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Taxonomic distribution of harmful insect pests of medicinal plants through light trap catches in medicinal garden of Jabalpur

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Abstract
The present research work on "Taxonomic distribution of harmful insect pests of medicinal plants through light trap Catches in Medicinal Garden of Jabalpur" was conducted at the Medicinal garden in college of agriculture, Jabalpur (MP) during the period between last week of September 2019 to last week of March 2020. Taxonomic analysis revealed that these 29 harmful insect species belonging to 5 orders and 11 families were recorded throughout the season (*Rabi* 2019-20) based on number of species collected, largest collection was represented by family Noctuidae 7 species (28%) followed by family Erebidae 5 species (20%), family Arctidae recorded 3 species (12%). Families Sphingidae and Chrysomelidae was represented by 2 species each (8%). Families Pentatomidae, Cicadellidae, Pyrrhocoridae, Gryllidae, Gryllotalpidae and Bibionidae were represented by each one species (4%). The study also revealed that documented the documented information on these species gives broader scope of using light trap as integrated pest management tool against these insect pests of medicinal, vegetables and other crops.

Keywords: Taxonomic distribution, medicinal plants, light trap and harmful insect pests

Introduction
Medicinal plants play an important role in achieving the goal of personal and public health care globally (Bhargava *et al.* 2019) [1] as the trend of poor health index across all age groups around the world and the incidents of death due to non-communicable diseases are rising at an alarming rate. Since antiquity, these medicinal plants have been conserved and protected for their medicinal properties and hence Indian sub-continent is a rich repository of these plants. Like any other plant, medicinal plants are attacked by a plethora of insect and mite pest species that depreciate the quality and quantity of raw materials and the therapeutic values in these plants. (Suchithra kumara 2018) [2]. Light trap is also used for detection of new invasions of insect pest in time and/or space, for delimitation of area of infestation, and for monitoring population levels of established pests. With the introduction of the concepts of "Integrated Pest Management" and "Economic Threshold" around 1975 and revival of non-chemical methods of pest control, light trap gained a wide spread importance in Integrated Pest Management strategies in many parts of the world. Urgency was felt to use non-chemical approach in pest control which is economically viable and environmentally safe. Use of light trap is one such approach in which pest control is achieved without the use of insecticides (Vaishampayan and Vaishampayan, 2016) [8].

Material and Methods
The experiment was conducted at the Medicinal garden in college of agriculture Jabalpur (MP) during the period between last week of September to last week of March, 2019-2020. New Jawahar light trap model developed at JNKVV, Jabalpur with mercury vapor lamp (125 W) as light source was used for the present study. (Bhargava *et al.* 2019) [1].
The insects collected in the chamber of light trap were killed by the exposure of Dichlorvos 76 EC vapors (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 will be recorded every day throughout the *Rabi* season. Total insects were observed and sorted out on the basis of species and their

family. Identification of insects was done on the basis of specimens available in insect museum of the Department, Department of Entomology, UAS, Bangalore and Zoological Survey of India, Jabalpur. After counting, 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.

Result and Discussion

A total of twenty-nine insect species belonging to 5 orders and 11 families were recorded throughout the season (*Rabi* 2019-20). Based on number of species collected, largest collection was represented by order Lepidoptera. The highest number of 4 families including 20 species, in which family Noctuidae has the highest 7 species (28%). This family includes 7 species as important pests of different crops. Among these species, *Plusia orichalcea* (Fabricius) has the highest size of trap catch (401 moths) followed by *Helicoverpa armigera* (Hubber) (310 moths), while the lowest size of trap catch was of *Agrotis ipsilon* (Hufnagel) (71 moths) and *Hyblaea puera (Cramer)* (80 moths). Family Arctiidae has recorded 3 species (12%). Among these species, *Creatonotos gangis* has the highest trap catches (410) followed by *Spilarctia obliqua* (Walker) and *Amsacta moorei* (Butler) (37) lowest was recorded. Family Sphingidae has recorded 2 species (8%). Among them, *Agrius convolvuli* (Linnaeus) the highest size of trap catches (143) while the lowest size of trap catch was of *Daphnia* (Linnaeus) (118). Family Erebidae has recorded 5 species (20%). Among these species, *Cyana peregrine (Walker)* the highest size of trap catches (109) followed by *Digama sp. (Moore)* (68) while the lowest size of trap catch was of *Palpita vitrealis (Rossi)* (18). Whereas Muchala (2014) observed 5 families and 8 species of lepidoptera. The family Cicadelidae was represented by *Nephotettix virescens* (Distant) with a highest trap catch of 22,753 hopper followed by *Pyrilla perpusilla* Walker (1890 hoppers), *Nezara viridula* Linnaeus (964 bugs), *Dysdercus koenigii* (Fabricius) (401 bugs) *Antestiopsis cruciata* (Fabricius) (187 bugs). Family Cicadelidae 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). In accordance with the present findings Mishra (2016) also reported 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, *Creatonotos 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, *Melanitis leda ismene* (Cramer) (565 butterflies) family Nymphalidae, *Mythimna separata* (Walker) (565 moths) family Noctuidae.

