlation was observed between light trap catches vs. larval population during crop season.

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**POPULATION DYNAMICS OF INSECT PESTS
OF PIGEONPEA IN SOUTH GUJARAT
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ABSTRACT

The field experiment on the population dynamics of pigeonpea pests carried out at the College Farm, N. M. College of Agriculture, N.A.U., Navsari during *Kharif* 2014-15 brought out the correlation between various weather parameters and insect pests. These indicated that maximum temperature exhibited significant positive influence on the incidence of cow bug, pod bug, blue butterfly, plume moth and pod borer. Minimum temperature exhibited significant negative impact on plume moth and pod fly and significant positive impact on mite and blister beetle. Average temperature exhibited significant positive influence on cow bug, blister beetle, blue butterfly and pod borer and negative influence on pod fly population. Morning, evening and average relative humidity exhibited positive relationship with mite and leaf folder population, while, it was significantly negative with plume moth, pod borer and pod fly populations.

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**ENDOPARASITOID: *BRACON LEFROYI* (DUDGEON AND GOUGH) OF PINK BOLLWORM
PECTINOPHORA GOSSYPIELLA (SAUNDERS) ON COTTON
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ABSTRACT

Pink bollworm *Pectinophora gossypiella* (Saunders) is a major insect pest of cotton in India. Neonates enter developing bolls and destroy seed as well as fibre forming tissue. Chemical control method is the dominant method against this pest. Excessive use of insecticides has resulted in tolerance in this pest against insecticides. Biocontrol agents are the key components of IPM that provide sound ecological foundation, while being safe. The present study on the endoparasitoid, *Bracon lefroyi* (Dudgeon and Gough) (Hymenoptera: Braconidae) reveals observations on its incidence in Indian locations. It was observed that this parasitoid exerts control of the pink bollworm in central and north India. The % parasitization was more in Sriganaganagar (74.65 %) as compared to the other locations in 2015-2016. The incidence of the endoparasitoid was nil during 2014-2015 and 2013-2014 except Nagpur.

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**MORPHOMETRIC ANALYSIS OF OXYOPID SPIDERS
(ARANEAE: OXYOPIDAE) FROM KARNATAKA
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ABSTRACT

Arachnids constitute the second largest class representing 7% of known arthropods and it is estimated that 8.3% of arthropods are arachnids (Coddington and Levi, 1991). Spiders are the most diverse and abundant invertebrate predators in the terrestrial ecosystems (Specht and Dondale, 1960). Order Araneae is subdivided into the ancient Mesothelae (segmented abdomen) and the derived Opisthothelae (unsegmented body). Opisthothelae can be subdivided into two lines, the paraphyletic Mygalomorphae and all the “true” spiders, the Araneomorphae. About 46,000 species of spiders belonging to 114 families and 3935 genera are described as of now (World Spider Catalog, 2016), of which from India, about 1520 species under 377 genera and 60 families are known (Sebastian and Peter, 2009). Tikader (1982; 1987) published an inclusive list of Indian spiders with nearly 1067 species under 249 genera and 43 families. Siliwal et al. (2005) studied the families covering many species distributed in the Indian subcontinent.

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ESSENTIAL OILS AS GRAIN PROTECTANTS AGAINST PULSE BEETLE *CALLOSOBRUCHUS CHINENSIS* (L.) INFESTING PEA SEEDS

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ABSTRACT

Six plant essential oils viz. camphor (*Cinnamomum camphora* L.), wild marigold (*Tegetes minuta* L.), cone-bearing sage (*Meriandra strobilifera* B.), eucalyptus (*Eucalyptus sp.*), lemon grass (*Cymbopogon citratus* L.) and sweet flag (*Acorus calamus* L.) were evaluated against pulse beetle, *Callosobruchus chinensis* (L.) in the Department of Seed Science and Technology, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan. All the essential oils were effective against pulse beetle upto two months of treatment. Among them, the treatment with sweetflag recorded the maximum mean mortality (70 %) and found effective against *C. chinensis*. All the tested essential oils at 2.5 ml/ kg inhibited oviposition and progeny development of pulse beetle upto 6 and 8 months after treatment, respectively. Seed damage by pulse beetle was protected with sweet flag upto 8 months of treatment with maximum seed germination (82.67 %), seed vigour index-I(1796.62) and II (1965.90) using 2.5 ml/kg.

