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SPIDER FAUNAL DIVERSITY IN PADDY FIELD (*ORYZA SATIVA*)
ECOSYSTEM AT UTHAMAPALAYAM IN THENI DISTRICT

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ABSTRACT

The present study was carried out in the paddy field ecosystem at Uthamapalayam in Theni District for a period of four months from October 2014 to January 2015. The active searching, pitfall and net sweeping collection recorded five families name Tetragnathidae, Amaurobiidae, Salticidae, Oxyopidae, Araneidae. The families Salticidae were proximate family with 5 species. The family Amaurobiidae, Oxyopidae was the least recorded family with only one species. The family Salticidae was most abundant with maximum number of individuals (315) and Amaurobiidae, was the least abundant with less number of individuals (26).

KEYWORDS: Diversity Of Spider Induces.

INTRODUCTION

India has the largest paddy output in the world and is also the fourth largest exporter of rice in the world. In India, West Bengal is the largest rice production state. Paddy fields are a common sight throughout India, both in the northern gangetic plains and the southern peninsular plateaus. Rice is a major cash crop plays a multifarious role in the agro based economy of India. Firstly, being a major food crop it contributes a major portion to our national food requirement. Secondly, rice industry is an important source of employment and generates income for rural people. Thirdly, it contributes to country's foreign exchange earnings. The climate of Tamil Nadu is basically tropical. Due to its proximity to the sea the summer is less hot and winter is less cold. The maximum daily temperature rarely exceeds 43°C and the minimum daily temperature seldom falls below 18°C. The average annual rainfall of Tamil Nadu is 925.0 mm.

Spiders consume a large number of preys, and do not damage plants. They can achieve equilibrium in pest control, after which their own number are suppressed by their territoriality and cannibalism. For some time, spiders have been considered important predators which help to regulate the population densities of insect pests (Dondale, 1956, Duffey, 1962, Kajak *et al.* 1968; Fox and Dondale, 1972 and Tanaka 1989).

MATERIAL AND METHODS

Study Area

Uthamapalayam in Theni District was selected for the study of diversity of spider associated with paddy field.

Paddy is cultivated twice in a year. The normal seasons for cultivation of paddy are June-August and September - December.

COLLECTION METHODS

Active Searching

Ground active collection was done during early morning hours because it was observed that spider activity is maximal at that time of the day in the rice fields (Sebastian *et al.*, 2005).

PITFALL METHOD

Spiders were collected by pitfall traps. Wide mouthed glass jars were used as pit fall traps. During sampling the jars were buried in the soil such that their rims were at the ground. Two hundred and fifty ml of 70 percent alcohol was added to each trap. A Plastic rain cover supported by three nails was placed over the trap to prevent inundation by rain water. At each location, traps were operated consecutively for 72 hours after every two weeks.

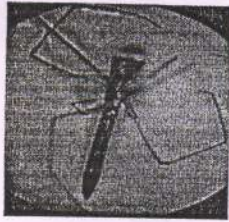
NET SWEEPING

Spiders were collected by sweeping the net to and fro randomly on the vegetate during sweeping the net was examined at regular intervals for any trapped spiders, which were immediately transferred to polythene bags. And preserved in 70% alcohol.

STATISTICAL ANALYSIS

The diversity indices viz. Hills diversity index (H'), Simpson's Index (λ) and species richness indices ($R1$ and $R2$) were calculated by using GW-Basic version 3.22.

