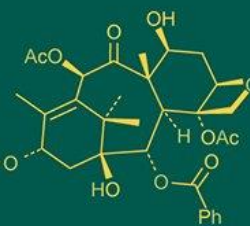
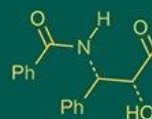


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Sravani Pasham
Department of Entomology,
M.Sc. Research Scholar,
College of Agriculture,
Rajendranagar, PJTAU,
Hyderabad, Telangana, India

I Aruna Sri
Department of Entomology,
Scientist, AICRP on Rice, Rice
Research Unit, ARI,
Rajendranagar, Hyderabad,
Telangana, India

M Deepa
Department of Entomology,
Scientist E, Institute of Forest
Biodiversity, ICFRE,
Dulapally, Hyderabad,
Telangana, India

D Srinivasa Chary
Department of Statistics &
Mathematics, Associate
Professor, College of
Agricultural Engineering,
Kandi, Sangareddy,
Telangana, India

Corresponding Author:
Sravani Pasham
Department of Entomology,
M.Sc. Research Scholar,
College of Agriculture,
Rajendranagar, PJTAU,
Hyderabad, Telangana, India

Relative abundance of insect fauna in agroforest ecosystem of Kowdipally village, Medak district

Sravani Pasham, I Aruna Sri, M Deepa and D Srinivasa Chary

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Abstract

In the present study, an attempt was made to study the relative abundance of different families of insect orders in the Kanchapally village of Medak district during *Kharif* season 2024. Relative abundance of major insect orders and their families were calculated using different trapping methods. Of all the orders lepidoptera was found to be the most abundant insect order. Similarly, within each major insect order relative abundance was depicted for the families. This study is a comprehensive documentation of relative abundance of families forming a baseline data for future studies in the agroforest ecosystem.

Keywords: Relative abundance, order, family, most abundant, ecosystem, agroforest

Introduction

Rice is one of the world's most important food grain crop, it is also staple food of most of the Asian countries. The crop is been attacked by many insect pests from nursery stage to final harvest, Major insect pest includes yellow stem borer, *Scripophaga incertulas* (Walker), leaf folder, *Cnaphalocrocis medinalis* (Guenée), white backed planthopper, *Sogatella furcifera* (Horváth), brown planthopper, *Nilaparvata lugens* (Stål.), gundhi bug, *Leptocoris acuta* (Thunberg) and others. Among these, yellow stem borer and leaf folder are the most notorious pests causing significant losses (Saini *et al*, 2015) ^[12]. Limited research exists on arthropod diversity in agroforestry systems within Telangana. This study aims to establish baseline data and generate a preliminary checklist to support future research and sustainable agricultural practices. So, a comprehensive investigation was performed to study the relative abundance of different insect families of various insect orders in the paddy with teak agroforest ecosystem during *Kharif* 2024 in the Kowdipally village.

Materials and Methods

The current investigation 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. Different insect trapping methods were used for collection of insects including active sampling methods (visual observation, sweep net) and passive methods viz., sticky traps, pitfall traps, pheromone trap for estimation of YSB abundance. All the insects were collected and sorted out into various families of different orders. All the data was analysed using MS Excel 2007 for calculating the relative abundance.

Relative abundance: Generally expressed as a percentage, is a method for estimation of abundance of each taxon among the current taxa collected in a habitat. Using the following formula, the relative abundance of various insect orders and families was calculated.

$$\text{Relative abundance (\%)} = \frac{n_i}{N} \times 100$$

Where,

N: the total number of individuals of all species

n_i: the number of individuals of species.

Following the collection of all insect individuals, they were divided into several families within their respective orders.

The relative abundance of each order was then determined in relation to the total number of individuals taken from all orders, and similarly for families in which more than two families were reported.

