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Trap wise composition of insects in Agroforest ecosystem (Paddy + Teak) of Kowdipally, Medak district, Telangana

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Abstract

Insects are the most abundant creatures in the world belonging to the Phylum Arthropoda accounting for considerable proportion of all the life on the planet. Rice ecosystem is the artificial wet land system that's supports diverse form of life playing an important role in agricultural ecological systems. Modern agricultural practices have significantly relied on usage of pesticides, which not only decreased pest population but also showed effect on the natural enemies population. The present study was conducted in the farmers field in Kowdipally village during *Kharif* 2024 where they practiced agroforest ecosystem including Teak plantation along the bunds across the Paddy field. An attempt was made to document insect composition trap wise viz., Sweep net, pitfall trap, visual count, sticky trap and pheromone trap.

Keywords: Agroforest ecosystem, abundance, trap wise, composition, sweep net

Introduction

Insects are the diverse animal species of different taxonomic category. In India, about 27 orders under 658 families make up the biodiversity of insects of which eight majors orders Lepidoptera, Thysanoptera, Coleoptera, Hymenoptera, Diptera, Hemiptera, Thysanoptera, Orthoptera and Odonata accounts for about 94% of all known insect species in India. The most diversified order in terms of families is the order coleoptera (Chandra, 2011) [2]. They habitat different locations may be in the soil, air, surrounding and underneath the foliage etc. their population monitoring and quantification is required for proper taxonomical studies. Monitoring of pest and natural enemies population is very vital in integrated pest management. Many arthropods inhabitate rice fields in which some are harmful to the crop, while other are not noxious to rice plant. After the green revolution insect pest showed a steady growth and vast shift in the pest status and their spread. So, A comprehensive investigation was performed to document different insect fauna and their abundance in the paddy ecosystem surrounded with teak plantations. An attempt to describe the trap wise composition of insect during *Kharif* 2024 in Agroforest ecosystem.

Material and Methods

The study Area: The present study was carried out in Kanchanpally village of Kowdipally Mandal of Medak Dist located at Latitude 17.904944° N, Longitude 78.253132° E during *Kharif* 2024 from July-November.

Collection Methods: Insect sampling was performed in study location using combination of both active and passive methods. Active sampling methods includes visual observation during morning hours and during Evening hours for documentation during field walks. Photographs of pest and natural enemies collected were taken for later identification. Sweep net was used for collection of flying insects in the rice canopy and understory vegetation. Sampling was done diagonally between 9.00 AM and 1:00 PM at weekly intervals. Passive method of collection includes pheromone traps for monitoring of yellow stem borer (*Scirpophaga incertulas*) which were installed @ 4 traps per acre. Lure were replaced for every 45 days and insects were monitored weekly. Sticky traps were installed @ 4 traps per.

acre which were coated with grease or adhesive materials and captured insects were counted using a magnifying lens. Pitfall trap (plastic cup with rim placed up to surface level) were used for capturing ground dwelling insects. The cup was filled with soap water to trap soil insects and were preserved until identification. All the insect specimens were sorted soon after collection and were categorized by insect order. Hard bodied insects were pinned and stored in insect box while soft body were preserved in ethyl alcohol in glass vials. Identification was performed up to the family level using taxonomic keys provided by Triplehorn and Johnson (2005), if additional help required, taken from experts from research institutes, Rajendranagar. All the data was analysed using MS Excel 2007 and calculation were performed.

Results and Discussion

All together about 1,906 insect individuals were collected from agroforest ecosystem of kowdipally village from different insect orders including different families collected via various sampling methods.

Composition of insect individuals collected using yellow sticky trap

In the Kowdipally study area, only four insect orders (Hemiptera, Lepidoptera, Diptera, Hymenoptera) were collected using yellow sticky trap (YST) in the agroforest ecosystem. Among the recorded insect orders, YST collected individuals from Hemiptera order with about 126 individuals followed by Hymenoptera with 21 insect individuals and Diptera with 04 insect individuals. (Fig 1) Trend as follows: Hemiptera (126) > Hymenoptera (21) > Diptera (4) (Table 1) and maximum composition was from Hemiptera with 83.44% and Hymenoptera with 13.90%. In the present study YST method of trap collected highest number of individuals which was in accordance with Pasham *et al* (2025) ^[6] who studied insect diversity in agroecosystem and agroforest ecosystem in Narsapur location, also with the study of Mahendra *et al.* (2024) ^[5] who reported YST as most effective sampling method for collection of hemipteran insects.