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PEST COMPLEX, BIOLOGY AND POPULATION DYNAMICS OF INSECT PESTS OF GINGER IN NORTHEAST INDIA

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ABSTRACT

Insect pests are one of the most important constraints in the cultivation of ginger, *Zingiber officinale* (Roscoe) in Meghalaya. Although, ginger is an important cash crop in Meghalaya, the detailed information on pest complex of ginger and their population dynamics is lacking, which is crucial to formulate effective IPM strategies. Thus, a field experiment was conducted during 2013-2014 to study the ginger pest complex, their biology, and population

dynamics. The rhizome fly (*Mimegralla coeruleifrons* complex), shoot borer (*Conogethes* (= *Dichocrocis punctiferalis*), rhizome mealy bug (*Formicococcus polysperes*), white grub (*Holotrichia* spp.), rhizome weevil (*Prodiocetes haematicus*) were recorded as pests. In addition, infestation of rhizome scale (*Aspidiotus hartii*) and termite (*Odontotermes obesus*) were also observed at the time of harvesting. Weather parameters, particularly temperature and rainfall were found to have significant impact on pest populations.

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**EVALUATION OF INSECTICIDES AGAINST CHIKU MOTH
NEPHOPTERYX EUGRAPHELLA RAGONOT**

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ABSTRACT

A field trial was laid out at the College Farm, College of Agriculture, N. A. U., Bharuch (Gujarat) to evaluate the efficacy of newer insecticides against chiku moth, *Nephoteryx eugraphella* Ragonot infesting sapota during 2012-13 to 2014-15. All the treatments were observed to be significantly superior over control. Considering the effectiveness, yield, net return and economics, flubendiamide 39.35SC @ 0.0096% was found to be the most effective followed by emamectin benzoate 5SG @ 0.0022% and spinosad 45 SC @ 0.009%.

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**INSECT FAUNAL CHECKLIST OF MUGA ECOSYSTEM
IN NORTH EAST INDIA**

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ABSTRACT

Muga silkworm, *Antheraea assamensis* (Helfer) (Lepidoptera: Saturniidae) is endemic species, which produce golden natural silk. Muga silkworm is found exclusively in rain forest ecosystem of Himalayan Foot Hills in North Eastern India, especially in Assam and Meghalaya due to its unique climatic conditions. Muga culture is of considerable economic importance and closely associated with the life, tradition and culture of the tribal people. This study was conducted in six states (Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram, Nagaland) of North East India for collection, preservation and identification of insect pests, predators, pollinators, and natural enemies of muga ecosystem. This study updates the earlier status that only 30 species had been known from muga ecosystem to 203 species, as enlisted herein.

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**FIELD EFFICACY OF NEW INSECTICIDES AGAINST APPLE WOOLY APHID
ERIOSOMA LANIGERUM (HAUSMANN)**

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ABSTRACT

The wooly aphid, *Eriosoma lanigerum* (Hausmann) (Aphididae: Homoptera) on apple, a key pest was studied in its aerial form for field efficacy of five insecticides namely spirotetramat (Movento1500D)- 0.009, 0.012, 0.015%, flupyradifurone (Sivanto 200SL)- 0.02, 0.03, 0.04%, thiamethoxam (Thomson 25WG)- 0.012, 0.025% and flonicamid (Ulala 50WG)- 0.20, 0.30, 0.40%. These were compared with chlorpyrifos (Dursban 20 EC) 0.04%. The field trial was conducted during October- November 2015 in apple orchards at Regional Horticulture Research and Training Station, Mashobra. The results revealed that all the treatments were superior, and 21 days after spray, chlorpyrifos (0.04%) and thiamethoxam 25WG (0.025%) were the best with zero infestation; but these were statistically at par with flupyradifurone (0.03 and 0.04%). Spirotetramat was observed to be the least effective. All the insecticides proved safe as regards phytotoxic symptoms.

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WEB-BASED SYSTEM FOR STUDY OF PEST DYNAMICS IN RELATION TO CLIMATE CHANGE

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ABSTRACT

A web based system for study of Real Time Pest Dynamics (RTPD) was developed and implemented under National Initiative in Climate Resilient Agriculture to assess the field level impact of climate change on pest dynamics of four major crops viz., rice, pigeon pea, groundnut and tomato. Understanding pest dynamics *vis-a-vis* climate change is essential for prediction of pest severity. Predictions lead to pest forewarning that provides lead time for managing impending pest attacks, minimizes crop loss, and optimize pest control leading to reduced cost of cultivation and better environmental safeguards. The current efforts mainly focus on pest data capture, reporting, analysis and its relation with weather data. The system consists of three major components viz. a database, an offline pest data capture application and online pest-weather reporting and analysis application. Pest and other relevant information obtained through regular monitoring of experimental and farmer's fields by Real Time Pest Surveillance (RTPS) locations established across the major agro ecological regions growing the target crops and daily weather data for these locations is captured on weekly basis by an offline application deployed at computers of RTPS locations which is transferred to central database. Subsequently, experts from research institutes view this information in various formats through online reporting and analysis application to compare pest scenarios, to study pest –weather interactions as well as for generation of pest forewarning models.

