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Taxonomic documentation of insect pest fauna of rice collected in light trap at Jabalpur district of Madhya Pradesh

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Abstract
The present investigation was conducted for taxonomic documentation of insect pest fauna of rice. Information on insect pest fauna of rice ecosystem collected in Jabalpur region during the period between the last weeks of June to last week of December 2015. Total 62 species were recorded in *kharif* cropping season of rice cropping area. These insect belongs to 11 orders and 34 families. Lepidoptera was the largest order with 19 species followed by order Coleoptera 13 species, Hemiptera 12 species, Orthoptera 5 species and Hymenoptera 5 species in descending order respectively. Orders of minor significance are represented by Odonata and Neuroptera having 2 species each while Isoptera, Diptera, Dermaptera and Dictyoptera were represented by one species only. These species were grouped on the basis of their economic importance in three major categories viz. Harmful insects- as crop pests 32 species, beneficial insects- as bio-control agents (predators and parasites) 28 species and beneficial insects- as commercially important 2 species. The present study also reviles that documented information on these species gives broader scope of using light trap as Integrated Pest Management tool against these insect pests of vegetables and other crops.

Keywords: Taxonomic, rice, light trap, insect pest, documentation

1. Introduction
Rice (*Oryza sativa* L.) is an important cereal crop in the world serving as staple diet for millions of peoples. Rice stands second in the world after wheat in area and production. In India it is cultivated in an area of 44.00 million hectares with a production of 104.80 million tonnes and productivity of 2177kg ha^{-1} whereas estimated production in 2015-16 is 106.10 million tonnes [2]. Almost 90% of rice is grown and consumed in Asia [1]. In India average losses in paddy production due to insect pests are 25-30% [4] and in Madhya Pradesh about 40-100% losses were observed [5, 13] reported that over 100 insect pest species attacks paddy crop at various stages of its growth in which 20 species cause the economic damage. Light trap is an important tool for minimizing the insect pests damage without any toxic hazards [17]. Other than this light trap has been used to supplement the knowledge of pest fauna of given locality, geographical distribution and their seasonal activity etc. [24, 18]. Many insects are positively phototrophic in nature and use of light traps for insect catches produces valuable faunistic data. This data can be seen as a parameter of health of biodiversity of the concerned vicinity. The data provided by light trap catches could throw light on period of maximum activity of insects. The phototropic behavior of insects makes the scientist capable to use light trap for capturing insects either for study or destruction. The forecasting and predication of insect occurrence or outbreak can be made by using light trap [21]. These studies are helpful in the rational and timely application of insecticide which may lead to better and cheaper insect control with least hazards. The present study reviles that documented information on these species gives broader scope of using light trap as Integrated Pest Management tool against these insect pests of vegetables and other crops. The trap catch data also provide voluble information on bio control agents (predatory) active in rice ecosystem.

2. Materials and Methods
The present experiment was conducted at the Krishi Nager Experimental Farm, Adhartal, Jabalpur (MP) during the period between the last week of June to last week of December, 2015. New Jawahar light trap model developed at JNKVV, Jabalpur with mercury vapor lamp (80 W) as light source was used for the present study.

The insects collected in the chamber of light trap were killed by the exposure of Dichlorvos 76% EC vapours (as fumigating agent) which is directly placed in collection tray for instant killing of trapped insects.

For the taxonomic documentation, the light trap was operated every night and collection was observed on the next day morning. Observations were recorded every day throughout the *kharif* season. Total insects was observed and sorted out on the basis of their order and family. Identification of insects was done on the basis of specimens available in insect museum of the Department of Entomology, JNKVV, Jabalpur, Department of Entomology, UAS, Bangalore and Zoological Survey of India, Jabalpur. Dried 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.

