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Studies on insect fauna collected in light trap during *Rabi* season in vegetable fields at Jabalpur

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Abstract

The present study was conducted under the Studies on insect fauna collected in light trap during *Rabi* season in vegetable fields at Jabalpur. Information on insect fauna of vegetable fields collected in Maharajpur Horticultural experiment farm Jabalpur M.P. The data of trap catch during the year 2016-17 (*Rabi* season) was classified on taxonomic basis, economic aspect (crop pest) and bio control significance (parasite and predators) a total 54 insect species belonging to 10 orders and 33 families were recorded throughout the season (*Rabi* 2016-17) based on number of species collected, largest collection was represented by order Lepidoptera 24 species (44.44%) followed by order Coleoptera 8 species (16.66%), Hemiptera 8 species (14.81%), Orthoptera 3 species (5.55%) and Hymenoptera 2 species (3.77%) in descending order respectively. Orders of minor significance are represented by Odonata, Diptera and Neuroptera having 2 species each while Dermaptera and Dictyoptera were represented by one species only. Based on economic importance this collection was represented by 37 species of harmful insects (as crop pest) 17 species of predatory insects (useful as bio control agents). Category of harmful insect pests includes the major and minor pest species of vegetables, major polyphagous pest, pest of cereals, oilseeds and other crops. The present study reviles that studies on insect fauna collected in light trap during *Rabi* season in vegetable fields at Jabalpur.

Keywords: trap catches, vegetable ecosystem, taxonomic basis, polyphagous

1. Introduction

India's diverse climate ensures availability of all varieties of vegetables. It ranks second in vegetable production in the world, after China. India produced 169.478 million metric tons of vegetables, in 2014-15 ^[1]. Light trap is an important tool for minimizing the insect pests damage without any toxic hazard ^[10]. Apart from this light trap has been used to supplement the knowledge of pest fauna of given locality, geographical distribution and their seasonal activity ^[13]. Insects are the most species-rich taxon with about one million species described worldwide, corresponding to more than half of all known species ^[3&4]. Due to their high ecological diversification and short generation times, insects are useful indicators of environmental change ^[8]. Lepidoptera (butterflies and moths) is one of the largest insect orders with 160,000 described species, of which 95% are moths ^[5]. Moths play important roles in many ecosystems as pollinators, herbivores, and prey for a wide range of species such as birds and bats ^[13]. Extensive work has been carried out by Vaishampayan and his associates on various aspects of light-trap designs, light sources and seasonal activities of major insect pests of gram but very little information is available on phototactic insect fauna collected in light trap on vegetables crops ^[12], therefore present investigation is proposed to fillup this gap with studies on insect fauna collected in light trap during *Rabi* season in vegetable fields

2. Materials and Methods

The experiment was conducted at the Horticultural Experimental Farm, Maharajpur, Jabalpur (MP) during the period between second week of November to last week of April, 2016-17. Experiment conducted by standard design of Jawahar light trap by using 125 watt mercury vapor lamp. Light trap was operated every night and collection was observed on the next day morning. Observations will be recorded every day throughout the *Rabi* season. Total insects was observed and sorted out on the basis of species and their family. Specimens were prepared by keeping the pinned insects in oven for 24 hours at 30 °C and thereafter well labeled specimens were stored in insect boxes and show cases. Detail photographic presentation of these species was also made.

3. Results

Taxonomic analysis revealed that these 54 insect species belonging to 10 orders and 33 families were recorded throughout the season (*Rabi* 2016-17) based on number of species collected, largest collection was represented by order Lepidoptera 24 species (44.44%) followed by order

Coleoptera 8 species (16.66%), Hemiptera 8 species (14.81%), Orthoptera 3 species (5.55%) and Hymenoptera 2 species (3.77%) in descending order respectively. Orders of minor significance are represented by Odonata, Diptera and Neuroptera having 2 species each while Dermaptera and Dictyoptera were represented by one species only (Fig.1).

