Biological Forum – An International Journal **15(3): 91-94(2023)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Phototactic Response and Taxonomic Distribution of Predaceous Species of Paddy Ecosystem

Amit Kumar Sharma[1]*, Neeraj Kumar[1], Naveen[2], Shardhha Tare[1], Siddarth Nayak[3] and Sitaram Seervi[2]

[1]Department of Entomology, College of Agriculture,
Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (Madhya Pradesh), India.
[2]Department of Entomology, College of Agriculture,
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (Madhya Pradesh), India.
[3]Directorate of Extension Services,
Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (Madhya Pradesh), India.

(Corresponding author: Amit Kumar Sharma)*
(Received: 11 January 2023; Revised: 12 February 2023; Accepted: 20 February 2023; Published: 22 March 2023)
(Published by Research Trend)

ABSTRACT: The present investigation was carried out at the Research Farm of the College of Agriculture, JNKVV, Jabalpur (M.P.) during Kharif 2020 with a view to collect valuable information on the distribution of predatory species of paddy ecosystem in the Jabalpur region. The majority of nocturnal insect pests with a positive phototropic response are being controlled with light traps. Therefore, gathering data and documentation on natural enemies found in the paddy ecosystem's light traps is equally crucial. During the investigation, light trap collection was represented by a total of 17 predatory species. These species belong to 5 orders and 13 families. Among these orders, Coleoptera was the highest order with 4 families and 6 species. The highest size of trap catch of 3,856 beetles was recorded in *Coccinella* sp. of the family Coccinellidae. Hemiptera was the next order, represented by 3 families and 5 species. Major hemipteroid predatory species were *Canthecona furcellata* (166), *Antilochus* sp. (122) *Ectomocoris cordiger* (145), *Sirthenea* sp. (98) and *Erthesina fullo* (52). Among the other predatory orders, Odonata was represented by *Libellula* sp. (224) and *Coenagrion* sp. (52). Similarly orders Hymenoptera was also represented by two species *viz. Eumenes* sp. (58) and *Dorylus* sp. (21) while order Dictioptera was represented by only one species each. Thus, these results concluded that the positive benefit far outweighs the negative effect, demonstrating the safety of using light traps in IPM programmes with regard to their influence on natural enemies.

Keywords: Predator, distribution, light trap, paddy, ecosystem, Integrated Pest Management, monitoring.

INTRODUCTION

An adequate indication of the ecological impacts of climate change on insects is the light trap (Hufnagel *et al*., 2008). The majority of nocturnal insect pests with a positive phototropic response were controlled with light traps (Javeri, 1921). In recent years, the use of light traps has played a significant role in entomological research conducted worldwide to monitor, identify, and manage insect pest populations in various agroecosystems. The light trap also draws in large numbers of useful insects like parasites and predators. Although a lot of material is accessible on luring the crop pest species in the light trap, very few reports of work done on the light trap in the collection of natural enemies include Atwal *et al*. (1969); De bach (1974); Ismael (1974); Patil *et al*. (1982); Khan (1983). Consequently, gathering data and documentation on natural enemies found in the paddy ecosystem's light traps is equally crucial. The goal of the current study is to analyze the behavior and distribution of predatory species in the paddy ecosystem in the Jabalpur region of Madhya Pradesh.

MATERIALS AND METHOD

The experiment was conducted during Kharif 2020 at Research Farm, JNKVV, Jabalpur (M.P.) by using a standard design of light trap (model SM-01) with a 15-watt UV lamp. The light trap was operated every night but the collection of a single day per week was recorded during the principal cropping season from July to December. From the light, trap catches the specimen of the concerned species were preserved by keeping the pinned specimens as per the standard procedure but the small insects, such as coccinellid beetles were directly mounted over the small pieces of card sheets with the help of gum. Dried specimens were kept in insect boxes and showcased for identification. A detailed photographic presentation of these insects was also prepared.

