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Composition of Insect fauna in Rice Ecosystem in Professor Jayashankar Telangana State Agricultural University, Hyderabad, Telangana

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ABSTRACT: Comprehensive investigation of different insect fauna on different crops was not studied systematically at PJTSAU, Hyderabad. Hence, an attempt to describe composition and abundance of insects was made during *Kharif* 2021 on rice ecosystem. An experiment was conducted between September 2021-February 2022 to record the composition of Insect fauna in Rice ecosystem at college farm of PJTSAU. Sampling was done through three different trapping methods (Light trap, Sweep net, Pitfall trap) altogether 11,094 individuals of 39 families and 10 orders were collected. Of all the orders Hemiptera (3647) accounted for major share with maximum number of individuals followed by Coleoptera (3514) and Lepidoptera (1353) and minimum number of individuals in Neuroptera (22).Out of all collection methods employed, Light trap recorded (7838) highest number of individuals.

Keywords: Rice ecosystem, Composition, Insect fauna, Sweep net, Light trap, Pitfall trap.

INTRODUCTION

In terms of taxonomic diversity, insects are the most diverse group of creatures on the planet (Belamkar and Jadesh 2014). With 1,020,007 species, or 66 percent of total known animal species, insects are the most prevalent (Zhang, 2011). In India, there are 27 orders under 658 families that make up the insect biodiversity. Coleoptera, Lepidoptera, Orthoptera, Hymenoptera, Diptera, Hemiptera, Odonata and Thysanoptera are eight major orders of insects accounting for 94% of all insect species in India. The remaining 21 groups only account for six percent of all insect species. The most diverse order in terms of families (114 families) was coleopteran (Chandra, 2011).

Rice is one of the important field crops grown in India which exhibits an excellent instance of changing insect pest scenario in recent past. The abundance and diversity of insects differ in the rice ecosystem in addition to the growth stages of its sowing season. Many arthropods species inhabit rice fields in which some are harmful to the crop, but most of them are not noxious to rice plant (Singh and Singh 2014). In India after green revolution there was a steady growth of the total number of insect pests and concomitant shift of their pest status its diversity and spread (Sain and Prakash 2008).

In addition to the above, a total of 800 insect species have been identified worldwide, with 100 species being pests that attack different portions of the rice plant and the others being beneficial. Stem borer, defoliators, gall midge and disease-transmitting vectors such as plant hoppers and leaf hoppers are all major rice pests. The species makeup of the aforementioned important insect pest stem borer, which includes yellow stem borer, white stem borer, pink borer, and black headed borer, has demonstrated broad geographical variance throughout the country. From the time of sowing to harvest, the majority of rice plant elements are vulnerable to pest assault. Insects cause damage to a variety of plant parts by burrowing into stems, devouring plant tissues, and draining sap from stems and grains (Ane and Hussain 2016).

MATERIAL AND METHODS

The study area. Sampling of insect fauna was carried between September 2021 to February 2022 in the rice ecosystem at College farm, College of agriculture, Rajendranagar which is located at 17°.19'N latitude and 17°24'E longitude at an altitude of 542.6 m above the Mean Sea Level.

Collection Methods. Insect collections were carried at weekly intervals through light trap, pitfall trap and sweep net by using three different traps.

Pitfall trap: Pitfall traps, (plastic cups with a top diameter of 12 cm and a height of 14 cm), 5 per acre were placed at random sites. Salt and soap-infused

water will be added to each cup until it is one-fourth of the way full.

Light trap: The nocturnal insects were captured using light traps (1 per hactare), which were lighted in the evening (6pm to 10pm). There was random distribution of light traps with containers filled with soap water. The following morning, each trap was serviced and the captured insects were taken to the lab for identification.

Sweep net: The insects were collected once a week during the day (9 am to 1 pm) using sweep nets (30 cm hoop diameter and 80 cm handle length). Five sweeps were used at each point while moving in a diagonal route at intervals of 50m. The insects were brought into the lab for preservation and further identification was done after placing in to a killing jar containing cotton swabs dipped in ethyl acetate.

Most of the collected specimens were recognised by key (Triplehorn and Johnson 2005) up to the family level.