The next order of insect pest species was Hemiptera with 3 families and 3 species. The families Pentatomidae, Cicadellidae and Pyrrhocoridae have recorded *Nezara viridula* (Linnaeus) (384 bugs), *Nephotettix virescens* (Distant) (1643 hoppers) and *Dysdercus koenigii* (Fabricius) (389 bugs) respectively. Whereas Muchala (2014) observed 5 families and 8 species of Hemiptera. The family Cicadelidae was represented by *Nephotettix virescens* (Distant) with a highest trap catch of 22,753 hopper followed by *Pyrilla perpusilla* Walker (1890 hoppers), *Nezara viridula* Linnaeus (964 bugs), *Dysdercus koenigii* (Fabricius) (401 bugs) *Antestiopsis cruciata* (Fabricius) (187 bugs). Bhargav *et al.* (2019) [1] also reported similar findings who was the family Pentatomidae is represented by Nezara viridula (Linnaeus) (635 bugs), followed by Nephotettix virescens (Distant) (1399 hoppers) and Dysdercus koenigii (Fabricius) (430 bugs). Whereas Muchala (2014) observed 5 families and 8 species of lepidoptera. The family Cicadelidae was represented by Nephotettix virescens (Distant) with a highest trap catch of 22,753 hopper followed by Pyrilla perpusilla Walker (1890 hoppers), Nezara viridula Linnaeus (964 bugs), Dysdercus koenigii (Fabricius) (401 bugs) Antestiopsis cruciata (Fabricius) (187 bugs).

Then order Coleoptera was represented by 2 families and 3 species. The family Chrysomelidae, had represented by *Aulacophora foveicollis* (Lucas) with a highest trap catch of (473 beetles) followed by *Altica* sp. (162 beetles), family Cerambycidae, *Stromatium barbatum* (57 beetles). Similarly Sharma *et al.* (2010) [200] also recorded highest trap catch of *Aulacophora foveicollis* (451 beetles) among coleopteran at Jabalpur.

The 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) (754 crickets) followed by Mole cricket, *Gryllotalpa orientalis* (Burmeister) (654 crickets). In contrast with the present findings, Sharma *et al.* (2006) [5] 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* (Linn.) (213) at Jabalpur.

Order Diptera was represented by one family i.e. Bibionidae with single species *Plecia amplipennis* (Skuse) (197 flies). In conformity with the present findings Muchala (2014) and Bhargava *et al.* (2019) [1] 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 Harmful insect pests collected in light trap during *Rabi* season (2019-20) at Jabalpur

S. No.	Insect species collected	Total of seasons collection (October to March)	Economic status As a crop pest
	ORDER- LEPIDOPTERA		
	A) Family-Noctuidae		
1	*Plusia orichalcea* (Fabricius)	401	Major polyphagous pest of vegetable crops, cabbage, cauliflower etc. Major pest of Babchi, Bael.
2	*Helicoverpa armigera* (Hubner)	310	Major polyphagous pest of pulses, potato, tomato, chilli, okra and cotton. Major pest of Muskdana, Sarpagandha.
3	*Spodoptera litura* (Fabricius)	211	Major polyphagous pest of soybean, cabbage, cucurbits, potato, chilli and pea etc. Major pest of Brahmi.
4	*Chrysodeixis chalcites* (Esper)	209	Pest of soybean, potato, tomato and bean etc.
5	*Asota ficus* (Fabricius)	201	Fodder pest
6	*Agrotis ipsilon* (Hufnagel)	71	Major polyphagous pest of pulses, pest of cabbage, cucurbits, potato. Major pest of Muskdana, Ashwagandha, Sarpagandha.
7	*Hyblaea puera* (Cramer)	80	Major pest of teak.
	B) Family- Arctiidae		
8	*Creatonotos gangis* (Linnaeus)	410	Polyphagous pest.
9	*Spilarctia obliqua* (Walker)	315	Major polyphagous pest of sesame, linseed and minor pest of cabbage and sweet potato. Major pest of Sarpagandha, Sonapatha, Turmeric, Sadasuhagan.
10	*Amsacta moorei* (Butler)	37	Sarpagandha, Isbagol.
	C) Family-Sphingidae		
14	*Agrius convolvuli* (Linnaeus)	143	Major pest of sweet potato, sunflower and soybean.
15	*Daphinis niri* (Linnaeus)	118	Major pest of Sarpagandha, Serpentine.
	D) Family- Erebidae		
16	*Cyana peregrine (Walker)*	109	Pest of grasses
17	*Digama sp. (Moore)*	68	Pest of Natal plum (Carissa sp.)
18	*Eudocima aurantia (Moore)*	42	Pest of Lemon Grass.
19	*Utetheisa ornatrix (Linnaeus)*	38	Pest of Fodder crop.
20	*Palpita vitrealis (Rossi)*	18	Pest of ornamental plant (Jasmine)
	ORDER- HEMIPTERA		
	A) Family-Pentatomidae		
21	*Nezara viridula (Linnaeus)*	384	Major polyphagous pest of soybean, pigeon pea and vegetable crops. Pest of Sarpagandha, pudina.
	B) Family- Cicadellidae		
22	*Nephotettix virescens (Distant)*	1643	Major pest of paddy. Pest of Babchi, Bael.
	C) Family-Pyrrhocoridae		
23	*Dysdercus koenigii (Fabricius)*	389	Major pest of cotton and okra. Pest of Muskdana, Sarpagandha.
	ORDER- COLEOPTERA		
	A) Family- Chrysomelidae		
24	*Aulacophora foveicollis (Lucas)*	473	Major pest of cucurbitaceous particularly pumpkin. Pest of Muskdana.
25	*Altica oleracea (Linnaeus).*	162	Polyphagous pest.
	B) Family- Cerambycidae		
26	*Stromatium barbatum (Fabricius)*	57	Pest of bamboo and Teak
	ORDER- ORTHOPTERA		
	A) Family- Gryllidae		
27	*Euscyrtus concinnus (de Haan)*	754	Pest of fodder grasses
	B) Family- Gryllotalpidae		
28	*Gryllotalpa orientalis (Burmeister)*	654	Pest of paddy. Pest of Safed Mushli.
	ORDER- DIPTERA		
	A) Family- Bibionidae		
29	*Plecia amplipennis (Skuse)*	197	Fodder pest