TETRAGNETHA JAVANA



Tetragnatha javana



Tetragnatha extensa



Tetragnatha Montana



Leucauge decorata

AMAUROBIIDAE



Amaurobius ferox

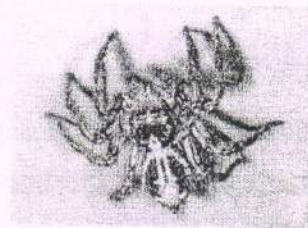
SALTICIDA



Hasarius adansoni



Menemerus bivittatus



Plexippus paykulli

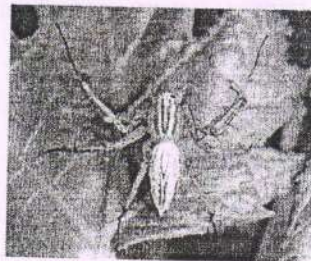


Plexippus petersi



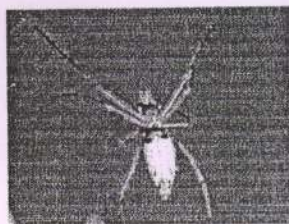
Telamonia dimidiata

OXYOPIDAE

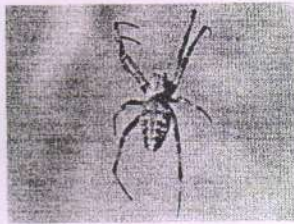


Oxyopes hindostanicus

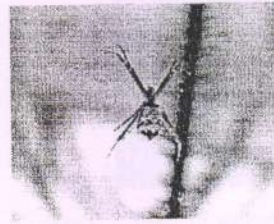
ARANEIDAE



Neoscona theisi



Neoscona oaxacensis



Argiope anusuja

RESULT

A total number of 14 species representing 5 families viz., Tetragnathidae, Amaurobiidae, Salticidae, Oxyopidae and Araneidae were collected from a paddy field at Uthamapalayam during October 2014 to January 2015 (Table-1). Fig-1 showed the number of spiders collected in each month during the study period. Fig. 2 represented the number of spiders collected in each family during October 2014 to January 2015. Fig.3 showed that the maximum number of spiders was recorded in the family Salticidae during October 2014 to January 2015.

The family Tetragnathidae was represented by four species namely *Tetragnatha javana*, *T. extensa*, *T. Montana* and *Leucauge decorata* (Table-1). *T. extensa* was more abundant than the other three species. Richness indices (R1 and R2) were maximum (0.748 and 0.539) during January 2015. Shannon Weiner Index (H') was maximum (1.376) and Simpson's index (λ) was less (0.241) during January 2015 which indicates high diversity during this month (Table-2, 3, 4 and 5).

The family Amaurobiidae was represented by a single species *Amaurobius ferox* with less abundance (Table-1). Simpson's index (λ) was high (1) indicating the diversity of the family was very poor (Table-2, 3, 4 and 5).

The family Salticidae was represented by 5 species namely *Hasarius adansoni*, *Menemerus bivittatus*, *Plexippus paykulli*, *Plexippus petersi* and *Telamoniya dimidiata*. (Table-1). Species richness (R1 and R2) was maximum (0.898 and 0.539) during January 2015. Simpson's index (λ) was less (0.210) during December 2014. This indicates high diversity of the family Salticidae during this period (Table-2, 3, 4, and 5).

The family Oxyopidae was represented by a single species *Oxyopes hindostanicus*, (Table-1). Simpson's index (λ) was high (1) indicating less diversity.

The family Araneidae was represented by three species namely *Neoscona oaxacensis*, *Neoscona theisi* and *Argiope anusuja*. *N. oaxacensis* was less abundant than the other two species (Table-1). Richness indices (R1 and R2) were maximum (0.567 and 0.514) during October 2014 and minimum (0.315 and 0.408) during November 2014. Simpson's index (λ) was less (0.327) during January 2015 indicating high diversity during this period (Table-2, 3, 4 and 5). In the present study *N. oaxacensis* was not represented during November 2014 (Table-1).

The overall species richness indices Menhinick index (R1) showed that the family Salticidae has high richness value (0.695) in the study area during the study period. Minimum Menhinick index (R1) was represented by the family Amaurobiidae and Oxyopidae. Shannon Weiner index (H') was high (1.552) and Simpson's index (λ) was less (0.220) for the family Salticidae indicating that among the families, the family Salticidae has more diversity when compared to other four families (Table-6). Menhinick index (R1) and Margalef index (R2) was maximum (0.766 and 0.368) during January 2015. Shannon Weiner index (H') was high (1.349) and Simpson's index (λ) was less (0.281) during January 2015 indicating high diversity during this month (Table-7).

