

EVALUATION OF NEW INSECTICIDES AGAINST RICE BROWN PLANT HOPPER

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ABSTRACT

Evaluation of six insecticides viz., ethiprole 40 + imidacloprid 40 WG, etofenprox 10 EC, buprofezin 25 SC, pymetrozine 50 WG, acephate 75 SP and monocrotophos 36 SL were evaluated against rice brown plant hopper BPH. The BPH population was counted on 20 randomly selected hills before spray at 1, 3, 7 and 10 days after spray. The experiment was conducted during *kharif* 2014 and 2015 at the Agricultural Research Station, Kampasagar, laid out in Randomized Block Design with three replications. All the insecticides significantly reduced the BPH. The BPH population varied from 114.0 to 156.6 and 133.4 to 176.6/ 20 hills during *kharif* 2014 and 2015 at one day prior to spray. The population was significantly lower with pymetrozine 50 WG @ 250 g/ha, followed by ethiprole 40 + imidacloprid 40 W.G @ 125 g/ha, etofenprox 10 EC @ 750 ml/ha, acephate 75 SP @ 667g/ha, monocrotophos 36 SL @ 1390 ml/ha and buprofezin 25 SC @ 825 ml/ha at all the counting days of after spray in both 2014 and 2015. The maximum reduction of population was found with pymetrozine 50 WG. The highest grain yield was obtained with pymetrozine 50 WG @ 250 g/ha in *kharif* 2014 and 2015.

POPULATION DYNAMICS AND EFFICACY OF INSECTICIDES ON SYRPHID FLIES ON CAULIFLOWER

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ABSTRACT

Syrphid flies on cauliflower when studied for population dynamics at Parbhani during *rabi* 2015-16 and 2016-17 revealed that their maggots were first observed in 50th meteorological week- MW (10-16 Dec. 2015-16) and in 51st MW (17-23 Dec. 2016-17). The peak activity was during 1st MW (1-7 Jan.) and 52nd MW (24-31 Dec.) in 2015-16 and 2016-17, respectively. The correlation of minimum temperature with population of maggots was negative and significant in 2015-16; it was positive and significant with population of aphids during 2015-16 and 2016-17. Buprofezin 25%SC and flonicamid 50%WG and cyantraniliprole 10.16%OD were found safer against syrphids.

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BEHAVIOURAL RESPONSE OF *COCCINELLA TRANSVERSALIS* TO THE VOLATILES FROM *APHIS CRACCIVORA* AND COWPEA

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ABSTRACT

The behaviour and orientation modifying cues from host plant and prey insect play key role in the process of host selection and acceptance by predators. So, for the first time we conducted an experiment to understand the orientation behaviour of *Coccinella transversalis* on cowpea aphid, *Aphis craccivora*. Y-tube olfactometer studies of *C. transversalis* male and females were studied against both Hexane and DCM extracts from healthy cowpea leaves, cowpea leaves infested with aphid, only aphid injured leaves and body extracts of aphids. Response in terms of number of adult beetles reaching to the source was significantly higher for 10% concentration of extracts from infested cowpea leaves along with aphids followed by response to aphid injured leaves extract, aphid body extracts and healthy leaves extracts of both hexane and DCM solvent.

Response in terms of time taken to reach the source was also significantly higher at 10% concentration followed by 15, 5 and 20% in both hexane and DCM by male and female *C. transversalis*. Further the GC-MS analysis of hexane extract of infested cowpea leaves along with aphid shown the presence of compounds viz., octane, 5-ethyl-2-methyl-nonane, 5-butyl-tetracosyl acetate etc., similarly, in DCM octacosanal, nonadecanol, 2, 6, 11-trimethyl-dodecane etc., were found prominent and these compounds could be responsible for eliciting attraction in predator towards extracts from aphid infested leaves. Our study suggested that synomones (volatiles from cowpea plant) and kairomones (volatiles from aphid body) are playing a vital role in orientation behaviour of *C. transversalis* to locate the cowpea aphid.

DIVERSITY AND FORAGING BEHAVIOUR OF INSECT POLLINATORS IN ONION

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ABSTRACT

An experiment was carried out to examine the diversity and foraging behavior of major insect pollinators in onion. Eleven insect species viz., *Apis florea*, *A. cerana*, *A. dorsata*, *A. mellifera*, *Tetragonula* sp., *Xylocopa* sp., *Vespa* sp., *Pieris rapae*, *Danais chrysippus*, *Eristalis* sp. and *Musca domestica* were observed pollinating. Of these 98% of forage visits were of hymenopterans, with most of these happening during 1330-1430 hrs. The Berger-Parker index of abundance computed revealed that *A. dorsata* was the dominant. The analysis of foraging behaviour revealed that maximum foraging was by *A. cerana* (3.17 umbels/min) followed by *A. dorsata* (3.0 umbels/min) and the least with *A. florea* (2.0 umbels/min). Time spent/ flower was the maximum with *Tetragonula* sp. (27.50 sec/umbel) followed by *A. florea* (18.83 sec/umbel) and *A. dorsata* (17.83 sec/umbel) and the least with *A. cerana*.

