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## Study of the taxonomic distribution of insect fauna collected in light trap with different light sources during *Rabi* season at Jabalpur (M.P.)

**Vaishampayan Sanjay**DOI: <https://doi.org/10.22271/chemi.2021.v9.i1aa.11501>**Abstract**

The experiment was carried out at JNKVV Jabalpur (MP) to study the taxonomic distribution of insect pest species collected in light trap with various light sources viz. MV 125w bulb, UV 8+8w tubes and LED (White)15w bulb.

The analysis revealed that 31 insect species belonging to 10 orders and 23 families were recorded throughout the season (*Rabi* 2016-17). These species were grouped in two major categories. Among the harmful crop pest group 22 species collected under 5 orders and 14 families (total collection was 15599 insects). Order Lepidoptera was represented by the highest number of 6 families including 13 species followed by the order Hemiptera. Group of beneficial insects as natural bio control agents represented by 6 orders and 9 families (total collection was 2114 insects). Comparing the relative size of trap catches the highest catch was observed of *Dorylus* sp. (1492 wasps) among all the order followed by *Hydrochara caraboides* Latreille (316 beetles).

**Keywords:** Light trap, light source, UV, MV, insect fauna, taxonomic distribution

**Introduction**

It is well known that insects fly toward streetlight or other outdoor illumination at night. This innate phototactic behavior has provided the basis of the design of electric insect trap. Equipped with UV-emitting fluorescent tubes, the light trap effectively attract insects such as moths and beetles and prevent these insects from entering into fields, greenhouses and stores that are open at night. In recent years, considerable interest has been generated in pest control technology that utilizes the responses of insects to light as a “clean” form of pest control that does not use synthetic pesticides (Emura and Tazawa 2004; Honda 2011; Tazawa 2009) <sup>[1, 4, 9]</sup>.

The key insect pests of cereal crops, pulse crops, vegetable crops, horticultural crops can be mass trapped by using the light trap. Farmers must know that by attracting and killing one adult moth or insect they control around 500-600 insect progenies through them (Vaishampayan 2007) <sup>[11]</sup>.

In recent years, as a non-chemical method for insect pest control, light traps have been widely used to control agricultural pests in developing countries (Vaishampayan and Vaishampayan 2016) <sup>[12]</sup>. In China, currently commercial light traps are being used by the Chinese Ministry of Agriculture to control agricultural pests over an area of more than 32 million ha. (Ma *et al.* 2009) <sup>[5]</sup>. The use of light traps for controlling insect pests is restricted since they kill both pests and beneficial insects. It may be a possible to reduce the numbers of beneficial insects trapped by adjusting nightly trapping time based on differences recorded in the timing of the nocturnal flight peaks of target pests and beneficial (Ma and Ma 2012) <sup>[6]</sup>.

**Materials and Methods**

The experiment was conducted at JNKVV Jabalpur (MP) during the period between first week of January to last week of April, 2017. Light Trap models SMV- 4 developed by Dr. S. M. Vaishampayan in 2014, were used in the present study. Traps are suitable to use Mercury Vapour (MV), Ultra Violet (UV) and Light Emitting Diode (LED) lamps as light source. The insects collected in the collection bag were killed by the exposure of Dichlorvas 76 EC vapors (as fumigating agent) released in a dispenser with scrubber, placed in a collection tray for

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instant killing of trapped insects. Light traps were operated every night and collection was observed next morning. Total insects fauna was observed and sorted out on the basis of major species and order groups. Data of daily trap catch was maintained. In all, three light traps were installed in the experimental area. This area was covered mainly by a gram crop in around 30 hectares of crop area. Spacing between each trap was approximately 100 meter. The data were subjected to statistical analysis

## Results and Discussion

The research experiments were carried out to study the taxonomic distribution of insect pest species towards various light sources viz. Light trap with MV 125 watt bulb (T1), UV 8+8 watt tubes (T2), LED (White) 15 watt bulb (T3). Observations of species wise total trap catches per day/treatment (Light source) that is T1, T2, and T3 were recorded. The month wise catches were represented in following table no. 1.

