



Taxonomic Distribution of Major Insect Pest of *Rabi* Season at Jhansi (U.P.) Using Solar Powered Light Traps

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The experiment was conducted at Bundelkhand University, Jhansi (UP) during the period March and April, 2021 to study the taxonomic distribution of insect pest species collected in Solar powered Light Traps model SMV- 8 and SMV- 9 using low energy light source i.e. 7w UV LED. According to taxonomic analysis, 8 insect species were recorded and they belong to four orders and eight

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families. Based on the number of species collected, the order Lepidoptera had the biggest collection (42 per cent), followed by the order Coleoptera with 3 species (40 per cent). The pyraliidae family has the most insect pests (25 per cent), followed by the Scarabaeidae family (19 per cent).

Keywords: Light trap; taxonomic distribution; UV LED; insect fauna; solar trap.

1. INTRODUCTION

Light traps are used to catch insects and survey the density of insects in our environment or at a particular place. A light trap is a device that captures and killing insects. Light trap used to monitor the Insects to maintain their population level and its use is increasing rapidly among farmers to control Insect. Light traps are suitable for sampling only those flying insects that are attracted to the light source being used [1]. The attraction of insect to light for their positive photo active response has been under study for a long-time by ecological entomologist. The data provided by the light trap catch could throw light on period of maximum activities of insect Dadmal and Khadakkar (2014).

Light trap for insect catches give useful faunistic data because many insects are positively phototrophic in nature. This information can be interpreted as a measure of the health of the biodiversity in the area. The data produced by light trap catches could shed light on when insects are at their most active [2,3-5]. Light trap data can be used to forecast and predict insect incidence or outbreaks [6]. Farmers must know that by attracting and killing one adult moth or insect they control around 300-400 insect progenies through them. By monitoring the light traps, they will know better what types of insects are there in the field and whether they are in controllable level or not [7-10]. The light trap has undergone lots of changes from its simple beginning as a kerosene lamp kept in front of a cloth sheet or water container to electrically operated ones to battery operated now [11,12-14].

For that reason, firstly a model of light trap box with iron structure was developed then a solar light system including Solar panel charging unit battery and LED bulb install with the insect light trap box so that this solar light trap can screen and control the insect pests' nuisances of various crops adequately (Dronachari and Nikhil kumar, 2019). It is the best IPM tools which give better defend to the nature in contrast with the other technique for insect pest control. There are various IPM practice that work best when applied

by the whole entire community and local area and in a synchronized mode [15-18]. This is probably not going to occur without showing advantages of gathering approach, and outer inspiration and backing to the farmers.

2. MATERIALS AND METHODS

The trials were conducted during March April 2021 (*Rabi* Season), at Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi (Uttar Pradesh).

The climatic conditions prevalent in Jhansi are essentially semi-arid and sub-tropical. It is situated at 25°26'55"N latitude, 78°34'11"E longitude and at an altitude of 285m above the mean sea level. The annual rainfall varies from 830 to 930mm with an average of 850 mm, the rainy season starts by the third week of June (although this is variable year to year), while the monsoon rains gradually weaken in September and end before the last week of September. The average maximum temperature was 42°C and minimum temperature is 40°C. Relative humidity remains very low during summer (34), moderate during winter (59) and attain higher value (85) during rainy season.

The insects contained in the collecting bag were killed by exposure to Dichlorvos 76 EC vapors (as a fumigating agent) released in a dispenser with scrubber and deposited in a collection tray for quick killing. Every morning, insects were collected from the collection bag. Every night, light traps were set, and the collection was monitored the next morning. Observations were made every day. The entire insect fauna was observed and classified into major species and order groups. Daily trap catch data was recorded for analysis. In the experimental area, two light traps were installed. A gram crop was sown in roughly 5 hectares of area. The distance between two traps was about 100 meters.

Investigate the taxonomic distribution activity of insect pest species gathered in light traps. The total number of insects trapped each week (adjusted to seven days total) in two traps (i.e.,

Solar light trap models SMV-8 UV LED 7-watt without electric grid and SMV-9 UV LED 7-watt with electric grid) is used to study taxonomic distribution activity.

