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Research Note

Natural enemies of brown planthopper and whitebacked planthopper during rice cropping season at Madurai

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ABSTRACT: Studies on the natural enemies of rice planthoppers revealed that *Anagrus* sp. was seen throughout the season, which shot up from the second fortnight of October to the first fortnight of November. *Pseudogonatopus* sp. parasitized more number of Brown Planthopper (BPH). Parasitic efficiency of *Pseudogonatopus* sp. was more when two parasitoid adult females were released per hill. The functional response of a single mirid *Cyrotorhimus lividipennis* prey was greater than when in groups. A single mirid predated 3.33 and 2.66 BPH nymphs and 2.66 and 3.0 WBPH nymphs per day on TN1 and ADT36 rice varieties, respectively.

KEY WORDS: *Anagrus sp.*, BPH, *Cyrtorhinus lividipennis*, *Psuedogonatopus*, WBPH

Rice is an important crop grown over an area of 40–41million hectares under diverse conditions in India (Sampath, 1990). Rice is attacked by more than 100 insect species, which cause significant economic loss. More than 22 species of planthoppers occur in South and South-East Asia (Wilson and Claridge, 1991) and only two species cause significant widespread problems. The brown planthopper (BPH), *Nilaparvata lugens* (Stål) and the whitebacked planthopper (WBPH), *Sogatella furcifera* (Horvath) damage plants by direct feeding showing a symptom known as "hopperburn". The BPH also transmits virus diseases. The planthoppers became serious pests of rice in Asia about 30 years ago (Dyck and Thomas, 1979) and continue to be a threat for rice cultivation.

The rice ecosystem is bestowed with lot of natural enemies. More than 200 natural enemies were recorded on BPH (Ooi, 1988). Egg parasitism was often very high. The most commonly reported predator is the mirid bug *Cyrtorhinus lividipennis*, which feeds on all stages (Rajendran, 1994).

Field experiments were conducted to know the activity of egg predators, nymphal parasitoids and predators of BPH and WBPH and the results of which are presented below. The activity of egg parasitoid, parasitoid efficiency of dryinid, *Pseudogonatopus* sp. and the predatory potential of *Cyrtorhinus lividipennis* was studied under field conditions at Agricultural College and Research Institute, Madurai during *Rabi* season. The activity

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of egg parasitoids of BPH and WBPH was studied by randomly placing potted rice seedlings with hopper eggs in the field and exposed for three days (Otake, 1967). The potted plants were brought back to the insectary and the hopper eggs were allowed to hatch. Emerging nymphs were counted and removed. Once the hatching stopped the seedlings were dissected out, and the orange red eggs were considered as parasitized and percentage parasitization was computed. Parasitoid trapping was done at weekly interval and there were three replications for both BPH and WBPH.

The efficiency of dryinid parasitoid, *Pseudogonatopus* sp. was studied on ADT36 and TN1 plants by using ten fourth instar BPH nymphs in polyester film cages. The female dryinids were released at 1, 2, 3, 4 and 5 numbers. Each treatment was replicated four times. Plants with BPH nymphs without the parasitoid served as control. Seven days later, the nymphs were examined for the presence of abdominal sac to ascertain parasitization and were counted. The observation was taken for three days. A similar experiment was conducted separately for WBPH nymphs.

Predatory potential of the mirid, *Cyrtorhinus lividipennis* was studied by caging twenty-five last instar nymphs of BPH on 30day–old potted plants of ADT36 and TN1. Pre-starved freshly adult predator at densities 1, 5, 10, 15, 20 and 25 numbers were released into each cage, separately and each treatment was replicated four times. Number of BPH nymphs killed in a day was recorded. Similar experiment was conducted for WBPH also.

The egg parasitoids were active throughout the cropping season of rice. More than 50 per cent egg parasitization was recorded during the second fortnight of September to the second fortnight of November in case of BPH. In case of WBPH more

Table I. Parasitization of eggs of BPH and WBPH by parasitoids

Month & fortnight	Per cent parasitization	
	BPH	WBPH
August 15	0.00(0.90)[g]	0.00(0.90)[f]
August 30	15.00(22.72)[f]	6.33(14.43)[e]
September 15	48.00(43.85)[d]	34.00(35.64)[d]
September 30	53.33(46.91)[d]	45.00(42.12)[c]
October 15	62.33 (52.15)[c]	49.33(44.61)[c]
October 31	77.00(61.38)[b]	89.66(71.33)[a]
November 15	84.66(67.07)[a]	91.00(72.70)[a]
November 30	68.00(55.56)[c]	71.66(57.86)[b]
December 15	34.00(35.65)[e]	45.66(42.51)[c]
December 31	30.66(33.61)[e]	37.33(37.65)[d]

Figures in parentheses are arcsine- transformed values.