**Table 1:** Insect fauna collected in light trap during Rabi season (2016-17) at Jabalpur

S.N.	Insect species collected		Number of insect collection in light trap												Total		
			January			February			March			April					
		Order- Lepidoptera	MV 125wt	UV 8+8 wt	LED 15 wt	MV125 wt	UV 8+8 wt	LED 15 wt	MV125 wt	UV 8+8 wt	UV15 wt	MV125 wt	UV 8+8 wt	LED (Blue) 4+4wt			
		<b>A) Family-Noctuidae</b>	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
1	1	<i>Spodoptera litura</i> (Fabricius)	12	9	-	12	11	1	75	55	37	33	38	-	132	113	38
2	2	<i>Helicoverpa armigera</i> (Hubner)	39	23	2	126	57	12	177	187	94	249	337	-	591	604	110
3	3	<i>Plusia orichalcea</i> (Fabricius)	18	55	4	97	78	3	287	204	168	241	333	-	643	578	175
4	4	<i>Mythimna separata</i> (Walker)	21	4	-	8	7	-	13	10	-	12	19	-	54	40	-
5	5	<i>Agrotis ipsilon</i> (Hufnagel)	25	15	-	16	17	-	66	52	79	138	219	-	245	303	79
6	6	<i>Asota ficus</i> (Fabricius)	4	3	-	17	-	-	61	34	10	19	10	-	101	47	10
		<b>B) Family- Arctiidae</b>			-			-						-			
7	1	<i>Cretonotos gangis</i> (Linnaeus)	82	76	-	134	99	24	343	168	175	282	301	3	841	644	202
8	2	<i>Amata</i> sp.	43	34	-	135	116	-	218	165	117	99	184	-	495	499	117
9	3	<i>Spilosoma obliqua</i> (Walker)	6	-	-	18	3	1	4	9	8	-	2	-	28	14	9
		<b>C) Family-Sphingidae</b>			-									--			
10	1	<i>Agrius convolvuli</i> (Linnaeus)	-	5	-	3	-	-	15	6	11	27	30		45	41	11
		<b>D) Family- Pyralidae</b>			-									-			
11	1	<i>Chilo partellus</i> (Swinhoe)	7	4	-	8	7	-	3	8	5	3	-	-	21	19	-
		<b>E) Family- Nymphalidae</b>			-									-			
12	1	<i>Melanitis leda ismene</i> (Cramer)	5	2	-	11	7	-	1	3	-	-	-	-	17	12	-
		<b>F) Family- Lymantriidae</b>			-												
13	1	<i>Euproctis similis</i> (Moore)	7	9	-	13	12	-	4	6	5	27	36	-	51	63	5
		<b>Order- Hemiptera</b>			-												
		<b>A) Family-Pentatomidae</b>			-												
14	1	<i>Nezara viridula</i> (Linn)	8	5		9	5		12	14	12	109	186	7	138	210	19
15	2	<i>Antestiopsis cruciata</i> (Fabricius)	-	-		3	-		418	296	392	280	437	-	701	733	392
		<b>B) Family- Cicadellidae</b>															
16	1	<i>Nephotettix virescens</i> (Distant)	24	30		21	14		17	12	11	5	9	-	67	65	11
		<b>C) Family-Pyrrhocoridae</b>															
17	1	<i>Dysdercus koenigii</i> (Fabricius)	15	12	4	10	14	4	23	7	5	8	19	-	56	52	13
		<b>Order- Coleoptera</b>															
		<b>A) Family- Scarabaeidae</b>															
18	1	<i>Holotrichia</i> sp.(Hope)	-	2		9	41		-	1	3	1	1	-	10	45	3
		<b>B) fAMILY-Hydrophidae</b>															
19	1	<i>Hydrochara caraboides</i> (Latreille)	23	44		23	13		39	23	18	60	73	-	145	153	18
		<b>C)Family- Chrysomelidae</b>															
20	1	<i>Aulacophora foveicollis</i> (Lucas)	24	25		30	20		12	10	9	8	2	-	74	57	11
		<b>Order- Orthoptera</b>															
		<b>A)Family- Gryllidae</b>															
21	1	<i>Gryllus bimaculatus</i>	128	136		198	217	21	477	464	183	707	819	17	1510	1636	221
		<b>B) Family- Gryllotalpidae</b>															
22	1	<i>Gryllotalpa orientalis</i> (Burmeister)	159	79		132	113		132	91	83	275	125	10	698	408	93
		<b>Order- Hymenoptera</b>															
		<b>A) Family- Ichneumonidae</b>															
23	1	<i>Enicospilus purgatus</i> (Say)	-	6		2	-			3	-			-	2	9	-
		<b>B) Family- Formicidae</b>															
24	1	<i>Dorylus</i> sp.(Fabricius)	4	4		22	9		300	294	76	421	353	9	747	660	85
		<b>Order- Odonata</b>															
		<b>A) Family- Libellulidae</b>															
25	1	<i>Pantala flavescens</i> (Fabricius)	-	-		2	-		-	2	1	-	-	-	2	2	1
		<b>B) Family- Coenagrionidae</b>															
26	1	<i>Coenagrion</i> sp.(Kirby)	-	-		2	-		-	-	2	-			2	-	2
		<b>Order- Neuroptera</b>															
		<b>A) Family- Ascalaphidae</b>															
27	1	<i>Ascalaphus</i> sp.(Walker)	-	-		6	2				7	2			8	2	7