DISTRIBUTION PATTERN AND LIFETABLE OF STEM BORER *CHILO PARTELLUS* ON MAIZE

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ABSTRACT

Distribution pattern and lifetable of stem borer *Chilo partellus* (Swinhoe) was studied on maize, which revealed that of the 10 plants only 4-6 plants were chosen by the female moth for oviposition. The distribution pattern of eggs showed that most eggs were laid in the first leaf sheath (107 ± 0.55) followed by the second (75.33 ± 1.72), with the least on the basal leaf sheath (47.10 ± 0.55). Maximum eggs (95.33) were laid two days after the emergence of adult. The larvae were observed scattered from the seedling to early vegetative stage with distribution being contagious in nature around 22 to 71 days old crop. Lifetable analysis

revealed that there was 42% egg mortality due to unknown factors and 19.54% failed to hatch, with 36.17% surviving to larva. Larval mortality was observed due to unknown factors and parasitization with larval parasitoids; while in pupae it was diseases (11.76%). Due to biotic and abiotic factors the mortality of *C. partellus* was of a K value of 0.88.

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EVALUATION OF COMPATIBILITY OF INSECTICIDES WITH FUNGICIDES ON LEPIDOPTEROUS PESTS AND TIKKA LEAF SPOT OF GROUNDNUT

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ABSTRACT

Three insecticides and three fungicides were evaluated alone and in combination against leaf miner, tobacco caterpillar, early and late leaf spot in groundnut, and their phytotoxicity during *kharif*, 2015. No phytotoxic symptoms were observed indicating that all the combinations are safe. Against leaf miner and tobacco caterpillar in combination and alone, chlorantraniliprole resulted in maximum reduction in foliage damage- 87.8% by leaf miner and 80.6% by tobacco caterpillar after second application (55 DAS). The combination with fungicides did not reduce its efficacy indicating good compatibility. Similarly, the fungicide hexaconazole was effective against early and late leaf spot alone and in combination with insecticides- this resulted in damage score of 0.9 (0%) and 6.5 (41-60% disease severity), respectively. All the insecticide and fungicide combinations which effectively controlled lepidopterous pests and tikka leaf spot disease gave higher dry pod yield (671 to 926 kg/ ha) compared to individual application of insecticides (440 to 556 kg/ha) and fungicides (440 to 486 kg/ha) and untreated control (255 kg/ ha).

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DIAGNOSTICS OF THREE SPECIES OF GEOMETRIDAE FROM TAMIL NADU

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ABSTRACT

The present study deals with the diagnostics of *Aporandria specularia* (Guenee, 1857), *Dysphania percota* (Swinhoe, 1891) and *Episothalma robustaria* (Guenee, 1858) belonging to the subfamily Geometrinae, Geometridae from Tamil Nadu.

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INTEGRATED MANAGEMENT OF TWO SPOTTED SPIDER MITE *TETRANYCHUS URTICAE* KOCH ON JASMINE AND ROSE

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ABSTRACT

The field experiments were conducted to evolve a IPM strategy against two spotted spider mite *Tetranychus urticae* Koch on jasmine and rose crops. The study revealed that tulsi (*Ocimum sanctum* L.) leaf extract @10% or neem (*Azadirachta indica* A. Juss.) oil @3% or nochi (*Vitex negundo* L.) leaf extract @ 5% followed by *Beauveria bassiana* @1x 10⁸ CFU/g or *Lecanicillium lecanii* @1x 10⁸ CFU/g followed by bifenthrin 240 SC @0.75ml/l or spiromesifen 240SC @ 0.75ml/l as foliar application at fortnightly interval proved efficient.

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EVALUATION OF MUSTARD GERMPLASM AGAINST APHID *LIPAPHIS ERYSIMI* (KALT.)