Means followed by the same letter(s) in a column are not significantly different (P=0.05) by DMRT.

than 50 per cent egg parasitization was recorded from second fortnight of October to November (Table 1). The peak egg parasitization of BPH (84.66 %) and WBPH (91.0 %) eggs was observed during first fortnight of November. The ovipositional injury made by WBPH attracted the egg parasitoids and resulted in maximum parasitization compared to BPH (Kisimoto, 1981). The planthopper eggs were also destroyed by the mirid predator. The predominant egg parasitoid was *Anagrus sp.* The present results are in conformity with the findings of Claridge *et al.* (1999).

The results of efficiency of parasitism indicated that the maximum parasitism of 75 and 70 per cent was recorded at a density of two and three *Pseudogonatopus sp.* in BPH on TN1, while 67.5 and 62.5 per cent on ADT36 variety, respectively (Table 2). A similar trend was noticed in WBPH with a maximum of 80 and 82.5 per cent on TN1 and ADT36, respectively. Overall, the parasitoid preference was more for WBPH than BPH and the susceptible variety TN1 recorded more parasitization than moderately resistant variety (ADT36). The per cent parasitization of BPH and WBPH decreased with the increase in the number of adult female parasitoids (*Pseudogonatopus* sp.) enclosed in the cage. There was no influence of rice varieties on parasitoid efficiency. Similar results were also reported by Amirtharaj (1996).

The predatory efficiency was high (3.33 BPH nymphs) when a single mirid was enclosed on TN1 rice variety. The predator efficiency decreased with increase in the number of predators enclosed (Table 3). The same trend was observed on WBPH on two rice varieties. Similar results were also reported by Saxena *et al.* (1974) and Poorani (1990) where a single predator consumed more prey than in a group.

Table 2. Parasitization of nymphs of BPH and WBPH by *Pseudogonatopus* sp. on two rice varieties

Parasitoid density (nos.)	Parasitization (%)			
	BPH		WBPH	
	TN 1	ADT 36	TN 1	ADT 36
1	55.0(48.84)^{b}	55.0 (46.92)^{b}	65.0(52.77)^{b}	57.5(50.85)^{b}
2	75.09(59.00)^{a}	67.5(54.78)^{a}	80.0(63.43)^{a}	82.5(63.43)^{a}
3	70.0(56.79)^{a}	62.5(50.77)^{ab}	72.5(59.00)^{a}	65.0(54.78)^{b}
4	47.5(43.07)^{c}	42.5(41.15)^{c}	57.5(48.84)^{c}	47.5(43.07)^{c}
5	15.0(22.14)^{d}	15.0(22.14)^{d}	25.0(28.78)^{d}	17.5(26.56)^{d}
Control	0.0(0.90)^{e}	0.0(0.90)^{e}	0.0(0.90)^{e}	0.0(0.90)^{e}

Figures in parentheses are arcsine-transformed values.
Means followed by same letter(s) in a column are not significantly different (P=0.05) by DMRT.

Table 3. Predation of BPH and WBPH by *C. lividipennis* on two rice varieties

Predator density	Number of nymphs preyed / day / predator			
	BPH		WBPH	
	TN1	ADT36	TN1	ADT36
1	3.33[c]	2.66[d]	2.66[c]	3.00[c]
5	6.66[d]	6.33[bc]	4.66[c]	4.33[c]
10	11.66[c]	9.66[b]	9.33[b]	9.00[b]
15	12.33[c]	12.00[b]	11.33[b]	11.66[b]
20	15.00[b]	15.33[a]	13.00[a]	13.33
25	18.33[a]	17.66[a]	15.66[a]	16.33[a]

Means followed by the same letter(s) in a column are not significantly different (P=0.05) by DMRT.

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