3. RESULTS AND DISCUSSION

During the main *Rabi* 2020-21 activity seasons (March- 2021 to April- 2021), the incidence of insects gathered in light traps was analyzed by operating light traps with solar model SMV - 8 and solar model SMV- 9, every night. Total trap catches were observed on a day-by-day basis. Light trap catches included in significant 8 species of insect pests that were evaluated for their relevance during *Rabi* season. According to an analysis of trap catches, these species shown in Table 1 and Fig. 1.

According to taxonomic analysis, these 8 insect species were recorded during the season (*Rabi* 2021) and belonged to four orders and eight families. Based on the number of species

collected, the order Lepidoptera had the biggest collection (42 per cent), followed by the order Coleoptera with 3 species (39 per cent) (Fig. 2). The pyraliidae family has the most insect pests (25 percent), followed by the Scarabaeidae family (19 percent).

Data of weekly collection of all the species, classified order wise and family wise respectively are presented in Table 1.

3.1 Discussion

The usage of a light trap has become a standard tool in entomological research for a variety of topics. Many insect species, generally nocturnal, are positively phototrophic and flock to light in great numbers. Light traps are one of the safest methods for reducing hazardous insect pests and can play a significant role in the monitoring and management of insect pest populations in agro-ecosystems.

Table 1. Taxonomic distribution of major insect pest collected in solar light traps

S.NO.	Insect species collected	March	April	Total
A). Coleoptera				
1.	<i>Hetwronychus arator</i>	107	53	160
2.	<i>Anolplhora glabripennis</i>	48	37	85
3.	<i>Ocybus Olens</i>	33	42	75
B). Lepidoptra				
4.	<i>Hyblaea purea</i>	35	17	52
5.	<i>Eutectona machaeralis</i>	136	75	211
6.	<i>Phthorimaea operculella</i>	32	46	78
C). Orthoptera				
7.	<i>Gryllus aesimillis</i>	35	31	66
D). Hemiptera				
8.	<i>Nezara viridula</i>	43	44	87