B) Family- Chrysopidae																	
28	1	<i>Chrysoperla sillemi</i> (Esben-petersen)	5	35		21	15	11	17	2	23		36	-	43	88	34
Order- Diptera																	
A) Family- Bibionidae																	
29	1	<i>Plecia amplipennis</i> (Skuse)	-	4		23	42		375	285	168	239	197	-	637	528	168
Order- Dermaptera																	
A) Family- Forficulidae																	
30	1	<i>Elaunon bipartitus</i> (Kirby)	9	26		12	9		3	-	2	34	-	-	58	35	2
Order- Dictyoptera																	
A) Family- Mentidae																	
31	1	<i>Archimantis latistyla</i> (Serville)	4	-		2	1		-	-	2	-	-	-	6	1	2

To study the relative size of trap catches of various species collected in different taxonomic groups, collection of entire season (January to April-2017). Was recorded species wise given in Table 1. These species were grouped on the basis of their economic importance in two major categories viz. Harmful insects- as crop pests in Table 2 and beneficial insects- as bio-control agents (Predators and parasites) were given in Table 3.

### Group-I) Harmful insects- as crop pests

Among the harmful crop pest species order Lepidoptera was represented by the highest number of 6 families including 13 species. The family Noctuidae has the highest 6 species (Fig.1) which includes most important pests of different crops. Among these *Plusia orichalcea* (Fabricius) has the highest size of trap catch (1396 moths) followed by *Heliothis armigera* (1305 moths), while the lowest size of trap catch was of *Melanitis leda* (29 moths) (Table-2). Five major polyphagous pest species of Lepidoptera namely, *Spodoptera litura* Fabricius (283 moths), *Mythimna separata* (94 moths), *Helicoverpa armigera* (Hubber) (1365 moths), *Plusia orichalcea* (1396 moths), and *Agrotis ipsilon* (Hufnagel) (627 moth) were also recorded during the season in trap catch. After Lepidoptera, Hemiptera was the next highest order of pest species in trap catches with 3 families and 4 species. The family Pentatomidae is represented by *Antestiopsis cruciata* (Fabricius) with a highest trap catch of (1826 bugs) followed by *Nezara viridula* (Linnaeus) (367 bugs), *Nephotettix virescens* (Distant) (143 hoppers) and *Dysdercus koenigii* (Fabricius) (121 bugs) Order Coleoptera was represented by 2 families and 2 species viz. family Chrysomelidae,

*Aulacophora foveicollis* (Lucas) (142 beetles), family Scarabidae, *Holotrichia consanguinea* (Blanch) (58 beetles). 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) (3367 crickets) followed by Mole cricket, *Gryllotalpa orientalis* (Burmeiste)r (1191 crickets).