RESULTS AND DISCUSSION

The study resulted with a total of 11,094 individuals were collected belonging to39 families and 10 orders in three traps (Table 1). Among the ten orders, Hemiptera was recorded with eight families, followed by the orders Coleoptera (seven families), Lepidoptera (six families), Hymenoptera (five families), Orthoptera and Diptera with four families each, Odonata with two families each, whereas orders Dermaptera, Mantodea and Neuroptera were reported with one family each. Decreasing order of Insects orders according to the number of individuals recorded is as follows. Hemiptera (3647) > Coleoptera (3514) > Lepidoptera (1353) > Orthoptera (818) > Hymenoptera (807) >Diptera (722) >Odonata (82) >Dermaptera (79) >Mantodea (50) >Neuroptera (22). Findings shows highest number of orders and families were documented than previous studies carried out by Ibrahim and Mugiasih (2020) who reported 15 families under 6 orders (Odonata, Orthoptera, Hemiptera, Lepidoptera, Hymenoptera, Coleoptera) in rice ecosystem.

Table 1: Insect composition with total number of individuals and methods of collection.

Sr. No.	Orders	Families	Methods of collection			Total no. of individuals
			LT	SN	PT	
1.	Odonata	Libellulidae	12	36	0	48
		Platycnemididae	6	24	4	34
2.	Orthoptera	Acrididae	46	241	186	477
		Gryllidae	85	0	111	196
		Pyrgomorphidae	0	17	22	39
		Tettigonidae	14	30	62	106
3.	Dermaptera	Dermaptera	0	0	79	79
4.	Mantodea	Mantidae	11	26	13	50
5.	Hemiptera	Alydidae	191	58	8	257
		Belostomidae	262	0	31	293
		Cicadellidae	1658	36	0	1694
		Delphacidae	50	9	0	59
		Fulgoridae	0	101	0	101
		Miridae	185	19	0	204
		Pentatomidae	728	156	23	907
		Reduvidae	75	37	20	132
6.	Neuroptera	Chrysopidae	22	0	0	22
7.	Lepidoptera	Crambidae	321	128	0	449
		Erebidae	565	88	0	653
		Geometridae	5	0	0	5
		Hesperidae	11	0	0	11
		Noctuidae	138	0	0	138
		Nymphalidae	56	41	0	97
8.	Diptera	Bibionidae	46	40	0	86
		Dolichopodidae	160	40	0	200
		Sarcophagidae	81	0	105	186
		Culicidae	250	0	0	250
9.	Hymenoptera	Apidae	43	0	0	43
		Formicidae	17	0	310	327
		Ichneumonidae	114	23	25	162
		Pompilidae	102	0	139	241
		Vespidae	34	0	0	34
10.	Coleoptera	Bostrichidae	42	0	0	42
		Carabidae	74	0	134	208
		Chrysomelidae	219	229	0	448
		Coccinellidae	542	335	0	877
		Hydrophilidae	465	0	0	465
		Scarabidae	297	0	270	567
		Staphylinidae	907	0	0	907
	Total		7838	1714	1542	11,094

SL- Serial number**, LT** – Light trap,**SN**-Sweep net,**PT** – Pitfall trap.

Order odonata includes dragonflies (Anisoptera) and damselfies (Zygoptera) wherein adults are predaceous insects. A total of 82 individuals were recorded with maximum of 48 individuals from Dragonfly family (Libellulidae) and 34 from damselfly family (Platycnemididae). Out of three different trapping methods, Sweep net (60) recorded highest number of individuals followed Light trap (18) and Pitfall trap (4) recorded lowest number of individuals. As these insects seen mostly near grasses and waterbodies more number of individuals are collected in Sweep net in rice ecosystem. Results shows that, family Libellulidae was found to be more prevalent which is in accordance with (Arulprakash *et al*., 2017).

Orthoptera includes grasshoppers, crickets and katydids. However, few grasshoppers are predators, and the most of them feed on plants. Totally 818insect specimens were collected from four families in three different trapping methods.477 individuals were collected from family Acrididae followed by Gryllidae (196), Tettigonidae (106) and Pygomorphidae (39). Among different methods, Pitfall trap (381) collected a highest number of insects than sweep net (288) and least number of individuals by light trap (195). Akthar *et al*. (2012) reported two families *viz*., Acrididae and Pygomorphidae from rice fields, which were similar with two of four families recorded in present findings.

Order Dermaptera recorded79 individuals under the family Labiduridae which were collected from pitfall method. This infers, pitfall trap documented more number of earwigs as they were restricted to dark soil habitat.

Using the three trapping methods, a total of 50 individuals were documented from the order Mantodea under the family Mantidae. Out of the three trapping methods highest number of specimens were captured in Sweep net (26) followed by Pitfall (13) and Light trap (11) respectively.