3. Result and Discussion

Sixty two (62) insect species belonging to 11 orders and 34 families were recorded throughout the season (*kharif* 2015). Based on number of species collected, largest collection was represented by order Lepidoptera 19 species (30%) followed by order Coleoptera 13 species (21%), Hemiptera 12 species (20%), Orthoptera 5 species (8%) and Hymenoptera 5 species (8%) in descending order respectively. Orders of minor significance are represented by Odonata and Neuroptera having 2 species each while Isoptera, Diptera, Dermaptera and Dictyoptera were represented by one species only. To study the relative size of trap catches of various species collected in different taxonomic groups, collection of entire season (June to Dec.) was recorded species wise. These species were grouped on the basis of their economic importance in three major categories viz. Harmful insects- as crop pests, beneficial insects- as bio-control agents (predators and parasites) and beneficial insects- as commercially important.

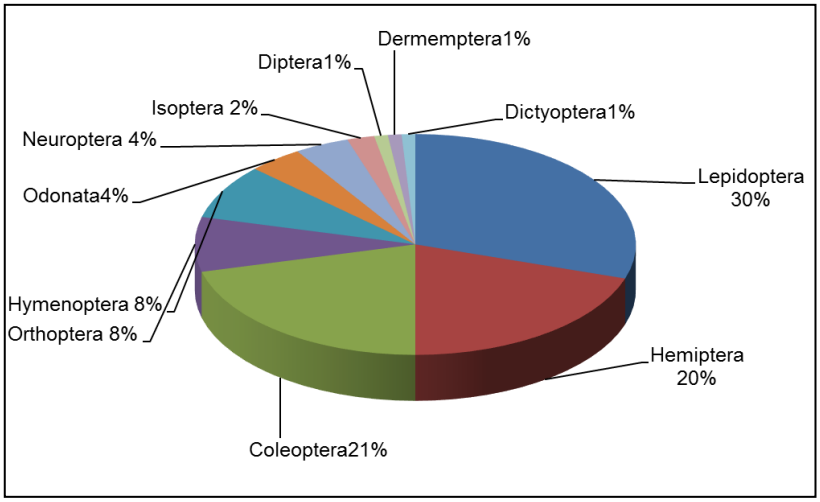

Fig 1: Per cent distribution of insect species of different orders trapped in light trap installed in paddy Field during *kharif* 2015 (June to December) at Jabalpur.

In accordance with present findings Sharma *et al.* [18] also reported a record of 62 species through light trap catches during the cropping season of paddy at Jabalpur (2002-03). These species belonging to 8 orders and 33 families. Lepidoptera was the largest order with 27 species, followed by Hemiptera (14 species), Coleoptera (12 species) and Orthoptera (4 species). Odonata, Hymenoptera, Isoptera and Dictyoptera were the other orders of minor significance.

3.1 Group I: Harmful insects- as crop pests

Group of Harmful insects- as crop pests, was represented by 6 orders, 19 families & 32 species as crop pests species. Among the harmful crop pest species, order Lepidoptera was represented by the highest number of 7 families including 18 species, in which, family Noctuidae has the highest 7 species. This family includes 6 species as important pests of different crops. Among these species, *Thysanoplusia orichalcea* (Fabricius*)* has the highest size of trap catch (1631 moths) followed by *Spodoptera litura* (Fabricius) (1465 moths), while the lowest size of trap catch was of *Hyblaea puera* Cramer (318 moths). In accordance to the present findings, Parra *et al.* [12] reported family Noctuidae as the most diversified group of Lepidoptera having major economic importance, similarly Stojanovic *et al.* [22] and Kumar *et al.* [9] also reported that family Noctuidae was the dominant and important family of order Lepidoptera in light trap catches.

