Impact of different modules on spiders in rice (*Oryza sativa* L.) ecosystem

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ABSTRACT

The impact of different modules against the population of spiders in rice (*Oryza sativa* L.) ecosystem was studied during 2012 – 13. Two supervised field experiments were conducted during *kharif* 2012 and *rabi* 2012 – 13. Totally five modules namely chemical module, bio intensive module, neem based module, integrated module and farmers practice module with four replications was evaluated in the two seasons. In this experiment nine species of spiders *viz*., *Araneus spp.* C., *Argiope catenulata* D., *Argiope pulchella* T., *Callitrichia formosana* Oi., *Clubiona japonicola* Bosenberg & Strand, *Leucage decorata* W., *Lycosa spp., Oxyopes javanus* T. and *Tetragnatha javana* T. were identified during the crop growth period. The population of spiders was observed from 14 days after transplanting (DAT) to 77 DAT in both the seasons. During *kharif* 2012 the population of spiders ranged from 0.05 to 0.45/hill. The overall mean population of spiders ranged from 0.14 to 0.25/hill irrespective of the treatments. It was found that the per cent reduction was higher in the chemical module (44%) compared to the farmers practice module. During *rabi* 2012 – 13 the population of spiders ranged from 0.15 to 1.92/hill. The overall mean population of spiders ranged from 0.33 to 1.18/hill. A higher per cent reduction was observed in the chemical module (72.03%) as in the *kharif*. It was concluded that from both the field experiments a higher population of spiders was observed in the farmers practice module followed by integrated module, neem based module, bio intensive module and chemical module.

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INTRODUCTION

Spiders are the most abundant group of predators in any agroecosystem, especially in rice fields (Bambaradeniya and Edirisinghe, 2008) and are insect's worst enemies feeding on a variety of prey, thus killing far more pests than commercial insecticides. Most of the spiders in rice fields seem to evacuate the field after application of chemical insecticides, thus their predatory capacity was suppressed and caused a negative impact on the population densities of rice field spiders (Lee *et al.*, 1993). Due to these constraints, researchers developed an alternative, economical and eco-friendly method of insect control (Venturino *et al*., 2008 and Chatterjee *et al*., 2009).

Agricultural entomologists recorded the important predators of insect pests and serve as a buffer to limit the initial exponential growth of prey population (Sigsgaard, 2000; Venturino *et al*., 2008 and Chatterjee *et al*., 2009). According to Bhantnagar *et al*. (1982) the crop having more insects or insect visitors always had more spiders. Among the identified species in rice, *Lycosa pseudoanulata* (Boe & Stand) was the most prevalent followed by *Atypena formosona* (Oi), *Argiope catenulate* (Doleschall) and *Clubiona japonicola* (Bosenberg and Strand) (Sahu *et al*., 1996). Samiyyan and Chandrasekaran (1998) reported that spiders were effective against leaf folders, cut worms and stem borers. Several researchers recorded spider population and their predatory potential in traditional cropping system in Tamil Nadu. The present study was carried out to study the safety of different modules to the spiders in rice ecosystem.

MATERIALS AND METHODS

The present study was carried out in the rice variety ADT 45 at PAJANCOA&RI, Karaikal, Puducherry in a Randomized Block Design with five treatments and four replications during *kharif* 2012 and *rabi*

Table 1. Treatments detail of the experiment for spiders in rice ecosystem

T_1 **Chemical module**	T_2 **Bio intensive module**	T_3 **Neem based module**	T_4 **Integrated module**	T_5 **Farmers practice (Control)**
Application of Carbofuran 3G in nursery at 72 g a.i./20 cents	Set up Pheromone traps at 30 DAT and subsequent at 15 days intervals	Neem cake half dose (125 Kg/ha) at basal application	Clipping of terminal leaves at the time of transplanting	Clipping of terminal leaves at the time of transplanting
Spraying Cartap hydrochloride 50 SP @ 250 g a.i./ ha at 30 DAT	Release of *Trichogramma japonicum* at 30 DAT and subsequent at 15 days intervals	Spray of NSKE 5% at 30 DAT	Application of Carbofuran 3G in nursery at 72 g a.i./20 cents	Whenever pest population reaches ETL spray locally available Chemical (Fenthion 100 EC at 500 g a.i. / ha)
Application of Cartap hydrochloride 4 G @ 800g a.i./ha at 45 DAT	Spray of *Bacillus thuringiencis* 1 lit/ha at 45 and 60 DAT	Application of neem cake remaining dose at 45 DAt	Set up Pheromone traps at 30 DAT and subsequent at 15 days intervals	-
If one more spray needed spray Cartap hydrochloride 50 SP at 250 g a.i./ha	-	Spray of neem oil 3% at 60 DAT	Release of *Trichogramma japonicum* at 30 DAT and subsequent at 15 days intervals	-
-	-	-	Application of neem cake ¼ dose at 45 DAT	-
-	-	-	Spray of Fipronil 5 SP at 50 g a.i./ha based on the ETL.	-