Table-8 indicated that the family Salticidae was represented by more number of spiders (315) and the family Amaurobiidae was represented by less number of spiders (26) during the study period. The collection was maximum during October 2014. Fig.3 clearly stated that maximum abundance (40%) was represented by the family Salticidae and minimum (3%) depiction by the family Amaurobiidae.

TABLE-1 Showing the spider population in the paddy field at Uthamapalayam

S.No	Family	Name of the species	Number of individuals								Total	Abundance (%)
			Oct.		Nov.		Dec.		Jan.			
			I	II	I	II	I	II	I	II		
1	Tetragnathidae	<i>Tetragnatha javana</i>	10	08	07	08	05	08	08	08	62	07.82
		<i>Tetragnatha extensa</i>	15	10	08	12	14	10	07	04	80	10.09
		<i>Tetragnatha Montana</i>	10	06	04	08	12	10	09	06	65	08.20
		<i>Leucauge decorata</i>	09	07	08	06	03	05	05	08	51	06.43
2	Amaurobiidae	<i>Amaurobius ferox</i>	05	05	04	04	03	-	03	02	26	03.28
3	Salticidae	<i>Hasarius adansoni</i>	-	05	07	08	-	09	12	12	53	06.68
		<i>Menemerus bivittatus</i>	14	10	10	09	11	05	04	-	63	07.94
		<i>Plexippus paykulli</i>	09	08	07	09	12	10	08	08	71	08.95
		<i>Plexippus petersi</i>	17	09	18	15	09	11	09	08	96	12.11
		<i>Telamonia dimidiata</i>	09	05	04	-	06	05	-	03	32	04.04
4	Oxyopidae	<i>Oxyopes</i>	06	04	09	07	05	06	06	05	48	06.05

		hindostanicus										
5	Araneidae	Neoscona theisi	-	04	08	05	08	08	10	10	53	06.68
		Neoscona oaxacensis	09	11	-	-	04	06	08	06	44	05.55
		Argiope anusuja	03	07	09	02	06	06	09	07	49	06.18
		Total	116	99	103	93	98	99	98	87	793	100.00

TABLE-2 Showing the species richness indices and diversity indices for spiders collected from the paddy field during October 2014.

Family	Richness index		Shannon weiner index (H')	Simpson's index (λ)
	Menhinick index(R1)	Margalef index (R2)		
Tetragnathidae	0.695	0.462	1.368	0.250
Amaurobiidae	0	0.316	0	1
Salticidae	0.898	0.539	1.499	0.229
Oxyopidae	0	0.316	0	1
Araneidae	0.567	0.514	0.924	0.430

TABLE-3 Showing the species richness indices and diversity indices for Spiders collected from the paddy field during November 2014.

Family	Richness index		Shannon weiner index (H')	Simpson's index (λ)
	Menhinick index(R1)	Margalef index (R2)		
Tetragnathidae	0.730	0.512	1.368	0.247
Amaurobiidae	0	0.353	0	1
Salticidae	0.896	0.536	1.456	0.249
Oxyopidae	0	0.250	0	1
Araneidae	0.315	0.408	0.689	0.482

TABLE-4 Showing the species richness indices and diversity indices for spiders collected from the paddy field during December 2014.

Family	Richness index		Shannon weiner index (H')	Simpson's index (λ)
	Menhinick index(R1)	Margalef index (R2)		
Tetragnathidae	0.713	0.489	1.305	0.277
Amaurobiidae	0	0.577	0	1
Salticidae	0.918	0.566	1.556	0.210
Oxyopidae	0	0.301	0	1
Araneidae	0.549	0.487	1.080	0.329

TABLE-5 Showing the species richness indices and diversity indices for Spiders collected from the paddy field during January 2015.