Order Diptera was represented by one family i.e. Bibionidae with single species *Plecia amplipennis* (Skuse) (1333 flies).

### Group- II) Beneficial insects- as bio-control agents

Order Hymenoptera was represented by 2 families and 2 species as parasites viz. *Dorylus* sp. (1492 wasps) has the highest trap catch followed by *Encospilus purgatus* (Say) (11 wasps). Order Odonata also represented two species namely *Coenagrion* sp. (4 flies) and *Pantala flavescens* (Fabricius) (5 flies) which belongs to family Coenagrionidae and Libellulidae respectively. Order Neuroptera was represented by two species namely *Ascalaphus* sp. (17 flies) and *Chrysoperla sillemi* (Esben-petersen) (165 green lacewings) which belongs to family Ascalaphidae and Chrysopidae respectively. Order Dermaptera, Dictyoptera and Coleoptera were represented by only one species each i.e. Earwig, *Elaunon bipartitus* (Kirby) (95 earwigs) family Forficulidae; Praying mantis, *Archimantis latistyla* (Serville) (7 mantis) family Mentidae and *Hydrochara caraboides* Latreille (316 beetles) family Hydrophilidae respectively.

Comparing the relative size of trap catches the highest catch was observed of *Dorylus* sp. (1492 wasps) among all the order followed by *Hydrochara caraboides* Latreille (316 beetles).

**Table 2:** 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 (January to April.)	Economic status As crop pest
Order- Lepidoptera			
A) Family-Noctuidae			
1	<i>Plusia orichalcea</i> (Fabricius) Cabbage semilooper	1396	Major polyphagous pest of vegetable crops, cabbage, cauliflower etc.
2	<i>Helicoverpa armigera</i> (Hubner) Gram pod borer	1305	Major polyphagous pest of pulses, potato, tomato, chilli, okra and cotton.
3	<i>Mythimna separata</i> (Walker) Army worm	94	Major pest of paddy.
4	<i>Spodoptera litura</i> (Fabricius) Tobacco caterpillar	283	Major polyphagous pest of soybean, cabbage, cucurbits, potato, chilli and pea etc.
5	<i>Asota ficus</i> (Fabricius)	198	Fodder pest
6	<i>Agrotis ipsilon</i> (Hufnagel) Cutworm	627	Major polyphagous pest of pulses, pest of cabbage, cucurbits, potato.
B) Family- Arctiidae			
7	<i>Cretonotos gangis</i> (Linnaeus) Tiger moth	1687	Polyphagous pest.
8	<i>Amata</i> sp. Seven spotted moth	1111	Fodder pest.
9	<i>Spilosoma obliqua</i> (Walker) Bihar hairy caterpillar	57	Major polyphagous pest of sesame, linseed and minor pest of cabbage and sweet potato
C) Family-Sphingidae			
10	<i>Agrius convolvuli</i> (Linnaeus)	97	Major pest of sweet potato, sunflower and soybean