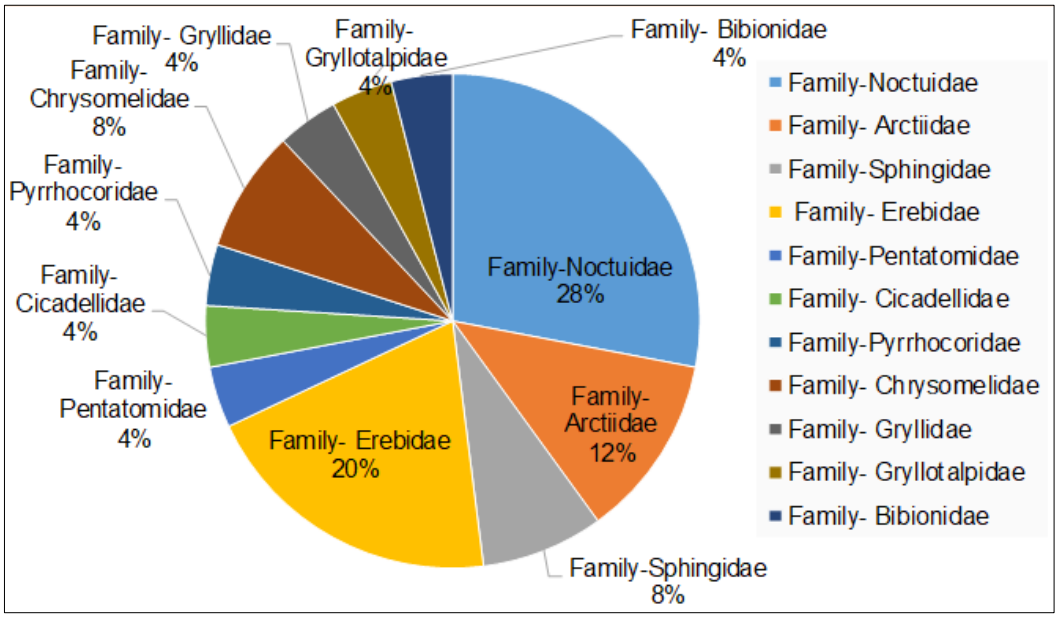

Fig 1: Percent distribution of harmful insect pest species of different families catches through light trap installed in Medicinal garden at Jabalpur in *Rabi* 2019-20 (September to March).

Conclusions

The present investigation has provided valuable information about taxonomic status of harmful insect pests of medicinal plants. Taxonomic analysis revealed that these 29 harmful insect species belonging to 5 orders and 11 families were recorded throughout the season (*Rabi* 2019-20) based on number of species collected, largest collection was represented by family Noctuidae 7 species (28%) followed by family Erebidae 5 species (20%), family Arctidae recorded 3 species (12%). Families Sphingidae and Chrysomelidae was represented by 2 species each (8%). Families Pentatomidae, Cicadellidae, Pyrrhocoridae, Gryllidae, Gryllotalpidae and Bibionidae were represented by each one species (4%). 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 medicinal plants and other economically important crop of this region.

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