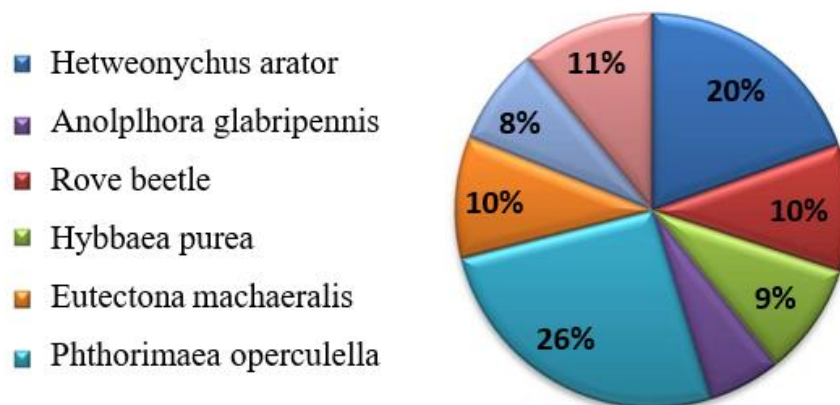


Fig. 1. Species wise percentage distribution

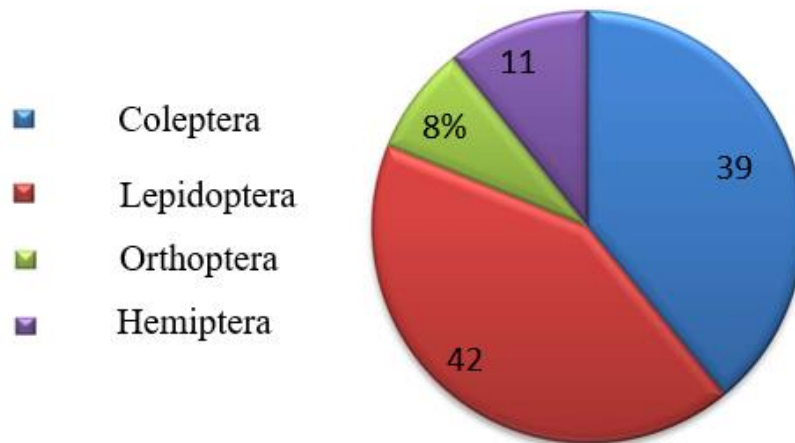


Fig. 2. Order wise percentage distribution

In addition, throughout the study period of the second week of March 2021 to the third week of April 2021, observations were made on the utility of UV light source in light trap operation for studying the seasonal activity of the major insect pest species.

According to taxonomic analysis, these 8 insect species belonged to four orders and eight families and were recorded throughout the season (Rabi 2020-21). Based on the number of species collected, the order Lepidoptera has the biggest collection (42 per cent), followed by the order coleoptera with 3 species (40 per cent). The pyraliidae family has the most insect pests (25 per cent), followed by the scarabaeoidea family (19 per cent).

Sharma and Bisen [19] also observed that light trap catches during the kharif season of 2006 at Jabalpur yielded 23 species of 7 families belonging to the order Lepidoptera. The Noctuidae family had the greatest number of species among these (13 species),

In a similar way, Sharma et.al. [20] during the paddy cropping season in Jabalpur (2002- 03), light trap catches revealed a total of 62 species belonging to 8 orders and 33 families. The largest order, Lepidoptera, has 27 species, followed by Hemiptera (14 species), Coleoptera (12 species), and Orthoptera (12 species) (4 species). The other orders of minor importance were Odonata, Hymenoptera, Isoptera, and Dictyoptera.

The collection of the entire season (November to April) was recorded species by species to

analyses the relative amount of trap catches of diverse species gathered in different taxonomic groupings. These species were divided into two categories based on their economic importance: Lepidoptera was the largest order with 24 species, with the largest collection represented by the family Noctuidae (8 species), followed by Arctiidae (4 species), Spingidae (2 species), and Erebidae (2 species), while families Geomeridae, Pyralidae, Lymentridae, Lasiocampidae, Nymphalidae, and Crambidae were grouped together.

Bernardi et.al. [21] used light traps to gather a total of 2,220 individuals from 14 families, 106 taxa, and 220 species. Noctuidae (59), Geometridae (30), Arctiidae (28) and Saturniidae (28) were the families with the most species obtained (14).

Spodoptera litura Fabricius (638 moths), *Chrysodeixis chalcites* (Esper) (25 moths), *Helicoverpa armigera* (Hubber) (538 moths), *Earias insulana* (70 moths), and *Agrotis ipsilon* (Hufnagel) (366 moths) were also found in trap catches during the season.

Spodoptera litura Fabricius, *Helicoverpa armigera* (Hubner), *Agrotis ipsilon* (Hufnagel), and *Plusia orichalcea* (Fabricius) were identified as polyphagous pests of the Noctuidae family in light trap catches in Jabalpur by Dangi [22].

Through trap catches in the paddy environment at Jabalpur, Sharma & Vaishampayan [23] and Sharma et.al. [24] revealed that *Helicoverpa armigera*, *Agrotis ipsilon*, and *Spodoptera litura* were the primary polyphagous pests of the family Noctuidae.

Cotton bollworm (*H. armigera*) individuals were often found in light trap catches, according to Nowinszky and Puskas [25]. Cutworm seasonal activity was studied using light trap catches by Bisht et.al. (2005).

4. CONCLUSION

According to taxonomic analysis, these 8 insect species were recorded during the season (*Rabi* 2020 -21) and belonged to four orders and eight families. Based on the number of species collected, the order Lepidoptera had the biggest collection (42 per cent), followed by the order coleoptera with 3 species (40 per cent). The pyraliidae family has the most insect pests (25 per cent), followed by the scarabaeoidae family (19 per cent).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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