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ABSTRACT

Experiments were carried out at Research Farm of Bihar Agricultural College, Sabour, Bhagalpur, Bihar during *Rabi* of 2015-16 and 2016-17 to evaluate mustard germplasm against *Lipaphis erysimi*. A total of 77 germplasm accessions were evaluated based on population build-up of mustard aphid and infestation index. IC491089 was tolerant and had least number of aphid population (21.3 -30.7

aphids/top 10 cm of central shoot/plant). IC385703 was highly susceptible and had 87.0-195.3 aphids/ top 10 cm of central shoot/plant. Based on infestation index, four, three, 54 and 16 accessions of mustard were categorized under tolerant, moderately tolerant, susceptible and highly susceptible categories, respectively. Accessions namely, IC491089, IC312545, IC385686 and IC 312553 were identified for further use in the breeding programme to develop tolerant varieties against *L. erysimi*.

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BIOLOGY OF *CLAVIGRALLA GIBBOSA* SPINOLA ON PIGEON PEA

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ABSTRACT

This study evaluates the biology of the pigeon pea pod bug *Clavigralla gibbosa* Spinola on two genotypes of pigeon pea viz., GT-101 and IPS-51. The results of the study done at the laboratory of Centre of Excellence for Research on Pulses, S. D. Agricultural University, Sardarkrushinagar during 2012-13 revealed no significant differences in the morphometrics and duration of life-stages. The total life cycle occupied slightly lesser time with the genotype GT-101- in case of male it was 61.35 ± 9.87 days and in female for 69.30 ± 11.21 days. Fecundity and hatching % were more when reared on the genotype GT-101. Likewise the sex ratio (male: female) was observed to be 1:1.27 and 1: 1.17 in the genotypes GT-101 and IPS-51, respectively.

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ARTHROPOD DIVERSITY IN MANGO AT KARAIKAL

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ABSTRACT

The diversity of arthropod fauna of mango ecosystem was studied in Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Union Territory of Puducherry and their population

dynamics from August' 2016 to February' 2017 evaluated. The fauna was collected at weekly intervals with net sweeping method, pitfall traps and *in situ* counts. The biodiversity analysis with Shannon-Wiener index and Margalef richness index revealed that the diversity was more for Coleoptera (3.0220 and 5.0520); Simpson's index was maximum for Orthoptera (0.1846), and equitability index being maximum with Neuroptera (1.00). Among the 127 arthropods observed, the population of *Idioscopus clypealis* Lethierry (Cicadellidae: Hemiptera) was the maximum during December' 2016 and the least during February' 2017. The incidence of *Polyrhachis* sp. (Formicidae: Hymenoptera) and *Anegleis cardoni* Weise (Coccinellidae: Coleoptera) revealed a positive correlation with maximum temperature, evening relative humidity, rainfall and a negative correlation with minimum temperature and morning relative humidity.

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**MANAGEMENT OF FRUIT FLIES (*BACTROCERA* SPP.) IN MANGO
USING BIOPESTICIDES AND CLAY**

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ABSTRACT

The evaluation of the biopesticides and clay against the fruit flies *Bactrocera* spp., on mango was done with field experiments. The results have revealed that spinosad @ 0.002% resulted in 14.44 and 8.89 % infestation in 2016 and 2017, respectively, and was the best. It was followed by 0.01% azadirachtin and observing that these are effective than the recommended 0.1% malathion. The cost benefit ratio was observed to be the maximum with malathion 1% (19.83:1 and 4.58:1 in 2016 and 2017, respectively).

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**POPULATION DYNAMICS OF POD FLY *MELANAGROMYZA OBTUSA*
IN LONG DURATION PIGEONPEA**

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ABSTRACT

To determine the impact of abiotic and biotic factors on population dynamics of *Melanagromyza obtusa* (Malloch), investigations were undertaken in long duration pigeonpea, BSMR-736 during *kharif* 2015-16. Present studies revealed that the maggot, pupal and total (maggots + pupae) population had the highest peak of 125 maggots, 67 pupae and 192 pod flies (maggots + pupae) per 100 pods on 3rd standard meteorological week (SMW). During the same period pod and grain damage due to *M. obtusa* ranged from 09.00 to 93.00 and 03.00 to 52.13 per cent; and was at its peak with 93.00 and 52.13 per cent on 3rd SMW.

During the investigation, four parasitoids *i.e.* *Euderus* sp., *Torymus* sp., *Ormyrus* sp. and *Eurytoma* sp. could be recorded on *M. obtusa* larvae and pupae. Analysis of abiotic factors relationship indicated significant strong negative correlation between maggot, pupal and total population *vis-a-vis* temperature ($r = -0.8045, -0.7578$ and $-0.6585; -0.8988$ and $-0.8490, -0.6652$; and $-0.8647, -0.7513$ and -0.7473). The natural maggot, pupal and total parasitism had ranged from 5.56 to 69.57, 13.79 to 50.00 and 10.64 to 56.14 per cent and was at its peak on 5th (69.17 per cent), 4th SMW (50.00 per cent) and 05th SMW (56.14), respectively. The correlation matrix between maggot, pupal and total population of *M. obtusa* with their respective parasitism exhibited moderate to strong positive correlation.