	Spingid moth		
	<b>D) Family- Pyralidae</b>		
11	<i>Chilo partellus</i> (Swinhoe) Maize stem borer	40	Major pest of maize and sorghum
	<b>E) Family- Nymphalidae</b>		
12	<i>Melanitis leda ismene</i> (Cramer) Rice butter fly	29	Major pest of paddy
	<b>F) Family- Lymantriidae</b>		
13	<i>Euproctis similis</i> (Moore)	119	Minor pest of paddy and ragi
	<b>G) Family- Crambidae</b>		
	<b>Order- Hemiptera</b>		
	<b>A) Family-Pentatomidae</b>		
14	<i>Nezara viridula</i> (Linnaeus) Green stink bug	367	Major polyphagous pest of soybean, pigeon pea and vegetable crops
15	<i>Antestiopsis cruciate</i> (Fabricius) Coffee plant bug	1826	Pest of coffee and jasmine
	<b>B) Family- Cicadellidae</b>		
16	<i>Nephotettix virescens</i> (Distant) Green leaf hopper	143	Major pest of paddy
	<b>D) Family-Pyrrhocoridae</b>		
17	<i>Dysdercus koenigii</i> (Fabricius) Red cotton bug	121	Major pest of cotton and okra
	<b>Order- Coleoptera</b>		
	<b>A) Family- Scarabaeidae</b>		
18	<i>Holotrichia consanguinea</i> White grub	58	Major pest of ground nut, sugarcane, chilli and soybean
	<b>Family- Chrysomelidae</b>		
19	<i>Aulacophora foveicolis</i> (Lucas)	142	Major pest of cucurbitaceous particularly pumpkin
	<b>Order- Orthoptera</b>		
	<b>A) Family- Gryllidae</b>		
20	<i>Gryllus bimaculatus</i> Field cricket	3367	Pest of fodder grasses
	<b>C) Family- Gryllotalpidae</b>		
21	<i>Gryllotalpa orientalis</i> (Burmeister) Mole cricket	1199	Pest of paddy
	<b>Order- Diptera</b>		
	<b>A) Family- Bibionidae</b>		
22	<i>Plecia amplipennis</i> (Skuse)	1333	Fodder pest
	<b>Family- Calliphoridae</b>		

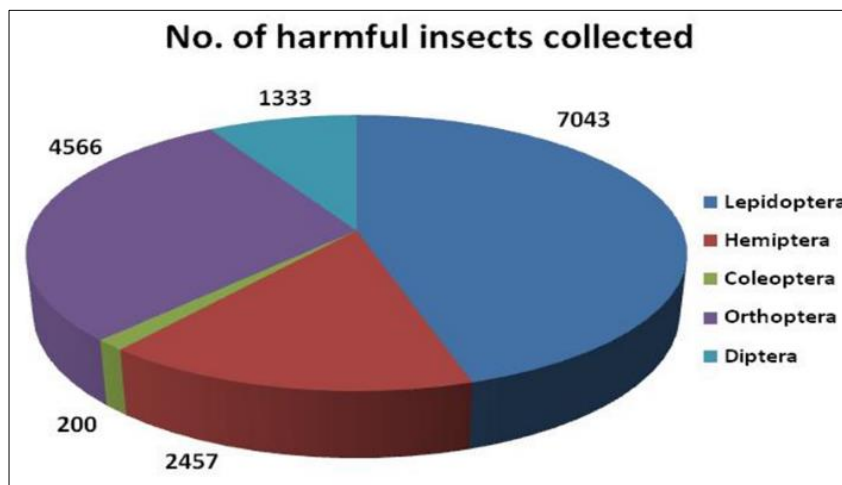


Fig 1: No. of harmful insects- as crop pests of different order collected in light trap

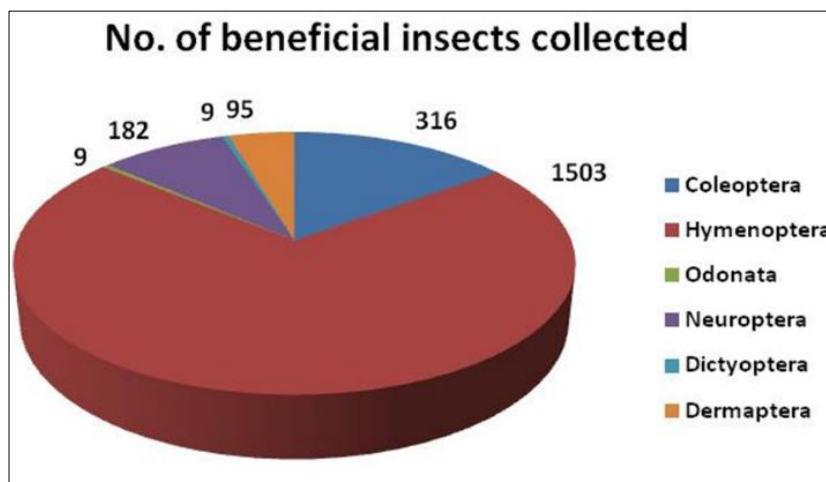


Fig 2: No. of beneficial insects (predators) of different order collected in light trap