2012 - 13. The experiment was laid out in an area of 25 cents with the plot size of 5 x 4 m and a spacing of 15 x 10 cm. The treatments of the experiement was detailed in Table 1. The observation of the population of spiders was taken in situ at weekly intervals from 14 days after transplanting (DAT) to 77 DAT on ten randomly selected plants leaving the border rows. The total number of spiders was counted and expressed in numbers per hill.

RESULTS AND DISCUSSION

A total of 9 species of spiders viz., *Araneus spp.* C., *Argiope catenulata* D., *Argiope pulchella* T., *Callitrichia formosana* Oi., *Clubiona japonicola* Bosenberg & Strand, *Leucage decorata* W., *Lycosa spp., Oxyopes javanus* T. and *Tetragnatha javana* T. were observed from five treatment modules during the crop growth period. The effects of different modules on the population of spiders during *kharif* 2012 in rice variety ADT 45 are presented in Table 2. The population of spiders was observed from 14 DAT to 77 DAT. At 14 DAT, the population of spiders ranged from 0.05 to 0.12/hill and there was no significant difference among the treatments. It was found that the population of spiders was low and similar trend was continued upto 49 DAT.

At 56 DAT, the population of spiders ranged from 0.10 to 0.35/hill. It was found that a low population was recorded irrespective of the treatments and similar trend was continued upto 77 DAT. The overall mean populations of predatory spiders ranged from 0.14 to 0.25 / hill. A low population of spiders was observed in the chemical module (0.14/hill) while a higher population of spiders was observed in the farmers practice module throughout the crop growth period. It was found that, a higher per cent reduction of spiders was observed in the chemical module compared to the farmers practice module. The population of spiders during *rabi* 2012

– 13 on rice variety ADT 45 are given in Table 3. The population of spiders was observed from 14 DAT to 77 DAT. At 14 DAT, the population of spiders ranged from 0.15 to 0.42 spiders/hill. It was found that a low population was recorded irrespective of the treatments. At 21 DAT, the population of spiders was in an increasing trend and ranged from 0.25 to 0.52/hill. It was found that, a low population was recorded in all the treatments and similar trend was continued upto 28 DAT. At 35 DAT, the population of spiders was in an increasing trend and ranged from 0.27 to 1.02 /hill. It was found that, the population trend was as at 28 DAT. Similar trend was continued upto 49 DAT. At 56 DAT, the population of spiders ranged from 0.47 to .87/hill. A low population was recorded in the chemical module while a higher population of spiders was recorded in the farmers practice module (1.87/hill). Similar trend was continued upto 77 DAT.The overall mean population of spiders ranged from 0.33 to 1.18/hill. A low population of spiders was observed in the chemical module (0.33/hill) while a higher population of spiders was observed in the farmers practice module (1.18/hill) throughout the crop growth period. It was found that the chemical module recorded a higher per cent reduction (72.03%) compared to the farmers practice module. It was concluded that, from both the field experiments a higher population of spiders was observed in the farmers practice module followed by integrated module, neem based module, bio intensive module and chemical module.