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FATE OF HEXYTHIAZOX RESIDUES IN TEA LEAVES

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ABSTRACT

Fate of hexythiazox 5.45 EC residue was evaluated in tea leaves after application @ 25 and 50 g a.i. ha⁻¹ to derive the safe preharvest waiting period with two field trials. Leaf samples (250 g) were collected on 0, 1, 3, 5, 7 and 10 days after third round of application. The residue estimated by High Performance Liquid Chromatography revealed that for the two doses of hexythiazox evaluated residues were 0.0933 and 0.2035 µg g⁻¹, respectively in the field trial I and 0.1113 and 0.1848 µg g⁻¹, respectively in the field trial II. The residues reached below detectable level on 5th and 7th day after application for the doses evaluated. Half-life of hexythiazox was observed to range from 1.10 to 1.82 days. A safe waiting period of 3.8 days might be recommended for harvesting the leaves after spraying hexythiazox @ 50 g a.i ha⁻¹.

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MITE *VARROA JACOBSONI* AND ITS IMPACT ON *APIS MELLIFERA* L.

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ABSTRACT

The present study was undertaken to study the morphology and seasonal variation of ectoparasitic mite, *Varroa jacobsoni* infesting European honeybee, *Apis mellifera* during May 2015 to April 2016. The study revealed that mite was oval, dome shaped covered with setae and reddish brown coloured visible with unaided eye. The gnathosoma consists of a pair of pedipalpi and modified pair of pointed bidentate chelicerae used to pierce the intersegmental membrane of bee host to feed on haemolymph. The *V. jacobsoni* population was at peak in May (114.5 ± 0.40) and lowest in January (46.72 ± 1.35) than other months.

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BIOLOGICAL CONTROL OF MOSQUITO LARVAE USING NAIAD OF RUDDY MARSH SKIMMER *CROCOTHEMIS SERVILIA*

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ABSTRACT

The naiads of *Crocothemis servilia* (Drury) feed only on larvae of *Culex quinquefasciatus* and both larvae and pupae of *Aedes aegypti* under laboratory condition. It prefers 2nd instar larva over other instars of *C. quinquefasciatus* and for 3rd instar larvae of *A. aegypti*. These exhibited higher predation rate during day time. The diurnal clearance rate was significantly higher than the nocturnal one for both the species. Maximum clearance rate was observed during first hour of predation. Results indicate that *C. servilia* could be used as a potential biocontrol agent against mosquito larvae.

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EVALUATION OF ENTOMOPATHOGENIC NEMATODE *STEINERNEMA DHARANAI* N.R. (TFRIEPN-15) ON

GREATER WAX MOTH, *GALLERIA MELLONELLA*

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ABSTRACT

Infectivity and progeny production by new-to-science native entomopathogenic nematode, *Steinernema dharanaii* sp. n.r. (TFRIEPN-15) was evaluated against the wax moth larvae, *Galleria mellonella* in different dose levels. Early last instar wax moth larvae were exposed to doses ranging from 3 to 30 IJs larva⁻¹ for evaluation of infectivity and 3 to 200 IJs larva⁻¹ for progeny production. The lowest dose of 3 IJs larva⁻¹ caused 44.00% mortality and highest mortality of 100% was obtained at 24 IJs larva⁻¹ and 30 IJs larva⁻¹. While the production of IJs of the next progeny was proportional to increase in EPN doses exposed, but this dose-dependent increase in progeny production was only up to a dose. The cadavers exposed to minimum dose of 3 IJs Larva⁻¹ produced 57,400 IJs, whereas, the highest dose 200 IJs Larvae⁻¹ allowed progeny production of only 39,320 IJs Larva⁻¹. The LC₅₀, LC₉₀ and LT₅₀, LT₉₀ were also calculated.

