



RESEARCH ARTICLE

SPIDERS AS BIOLOGICAL PEST CONTROL IN RICE FIELDS OF DAKSHINA KANNADA DISTRICT

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ARTICLE INFO

Article History:

Received 19th September, 2016
Received in revised form
14th October, 2016
Accepted 22nd November, 2016
Published online 30th December, 2016

Key words:

Spiders,
Pest control,
Rice field.

ABSTRACT

Spiders with various foraging strategies to prey on insects and pests in rice fields can be considered as biological pest control in rice fields. They prey on several species which harm the growth of rice plants and, thus help to increase the yield of rice in rice fields. The biodiversity study was conducted in two rice fields in Puttur taluk of Dakshina Kannada District. This resulted in confirmed identification 30 species of spiders belonging to 6 families - Salticidae, Araneidae, Oxyopidae, Tetragnathidae, Thomisidae, Pisauridae. In this study Salticidae, Araneidae, Tetragnathidae and Oxyopidae dominate the field controlling pests in the field and act as biological control agents in agricultural ecosystem.

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Citation: Jnaneshwari S. Joshi and Dr. Venkateshwarlu, M., 2016. "Spiders as biological pest control in rice fields of Dakshina Kannada District", *International Journal of Current Research*, 8, (12), 42749-42751.

INTRODUCTION

Spiders are dominant and most common predators in rice eco system. They are voracious feeders of leaf hoppers, plant hoppers, leaf eating caterpillars and adult stem borers. Research has shown that spiders in rice fields play an important role as predators (Chiu, 1979; Gavarra and Raros, 1973; Hamamura, T, 1969; Holt, Cook, Perfect, and Norton, 1987; Kobayashi. S, 1977; Lee and Kim, 2001; Samal and Misra, 1975; Tanaka, 1989).

Materials and methods, Procedure

A survey and systematic study of spider fauna was undertaken for a period of 6 months, every year (2013-2015) from June to November in two different agro fields using following techniques:

- **Hand picking:** The spiders were caught with the help of plastic vials simply by catching them into the vial and closing the opening end of vial.
- **Sweeping methods:** Using a heavy insect net sweeping is done through the paddy plants gently.

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After a few sweeps, the content of the net is dumped onto a flat sheet and spiders are captured. This is one of the best methods for capturing active hunters like Salticidae, Oxyopidae, Lycosidae. Small web-building species like Tetragnathidae are also frequently captured.

- Freshly collected specimens are euthanized with ethyl acetate, placed on the slide photographed. The data, location of collection, other morphological features are noted.
- They are stored in vials using 4% Formaldehyde or 70% alcohol.
- The collected spiders were identified using the available literature (Tikader, 1987) along with confirmation of identification with Dr. Sebastian and others.

RESULTS

The study identified 30 species of spiders belonging to over 6 families. The major families were found in the two rice field study areas were Araneidae, Salticidae, Tetragnathidae, and Oxyopidae. The web weaving category the highest values of species were obtained for the spider collection in Puttur fields. The web building spiders expend considerable amounts of energy and time building their webs rather in moving about in search of prey.

List of spider species found in the two rice fields selected for observation during June to November period over 3 years (2013-2015)

Sl.No	Family	Species	No of individuals	Status		
1.	Araneidae	<i>Gasteracantha geminata</i> Fabricius, 1798	12	C		
		<i>Neoscona theisi</i> Walckenaer, 1841	15	C		
		<i>Argiope anasuja</i> Thorell, 1887	18	C		
		<i>Neoscona mukerjei</i> Tikader, 1980	25	VC		
		<i>Neoscona nautica</i> L. Koch, 1875	22	VC		
		<i>Argiope pulchella</i> Thorell, 1887	12	C		
		<i>Bavia kairali</i> Simon, 1877	26	VC		
2.	Salticidae	<i>Menemerus bivittatus</i> Dufour, 1831	9	R		
		<i>Plexippus paykulli</i> Audouin, 1826	28	VC		
		<i>Plexippus petersi</i> Karsch, 1878	22	VC		
		<i>Telamonia dimidiata</i> Simon 1899	13	C		
		<i>Thiania bhamoensis</i> Thorell, 1887	4	VR		
		<i>Hasarius adansonii</i> Audouin, 1826	9	R		
		<i>Phintella vittata</i> C. L. Koch, 1846	9	R		
		<i>Hyllus semicupreus</i> Simon, 1885	21	VC		
		3.	Tetragnathidae	<i>Tetragnatha viridorufa</i> Gravely, 1921	19	C
				<i>Tylorida ventralis</i> Thorell, 1877	14	C
<i>Tetragnatha cochinchinensis</i> Gravely, 1921	20			C		
<i>Tetragnatha javana</i> Thorell, 1890	19			C		
<i>Leucauge decorata</i> Walckenaer, 1841	22			VC		
<i>Leucauge pondae</i> Tikader 1970	26			VC		
<i>Tetragnatha mandibulata</i> Walckenaer, 1842	18			C		
4.	Oxyopidae	<i>Oxyopes salticus</i> Hentz, 1845	5	R		
		<i>Peucetia viridana</i> Stoliczka, 1869	9	R		
		<i>Oxyopes bimanicus</i> Thorell 1887	19	C		
		<i>Oxyopes shweta</i> Tikader, 1970	18	C		
		<i>Oxyopes sunandae</i> Tikader, 1970	12	C		
5.	Thomisidae	<i>Oxytate virens</i> Thorell, 1891	9	R		
6.	Pisauridae	<i>Thalassius albocinctus</i> Doleschall, 1859	4	VR		
		<i>Perenethis venusta</i> L. Koch, 1878	21	VC		