Composition of insect individuals collected using Pitfall trap

In the pitfall trap, Agroforest ecosystem recorded altogether 313 insect individuals were collected using pitfall trap (Fig 1), Order orthoptera reported 68 individuals, Blattodea reported 1 insect individuals while preying mantids were only 5 insect individuals, Hemiptera reported 50 individuals and coleoptera with 94 individuals, Hymenoptera with 73 individuals and Araneae with 19 individuals (Table 1). Trend as follows: Coleoptera (94) > Hymenoptera (73) > Orthoptera (68) > Hemiptera (50) > Araneae (19) > Mantodea (5) > Odonata (3) > Blattodea (1). Maximum composition of insect individuals in major orders were as follows: Coleoptera with 30.03%, Hymenoptera with 23.32%, Orthoptera with 21.72%, Hemiptera with 15.97%, Spiders with 6.07 %.

Composition of insect individuals collected using visual count

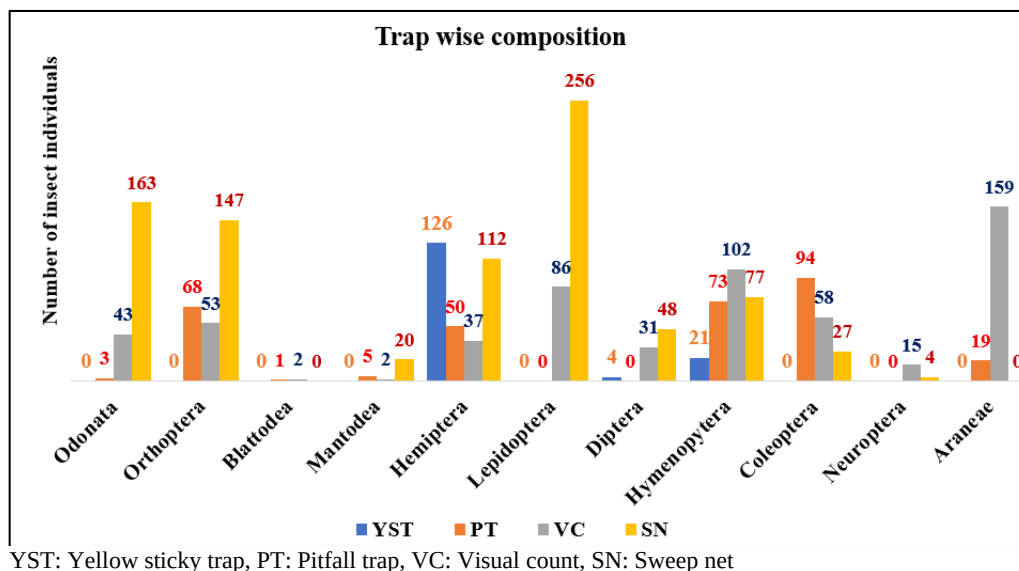
In kowdipally, agroforest ecosystem collected 588 insect individuals (Table 1) belonging to different orders with maximum individuals reported from the order Araneae (159) with 4 families followed by Hymenoptera (102) with

4 families, Lepidoptera (86) with 4 families, Coleoptera (58) with 3 families, Orthoptera (53) with 5 families, Odonata (43) with 2 families, Hemiptera (37) with 5 families, Diptera (31) with 3 families, Neuroptera (15) with 1 family, and minimum individuals were reported from Blattodea and Mantodea with 2 individuals from one family each (Table 1). Maximum composition were from the Araneae with 27.04% followed by Hymenoptera with 17.34%

Table 1: Trap wise composition of insect Individuals from various families of different Insect orders collected in agroforest ecosystem