RESULTS AND DISCUSSION

Predatory species were represented by 5 orders, 13 families, and 17 species in light trap collections (Table 1and Fig. 1).Among them order Coleoptera was represented by the highest number of 4 families including 6 speciesin which family Carabidae has the highest 3 predatory species namely *Deserida lineola* (166), *Crospedophorus elegans* Dej. (145), *Onitis facutus* and *Chlaenius* sp. (117).Comparing the relative size of trap catches the highest catch was observed of *Coccinella* sp. (3856) among all the species of order Coleoptera as well as among all the other orders.

Similarly, to this, Sharma *et al.* (2012) reported that the majority of coleopteroid predatory species were gathered using light traps, with *Coccinella* sp. recording the highest catch. In Northern India, Goel (1976) recorded 17 families of captured Coleoptera, including 89 species of Carabidae and 13 species of Coccinellidae. 141 species of Carabid beetles (Coleoptera: Carabidae) were also collected, according to Kadar and Szel (1989), from light traps set up in Hungary's apple orchards and maize stands. Similar to this, 8 species of Coccinellids (Coleoptera) were recorded by Ghorpade (1979) from Karnataka and were caught in light traps.

Megha and Sanjay (2020) conducted an experiment by using a light trap (model SMV 4) installed inside polyhouse at JNKVV Jabalpur during Rabi 2019-20 in Jabalpur district, Madhya Pradesh. Overall comparison of predator v/s pest species through trap catch revealed that it was 482 and 335 respectively. There was very high activity of predacious species (58.99%) in light trap compared to pest species (41%). Sharma and Bisen (2013) conducted the study for scope of light trap as IPM technology in Vegetable ecosystem collected in Balaghat region of M.P during the year 2006 (Kharif season). A total of 56 species were recorded in Kharif cropping season of vegetable cropping area. This insect pest belongs to 8 orders and 34 families. Lepidoptera was the largest order with 23 species. Other orders were Hemiptera (14species), Coleoptera (11 species) and Orthoptera (4 species). Odonata, Hymenoptera, Isopteran and Dictioptera were the other order of minor significance. Based on economic importance this collection was represented by 39 species of harmful insects (as crop pest) 17 species of predatory insects (useful as bio-control agents). The study reveals 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.

Table 1: Taxonomic distribution of predatory species collected in a light trap in the paddy ecosystem during Kharif 2020 based on the season's total collection.

Sr. No.		Insect species collected	Total of seasons collection (July to Dec 2020)*	Economic status beneficial predator – as biocontrol agents
ORDER-COLEOPTERA				
i) Family- Carabidae				
1.	1.	*Deserida lineola* Macl.	166	-
2.	2.	*Crospedophorus elegans* Dej.	145	Predator of lepidopterous larvae and soft-bodied insects
3.	3.	*Chlaenius* sp.	76	Predaccous upon *Laphgma pyrausta nubilalis*
ii) Family- Scarabidae				
4.	4.	*Onitis falcutus* (Wulfen) Dung beetle	117	Predator soft-bodied insects
iii) Family- Coccinellidae				
5.	5.	*Coccinella* sp.	3856	Predators of aphids, coccids, white flies& bugs
iv) Family- Cantharidae				
6.	6.	*Cicindela* sp.	188	Predaceous upon small insects
v) Family- Hydrophillidae				
7.	7.	*Hydrophilus* sp.	862	-
ORDER- HEMIPTERA				
i) Family- Reduvidae				
8.	1.	*Sirthenea* sp.	98	General predator feed upon Orycetes sp.
9.	2.	*Ectomocoris cordiger* Stal.	145	Predator upon- Caterpillars and small insects
ii) Family- Pentatomidae				
10.	3.	*Canthecona furcellata*	166	Predaceous up on caterpillars and small insects
11.	4.	*Erthesina fullo*	52	Predaceous habitually or occasionally
iii) Family-Pyrrhocoridae				
12.	5.	*Antilochus* sp.	122	Predator of nymphs of red cotton bug
ORDER-ODONATA				
i) Family- Libellulidae				
13.	1.	*Libellula* sp.	188	General predator of Lepidopterous, dipterous and Hymenopterous insects
ii) Family- Coenagriidae				
14.	2.	*Coenagrion* sp.	66	General predator
ORDER- HYMENOPTERA				
i) Family- Eumenidae				
15.	1.	*Eumenes* sp.	58	Predaceous upon green semi-looper and caterpillars
ii) Family- Formicidae				
16.	2.	*Dorylus*sp.	21	
ORDER-DICTYOPTERA				
i) Family- Mantidae				
17.	1.	*Statilia maculata* Thun.	18	Nymphs feed upon- leaf hoppers and aphids while adults feed on caterpillars, the grasshopper