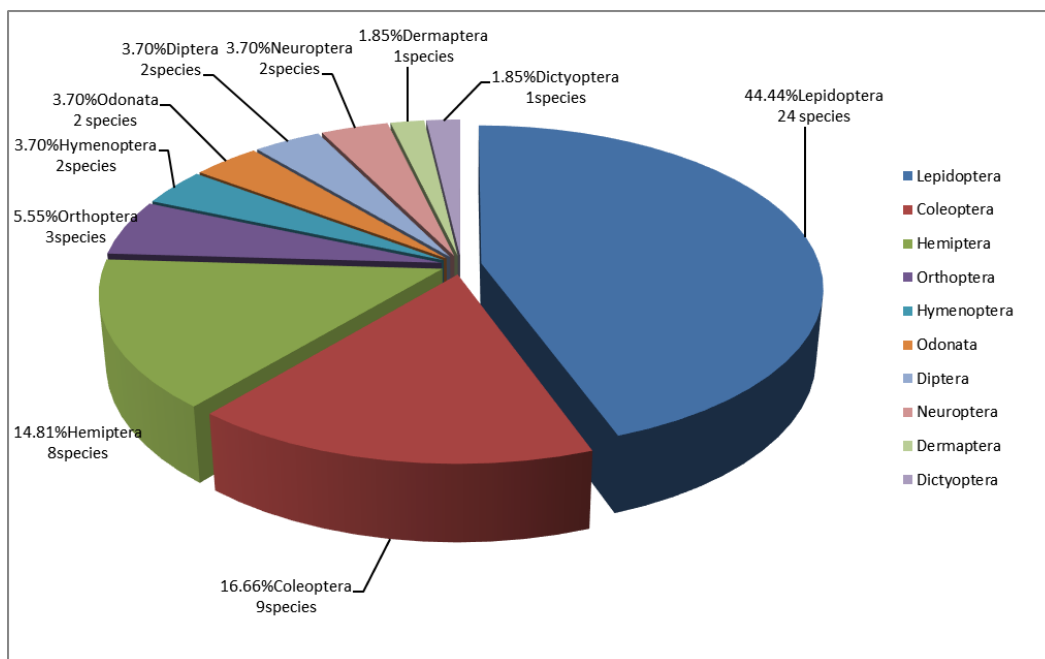


Fig 1: Percent distribution of insect species of different orders trapped in light trap installed in vegetable fields during *Rabi* 2016-17 (November to April) at Jabalpur.

These species were grouped on the basis of their economic importance in two major categories viz. Harmful insects- as crop pests and beneficial insects- as bio-control agents (Predators and parasites) were given in Table 1 and 2.

Among the harmful crop pest species order Lepidoptera was represented by the highest number of 10 families including 24 species (65%), in which, family Noctuidae had the highest 8 species (Fig.2)

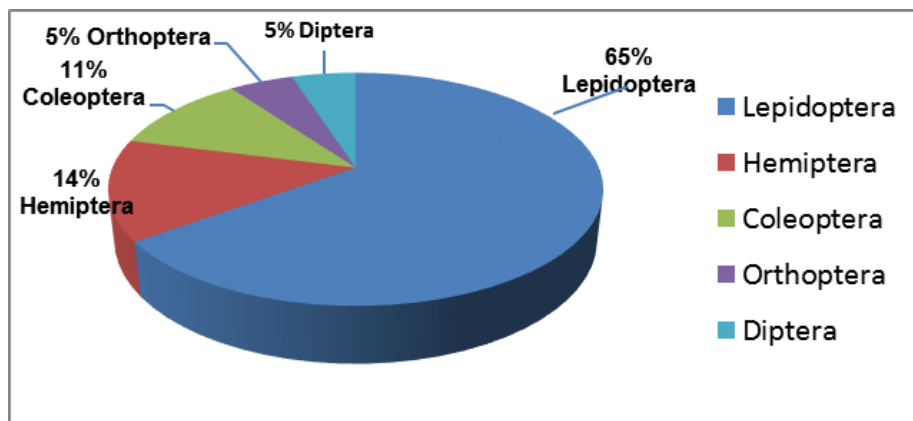


Fig 2: Percentage distribution of harmful insects- as crop pests of different order trapped in light trap installed in Vegetable field at Jabalpur *Rabi* 2016-17 (November to April).

This family includes 7 species as important pests of different crops. Among these species, *Plusia orichalcea* (Fabricius) has the highest size of trap catch (1501 moths) followed by *Spodoptera litura* (Fabricius) (638 moths), while the lowest size of trap catch was of *Chrysodeixis chalcites* (Esper) (25 moths) and *Spilosoma obliqua* Walker (25 moths), Sharma and Bisen (2013) also reported that 23 species of 7 families belonging to order Lepidoptera through light trap catches during kharif season 2006 at Jabalpur. Among these species highest number of species belonged to family Noctuidae. Five major polyphagous pest species of Lepidoptera namely,