**Table 3:** 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 (January to April.)	Economic status Beneficial- Predatory / parasitic as bio control agents
<b>Order- Coleoptera</b>			
<b>A) Family- Hydrophilidae</b>			
1	<i>Hydrochara caraboides</i> (Latreille) Water scavenger	316	General predator of aquatic insects
<b>Order- Hymenoptera</b>			
<b>B) Family- Formicidae</b>			
2	<i>Dorylus</i> sp. (Fabricius)	1492	General parasite of Lepidopterous and Dipterous insects
<b>C) Family- Ichneumonidae</b>			
3	<i>Enicospilus purgatus</i> (Say)	11	Larval parasite of stem borer, leaf folder and Lepidopterous insects
<b>Order- Odonata</b>			
<b>A) Family- Coenagrionidae</b>			
4	<i>Coenagrion</i> sp.(Kirby) Damsel fly	4	Predator of monarch butterfly, stem borer, gallmidge & leafeating caterpillar
<b>B) Family- Libellulidae</b>			
5	<i>Pantala flavescens</i> (Fabricius) Dragon fly	5	General predator on Lepidopterous, Dipterous & Hymenopterous insects
<b>Order- Neuroptera</b>			
<b>A) Family- Chrysopidae</b>			
6	<i>Chrysoperla sillemi</i> (Esben-petersen)	165	General predator on leaf hoppers and aphids
<b>B) Family- Ascalaphidae</b>			
7	<i>Ascalaphus</i> sp.(Walker) Owl fly	17	Adult feed on caterpillars and grubs
<b>Order- Dictyoptera</b>			
<b>A) Family- Mentidae</b>			
8	<i>Archimantis latistyla</i> (Serville) Preying Mantid	9	Nymph feed on leaf hopper and aphids while adult feed on caterpillars
<b>Order- Dermaptera</b>			
<b>A) Family- Forficulidae</b>			
9	<i>Elaunon bipartitus</i> (Kirby) Earwigs	95	General predator on Lepidopteran larvae

Muchala (2014) <sup>[7]</sup> revealed that 69 species belonging to 11 orders and 37 families were recorded throughout the season (*kharif* 2013). Based on number of species collected, largest collection was represented by order Lepidoptera (20 species), followed by orders Hemiptera (15 species), Coleoptera (15 species), Orthoptera (6 species) & Hymenoptera (5 species) in descending order respectively and natural bio-control agents were represented by 7 orders, 15 families & 25 species as predators and 1 order, 3 families & 4 species as parasites.

Sharma *et al.* (2010) <sup>[8]</sup> conducted a study during *kharif* 2004 to document the scope of light traps as integrated pest management tool in paddy ecosystem at Jabalpur region of Madhya Pradesh. A total of 62 species were recorded during the cropping season of paddy, 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. Based on economic importance, this collection was represented by 45 species of harmful insects (as crop pests) and 17 species of predatory insects (useful as bio-control agents).

Upadhyay *et al.* (2000) <sup>[10]</sup> also reported that a total of 17 predatory species belongs to 9 families and 4 parasitic species belongs to 2 families collected through light trap in Jabalpur. Among the predatory species Coleopterous insects were the most predominant, represented by 3 families Coccinellidae, Carabidae and Cicindelidae respectively.

Goel (1976) <sup>[3]</sup> observed 17 families of Coleoptera trapped at light including 89 species of Carabidae and 13 species of Coccinellidae in North India. Ghorpade (1979) <sup>[2]</sup> from Karnataka recorded 8 species of Coccinellides (Coleoptera) collected in light trap.

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