*Number of insects collected in light trap/total of 4 days collection per month (Single day per week)

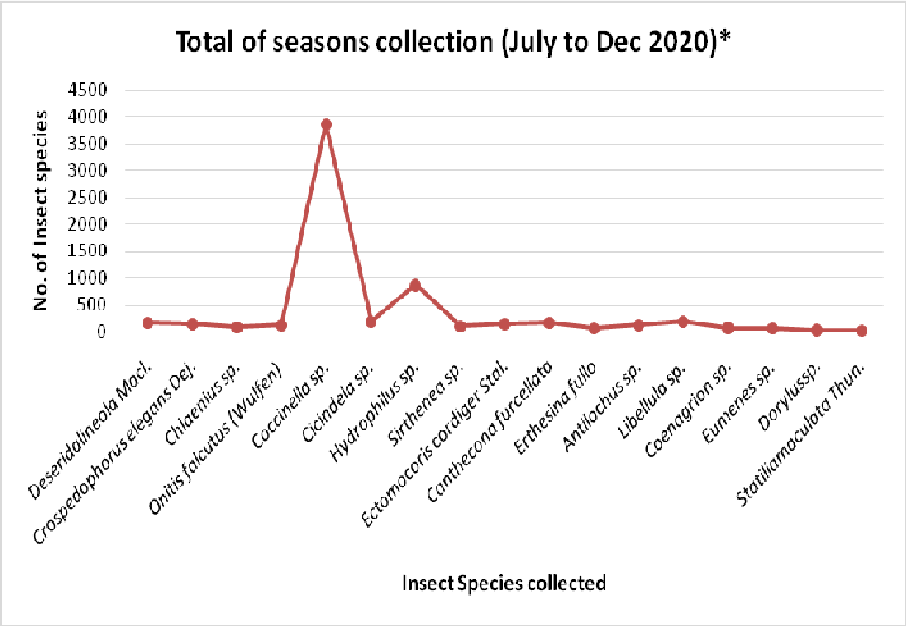

Fig. 1. Taxonomic distribution of predatory species collected in a light trap in the paddy ecosystem during Kharif 2020 based on the season's total collection.

Order Hemiptera was represented by 3 families and 5 species. Major predatory species were *Canthecona furcellata*(166), *Ectomocoris cordiger* (145) *Antilochus* sp. (122), *Sirthenea* sp. (98) and *Erthesina fullo* (90). Order Odonata contained two species namely *Libellula* sp. (188) and *Coenagrion* sp. (66) which belongs to the family *Libellulidae* and *Coenagriidae*, respectively. Order Hymenoptera was also represented by two species *viz. Eumenes* sp. (58) and *Dorylus* sp. (21) while order Dictyoptera was represented by only one species *i.e., Statilia maculata* (18) respectively.

Khan (1983) observed predaceous and parasitic species of insects collected in the light trap at Jabalpur. Species in Carabidae and Cicindelidae among the predaceous Coleoptera and Reduviids among the Hemiptera were however most responsive but Coccinellids were the least responsive to light which is in contrast with the current findings. Coccinellids were observed in significantly very large numbers in trap collection in the present study. Vaishamayan (1997) reported that observations were made during the 1983-84 crop season at Jabalpur (M.P.) on beneficial crop parasitic and predatory insects collected on the light trap. In all 21 predacious and 8 parasitic species were recorded to appear in significant numbers. Their proportion compared to the catch of harmful pest species was very low below 2 per cent.