Spodoptera litura Fabricius (638 moths), *Chrysodeixis chalcites* (Esper) (25 moths), *Helicoverpa armigera* (Hubber) (538 moths), *Earias insulana* (70 moths), and *Agrotis ipsilon* (Hufnagel) (366 moth) were also recorded during the season in trap catch. Dangi (2004) [2] reported that *Spodoptera litura* Fabricius, *Helicoverpa armigera* (Hubner), *Agrotis ipsilon* (Hufnagel) and *Plusia orichalcea* (Fabricius) as polyphagous pests of family Noctuidae, in light trap catches at Jabalpur. After Lepidoptera, Hemiptera was the next highest order of pest species in trap catches with 3 families and 5 species. The family Pentatomidae was represented by *Antestiopsis cruciata*

(Fabricius) with a highest trap catch of (819 bugs) followed by *Nephotettix virescens* (Distant) (302 hoppers), *Nezara viridula* (Linnaeus) (311 bugs), *Dysdercus koenigii* (Fabricius) (13 bugs) and *Idioscopus niveosparsus* (Lethierry) (1 hopper). Muchala (2014) [7] observed 5 families and 8 species. The family Cicadellidae was represented by *Nephotettix virescens* (Distant) with a highest trap catch of 22,753 hoppers followed by *Pyrilla perpusilla* Walker (1890 hoppers), *Nezara viridula* Linnaeus (964 bugs), *Dysdercus koenigii* Fabricius (401 bugs) *Antestiopsis cruciata* (Fabricius) (187 bugs).

Order Coleoptera was represented by 3 families and 4 species. The family Chrysomelidae, *Aulacophora foveicollis* (Lucas) (189 beetles), and *Altica* sp. (14 beetles), family Scarabidae, *Holotrichia consanguinea* (Blanch) (18 beetles), family Cerambycidae, *Stromatium barbatum* (2 beetles). Mishra (2016) [6] also reported order Order Coleoptera was represented by 2 families and 4 species. In terms of relative size of trap catch Red pumpkin beetle, *Aulacophora foveicollis* (Lucas) had the highest trap catch of 754 beetles

followed by *Holotrichia consanguinea* Blanch (47 beetles). In conformity with the present findings Sharma *et al.* (2010) also recorded highest trap catch of *Aulacophora foveicollis* (451 beetles) among coleopteran at Jabalpur.

Order Orthoptera was represented by 2 families and 2 species. Among two species of this order highest trap catch was of Field cricket, *Euscyrtus concinnus* (de Haan) (869 crickets) followed by Mole cricket, *Gryllotalpa orientalis* (Burmeister) (171 crickets), Sharma *et al.* (2006) [11] reported that order Orthoptera was represented by 3 families in which highest trap catch was of *Gryllus* sp. (3854) (fam. Gryllidae) followed by Grass hoppers *Trilophidia cristella* S. (311) & *Gastrimargus transversus* T. (387) and *Gryllotalpa gryllotalpa* Linn. (213) at Jabalpur.

Order Diptera was represented by two family i.e. Bibionidae with single species *Plecia amplipennis* (Skuse) (372 flies) and family Calliphoridae, *Chrysomya* sp. (4 flies), Muchhala (2014) [7] also reported that order Diptera was represented by only one family i.e. Bibionidae with single species *Plecia amplipennis* (Skuse.) The size of catch was 2941 adults

Table 1: Taxonomic distribution of insect fauna collected in light trap during *Rabi* season (2016-17) at Jabalpur Group-I) Harmful insects- as crop pests.

S. No.	Insect species collected	Total of seasons collection (November to April.)	Economic status As crop pest
	ORDER- LEPIDOPTERA		
	A) Family- Noctuidae		
1	<i>Plusia orichalcea</i> (Fabricius) Cabbage semilooper	1501	Major polyphagous pest of vegetable crops, cabbage, cauliflower etc.
2	<i>Helicoverpa armigera</i> (Hubner) Gram pod borer	538	Major polyphagous pest of pulses, potato, tomato, chilli, okra and cotton.
3	<i>Chrysodeixis chalcites</i> (Esper) Green semi looper	25	Pest of soybean, potato, tomato and bean etc.
4	<i>Mythimna separata</i> (Walker) Army worm	232	Major pest of paddy.
5	<i>Spodoptera litura</i> (Fabricius) Tobacco caterpillar	638	Major polyphagous pest of soybean, cabbage, cucurbits, potato, chilli and pea etc.
6	<i>Asota ficus</i> (Fabricius)	76	Fodder pest
7	<i>Agrotis ipsilon</i> (Hufnagel) Cutworm	366	Major polyphagous pest of pulses, pest of cabbage, cucurbits, potato.
8	<i>Earias vitella</i> (Linnaeus) Okra shoot and fruit borer	70	Major pest okra, cotton
	B) Family- Arctiidae		
9	<i>Cretonotos gangis</i> (Linnaeus) Tiger moth	938	Polyphagous pest.
10	<i>Amata</i> sp. Seven spotted moth	961	Fodder pest.
11	<i>Spilosoma obliqua</i> (Walker) Bihar hairy caterpillar	25	Major polyphagous pest of sesame, linseed and minor pest of cabbage and sweet potato
12	<i>Utheasia pulchella</i> (Linnaeus) Sunhemp hairy caterpillar	39	Major pest of sunhemp
	C) Family- Sphingidae		
13	<i>Agrius convolvuli</i> (Linnaeus) Spingid moth	40	Major pest of sweet potato, sunflower and soybean
14	<i>Acherontia styx</i> (Westwood) Til hawk moth	2	Major pest of sesame and minor pest of potato
15	<i>Daphinis niri</i> (Linnaeus) Oleander moth	6	Feed on nectar of variety of flowers. Like Petunia, Jasmine and Honeysuckle.
	D) Family- Pyralidae		
16	<i>Chilo partellus</i> (Swinhoe) Maize stem borer	11	Major pest of maize and sorghum
	E) Family- Nymphalidae		
17	<i>Melanitis leda ismene</i> (Cramer)	3	Major pest of paddy

