Research Article

TAXONOMIC DOCUMENTATION OF COLEOPTERAN PHOTOTACTIC INSECT FAUNA OF RICE COLLECTED IN LIGHT TRAP AT JABALPUR DISTRICT OF MADHYA PRADESH, INDIA

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ABSTRACT

The present research work was carried out at two distinct locations (Research Field and Farmer's Field). The Research Field, Jawaharlal Nehru Krishi Vishwa Vidyalaya and Farmer's Field Village – Jatwa, Panagar Block of district Jabalpur Madhya Pradeshduring two cropping season of rice *i.e.* Kharif of 2015 and 2016. Light trap was used for the taxonomic documentation Coleopteran phototactic insect fauna. Total 34 species of order Coleoptera belongs to 8 families were collected from rice ecosystem. Family Carabidae was the dominating family among the all 8 families. 34 species were collected at Farmer's Field while 29 species at Research Field.

INTRODUCTION

Rice is very important crop in India it was occupied 37.38 million ha area under cultivation and production was 104.8 MT (State of Indian Agriculture, 2015-16), while in Madhya Pradesh area under rice cultivation was 2.02 million ha and production was 5.32 MT (Statistics of Madhya Pradesh, 2015-16). Rice ecosystem provides favorable conditions for various kinds of invertebrates that inhabit soil, water and vegetation. Over 800 species of insects in rice ecosystems have been reported worldwide. Out of these, 100 species attack rice, while rests are considered as friendly insects (Pathak, 1970). Almost 20 insects are considered as rice pests of economic importance that include stem borers, gall midge, defoliators and vectors like leafhoppers and plant hoppers (Pathak, 1994). According to biodiversity productivity hypothesis (Yachi and Loreau, 1999), biodiversity plays significant role in maintaining a sustainable agronomic systems.

Coleoptera is an order of insects commonly called beetles. The order Coleoptera is the largest insect order constituting almost 25 percent of all known life-forms. Beetles are widely distributed found in all major habitats. Beetles play an important role in maintaining the eco-system. They are not only pests but can beneficial, like Ground beetles (Family Carabiadae) are common predators of many different insects (Gullan and Cranston, 2010) and Dung rollers (Family Scarabaeidae) are efficient scavengers.

Practices like over use of pesticides, monoculture, grazing, poor farming techniques etc. are posing threats to biodiversity associated with rice farming system (Asghar *et al.,* 2013). Agricultural activities create fragmented landscapes, which cause small isolated patches of species to go extinct (Tscharntke *et al.,* 2005). These oversimplified environments lead to intensified pest outbreaks, as well as a reduction in critical components of an ecosystem, such as pollinators (Letourneau and Bothwell, 2008). In order to gain productive results, it is necessary to conserve diversity in agricultural systems.

Light trap is a well-known tool for study the biodiversity of phototactic insects. Light-trapping has become a general term which refers to all methods of attracting nocturnal insects with lamps or artificial light sources. Phototropic behavior and phototactic response of insects are being largely used to monitor pest activity for their effective suppression (Dhiman, 2001). Light trap still occupied an important place in entomological studies worldwide for survey, detection and management of insect pest population in various Agro-Horticulture crops (Sharma and Bisen, 2013). Keeping the importance of biodiversity in mind for maintaining a sustainable agronomic system, this study propose to study of insect diversity Coleopteran insect fauna in rice ecosystem by using the light trap.

MATERIALS AND METHODS

The present research work was carried out at two distinct locations (Research Field and Farmer's Field). The Research Field, Jawaharlal Nehru Krishi Vishwa Vidyalaya and Farmer's Field Village – Jatwa, Panagar Block of district Jabalpur Madhya Pradesh during two cropping season of rice i.e. Kharif of 2015 and 2016.

Research field (RF)

RF is located in the JNKVV campus. Breeder seed production is carried out in almost all the field of JNKVV,

except research plots. Use of fertilizers, intercultural operations, weedicides and insecticides is a regular feature in these fields. Soil is black and irrigated, Rice-wheat cropping system is practiced. Research Field located in semi-urban area where light illumination due to street light during night was comparatively more than FF.

Farmer Field (FF)

FF was located in village- Jatwa, Panagar block of district Jabalpur which is 12 kilometre away from the RF. The farmer followed the traditional cultivation practices. No use of insecticides, less use of fertilizers, minimum intercultural operation with limited irrigation. Rice-wheat cropping system was also followed in black soil. The farmer's field was surrounded by dense vegetation and illumination was less due to no street light.

For the taxonomicdocumentation, 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 of, 2015 and 2016. Total insects were observed and sorted out on the basis of their order and family. Identification of insects were 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 54°C and thereafter well labeled specimens were stored in insect boxes and show cases.