CONCLUSIONS

The present study indicated the presence of 17 phototropic predatory species in the paddy ecosystem of the Balaghat region while the majority of well-known predatory and parasitic species were either very rare or absent from trap catches. As a result, the positive benefit far outweighs the negative effect, demonstrating the safety of using light traps in IPM programmes with regard to their influence on natural enemies.

FUTURE SCOPE

Further study on the seasonal activity of these phototropic predatory species can also be done to avoid the light trap operation during the peak activity period of these predacious species.

Acknowledgements. The authors extend their sincere thanks to the Head, Department of Entomology and Dean, College of Agriculture, Jabalpur, Madhya Pradesh for providing the necessary facilities for conducting the research work.
Conflict of Interest. None.

REFERENCES

Atwal, A. S., Chaudhary, J. P. and Ramzan, M. (1969). Studies on the seasonal abundance of insects in fight trap at Ludhiana. *Journal of Research-Punjab Agricultural University*, *6*(1 (suppl), 186-196.

De bach, P. (1974). Biological control by Natural enemies. Cambridge University Press, p. 323.

Ghorpade, K. D. (1979). On some Coccinellidae (Coleoptera) attracted to light. *Current Research. 8*(70), 113-114.

Goel, S. C. (1976). Phenology and relative abundance of Coleoptera in light trap in Northern India. *Utter Pradesh Journal of Zoology*, *1*, 108-115.

Hufnagel, L Sipkay, Cs. Drégelyi-Kiss, Á. Farkas, E. Türei, D Gergócs, V. Petrányi, G. Baksa, A. Gimesi, L. Eppich B., Dede, L. Horváth. L. (2008). Klímaváltozás, biodiverzitás ésközösségö kológiai folyamatok kölcsönhatásai. In: Zs. Harnos, L. Csete, (eds.). Klímaváltozás: környezet – kockázat – társadalom. Budapest: Szaktudás Kiadó Ház. pp. 229-266.

Ismael, I. I. (1974). The effect of certain weather factors on the activity and population density of tiger beetle *Cicindela melancholica* F. (Coleoptera, Cicindelidae). *Bulletin of Society of Entomology, Egypt., 58*, 345-348.

Javeri, T. N. (1921). Notes on "Kutra" (Hairy caterpillars) and their controlling measures. Res. Proc. 4th Ent. Mtgs. Pusa, 98-100.

Kadar, F. and Szel, G. (1989). Carabid beetles (Coleoptera, Carabidae) collected by light trap in apple orchards

and maize stands in Hungary. *Folia entomologica hungarica*, *50,* 27-36.

Khan, R. M. (1983). Studies on the common predatory and parasitic species of insects collected on light trap at Jabalpur. Unpublished M.Sc. Ag. thesis, JNKVV, Jabalpur, pp. 49.

Megha, A. and Sanjay, V. (2020). Comparative analysis of harmful and beneficial insect species collected through light trap in polyhouse. *Journal of Entomology and Zoology Studies, 8*(6), 1928-1932.

Patil, B. V., Devaiah, M. C. and Thontadarya, T. S. (1982). Studies on attraction of predatory insects to mercury bulb light trap. *Indian Journal of Ecology, 9*(1), 108-112.

Sharma, A. K. and Bisen, U. K. (2013). Taxonomic documentation of insect pest fauna of vegetable ecosystem collected in light trap. *International Journal of Environmental Science: Development and Monitoring, 4*(3), 4-11.

Sharma, A. K., Rathi, D. and Bisen, U. K. (2012). Use of light trap for recording the insect fauna in safflower ecosystem. *Journal of oilseed Research, 29* (Special issue) pp- 367-368.

Vaishamayan, S. M. (1997). Utility of light trap in Integrated Pest Management. Proceedings of National Seminar on Integrated Pest Management in Agriculture, Nagpur, India pp. 43-53.

How to cite this article: Amit Kumar Sharma, Neeraj Kumar, Naveen, Shardhha Tare, Siddarth Nayak and Sitaram Seervi (2023). Phototactic Response and Taxonomic Distribution of Predaceous Species of Paddy Ecosystem. *Biological Forum – An International Journal, 15*(3): 91-94.