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FORAGING ECOLOGY OF INSECT POLLINATORS ON APPLE BLOSSOMS IN KASHMIR HIMALAYA M.A.PARAY*, RIZWANA KHURSHEED, MUNAZAH YAQOOB SHIFA AND DEELAK AMIN

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ABSTRACT

A study was undertaken in five districts of Kashmir during 2012-15 at 15% bloom to study the foraging time, foraging rate, foraging speed and loose pollen grain load by insect pollinators visiting apple blossoms. This revealed that among the insect pollinators/ visitors, the earliest mean initiation foraging activity of 0723 ± 0012 h was reported with *Apis cerana* followed by *Xylocopa* spp. (0742 ± 0019 h), *Andrena* spp. (0747 ± 0015 h), *Lassioglossum* spp. (0756 ± 0016 h) and *Apis mellifera* (0859 ± 0016 h), respectively. Late cessation was recorded in *A. cerana* (1800 ± 0019 h) followed by *A. mellifera* (1735 ± 0014 h), *Xylocopa* spp. (1659 ± 0021 h), *Andrena* spp. (1658 ± 0013 h) and *Lassioglossum* spp. (1656 ± 0015 h). The observations on the number of flowers visited/ min and time spent/ flower revealed that *Xylocopa* spp. visited maximum number of flowers (14.6 ± 1.14) in $6.2 \pm$

2.60 sec. Maximum pollen grains (11121 ± 635 and 10937 ± 492) under caged conditions was observed with *A. mellifera* and under natural conditions, and maximum pollen grains (15636 ± 1026 and 14034 ± 1136) was carried by *Xylocopa* spp.

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**PERSISTENCE AND RESIDUAL TOXICITY OF INSECTICIDES
AGAINST *BEMISIA TABACI* (GENNADIUS) IN COTTON**

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ABSTRACT

Among the insecticides evaluated against *Bemisia tabaci* on cotton, triazophos @ 1500 ml/ha persisted for 9.14 days while buprofezin @ 625 ml/ha persisted for shortest period of 2.19 days during 2015-16. However, during 2016-17, the LT_{50} values were found higher in case of buprofezin @ 1250 ml/ha (8.00 days) while buprofezin @ 625 ml/ha persisted for shortest period of 1.35 days.

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**FIELD EFFICACY OF FLUBENDIAMIDE 480SC AGAINST
BRINJAL SHOOT AND FRUIT BORER (*LEUCINODES ORBONALIS*)**

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ABSTRACT

The field experiments were conducted at Bidhan Chandra Krishi Viswavidyalaya, Kalyani, West Bengal during 2012 and 2013 to evaluate the field efficacy of flubendiamide 480SC against shoot and fruit borer (*Leucinodes orbonalis*) of brinjal. Seedlings of Variety Muktakeshi were transplanted in plots of 25 m² area with a spacing of 60 x 45 cm. The experiment was designed in randomized block design (RBD) with four replications, and treatments viz., flubendiamide 480SC at 90 g, 72g and 60 g a.i./ha; thiodicarb 75 SP (750 g a.i./ha); quinalphos 20 EC (200 g a.i./ha); and water as untreated control. The insecticides were applied twice at 7 days interval. Results revealed that all the treatments gave significant reduction in infestation. It was evident that flubendiamide 480 SC @ 72 and 90 g a.i./ha was very effective with only 1.64 and 1.03% shoot, and 9.11 and 4.44% fruit infestation, respectively along with significant increase in yield.