RESULTS AND DISCUSSION

Taxonomic documentation of Coleopteran phototactic insect fauna in year 2015 at FF and RF

In year 2015 at FF, order Coleoptera was represented by 28 species and 8 families. Carabidae family of order Coleoptera represented by highest number (11 species) of species followed by Scarabaeidae (4 species), Meloidae (4 species), Cerambycidae (3 species), Chrysomelidae and Dytisadea (2 species). Hydrophidae and Staphylinidae were represented by one species each, while at RF, order Coleoptera was represented by 23 species and 7 families. Carabidae family was represented by highest number of species (10 species) followed by Scarabaeidae (4 species), Meloidae (3 species), Chrysomelidae (2 species), Dytisadea (2 species) while Cerambycidae and Hydrophidae represented by one species each. In year 2015, 5 species were found more in number at FF in comparison to RF.

Taxonomic documentation of Coleopteran phototactic insect fauna in year 2016 at FF and RF

In year 2016 at FF, order Coleoptera was represented by 34 species and 8 families. Carabidae family of order Coleoptera represented by highest number of species (14 species) followed by Scarabaeidae (6 species), Meloidae (5 species), Cerambycidae (3 species). Chrysomelidae and Dytisadea were represented by two species each, while Hydrophidae represented by one species, while at RF, order Coleoptera was represented by 29 species and 7 families. Carabidae family was represented by highest number of species (13 species) followed by Scarabaeidae (6 species) and Meloidae (4 species). Chrysomelidae and Dytisadea were represented by 2 species each. Cerambycidae and Hydrophidae were represented by one species each. In year 2016, 5 species were found more in number at FF in comparison to RF.

Table 1. Taxonomic distribution of Coleopteran phototactic insect species collected in light trap in rice ecosystem (farmer field and research field) during kharif 2015 and 2016.

Sl. No.	Insect species collected	Number of insect collected in light trap			
		FF		RF	
Order - Coleoptera					
	A) Family – Carabidae (14)				
1	*Chlaenius sp.*	48	42	24	28
2	*Calosoma sp.*	2	3	0	0
3	*Brachinus longipalpis* Wiedemann, 1821	0	6	0	2
4	*Prothyma sp.*	968	1220	685	942
5	*Cicindela flexuosa* Linnaeus, 1758	301	350	23	48
6	*Chlaenius medioguttatus* Chaudoir, 1876	34	44	10	16
7	*Chlaenius sp.*	50	60	22	42
8	*Ophionea indica* (Thunberg, 1784)	6162	9040	3868	6640
9	*Chlaenius circumdatus* (Dejean, 1826)	48	49	4	9
10	*Zuphium sp.*	0	16	0	9
11	*Macrochilus* tripustulatus (Dejean, 1825)	64	69	20	20
12	*Chlaenius panagaeoides* Chaudoir, 1876	54	69	23	33
13	*Brachinus sexmaculeatus* (Dejean, 1852)	24	44	8	9
14	*Crosopedophorus elegans* (Dejean)	0	15	0	9

	B) Family – Scarabaeidae (6)				
15	*Catharius sp.*	10	13	5	4
16	*Onthophagus sp.*	99	44	3	16
17	*Adoretus sp.*	27	22	6	9
18	*Heterorychus sp.*	0	12	0	3
19	*Apogonia sp.*	0	16	0	12
20	*Holotrichia consanguinea* Blanchard, 1851	31	44	40	63
	C) Family – Meloidae (5)				
21	*Epicauta sp.*	50	54	2	9
22	*Epicauta sp.*	7	12	0	0
23	*Epicauta sp.*	11	9	3	3
24	*Epicauta sp.*	0	12	0	3
25	*Lytta sp.*	26	26	22	22
	D) Family – Cerambycidae (3)				
26	*Xystrocera globosa* (Olivier, 1795)	2	4	0	0
27	*Stromotium sp.*	2	3	0	0
28	*Xylotrechus sp.*	2	3	1	1
	E) Family – Chrysomelidae (2)				
29	*Raphidopalpa foveicollis* Lucas, 1849	765	440	635	448
30	*Alticao leracea* (Linnaeus, 1758)	918	888	1359	1220
	F) Family – Dytisadae (2)				
31	*Sandrac ottus sp.*	56	93	40	66
32	*Dytiscus marginalis* Linnaeus, 1758	24	22	20	36
	G) Family – Hydrophidae (1)				
33	*Hydrochara caraboides* (Linnaeus, 1758)	518	620	420	520
	H) Family – Staphylinidae (1)				
34	*Aleochara sp.*	4	4	0	0

Pooled data results (FF AND RF)