Photo 1. Family Araneidae, *Neoscona mukerjei* Tikader, 1980



Photo 2. Family Salticidae, *Bavia kairali* Simon, 1877

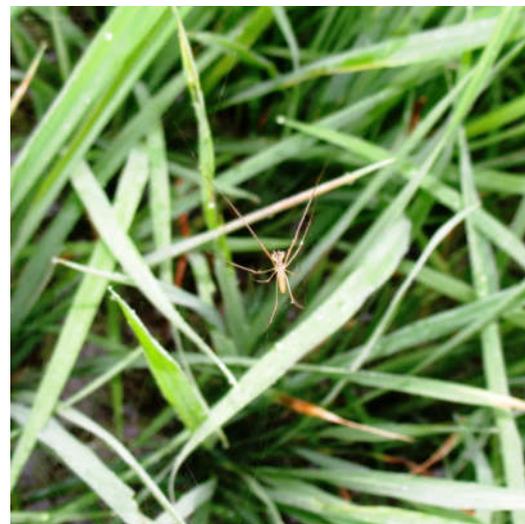


Photo 3. Family Tetragnathidae, *Tetragnatha viridorufa* Gravely, 1921

The following spiders were found to be very common in the study – *Neoscona mukerjei* Tikader, 1980, *Neoscona nautica* L. Koch, 1875, *Bavia kairali* Simon, 1877. *Plexippus paykulli* Audouin, 1826, *Plexippus petersi* Karsch, 1878, *Hyllus semicupreus* Simon, 1885, *Leucauge decorata* Walckenaer, 1841, *Leucauge pondae* Tikader, 1970, *Perenethis venusta* L. Koch, 1878. Yellow stem borer (*Scirpophaga incertulas* Walker, 1863) and leaf rollers (*Cnaphalocrocis medinalis* Guenée, 1854) Rice Earhead Bug (*Leptocoris oratorius* Fabricius, 1794) are major pests causing damage to rice field in this part of Dakshina kannada district (Moorthy and Moorthy, 1997). Highest season of pests like Yellow stem borer (*Scirpophaga incertulas* Walker, 1863) were found to be in October- November (Bandong and Litsinger, 2005) the following moths were also observed in the field. Brown planthopper (*Nilaparvata lugens* Stål, 1854) was found and the caterpillars have found to eat leaf blades of paddy plants (Basant, Sannaveerappanavar, and Gowda, D S, 2013). Leaf rollers (*Cnaphalocrocis medinalis* Guenée, 1854) (Padmavathi et al., 2013), Rice Earhead Bug (*Leptocoris oratorius* Fabricius, 1794) were also found. Rice Caseworm (*Nymphula depunctalis* Guenee, 1854) were also found to exist in the fields.

DISCUSSION

While observing the spiders existing in the two study fields of Puttur, Families of Salticidae, Araneidae, Tetragnathidae and Oxyopidae found to be dominate over others.

- The structure of vegetation and some physiochemical habitat parameters may determine a spiders habitat choice. (Mrzljak and Wiegleb, 2000)
- Spider diversity in the age of 50-60 days rice plants was found to be higher than other days.
- Spiders play an important role in regulating insect pests in agricultural ecosystem. (Sebastian, Mathew, Beevi, Joseph, and Biju, 2005)
- Salticidae are true jumpers. Many workers reported that Salticidae are diurnal unlike other major group of wandering spiders and they hunt by sitting on leaves and stems. (Givens, 1978)
- Araneidae was the family dominating in this study area. Since they are true orb-web weavers and they are also very good predators. They bite and eat the insect which stick and the orb webs. They are dominant may be due to the availability of sized orb-web *Argiope* species, showed more affinity towards *Leptocoris oratorius* Fabricius, 1794 than nest of spiders. Several studies have suggested that spider dispersed and recolonization of fields are significant aspects of spider population dynamics in agro ecosystem. (Bishop and Riechert, 1990)
- *Tetragnatha* species effectively reduce population of green leaf hoppers and brown plant hoppers.
- All spiders showed correlation with rice pests. Spider population need to be highest with the increase in number of pests too, during the months July, August and September.

Conclusion

The study showed a good positive number of existence of spiders in the paddy field and could survive eating the insects which enters the paddy fields including many pests which

otherwise would have harmed the quality and quantity of yield of rice in the studied rice fields of Puttur Taluk in Dakshina Kannada District.

Acknowledgement: We are thankful to authorities of Kuvempu University, Shankaraghatta for providing all facilities for completing this work. We are thankful to Dr. Sebastian P.A Head of the Department, Division of Arachnology, Sacred Heart College, Thevara, Cochin, Dr. Krishna Mohan, for identification of spider species.

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