Family	Richness index		Shannon weiner index (H')	Simpson's index (λ)
	Menhinick index(R1)	Margalef index (R2)		
Tetragnathidae	0.748	0.539	1.376	0.241
Amaurobiidae	0	0.447	0	1

Salticidae	0.962	0.625	1.383	0.268
Oxyopidae	0	0.301	0	1
Araneidae	0.511	0.424	1.087	0.327

TABLE-6 Showing the overall species richness indices and diversity indices for Spiders collected from the paddy field during October 2014 to January 2015.

Family	Richness index		Shannon weiner index (H')	Simpson's index (λ)
	Menhinick index (R1)	Margalef index (R2)		
Tetragnathidae	0.544	0.254	1.380	0.260
Amaurobiidae	0	0.196	0	1
Salticidae	0.695	0.282	1.552	0.220
Oxyopidae	0	0.144	0	1
Araneidae	0.401	0.248	1.096	0.331

TABLE-7 Total number of spiders collected in each family from the study area During October 2014 to January 2015.

S.No.	Family	Number of individuals				Total	Abundance (%)
		Oct.	Nov.	Dec.	Jan.		
1	Tetragnathidae	75	61	67	55	258	32.53
2	Amaurobiidae	10	08	03	05	026	03.28
3	Salticidae	86	87	78	64	315	39.72
4	Oxyopidae	10	16	11	11	048	06.05
5	Araneidae	34	24	38	50	146	18.41
	Total	215	196	197	185	793	100.00

Fig. 1 showing total number of spiders collected in the paddy field During October 2014 to January 2015.

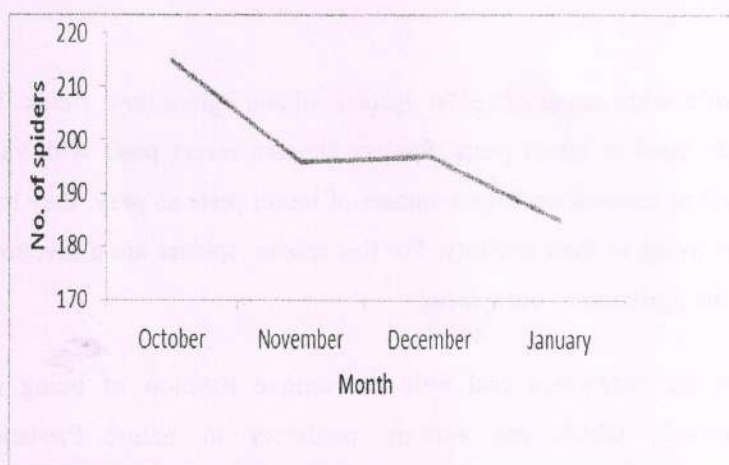


FIG: 2 Number of Spiders represented in each family in the paddy field During October 2014 to January 2015.

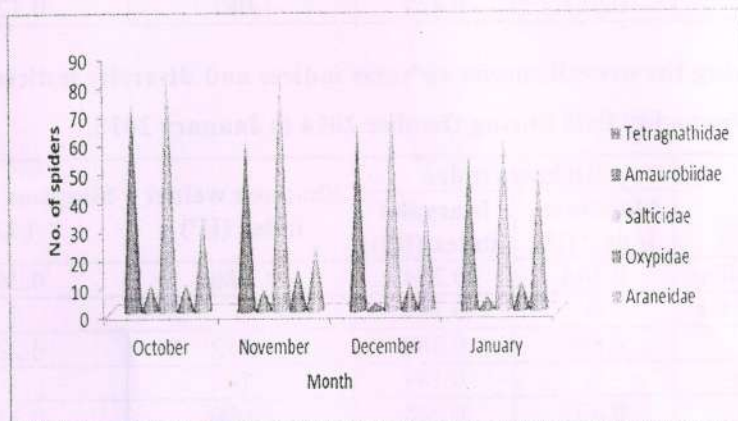
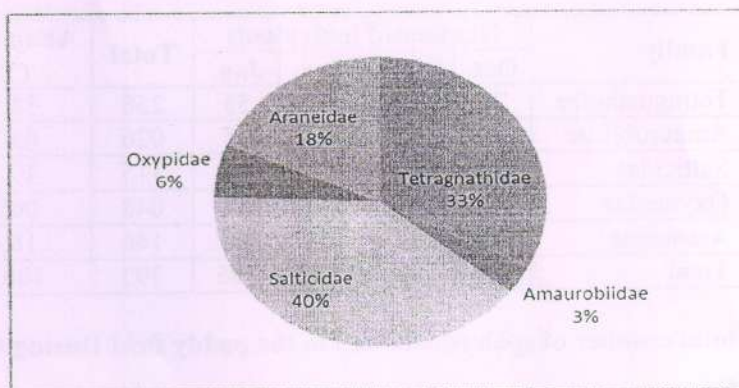