Five major polyphagous pest species of Lepidoptera namely, *Spodoptera litura* Fabricius (1465 moths), *Chrysodeixis chalcites* (Esper) (1341 moths), *Spilosoma obliqua* Walker (630 moths), *Amsacta moorei* Butler (415 moths) and *Helicoverpa armigera* (Hubber) (332 moth), were also recorded during the season in trap catch. Similarly Sharma and Vaishampayan (2009) [15] and Sharma (2004) [17] also reported that *Helicoverpa armigera*, *Agrotis ipsilon* and *Spodoptera litura* were the major polyphagous pests of family Noctuidae through trap catches in paddy ecosystem at Jabalpur. Other major pest species of order Lepidoptera were *Euproctis similis* (Moore) (153 moths) family Lymentriidae, *Agrius convolvuli* (Linnaeus) (165 moths) and *Acherontia styx* (Westwood) (77 moths) Family Sphingidae, *Cretonotos gangis* (Linnaeus) (804 moth) and *Amata* sp.(295 moth) family Arctiidae, *Chilo partellus* Swinhoe (88 moths) family Pyralidae, *Palpita vitrealis* (Rossi) (42 moths) family Crambidae and *Asota ficus* (Fabricius) (611 moths) family Noctuidae and among major paddy pests *Melanitis leda ismene* Cramer (565 butterflies) family Nymphalidae, *Mythimna separata* (Walker) (565 moths) family Noctuidae and *Cnaphalocrocis medinalis* (Guene) (17 moths) family Pyralidae.

Table 1: Taxonomic distribution of Harmful insects- as crop pests collected in light trap during kharif season (2015) at Jabalpur.

S. No.	Insect species collected	Total of season's collection (June to Dec.)	Economic status As crop pest
I.	**ORDER- Lepidoptera**		
	A) Family-Noctuidae		
1)	*Spodoptera litura* Fabricius Tobacco caterpillar	1465	Major polyphagous pest of soybean, cabbage, cucurbits, potato, chilli and pea etc.
2)	*Helicoverpa armigera* (Hubner) Gram pod borer	332	Major polyphagous pest of pulses, potato, tomato, chilli, okra and cotton.
3)	*Chrysodeixis chalcites* (Esper) Green semi looper	1341	Pest of soybean, potato, tomato and bean etc.
4)	*Thysanoplusia orichalcea* (Fabricius)	1631	Major pest of sunflower, potato and soybeen.
5)	*Mythimna separata* (Walker) Army worm	565	Major pest of paddy.
6)	*Hyblaea puera* Cramer Teak defoliator	315	Major pest of teak.
7)	*Asota ficus* (Fabricius)	611	Fodder pest
	B) Family- Arctiidae		
8)	*Creatonotos gangis* (Linnaeus) Tiger moth	807	Polyphagous pest.
9)	*Amata* sp.	295	Fodder pest.
10)	*Spilosoma obliqua* Walker Bihar hairy caterpillar	630	Major polyphagous pest of sesame, linseed and minor pest of cabbage and sweet potato
11)	*Amsacta moorei* Butler Red hairy caterpillar	451	Major pest of sun hemp, maize and jower
	C) Family-Sphingidae		
12)	*Agrius convolvuli* (Linnaeus)	165	Major pest of sweet potato, sunflower and soybean
13)	*Acherontia styx (Westwood) Til hawk moth*	77	Major pest of sesame and minor pest of potato
	D) Family- Pyralidae		
14)	*Cnaphalocrocis medinalis (Guene) Rice leaf folder*	0	Major pest of paddy
15)	*Chilo partellus Swinhoe Maize stem borer*	88	Major pest of maize and sorghum
	E) Family- Nymphalidae		
16)	*Melanitis leda ismene Cramer Rice butter fly*	565	Major pest of paddy
	F) Family- Lymantriidae		
17)	*Euproctis similis (Moore)*	153	Minor pest of paddy and ragi
	G) Family- Crambidae		
18)	*Palpita vitrealis (Rossi)*	42	Pest of ornamental plant (Jasmine)
II.	*ORDER- HEMIPTERA*		
	A) Family-Pentatomidae		
19)	*Nezara viridula Linnaeus Green sting bug*	1213	Major polyphagous pest of soybean, pigeon pea and vegetable crops
20)	*Antestiopsis cruciate (Fabricius) Coffee plant bug*	3	Pest of coffee and jasmine
	B) Family- Cicadellidae		
21)	*Nephotettix virescens (Distant) Green leaf hopper*	6240	Major pest of paddy
	C) Family- Lophopidae		
22)	*Pyrilla perpusilla Walker Sugarcane leaf hopper*	3329	Major pest of sugarcane, wheat and maize,
	D) Family-Pyrrhocoridae		
23)	*Dysdercus koenigii Fabricius Red cotton bug*	648	Major pest of cotton and okra
	E) Family- Coreidae		
24)	*Leptocorisa acuta (Thunberg) Rice gundhi bug*	1108	Major pest of paddy
III.	*ORDER- ORTHOPTERA*		
	A) Family- Gryllidae		
25)	*Euscyrtus concinnus (de Haan) Field cricket*	11149	Pest of paddy and fodder grasses
26)	*Gryllus bimaculatus De Geer Field cricket*	274	Pest of fodder grasses
	C) Family- Gryllotalpidae		
27)	*Gryllotalpa orientalis Burmeister Mole cricket*	402	Pest of paddy
	D) Family- Tetrigidae		
28)	*Tetrix subulata Linnaeus Short horn grass hopper*	294	Pest of paddy
II.	*ORDER- COLEOPTERA*		
	A) Family- Scarabaeidae		
29)	*Holotrichia consanguinea White grub*	176	Major pest of ground nut, sugarcane, chilli and soybean
	B) Family- Chrysomelidae		
30)	*Aulacophora foveicollis (Lucas) Red pumpkin beetle*	1956	Major pest of cucurbitaceous particularly pumpkin
III.	*ORDER- ISOPTERA*		
	A) Family- Termitidae		
31)	*Odontotermes obesus (Rambur) Termite*	214	Major pest of Wheat, gram and sugarcane & minor pest of many cereals and pulse crops
IV.	*ORDER- DIPTERA*		
	A) Family- Bibionidae		
32)	*Plecia amplipennis Skuse*	67	Fodder pest