In order Hemiptera, a total of 3647 individuals belonging to eight families were caught in three traps. As per the total number of individuals reported following is the trend of families: Cicadellidae (1694) > Pentatomidae (907) > Belostomidae (293) > Alydidae (257) > Miridae (204) >Reduvidae (132) >Fulgoridae (101) >Delphacidae (59). Out of three traps, Light trap collected more number with 3149 individuals followed by Sweep net (416) while Pitfall trap (20) caught least specimens. Family Cicadellidae is recorded with maximum number of individuals and are in congregation with the studies of Sheela and Delphine (2021) who reported Cicadellidae as most abundant family among five families (Cicadellidae, Alydidae, Pentatomidae, Delaphacidae and Pseudococcidae) of Hemiptera collected in rice field.

Order Neuroptera reported with the family Chrysopidae with 22 individuals recorded in light trap. As the adults were attracted to light and were seen mostly in the light traps.

Altogether 1353 individuals were collected under six families from the order Lepidoptera through light trap and sweep net. The line of decreasing order of families from maximum to minimum number of individuals documented is as follows: Erebidae (653) > Crambidae (449) > Noctuidae (138) > Nymphalidae (97) > Hesperidae (11) > Geometridae (5). Light trap captured maximum of 1096 number of individuals followed by Sweep net (257). Most of the individuals collected belong to moth families which are reported in light trap. Similar studies were reported by (Meena *et al*. 2018) who found that 10 families (Noctuidae, Erebidae, Arctiidae, Geometridae, Sphingidae, Pyralidae, Lymantriidae, Lasiocampidae, Nymphalidae, Crambidae) were collected in light trap.

Diptera is represented with 722 number of individuals from families Culicidae, Dolichopodidae, Sarcophagidae and Bibionidae with 250,200,186 and 86 number of individuals respectively from three traps. Highest number of individuals were collected from light trap (537) followed by pitfall trap (105) whereas lowest number of individuals were recorded from sweep net (80). Results validates with Majumder *et al*. (2013) who recorded most of families of diptera from light trap.

In order Hymenoptera 807 individuals from five families were found in this study were collected in three traps. Catch composition of insects in families is as follows: Formicidae (327), Pompilidae (241), Ichneumonidae (162), Apidae (43) and Vespidae (34). Pitfall trapdocumented 474 individuals followed by light trap (374) and Sweep net (23). Findings clearly showed that Formicidae dominated with more number of individuals which were similar with findings of Leksono *et al*. (2018).

In Order Coleoptera, a total of 3514 individuals from seven families were recorded from three collection traps. Number of individuals recorded family wise from highest to lowest were as follows: Staphylinidae (907) > Coccinellidae (877) > Scarabidae (567) > Chrysomelidae (448) > Hydrophilidae (465) > Carabidae (208) > Bostrichidae (42). Light trap (2546) catch recorded greater number of individuals followed by Sweep net (564) and least number of individuals in Pitfall trap (404). Results showed that the family Staphylinidae recorded maximum number of individuals among all the families which were in accordance to Sahoo *et al.* (2020) who recorded that family Staphylinidae was most abundant with relative abundance of 31.27%.

Altogether light trap catches maximum of 7838 number of individuals (Fig. 1) belonging to 35 families of 10 orders followed by Sweep net with1714 individuals from 20 families under seven orders and minimum number of 1542 insect specimens belonging to 17 families under 7 orders were documented in pitfall trap. From the studies it can be concluded that Light trap was one of the most efficient method in trapping diverse group of insect fauna irrespective of beneficial or harmful, which correlates with the studies of Mishra *et al*. (2017).

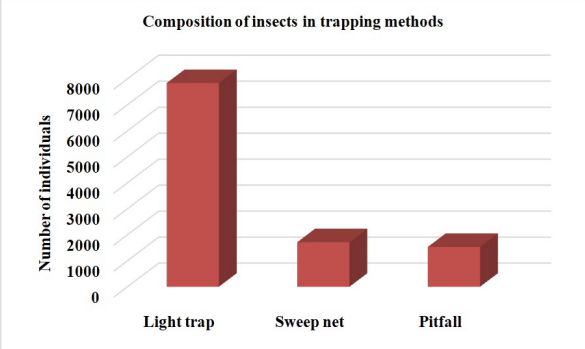

Fig. 1. Composition of insects in trapping methods.

CONCLUSION

The present study revealed that the Order Hemiptera was the most dominant in terms of total number of individuals collected than other nine orders *viz*., Coleoptera, Lepidoptera, Orthoptera, Hymenoptera, Diptera, Dermaptera, Odonata, Mantodea and Neuroptera. From the studied location it was showed that among the three sampling methods *viz*., Light trap, Sweep net, Pitfall trap installed, Light trap was one of the most efficient method in trapping the insects diverse groups.

FUTURE SCOPE

The current investigation reveals a wide variety of insects in the area and offers foundational information for subsequent research.

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Conflict of Interest: None.

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