Fig.3 showing the abundance of each family collected during October 2014 to January 2015.



DISCUSSION

Large numbers of a wide range of spider species inhabit agricultural fields. Their presence limits the habitats open to insect pests. Spiders threaten insect pests with various foraging strategies. As well as consuming large numbers of insect pests as prey, they have the trait of killing all insects living in their territory. For this reason, spiders are a favourable biological control agent in the agricultural ecosystem.

Spiders are obligate carnivores and hold the unique position of being the only large class of Arthropods which are entirely predatory in nature. Predation contributes significantly towards preventing excessive increase of insect populations.

A total of 5 families and 14 species were recorded from the Paddy field at Uthamapalayam, Theni District. In the present study 3 species were recorded in the family Araneidae.

Ganesan and Shanmugavelu (2012) recorded 8 species belonging to the family Araneidae. Mukhtar *et al.* (2012) recorded 5 species of spider representing the family Araneidae from the Trifolium and Brassica field. Sudhikumar *et al.*, (2005) recorded 11 species of Araneidae from Kuttanadu rice agro ecosystem, Kerala. Muthukumaravel *et al.*, (2013) recorded 5 species of spider representing the family Araneidae from Mangroves at Adirampattinam coast.

CONCLUSION

A quantitative analysis of the capacity of spiders to suppress insects pest, including the spatial distribution of major species of spider and pests, should be carried out in the field on a large scale, so that spiders can be successfully used as biological control agents.

REFERENCES

1. Doldal, C.D. Annotated list of spiders (Araneae) in Nova Scotia Apple orchards, 1956.
2. Duffy, E, A Population study of spiders on limestone grassland. *J. Anim. Ecol.*, 1962; 31: 571-599.
3. Fox, C.J.S. and C.D. Dondale. Annotated list of spiders (Araneae) from hayfields and Their margins in Nova Scotia. *Canadian Entomologist*, 1972; 104: 1911-1915.
4. Ganesan R. And M. Shumugavelu, Spider faunal diversity in Perumalmalai forest Area, Kodaikanal hills, Dindigul District, Tamil Nadu, India. *J. Biosci. Res.*, 2012; 3(i): 1-5.
5. Kajak, A., L. Andrzejewska and Z. Wojcik, The role of spiders in the decrease of Damages caused by Acridoidae on meadows experimental investigation. *Ekol.pol. (A)*, 1968; 16: 755-764.
6. Mukhtar, M.K. & S. Murphy, An Introduction to the spiders of south East Asian. Kola Lumpur, Malaysia Nature society, 2012; 625.
7. Muthukumaravelu, K., A. Amsath and R. Bose Raja. A preliminary investigation of spider fauna of Muthupet at Adirampattinam coast, Tamil Nadu, India, 2013; 1(4): 304-309.
8. Sebastian, P.A., M.J. Mathew, Pathummal beevi, S. Joseph, C.R. Biju. The spider fauna of the integrated rice ecosystem in control Karala, India, *J. Arachn*, 2005; 247-255.
9. Sudhikumar. V., J. Mathrw, A. Sebastian, Seasonal variation in spider abundance in kuttanad rice agro ecosystem, kerala, India (Aranea), *Acta Zoologica bulgarica*, 2005; 1: 181-190.
10. Tanaka, K., Movement of the spiders in arable land. *Plant protection*, 1989; 43(1): 34-39.