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SCREENING OF BLACK GRAM GENOTYPES AGAINST SPOTTED POD BORER

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ABSTRACT

Field screening was carried out during *kharif* season 2014 and 2015 with 20 varieties/genotypes of black gram, *Vigna mungo* (L.) Hepper against spotted pod borer *Maruca vitrata*. The maximum population of spotted pod borer was observed in genotypes CO5 followed by VBN 4 and Azad 4; the least population was observed with genotypes IPU 94-1, IPU 7-3 and WBC-108 and PU- 40 during both years. The maximum pod damage was observed with the genotype VBN 4 followed by CO 5 and LBG 20 and the least with IPU 94-1 and IPU 2-43. The maximum yield was obtained with IPU 94-1 followed by IPU 7-3 and IPU 2-43, and these were resistant. The least yield was obtained with VBN-4 and CO 5, and these were highly susceptible.

**IDENTIFICATION OF RESISTANT COWPEA SOURCES
FOR POD BORER COMPLEX**

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ABSTRACT

Eighty one cowpea accessions were screened under field conditions for resistance or tolerance to pod borers i.e., spotted pod borer, *Maruca vitrata*, gram pod borer, *Helicoverpa armigera* and blue butterfly, *Lampides boeticus*. The accessions were screened for three seasons i.e., *kharif* 2013, *rabi* 2013 and summer 2014. Among these, it was observed that the fifteen accessions showed stable resistance levels to all the pod borers and over all the seasons studied. VCP-09-022 was completely free from *H. armigera*; and VCP-09-025, VCP-09-028, CGD 195, CGD 15 and CP 2 showed <1% damage. Damage by *M. vitrata* was less (2%) in VCP-09-023 followed by VCP-09-022, VCP-09-032, CGD 195 and CP 2; and blue butterfly with <1 % damage with the entries, VCP-09-022, CGD 195 and CP 2. Mean cumulative pod borer damage was less than 5% in VCP-09-022 (3%), CGD 195 (4%) and CP 2 (3.7%). The entries with multiple resistance to all the three pod borers were VCP-09-022, CGD 195 and CP 2.

**DEVELOPMENTAL GENES RELATED TO PARTHENOGENESIS
REVEALED SINUSOIDAL PATTERN OF GENE-EXPRESSION IN
MUSTARD APHID *LIPAPHIS ERYSIMI***

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ABSTRACT

Mustard aphid, *Lipaphis erysimi* (Kalt.) is a major insect pest of rapeseed-mustard group of crops. The economic importance of this has prompted fundamental research on it including gene expression and gene silencing studies. To identify key genes regulating parthenogenetic reproduction, gene-expression pattern of five developmental genes have been studied across three developmental stages namely, nymph, third instar and adult. All the five genes showed a constitutive basal level as well as significant up- or down-regulation over and above the basal level, across the developmental stages. While *LeENDO*, *LeSTRN* and *LeFAS* genes showed decrease in gene expression as the insect matures to parthenogenetic mother; and *LeRNH* and *LeSNIV* showed continuous increase in transcript level peaking in alate mother. Interestingly, all the genes followed a sinusoidal pattern of gene- expression either directly or inversely related to progression of developmental stages from newborn nymph to adult parthenogenetic mother in *L. erysimi*. In addition, a phylogenetic analysis of these genes revealed extent of resemblance and divergence of the gene sequences with their homologs from other insects including aphid species and pollinators.

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SAL BORER *HOPLOCERAMBYX SPINICORNIS* NEWMAN: A DEVASTATING FOREST INSECT PEST IN INDIA

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ABSTRACT

The sal heartwood borer or sal borer, *Hoplocerambyx spinicornis* Newman is the most devastating insect pest of *Shorea robusta*. It is not only due to the incidence and intensity of the pest but also due to the ecological and economical losses it caused due to periodically repeated outbreaks or epidemics of this pest in sal dominating areas. Complex life cycle and related problems further makes the management tough. The chapter discusses various aspects of this pest along with possible management options including researches being undertaken on sal heartwood borer.

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**NEW RECORD OF SPIDER *HAMATALIWA MANCA TANG & LI*
(Araneae: Oxyopidae)**

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SCREENING OF LITCHI GENOTYPES FOR LAC CULTURE

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**NEW RECORD OF HARAR (*TERMINALIA CHEBULA*) FRUIT BORER
DICHOCROCIS SP. (LEPIDOPTERA: CRAMBIDAE)**

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

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**POPULATION DYNAMICS OF *LASIOPTERA BRYONIAE* SCHINER AND ITS
NATURAL ENEMIES IN BITTER GOURD**

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BIOLOGY OF SPINY BOLLWORM *EARIAS INSULANA* BOISDUVAL

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**EFFICACY OF NEW INSECTICIDES AGAINST CUCUMBER APHID
APHIS GOSSYPHII GLOVER IN POLYHOUSE**

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**PROSPECTS OF MOLECULAR GENETICS IN
SILKWORM BREEDING: AN OVERVIEW**

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