Results and Discussion

Of all the orders reported in the agroforest ecosystem, relative abundance of order Lepidoptera was found to highest with 17.94% followed by Hemiptera (RA = 17.05%), Hymenoptera (RA = 14.32%), Orthoptera (RA = 14.06%), Odonata (RA = 10.97%), Coleoptera (RA =

9.39%), Araneae (RA = 9.34%), Diptera (RA = 4.35%), Mantodea (RA = 1.42%), Neuroptera (RA = 1.00%) and lowest was reported from order Blattodea (RA = 0.16%) (Fig 1). Akhilandeshwari *et al.* (2022) ^[1] reported Hemiptera as the most abundant insect order which validated with the present study where Hemiptera with 17.05% Relative abundance as one of the orders reported in the ecosystem. In the current study Lepidoptera reported with RA = 16.91% which was in line with Pasham Sravani *et al.* (2026) ^[10] who studied relative abundance of insects in Narsapur location.

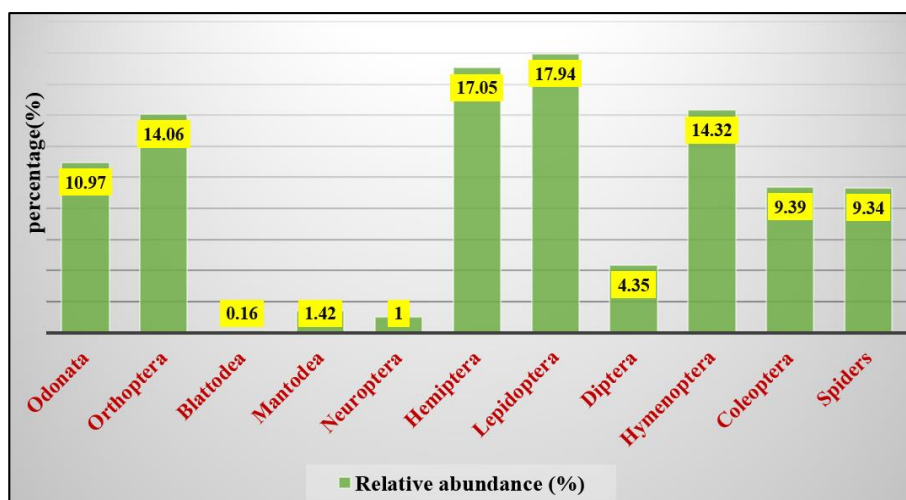


Fig 1: Relative abundance of insect orders in agroforest ecosystem

In the order Orthoptera, Acrididae (RA = 40.67%) recorded highest relative abundance in agroforest ecosystem followed by Tettigoniidae (RA = 29.10%), Pygromorphidae (RA = 19.03%), Gryllidae (RA = 7.09%) and least abundance was reported from Gryllotalpidae (RA = 4.10%) (Table 1). Acrididae and Tettigoniidae families recorded highest relative abundance with minimum difference while Gryllotalpidae recorded least abundance. The results were in line with Akhtar *et al.* (2012) ^[2] who reported Acrididae (85%) as most abundant insect order of Orthoptera.

In the order Hemiptera, Cicadellidae (RA = 48.62%) reported highest value of relative abundance followed by Miridae (RA = 17.23%), Pentatomidae (RA = 9.23%), Reduviidae (RA = 8.92%), Alydidae (RA = 8.31%), Delphacidae (RA = 7.69%) (Table 1). The current results were in accordance with Chaitanya *et al.* (2024) ^[7] who reported highest relative abundance of Cicadellidae as pest and Miridae as predator in bacillus treated rice fields.

Out of four families recorded in the order Lepidoptera, in the present study, Crambidae (RA = 56.73%) reported highest relative abundance followed by Noctuidae (RA = 16.96%), Erebiidae (RA = 15.20%), Nymphalidae (RA = 11.11%) (Table 1). The current findings were in contradiction with Meena *et al.* (2018) ^[9] who reported family Noctuidae as highly abundant.