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**POPULATION DYNAMICS OF BRINJAL FRUIT AND SHOOT BORER
LEUCINODES ORBONALIS (LEPIDOPTERA: PYRALIDAE) IN KASHMIR**

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ABSTRACT

Field surveys were carried out on the population dynamics of brinjal shoot and fruit borer, *Leucinodes orbonalis* at the University Experimental Farm, Shalimar Campus; Vegetable Farm, Habak and Wanganpora (Iddgah); and Bugam, Narkara and Gangbug from Budgam. Observations on the infestation were made at weekly intervals during kharif, 2014. The least shoot infestation was in the district Srinagar (Shalimar) at 13.03%, followed by Habak (14.47%) and Wanganpora (16.02%), whereas in the district Budgam it was 11.93% followed by Narkara (14.79%) and Gangbug (16.53%). Fruit infestation was also the least at Shalimar (14.57%) followed by Wanganpora (19.02%) and Habak (19.44%), whereas in district Budgam, the least infestation was 17.06% followed by Narkara (18.43%) and Gangbug (20.13%). Correlation coefficients between weather factors and adult catches at all the six locations revealed positive and significant relationships with minimum temperature, while maximum temperature, rainfall, relative humidity (evening), wind speed had positive and non significant ones; relative humidity (morning) had negative and non significant correlation. Multiple regression analysis too revealed that minimum temperature as the major weather factor followed by relative humidity (evening), wind speed, maximum temperature, and rainfall had the least effect.

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PHOSPHINE RESISTANCE IN CIGARETTE BEETLE *LASIODERMA SERRICORNE* (F.) (ANOBIIDAE: COLEOPTERA) IN MAJOR TURMERIC GROWING AREAS

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ABSTRACT

Cigarette beetle, *Lasioderma serricorne* (F.) is a serious pest of stored turmeric causes huge losses by boring extensively through dry turmeric rhizomes. Stored turmeric is commonly disinfected by fumigation with phosphine gas as it leaves almost negligible amount of residue. *L. serricorne* is known to be resistant to phosphine due to its heavy and indiscriminate uses. No detailed information is available on current status of phosphine resistance in *L. serricorne* in major turmeric growing areas. This study investigated resistance level in twelve populations of *L. serricorne* collected from Tamil Nadu, Andhra Pradesh and Telangana. Samples collected were subjected to bioassay on the basis of the response of adults to discriminating concentration of 0.07mg L^{-1} for 24 hr exposure. The bioassay results showed that resistance was common in all the field collected populations of *L. serricorne* and the level of resistance ranged from 27.41 to 82.16%. The populations from Erode (82.16%), Salem (76.66%) in Tamil Nadu and Duggirala (80.23%) in Andhra Pradesh showed high level of resistance. The low level of phosphine resistance (27.41 to 48.30%) was observed in populations from Tiruchengodu, Rasipuram, Athur, Namagiripettai in Tamil Nadu and Kadapa in Andhra Pradesh. The correlation between the number of aluminium phosphide fumigations and the resistance was showed a correlation coefficient (r) of 0.534, indicating that indiscriminate use of phosphine and improper fumigation might lead to development of phosphine resistance in *L. serricorne* in turmeric storage.

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EDIBLE INSECT RESOURCES AND THEIR USE AMONG THE DIMASA KACHARIS OF DIMA HASAO DISTRICT, ASSAM SABINA LANGTHASA*, ROBINDRA TERON AND AJIT KUMAR TAMULI

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ABSTRACT

Entomophagy, the practice of eating insects and insect products as food is common among the Dimasa Kacharis of Dima Hasao district. The district constitutes a biodiversity rich area but largely remained unexplored particularly

due to lack of road connectivity with remote villages. The present study documents the edible insect resources and their therapeutic uses among the Dimasa Kacharis. Group discussion and semi-structured interview methods resulted in documentation of 19 species belonging to 13 families, 16 genera and 6 orders out of which 11 species are known for their medicinal value. Edible insects are known to have high nutritive value while some are highly effective in therapeutic uses. The present study documents the Dimasa traditional knowledge system and their insect resources. This baseline information will be of use for researchers interested in undertaking ethnobiological research in Dima Hasao district.

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**COW URINE AS A CHEMOTHERAPEUTIC IN COMBATING
EUROPEAN FOUL BROOD IN HONEY BEE, *APIS MELLIFERA* L.
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ABSTRACT

Investigations were carried out at few apiaries in Himachal Pradesh and Haryana to gather relevant data to antioxidant and antimicrobial activities of cow urine and Terramycin against bacterial disease, European Foul brood (*Melissococcus plutonius*) in honey bee, *Apis mellifera* colonies. Seventy colonies were selected for experimentation and equalized for colony strength, food stores and assured to have same aged queen. Observations were recorded on disease infection level on 3, 7, 15 and 21 days after 1st and 2nd spraying and % recovery of infection worked out. It is concluded that the spray of cow urine showed a rapid significant reduction in the infection within 21 days and also improved brood growth and health as well as hygienic colonies. Moreover, there was no contamination in the hive products. Whereas, terramycin treatments showed high reduction in the infection below the detectable level in 15 days only but left residues in hive products. Thus the study reveal that the cow urine could have a potential as a therapeutic against bacterial disease supporting the claim of traditional management practice. Cow urine could be used as alternative to chemotherapeutic for the management of European Foul Brood in honeybee colonies.