In conformity with the present finding, Muchhala [11] also reported that other major pest species of order Lepidoptera included *Agrius convolvuli* (Linnaeus) (298 moths) & *Acherontia styx* (Westwood) (13 moths) Family Sphingidae, *Euproctis similis* (Moore) (155 moths) & *Psalis pennatula* (Fabricius) (15 moths) family Lymentriidae, *Chilo partellus* Swinhoe (49 moths) family Pyralidae, *Palpita vitrealis* (Rossi) (24 moths) family Crambidae & *Thysanoplusia orichalcea* (Fabricius) (18 moths) family Noctuidae and among major paddy pests *Melanitis leda ismene* Cramer (397 butterflies) family Nymphalidae, *Mythimna separata* (Walker) (152 moths) family Noctuidae & *Cnaphalocrocis medinalis* (Guene) (17 moths) family Pyralidae. *Cnaphalocrocis medinalis* (Guene) was observed as major pest of paddy with highest trap catch (1327) by Sharma *et al*. [20], while this year it was recorded lowest in trap catches during the entire season of paddy.

After Lepidoptera, Hemiptera was the next highest order of pest species in trap catch with 5 families and 6 species. The family Cicadellidae is represented by *Nephotettix virescens* (Distant) with a highest trap catch of (6,240 hoppers) followed by *Pyrilla perpusilla* Walker (3,329 hoppers), *Nezara viridula* Linnaeus (1.213 bugs), *Leptocorisa acuta* (Thunberg) (1,108 bugs), *Dysdercus koenigii* Fabricius (648 bugs), *Antestiopsis cruciata* (Fabricius) (3 bugs), while Brown plant hopper, *Nilaparvata lugens* (Stal) & White backed plant hopper, *Sogatella furcifera* (Harvath) family Delphacidae were surprisingly absent throughout the season in trap catches.In accordance with the present findings Sharma and Bisen [19] also reported that after Lepidoptera, Hemiptera was the next highest order of pest species in trap catches.

Order Orthoptera was represented by 3 families and 4 species. Among all the pest species of this order highest trap catch was of Field cricket, *Euscyrtus concinnus* (de Haan) (11,149 crickets) followed by Mole cricket, *Gryllotalpa orientalis* Burmeister (402 crickets), Short horn grass hopper, *Tetrix subulata* Linnaeus (294 hoppers) and Gryllid, *Gryllus bimaculatus* De Geer (274 crickets). Similarly Sharma *et al*. (2006) [20] reported that order Orthoptera was represented by 3 families and species 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. Singh and Ramaneek [21] reported six families of Orthoptera by using light trap viz. Gryllidae, Gryllotalpidae, Tettigoniidae (belonging to Suborder Ensifera) and Acrididae, Tridactylidae, and Tetrigidae (belonging to Suborder Caelifera). Gryllidae was found dominant followed by Tetrigidae as compared to other families.