	Rice butter fly		
	F) Family- Lymantriidae		
18	<i>Euproctis similis</i> (Moore)	66	Minor pest of paddy and ragi
	G) Family- Crambidae		
19	<i>Palpita vitrealis</i> (Rossi) Jasmine moth	16	Pest of ornamental plant (Jasmine)
	Family- Lasiocampidae		
20	<i>Metanastria hirtaca</i> (Cramer)	1	Pest of Almond, Guava, Sal tree, Babul and Cashew nut etc.
21	<i>Trabala vishnou</i> (Lefebve)	1	Pest of pomogranate, castor, almond, jamun, guava, Acacia and <i>Eucalyptus</i> etc
	Family- Geometridae		
22	<i>Buzura suppressaria</i> (Guenee) Tea looper	3	Pest of tea
	Family-Erebidae		
23	<i>Cyana peregrine</i> (Walker)	3	Pest of grasses
24	<i>Digama hearseyana</i> (Moore)	5	Pest of Natal plum (<i>Carissa</i> sp.)
	ORDER- HEMIPTERA		
	A) Family-Pentatomidae		
25	<i>Nezara viridula</i> (Linnaeus) Green stink bug	311	Major polyphagous pest of soybean, pigeon pea and vegetable crops
26	<i>Antestiopsis cruciata</i> (Fabricius) Coffee plant bug	819	Pest of coffee and jasmine
	B) Family- Cicadellidae		
27	<i>Nephotettix virescens</i> (Distant) Green leaf hopper	302	Major pest of paddy
28	<i>Idioscopus niveosparus</i> (Linnaeus) Mango hopper	1	Major pest of mango
	D) Family-Pyrrhocoridae		
29	<i>Dysdercus koenigii</i> (Fabricius) Red cotton bug	13	Major pest of cotton and okra
	ORDER- COLEOPTERA		
	A) Family- Scarabaeidae		
30	<i>Holotrichia consanguinea</i> White grub	18	Major pest of ground nut, sugarcane, chilli and soybean
	Family- Chrysomelidae		
31	<i>Aulacophora foveicolis</i> (Lucas)	189	Major pest of cucurbitaceous particularly pumpkin
32	<i>Altica oleracea</i> (Linnaeus).	14	
	Family- Cerambycidae		
33	<i>Stromatium barbatum</i> (Fabricius) Bamboo borer beetle	2	Pest of bamboo (Teak)
	ORDER- ORTHOPTERA		
	A) Family- Gryllidae		
34	<i>Euscyrtus concinnus</i> (de Haan) Field cricket	869	Pest of fodder grasses
	C) Family- Gryllotalpidae		
35	<i>Gryllotalpa orientalis</i> (Burmeister) Mole cricket	171	Pest of paddy
	ORDER- DIPTERA		
	A) Family- Bibionidae		
36	<i>Plecia amplipennis</i> (Skuse)	372	Fodder pest
	Family- Calliphoridae		
37	<i>Chrysomya</i> sp. (Robineau-Desvoidy)	4	Feed on flowers of many plants, decaying matter.