Order Coleoptera was represented by 34 species and 8 families. Carabidae family was represented by highest number of species (14 species) followed by Scarabaeidae (6 species), Meloidae (5 species), Cerambycidae (3 species), Chrysomelidae and Dytisadea were represented by 2 species each while Hydrophidae and Staphylinidae were represented by one species each, while at RF order Coleoptera was represented by 29 species and 8 families. Carabidae family was represented by highest number of species (13 species) followed by Scarabaeidae (6 species), Meloidae (4 species), while Chrysomelidae and Dytisadea were represented by 2 species each. Cerambycidae and Hydrophidae were represented by one species each. Pooled data study revealed that 5 species were found more in number at RF in comparison to RF. Similarly Banerjee (2014) reported nine family of Coleoptera from three different sites. Similarly Sharma *et al.* (2015) also reported significantly very high activity of beneficial predacious species in light trap at farmer's field, compared to research farm shows the importance of minimum use of pesticides and least disturbances to ecosystem.

Taxonomic documentation of total Coleopteran phototactic insect fauna at FF and RF

Order Coleoptera was represented by 34 species and 8 families. Carabidae family of order Coleoptera represented by highest number of species (14 species) followed by Scarabaeidae (6 species), Meloidae (5 species), Cerambycidae (3 species), while Chrysomelidae and Dytisadae reperesented by 2 species each. Hydrophidae and Staphylinidae represented by one species each. Similarly Sharma *et al.* (2010) also reported a record of 12 species of order Coleoptera in rice ecosystem. Again Sharma *et al.* (2013) reported 11 species of order Coleoptera in vegetable field.

CONCLUSION

Total 34 species of order Coleoptera belongs to 8 families were collected from rice ecosystem. Family Carabidae was

the dominating family among the all 8 families. 34 species were collected at Farmer's Field while 29 species at Research Field. Five species were found more in number at Farmer's Field in comparison to Research Field shows the importance of minimum use of pesticides and least disturbances to ecosystem.

REFERENCES

Asghar, M., M. Arshad, M. Fiaz, A. Suhail and A.M. Sabir. 2013. A survey of rice farmers' farming practices posing threats to insect biodiversity of rice crop in the Punjab, Pakistan. *International Journal of Biodiversity and Conservation*, **5**(10): 647-654.

Dhiman, S.C. 2001. Incidence of mass attraction of Pyrillaperpusilla Walker on fluorescent light at Saharanpur, Uttar Pradesh. *Journal of Applied Zoological Researches*, **12**(2/3): 142-143.

Letourneau, D. and S. Bothwell. 2008. Comparison of organic and conventional farms: Challenging ecologists to make biodiversity functional. *Frontiers in Ecology and the Environment*, **6**(8): 430-438.

Pathak, M.D. 1970. Insect pests of rice and their control. IRRI. (ed.). *Rice Production Manual. Los Baños: University of the Philippines, College of Agriculture in cooperation with the International Rice Research Institute*, 171- 198.

Pathak, M.D. and Z.R. Khan. 1994. Insect Pests of Rice. *International Rice Research Institute, Rice Production Manual. Los Banos, Manila*, 19.

Gullan, P.J. and P.S. Cranston. 2010. *The Insects: An Outline of Entomology*, John Wiley & Sons, Oxford, UK, **4th edition.**

Banerjee, M. 2014. *Diversity and Composition of Beetles (Order: Coleoptera)* of Durgapur, West Bengal, India. Psyche, **4**: (6).

Sharma, A.K., S. Barche and P.K. Mishra. 2010. Pest and predatory insect species inhabiting paddy ecosystem in Jabalpur, Madhya Pradesh collected with the help of light traps. *Pest Management and Economic Zoology* **18**(1/2): 125-133.

Sharma, A.K., S. Bisen and U.K. Bise. 2015. Comparative analysis on activity of majorpredatory and insect pest species of Paddy in two district (Forming-Ecological) locations through light trap. The Ecoscan, **9**(1&2): 81-84.

State of Indian Agriculture. 2015-16. Government of India Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare Directorate of Economics and Statistics, New Delhi.

Statistics of Madhya Pradesh. 2015-16. Department of Farmers Welfare and Agriculture Development, Madhya Pradesh.

Tscharntke, T., A. Klein, A. Kruess, I. Steffan-Dewenter and C. Thies. 2005. Landscape perspectives on agricultural intensification and biodiversity – ecosystem service management. *Ecology Letters*, **8(**8): 857-874.

Yachi, S. and M. Loreau. 1999. Biodiversity and ecosystem productivity in a fluctuating environment: The insurance hypothesis. Proc. Natl. Acad. Sci. USA, **96**: 1463–1468.

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