Order Coleoptera was represented by 2 families and 2 species. In terms of relative size of trap catch Red pumpkin beetle, *Aulacophora foveicollis* (Lucas) has the highest trap catch of (1,956 beetles) followed by *Holotrichia consanguinea* Blanch (176 beetles). In conformity with the present findings Sharma *et al*. [18] also recorded highest trap catch of *Aulacophora foveicollis* (451 beetles) among coleopterous at Jabalpur.

Order Isoptera was represented by only one family i.e. Termitidae with single species of Termite, *Odontotermes obesus* (Rambur). The size of catch was 214 adults. Medrios *et al*. (1999) [10] reported 24 species of termites belonging to 3 families including Termitidae through light trap catches at Atlantic forest of North East Brazil.

Order Diptera was represented by only one family i.e. Bibionidae with single species *Plecia amplipennis* Skuse. The size of catch was 67 adults. In conformity with the present findings, Muchhala [11] 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, while Williams *et al*. [25] reported several species of Diptera in trap catches.

3.2 Group II: Beneficial insects- as bio-control agents (predators and parasites)

Group of beneficial insects as natural biocontrol agents was represented by 7 orders, 15 families & 28 species as predators and 1 order, 3 families & 4 species as parasites. Among the predatory species order Coleoptera was represented by the highest number of 4 families including 11 species in which family Carabidae has the highest 8 predatory species namely *Prothyma* sp. (272 beetles), *Chlaenius pictus* Choudoir (61 beetles), *Brachinus sexmaculeatus* Dejean (52 beetles), *Chlaenius nigricans* Wiedemann (43 beetles), *Diplocheila polita* Fab. (34 beetles), *Brachinus longipalpis* Wiedemann (31 beetles) *Crosopedophorus elegans* Dejean (18 beetles) and *Cicindela flexuosa* (Distant) (9 beetles). While family Scarabaeidae was reported by one species Dug beetle, *Onitis falcutus* (Wulfen) (165 beetles). Similarly Goel (1976) [7] reported 17 families of Coleoptera trapped at light including 89 species of Carabidae and 13 species of Coccinellidae in North India. Upadhyay *et al*. [23] also reported that a total of 17 predatory species belongs to 9 families and 4 parasitic species belonging to 2 families. Among the predatory species, coleopterous insects were the most predominant, represented by 3 families (Coccinellidae, Carabidae and Cicindelidae

Comparing the relative size of trap catches the highest catch was observed of Lady bird beetle, *Cyphon padi* Fleming (910 beetles) among all the species of order Coleoptera as well as among all the other orders followed by *Hydrochara caraboides* Latreille (358 beetles). Sharma *et al*. [16] reported that lady bird beetle (*Coccinella* sp.) was having the highest trap catches among the coccinellids in paddy field at Jabalpur. Similar to the present findings, several workers viz., One latter Atwal *et al*. [3] and Ghorpade [6] reported the highest activity of Coccinelids among coleopterous in trap catches.

After Coleoptera Order, Hemiptera was represented by 4 families and 6 species. Major Hemipterous predatory species includes *Sirthenea carinata* (Fabricius) (135 bugs), *Antilochus conqueberti* (Fabricius) (69 bugs), *Ectomocoris ululans* (Rossi) (61 bugs) *and Eocanthecona furcellata* (Wolff) (25 bugs). In accordance with the present findings, Sharma *et al*. (2013) [19] reported that order Hemiptera was represented by 4 families and 6 species in trap catches including major predatory species viz. *Canthacona furcellata* (176), *Antilochus* sp. (126). *Geocories bullatus* S. (105) and *Sirthenea* sp. (96). Upadhyay *et al*. [23] also reported *Sirthenea* sp. through light trap catches in paddy ecosystem at Jabalpur.