S. No	Order	Families	Method of Collection				Total no. of Individuals
			YST	PT	VC	SN	
1	Odonata	Libellulidae	0	0	15	110	125
		Coenagrionidae	0	3	28	53	84
		Total	0	3	43	163	209
2	Orthoptera	Acrididae	0	16	11	82	109
		Gryllidae	0	12	7	0	19
		Gryllotalpidae	0	7	4	0	11
		Pygromorphidae	0	12	16	23	51
		Tettigoniidae	0	21	15	42	78
	Total		0	68	53	147	268
3	Blattodea	Blattidae	0	1	2	0	3
		Total	0	1	2	0	3
4	Mantodea	Mantidae	0	5	2	20	27
		Total	0	5	2	20	27
5	Hemiptera	Alydidae	7	14	1	5	27
		Cicadellidae	77	0	21	60	158
		Delphacidae	17	0	0	8	25
		Miridae	19	0	12	25	56
		Reduviidae	0	15	1	13	29
		Pentatomidae	6	21	2	1	30
		Total	126	50	37	112	325
6	Lepidoptera	Crambidae	0	0	26	168	194
		Erebidae	0	0	20	32	52
		Nymphalidae	0	0	21	17	38
		Noctuidae	0	0	19	39	58
	Total		0	0	86	256	342
7	Diptera	Dolichopodidae	0	0	17	21	38
		Culicidae	4	0	8	15	27
		Muscidae	0	0	6	12	18
		Total	4	0	31	48	83
8	Hymenoptera	Apidae	0	0	18	31	49
		Formicidae	0	61	37	0	98
		Ichneumonidae	21	12	29	34	96
		Vespidae	0	0	18	12	30
	Total		21	73	102	77	273
9	Coleoptera	Carabidae	0	5	21	0	26
		Coccinellidae	0	57	0	13	70
		Scarabidae	0	7	19	0	26
		Staphylinidae	0	13	0	12	25
		Hydrophilidae	0	12	18	2	32
	Total		0	94	58	27	179
10	Neuroptera	Chrysopidae	0	0	15	4	19
		Total	0	0	15	4	19
11	Araneae	Lycosidae	0	8	53	0	61
		Oxyopidae	0	0	34	0	34
		Sparassidae	0	0	37	0	37
		Tetragnathidae	0	11	35	0	46
	Total		0	19	159	0	178

YST: Yellow sticky trap, PT: Pitfall trap, VC: Visual count, SN: Sweep net



YST: Yellow sticky trap, PT: Pitfall trap, VC: Visual count, SN: Sweep net

Fig 1: Trap wise composition of insect individuals at Insect Order level

Composition of insect individuals collected sweep net

Altogether, 854 individuals were reported from 9 orders in agroforest ecosystem. Highest individuals were documented from Lepidoptera (256) > Odonata (163) > Orthoptera (147) > Hemiptera (112) > Hymenoptera (77) > Diptera (48) > Coleoptera (27) > Mantodea (20) > Neuroptera (4) (Table 1). Maximum composition were recorded from Lepidoptera with 29.97% followed by Odonata with 19.08%, Orthoptera with 17.21%.

Insect individuals collected by installing pheromone trap

Pheromone traps for monitoring of yellow stem borer (*Scirpophaga incertulas* Walker) were installed @ 4 traps per acre in both the ecosystems of study locations From July 2024 – November 2024. Traps were monitored weekly. Yellow stem borer was the monophagous pest and caused dead hearts and white ears in the rice ecosystem which contributed great economic loss to the field. In Kowdipally, peak population was noticed at SMW 37 in both the ecosystems and then gradual decline up to November was reported.

Conclusion

In the present study, of all methods of sampling, highest number of individuals were collected using sweep net followed by visual count, pitfall trap and yellow sticky trap. Sweep net found to be effective method of sampling in insect collection. The current study was in accordance with Kathirvelu *et al.* (2019) [3] who studied diversity of parasitic fauna in rice ecosystem using sweep net, Malaise trap, UV light trap and yellow pan trap and found sweep net as best method of collection. The families of different insect orders reported in the present study were in congregation with Sravani *et al.*, who studied insect composition in the agroforest ecosystem. Current documentation clearly showed that Formicidae dominated order hymenoptera with 98 individuals (Table 1) which were similar with findings of Leksono *et al.* (2018) [4]. In the order Hemiptera Family Cicadellidae is reported maximum number of individuals (Table 1) and are in congregation with the studies of Sheela and Delphine (2021) [7] and Akhilandeshwari *et al.*, (2022) [1] who reported Cicadellidae as most abundant family of Hemiptera collected in rice field.

Disclaimer (Artificial intelligence)

Author(s) hereby declares that text-to-image generators and no generative AI technologies such as Large Language Models (Chat GPT, COPILOT, etc) have been used by them during writing or editing the present manuscript.

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Competing Interests

Author(s) declared that no conflict of interests exists.

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