In agroforest ecosystem, Dolichopodidae (RA = 45.78%) reported highest relative abundance followed by Culicidae (RA = 32.53%), Muscidae (RA = 21.69%) from the order Diptera (Table 1). Muscidae reported relatively lower abundance than other families. Attaullah *et al.* (2021) ^[5] reported Culicidae as most abundant in rice ecosystem which were in accordance with agroecosystem of Kowdipally and agroforest ecosystem of Narsapur of present study and were also in line with Ponaraman *et al.*

(2016) ^[11] who studied aquatic insects in irrigated rice fields and reported family Culicidae as most abundant.

Formicidae (RA = 35.90%) was with higher relative abundance in the order Hymenoptera followed by Ichneumonidae (RA = 35.16%) with little difference, Apidae (RA = 17.95%), Vespidae (RA = 10.99%) (Table 1), relative higher percentage of abundance of families viz., Ichneumonidae and Apidae was seen in agroforest ecosystem which was in accordance with (Ikhsan and Hamid, 2020) ^[8] who recorded Formicidae and Ichneumonidae as most abundant families of Hymenoptera.

The sequence of Coleopteran families reported in decreasing order were as below: Coccinellidae (RA = 39.11%) > Hydrophilidae (RA = 17.88%) > Carabidae (RA = 14.53%) = Scarabidae (RA = 14.53%) > Staphylinidae (RA = 13.97%) (Table 1). In this study area, Coccinellidae were with higher percentage of relative abundance while other families were with slight difference in abundance which was in line with Anitha *et al.* (2020) ^[4] who studied diversity of coccinellids in *Kharif* rice. Similar findings were noticed with Bhede *et al.* (2023) ^[6] who reported coccinellids (32.92%) as the most abundant predators followed by spiders (30.66%) in cotton.

In the Araneae, Lycosidae (RA = 34.27%) was reported to be relatively in higher abundance followed by Tetragnathidae (RA = 25.84%), Sparassidae (RA = 20.79%) while least abundance was in the family Oxyopidae (RA = 19.10%) (Table 1). Higher percentage of abundance of Lycosidae and Tetragnathidae were seen in agroforest ecosystem. The current findings were in accordance with Anitha and Vijay (2016) who reported Tetragnathidae (46.32%) and Lycosidae (26.22%) were most abundant families of arachnid population in *kharif* season (2012-13).

Table 1: Relative abundance of different insect families

S. No	Order	Families	Relative Abundance (RA)%
1	Orthoptera	Acrididae	40.67
		Gryllidae	7.09
		Gryllotalpidae	4.10
		Pygromorphidae	19.03
		Tettigoniidae	29.10
2	Hemiptera	Alydidae	8.31
		Cicadellidae	48.62
		Delphacidae	7.69
		Miridae	17.23
		Reduviidae	8.92
3	Lepidoptera	Pentatomidae	9.23
		Crambidae	56.73
		Erebidae	15.20
		Nymphalidae	11.11
		Noctuidae	16.96
4	Diptera	Dolichopodidae	45.78
		Culicidae	32.53
		Muscidae	21.69
5	Hymenoptera	Apidae	17.95
		Formicidae	35.90
		Ichneumonidae	35.16
6	Coleoptera	Vespidae	10.99
		Carabidae	14.53
		Coccinellidae	39.11
		Scarabidae	14.53
7	Araneae	Staphylinidae	13.97
		Hydrophilidae	17.88
		Lycosidae	34.27
		Oxyopidae	19.10
		Sparassidae	20.79
		Tetragnathidae	25.84

Conclusion

The relative abundance of insect order was differing from each other might be due to the diverse food sources, complex vertical habitats, and stable microclimates provided by the agroforest ecosystem. Plant hoppers (Brown plant hopper and leafhoppers (green leafhopper) were found to be distributed most widely in paddy fields, also leaf folder population seen higher during *Kharif* 2024 in the study location along with yellow stem borer population, that caused highest abundance of lepidopteran order. The present study shows the baseline relative abundance of insect individuals of different families which will help in survey and surveillance of rice arthropods in agroforest ecosystem with regard to change in climatic condition.

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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