Comparing the relative size of trap catches the highest catch was observed of *Diplonychus rusticus* Fabricius (3343 bugs) among all the species of order Hemiptera while *Sirthenea* sp. was represented by the lowest size of trap catch (9 bugs). In conformity with the present findings Muchhala [11] also reported that the highest trap catch was observed of *Diplonychus rusticus* Fabricius (2655 bugs) among all the species of order Hemiptera.

Table 2: Taxonomic distribution of Beneficial insects- as bio-control agents (predators and parasites) collected in light trap during kharif season (2015) at Jabalpur.

S. No.	Insect species collected	Total of season's collection (June to Dec.)	Economic status Beneficial- Predatory / parasitic as bio control agents
I.	Order- Coleoptera		
	A) Family- Carabidae		
1)	*Prothyma* sp. Tiger beetle	272	Predator of Colorado potato beetle and small insects
2)	*Cicindela flexuosa* (Distant)	9	General predator of small insects
3)	*Chlaenius pictus* Choudoir	61	General predator of Lepidopterous larvae
4)	*Chlaenius nigricans* Wiedemann	43	Predaceous upon *Laphgma pyrausta nubilalis* and *Pinusinsiguos* sp.
5)	*Diplocheila polita* Fab.	34	General predator
6)	*Brachinus sexmaculeatus* Dejean	52	General predator
7)	*Brachinus longipalpis* Wiedemann	31	General predator
8)	*Crosopedophorus elegans* Dejean	18	Predator of Lepidoptera larvae and soft body insects
	B) Family- Hydrophilidae		
9)	*Hydrochara caraboides* Latreille Water scavenger	358	General predator of aquatic insects
	C) Family- Scarabaeidae		
10)	*Onitis falcutus* (Wulfen) Dug beetle	165	General predator of aphid, coccids, white fly and bugs
	D) Family- Scirtidae		
11)	*Cyphon padi* Fleming Lady bird beetle	910	General predator of small insects
II.	Order- Hemiptera		
	A) Family- Reduviidae		
12)	*Sirthenea carinata* (Fabricius)	135	Predator of mole cricket and G*ryllus* sp.
13)	*Sirthenea* sp.	9	Generaly feed upon *Orycetes* sp., *Scapterisus* sp. and small insects
14)	*Ectomocoris ululans* (Rossi)	61	Predator of caterpillars and small insects
	B) Family- Pentatomidae		
15)	*Eocanthecona furcellata (Wolff)*	25	Predator of caterpillars and small insects
	C)Family- Belostomatidae		
16)	*Diplonychus rusticus Fabricius Water bug*	3343	Feed on aquatic insects
	D) Family- Pyrrhocoridae		
17)	*Antilochus conqueberti (Fabricius)*	69	Predator of nymph of red cotton bug
I.	*ORDER- HYMENOPTERA*		
	A) Family- Vespidae		
18)	*Vespa orientalis Linnaeus*	29	General parasite of Lepidopterous, Coleopterous and Dipterous insects
	B) Family- Formicidae		
19)	*Myrmicaria brunnea Saunders*	536	Egg parasite of Lepidopteran insects
20)	*Dorylus sp.*	30	General parasite of Lepidopterous and Dipterous insects
	C) Family- Ichneumonidae		
21)	*Enicospilus purgatus (Say)*	319	Larval parasite of stem borer, leaf folder and Lepidopterous insects
II.	*Order- Odonata*		
	A) Family- Coenagrionidae		
22)	*Coenagrion sp. Damsel fly*	102	Predator of monarch butterfly, stem borer, gall midge and leaf eating caterpillar
	B) Family- Libellulidae		
23)	*Pantala flavescens (Fabricius)*	165	General predator on Lepidopterous, Dipterous and Hymenopterous insects
III.	*Order- Neuroptera*		
	A) Family- Chrysopidae		
24)	*Chrysoperla sillemi (Esben-petersen) Green lace wing*	73	General predator on leaf hoppers and aphids
	B) Family- Ascalaphidae		
25)	*Ascalaphus sp. Owl fly*	694	Adult feed on caterpillars and grubs
VI.	*Order- Dictyoptera*		
	A) Family- Mentidae		
26)	*Archimantis latistyla (Serville) Mantis*	62	Nymph feed on leaf hopper and aphids while adult feed on caterpillars
I.	*Order- Orthoptera*		
	Family- Tettigoniidae		
27)	*Conocephalus sp. Long horn grass hopper*	159	Predator of Lepidopteran eggs
II.	*Order- Dermaptera*		
	A) Family- Forficulidae		
28)	*Elaunon bipartitus (Kirby) Earwigs*	135	General predator on Lepidopteran larvae