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**A NEW RECORD OF TERMITE *AMITERMES BELLI* (DESNEUX)
FROM HIMACHAL PRADESH**

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ABSTRACT

This paper deals with first report of termite *Amitermes belli* (Desneux) from Himachal Pradesh. Currently 23 species under five families (Termopsidae, Kalotermitidae, Stylotermitidae, Rhinotermitidae and termitidae) and ten genera are known from Himachal Pradesh. As a member of the highly specialized termite family Termitidae, *A. belli* is unique among other termites found in India, due to backwardly directed tooth. This species had been reported from Delhi, Haryana, Madhya Pradesh and Rajasthan earlier; and this study sample is collected from cow dung from Renuka village, Sirmour district, Himachal Pradesh.

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**FITNESS COSTS OF RESISTANCE TO CRY1AC TOXIN IN *HELICOVERPA ARMIGERA* (HÜBNER)
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ABSTRACT

Transgenic cotton producing a *Bacillus thuringiensis* is widely used for controlling *Helicoverpa armigera* (Hubner). Increasing adoption of Bt cotton expressing *cry* genes from *Bacillus thuringiensis* run under high risk for development of resistance. Fitness costs can greatly influence the rate of resistance evolution and also aids in delaying resistance. In the present study fitness costs in resistant *H. armigera* were evaluated by comparing biological performance to susceptible insects when reared on untreated diet. Parameters monitored includes larval survival, larval and pupal weights, pupal malformation, developmental time (larval and pupal), reproductive traits (fecundity and fertility). From the results, we found that fitness costs reduced survival of resistant strain on untreated diet by 12-25%. Significant weight differences were recorded between resistant and susceptible on untreated diet. Slower growth and development of resistant insects on untreated diet was also observed. Resistant insects took 2-4 days more for larval development, which led to emergence asynchrony between susceptible and resistant adults.

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**FIELD BIOLOGY AND SEM STUDY OF SUGARCANE WOOLY APHID
CERATOVACUNA LANIGERA ZEHNTNER**

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ABSTRACT

Field biology, morphometrics and SEM study of body parts of sugarcane woolly aphid, *Ceratovacuna lanigerum* Zehntner are included in this study. Twenty morphological characters were measured. The line diagrams of body, head, abdomen, the arrangement of antennae, rhinaria wax glands, wax gland plates, spiracles, subanal plate, cauda frontal horns wing venation of forewing and hindwing are given. The data on the field biology reveal that the aphid lifecycle is completed in 20 days with four moults, and it reproduces parthenogenetically, and exhibit morphological variations.

The following are short communications, these have no abstracts

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**EFFICACY OF NEWER INSECTICIDES AGAINST
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**EVALUATION OF ARTIFICIAL DIETS FOR LABORATORY REARING OF
COCCINELLA SEPTEMPUNCTATA L. (COLEOPTERA: COCCINELLIDAE)
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**EFFICACY OF INSECTICIDES AGAINST APHIDS INFESTING
VEGETABLE DOLICHOS BEAN
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**SEASONAL INCIDENCE OF PESTS OF SAPOTA IN SOUTH GUJARAT
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**DESCRIPTION OF A NEW PIPUNCULID (DIPTERA) FROM
INDO-NEPAL BORDER OF CHAMPARAN DISTRICT, BIHAR
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**SEASONAL INCIDENCE OF RED SPIDER MITE
TETRANYCHUS URTICAE KOCH INFESTING MARIGOLD IN JAMMU
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**ASSESSMENT OF AVOIDABLE YIELD LOSS DUE TO POD BORER
HELICOVERPA ARMIGERA IN CHICKPEA
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**EFFICACY OF MANAGEMENT MODULES AGAINST BRINJAL
SHOOT AND FRUIT BORER *LEUCINODES ORBONALIS* IN KASHMIR
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**EFFECT OF EXTRACTS OF *CENTELLA ASIATICA* ON THE
PULSE BEETLE *CALLOSOBRUCHUS CHINENSIS* L.
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