Group of beneficial insects as natural biocontrol agents was represented by 7 orders, 13 families & 15 species as predators and 1 order, 2 families and 2 species as parasites. Among the predatory species order Coleoptera was represented by the highest number of 3 families including 5 species followed by order Hemiptera was represented by 3 families and 3 species, order Hymenoptera was represented by 2 families and 2 species as parasites, order Odonata and Neuroptera were represented by two species while order Dermaptera, Dictyoptera and Orthoptera were represented by only one

species each.

Among the predatory species order Coleoptera was represented by the highest number of 3 families including 5 species in which family Carabidae has the highest 3 predatory species namely *Prothyma* sp. (27 beetles), *Chlaenius pictus* (Choudeir) (11 beetles), and *Cicindela flexuosa* (Distant) (7 beetles), while family Hydrophilidae was represented by one species of water beetle, *Hydrochara caraboides* Latreille (175 beetles)

Table 2: Taxonomic distribution of insect fauna collected in light trap during *Rabi* season (2016-17) at Jabalpur. Group- II) Beneficial insects- as bio-control agents (Predators and parasites).

S. No.	Insect species collected	Total of seasons collection (November to April.)	Economic status Beneficial- Predatory / parasitic as bio control agents
	ORDER- COLEOPTERA		
	A) Family- Carabidae		
1	<i>Prothyma</i> sp. Tiger beetle	27	Predator of Colorado potato beetle and small insects
2	<i>Cicindela flexuosa</i> (Distant)	7	General predator of small insects
3	<i>Chlaenius spictus</i> (Choudoir)	11	General predator of Lepidopterous larvae
	B) Family- Hydrophilidae		
4	<i>Hydrochara caraboides</i> (Latreille) Water scavenger	175	General predator of aquatic insects
	C) Family- Scarabaeidae		
5	<i>Onitis falcatus</i> (Wulfen) Dung beetle	78	General predator of aphid, coccids, white fly and bugs
	ORDER- HEMIPTERA		
	A) Family- Reduviidae		
6	<i>Sirthenea carinata</i> (Fabricius)	3	Predator of mole cricket and <i>Gryllus</i> sp.
	C) Family- Belostomatidae		
7	<i>Diplonychus rusticus</i> (Fabricius) Water bug	30	Feed on aquatic insects
	D) Family- Pyrrhocoridae		
8	<i>Antilochus conqueberti</i> (Fabricius)	4	Predator of nymph of red cotton bug
	ORDER- HYMENOPTERA		
	B) Family- Formicidae		
9	<i>Dorylus</i> sp. (Fabricius)	1166	General parasite of Lepidopterous and Dipterous insects
	C) Family- Ichneumonidae		
10	<i>Enicospilus purgatus</i> (Say)	65	Larval parasite of stem borer, leaf folder and Lepidopterous insects
	ORDER- ODONATA		
	A) Family- Coenagrionidae		
11	<i>Coenagrion</i> sp. (Kirby) Damsel fly	3	Predator of monarch butterfly, stem borer, gall midge and leaf eating caterpillar
	B) Family- Libellulidae		
12	<i>Pantala flavescens</i> (Fabricius) Dragon fly	15	General predator on Lepidopterous, Dipterous and Hymenopterous insects
	ORDER- NEUROPTERA		
	A) Family- Chrysopidae		
13	<i>Chrysoperla sillemi</i> (Esben-petersen)	135	General predator on leaf hoppers and aphids
	B) Family- Ascalaphidae		
14	<i>Ascalaphus</i> sp. (Walker) Owl fly	130	Adult feed on caterpillars and grubs
	ORDER- DICTYOPTERA		
	A) Family- Mentidae		
15	<i>Archimantis latistyla</i> (Serville) Preying Mantid	9	Nymph feed on leaf hopper and aphids while adult feed on caterpillars
	ORDER- ORTHOPTERA		
	Family- Tettigoniidae		
16	<i>Conocephalus</i> sp. Long horn grass hopper	4	Predator of Lepidopteran eggs
	ORDER- DERMAPTERA		
	A) Family- Forficulidae		
17	<i>Elaunon bipartitus</i> (Kirby) Earwigs	4	General predator on Lepidopteran larvae

4. Conclusion

The present investigation has provided valuable information on taxonomic analysis of 54 insect species belonging to 10 orders and 33 families were recorded throughout the season (*Rabi* 2016-17) based on number of species collected, largest collection was represented by order Lepidoptera 24 species (44.44%) followed by order Coleoptera 8 species (16.66%), Hemiptera 8 species (14.81%), Orthoptera 3 species (5.55%) and Hymenoptera 2 species (3.77%) in descending order

respectively. Orders of minor significance are represented by Odonata, Diptera and Neuroptera having 2 species each while Dermaptera and Dictyoptera were represented by one species only.

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