Order Odonata contained two species namely *Pantala flavescens* (Fabricius) (165 flies) and *Coenagrion* sp. (102 flies) which belongs to family Libellulidae and Coenagrionidae respectively. Similarly Sharma *et al*. [19] and Sharma *et al*. [16] also reported that predatory order Odonata was represented by *Libellula* sp. (213) and *Coenagrion* sp. (48) belonging to family Libellulidae and Conenagriidae, respectively.

Order Neuroptera was represented by two species namely *Ascalaphus* sp. (694 flies) and *Chrysoperla sillemi* (Esben-petersen) (73 green lace wings) which belongs to family Ascalaphidae and Chrysopidae respectively. Honek and Kraus [8] also reported that *Chrysoperla sillemi* (Esben-petersen) (Neuroptera: Chrysopidae) was active from July to September and varied from 3369 to 12528 though light trap catches.

Order Dermaptera, Dictyoptera and Orthoptera were represented by only one species each i.e. Ear wing, *Elaunon bipartitus* (Kirby) (135 ear wings) family Forficulidae; Mantis, *Archimantis latistyla* (Serville) (62 mantis) family Mentidae and Long horn predatory grass hopper, *Conocephalus* sp. (159 hoppers) family Tettigoniidae respectively. In conformity to the present findings Muchhala [11] also reported Orders Dermaptera, Dictyoptera and Orthoptera were represented by only one species each i.e. Earwigs, *Elaunon bipartitus* (Kirby) (240 earwigs) family Forficulidae; Mantis, *Archimantis latistyla* (Serville) (8 mantis) family Mentidae and Long horn predatory grass hopper, *Conocephalus* sp. (238 hoppers) family Tettigoniidae respectively.

3.3 Group III: Beneficial insects- as commercially important.

Order Hymenoptera and Lepidoptera were represented by insects of commercial importance namely Honey bee, *Apis cerana indica* Fabricius (131 bees) and Silk worm, *Antheraea paphia* Linnaeus (45 moths) respectively. Although, the trap catches of both the species were low in numbers but it gave an indication of their presence in kharif season. Sadakathula and Ramachandran [14] have also reported data on collection of honey bee, *Apis cerana indica* Fabricius in light trap in coconut garden in Tamil Nadu.

Table 3: Taxonomic distribution of beneficial insects- as commercially important collected in light trap during kharif season (2015) at Jabalpur.

S. No.	Insect species collected	Total of season's collection (June to Dec.)	Economic status: Beneficial insects- as commercially important
	Order- Hymenoptera		
	A) Family- Apidae		
1)	*Apis cerana indica* Fabricius Honey bee	131	Production of Honey
	Order- Lepidoptera		
	A) Family- Saturniidae		
2)	*Antheraea paphia* Linnaeus Silk worm	45	Production of silk

4. Conclusions

The present investigation has provided valuable information about taxonomic status of insect fauna of paddy ecosystem. Sixty two insect species belonging to 11 orders and 34 families were recorded throughout the season. Lepidoptera was dominant order followed by order Coleoptera, Hemiptera 12 species, Orthoptera and Hymenoptera. The investigation also has provided information on presence occurrence, distribution and population dynamics of insect pest of rice and beneficial insects as well. The data collected serve as base line data, useful at present and future for surveillance and monitoring of insects for forecasting and also in use of light trap as Integrated Pest Management tool against these pest species of rice and other economically important crop of this region.

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