These findings are in consonance with that of Shepard and Ooi (1992) and Garg *et al*. (2002) recorded a high population of natural enemies in IPM plots than in the other treatments. Kareem *et al.* (1988) and Dash *et al.* (2006) reported that a decimation of the predators significantly was observed in insecticide treated plots in rice. Elakkiya (2011) and Punithavalli *et al.* (2011) stated that the natural enemies *viz.*, coccinellids and spiders were found more in untreated control compared to other treatments in rice. Sidde Gowda and Gubbaiah (2011) stated that the application of neem products *viz.*, econeem plus @ 0.2 per cent, vijay neem 0.035 per cent and neem mark 0.035 per cent were found to be safer to predators. The above findings are found to support the present findings.

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Table 2. Effect of different modules on the population of spiders during *kharif*, 2012

Sl. No.	Treatments	Number of spiders / hill											Percent reduction over control
		14 DAT	21 DAT	28 DAT	35 DAT	42 DAT	49 DAT	56 DAT	63DAT	70 DAT	77 DAT	Overall mean	
1.	T_1 Chemical module	0.05	0.02 [b]	0.07	0.10	0.17	0.15	0.25 [a]	0.17	0.17 [b]	0.25 [bc]	0.14 [c]	44.00
2.	T_2 Bio intensive module	0.12	0.10 [ab]	0.15	0.10	0.17	0.30	0.27 [a]	0.20	0.25 [ab]	0.17 [c]	0.18 [b]	28.00
3.	T_3 Neem based module	0.07	0.15 [a]	0.20	0.22	0.25	0.25	0.35 [a]	0.22	0.37 [a]	0.32 [ab]	0.24 [a]	4.00
4.	T_4 Integrated module	0.12	0.10 [ab]	0.17	0.10	0.20	0.25	0.10 [b]	0.22	0.37 [a]	0.25 [bc]	0.19 [b]	24.00
5.	T_5 Farmers practice (control)	0.12	0.17 [a]	0.25	0.12	0.17	0.22	0.25 [a]	0.35	0.45 [a]	0.40 [a]	0.25 [a]	-
CD (P = 0.05)		NS	0.13*	NS	NS	NS	NS	0.16*	NS	0.17*	0.12*	0.09**	-

DAT – Days after transplanting, **- Significant at 1% level, *- Significant at 5 % level, NS- Not Significant
In a column, mean followed by common letters are not significantly different by DMRT (P = 0.05)

Table 3. Effect of different modules on the population of spiders during *rabi*, 2012-13

Sl. No.	Treatments	Number of spiders / hill											Percent reduction over control
		14 DAT	21 DAT	28 DAT	35 DAT	42 DAT	49 DAT	56 DAT	63 DAT	70 DAT	77 DAT	Overall mean	
1.	T_1 Chemical module	0.15^{c}	0.25 ^{c}	0.20 ^{c}	0.27 ^{d}	0.30 ^{d}	0.32 ^{d}	0.47^{d}	0.55^{d}	0.55^{d}	0.27^{d}	0.33^{d}	72.03
2.	T_2 Bio intensive module	0.35^{ab}	0.35 ^{b}	0.25 ^{c}	0.45 ^{c}	0.40 ^{cd}	0.75^{b}	0.75^{c}	0.77^{c}	0.80^{c}	0.55^{c}	0.54^{c}	54.23
3.	T_3 Neem based module	0.25^{b}	0.25 ^{c}	0.37 ^{b}	0.35 ^{cd}	0.45 ^{c}	0.45^{c}	0.82^{c}	0.85^{c}	1.12^{b}	0.82^{b}	0.57^{c}	51.69
4.	T_4 Integrated module	0.37^{a}	0.40 ^{b}	0.42 ^{b}	0.62 ^{b}	0.70 ^{b}	0.82^{b}	1.10^{b}	1.12^{b}	1.17^{b}	0.82^{b}	0.75^{b}	36.44
5.	T_5 Farmers practice (control)	0.42^{a}	0.52 ^{a}	0.57 ^{a}	1.02 ^{a}	1.25 ^{a}	1.32^{a}	1.87^{a}	1.85^{a}	1.92^{a}	1.10^{a}	1.18^{a}	-
CD (P = 0.05)		0.10**	0.09**	0.11**	0.09**	0.12**	0.06**	0.06**	0.05**	0.05**	0.07**	0.14**	-

DAT – Days after transplanting, **- Significant at 1% level, *- Significant at 5 % level, NS- Not Significant
In a column, mean followed by common letters are not significantly different by DMRT (P = 0.05)

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