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Field Efficacy of Bio-Agent *Trichogramma* spp. Against Stem Borer and Leaf Folder in Rice Crop under Mid-Western Plain Zone of UP

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Abstract

A study was undertaken to evaluate the bio-efficacy of *Trichogramma japonium* and *T. chilonis* against stem borer and leaf folder of rice at farmer's field. Different doses of the egg parasitoids, *T. japonicum* and *T. chilonis* were evaluated and the results revealed the reduction in the tiller damage caused by stem borer and folded leaves by rice leaf folder varied from 50.1 to 63.5% and from 60.8 to 70.5% respectively, where the egg parasitoid were released at 50,000/ha. Similarly, reduction in the tiller damage and folded leaves varied from 68.2 to 78.3% and from 70.3 to 78.8% respectively, where egg parasitoids were released at 75,000/ha during the season, when the third dose of both bio-agent applied at 100,000/ha during the crop season, the reduction in damage tiller and folded leaves varied from 78.1 to 82.1% and from 76.6 to 84.6% respectively. All the doses used in the inundative releases were found effective over the control but the releases at 100,000/ha was found to be superior over the lower dose.
Key words : *Trichogramma japonicum, Trichogramma chilonis, Oryza sativa,* Parasitoids.

The lepidopteran stem borer and leaf folder are the most important biotic constraints to rice production in UP. For sustainable agricultural production, use of pesticides for the control of insect pests increased manifold and their indiscriminate uses resulted in many ill effects including resurgence and outbreaks of new pests in almost all the important crops. To overcome these problems an ecologically, sound strategy in the form of BIPM is needed, which includes successive releases of bio-control agents. These bio-control agents devour pests and keep their population under check without disturbing atmospheric balance in the agro-ecosystem. In this millennium, Indian agriculture is passing through a critical phase with greater emphasis on quality crop protection. With this view, the present study was undertaken to evaluate the efficacy of bio-agent *Trichogramma* spp. against stem borer and leaf folder in rice crop.

Methods

To develop BIPM strategy for the control of rice stem borer, *Scirpophaga incertulas* walker and leaf folder, *Cnaphalocrocis medinalis* Cuenee, bio-efficacy of the egg parasitoids *T. japonicum* and *T. chilonis* was assessed in NDR-359, a long duration variety of rice. Farmer's field at Kalakhari Nagina village of Bijnor district was selected as an experimental area. Four farmer's field adjacent to each other having same ecological zones were selected for the purpose of studies. Each farmer's field was divided into four equal sized plots (800 m^2). There were four treatments including control and each treatment was replicated four times (farmer fields were taken as replication).

The treatments were *T. japonicum* and *T. chilonis* released at 50,000, 75000 and 100,000/ha and in the control where no parasitoids were released and each treatments were assigned randomly in each farmer's field. Long duration variety of rice NDR-359 was seeded and transplanted on the same date at each farm. Mass production of egg parasitoids and preparation of trichocards were done in the bio-control laboratory, Department of Entomology, S. V. B. P. University of Agriculture and Technology Meerut. As the long duration varieties of rice like NDR 359 took the longer time for maturation, total of ten releases of the egg parasitoids at 50,000, 75,000 and 100,000/ha/week starting from 35 DAT were made. The trichocards were transported to the farmer's field in the ice boxes and stapled to the leaves at evening hours to prevent the

Table 1. Bio-efficacy of *Trichogramma japonicum* and *Trichogramma chilonis* against rice stem borer and leaf folder of rice. Figures within parentheses are percent reduction in the damage caused by rice stem borer and rice leaf folder. DH—Dead heart, WEH—White ear head; FL—Folded leaf.

Time of observation	Mean percent damage Parasitoids released per ha 50,000 DH/WEH	50,000 FL	75,000 DH/WEH	75,000 FL	100,000 DH/WEH	100,000 FL	Control DH/WEH	Control FL
Aug 2005	6.30	3.16	2.69	2.36	3.38	4.89	12.23	8.48
	(50.16)	(60.8)	(68.2)	(70.30)	(78.16)	(76.6)		
Sep 2005	2.80	3.36	1.54	2.42	1.37	3.51	10.66	12.62
	(70.28)	(63.85)	(61.41)	(76.97)	(85.96)	(84.72)		
Oct 2005	1.94	4.68	2.92	3.13	1.85	3.43	4.35	19.17
	(63.5)	(71.5)	(78.3)	(78.80)	(82.1)	(84.60)		
SE	1.39	0.28	1.68	0.43	0.88	0.18	1.54	0.65
	6.78	2.30	6.87	3.10	4.68	2.13		
CD at 1%	6.46	1.28	4.86	1.84	3.98	0.86	7.68	3.01
	31.97	10.13	22.87	11.84	22.11	10.05		
CD at 5%	4.52	0.88	3.18	0.68	2.71	0.56	5.37	2.12
	22.08	7.47	16.63	7.29	15.14	6.85		

desiccation and mortality by excessive heat and sunshine. To find out the damage level in different treatments, 10 hills were selected randomly for the purpose of observations on the infested tillers in the form of dead hearts (DH) and white ear heads (WE) during tillering and reproductive stages, respectively, in stem borer while the folded leaves (FL) were recorded in rice leaf folder.

Results and Discussion

Incidence of rice stem borer and rice leaf folder were found to be low in the plot where, *Trichogramma japonicum* and *T. chilonis* released at 50,000/ha (Table 1). Dead heart count observed in August was 6.3% as compared to 12.2% in the control. Similarly, 2.8% DH recorded in September was low compared to 10.6 in the control plot. White ear head population observed in October was 1.9% over the control (4.3%). The overall reduction in the damage of tillers over the control varied from 50.1 to 63.1% during the season.

Six releases of *T. japonicum* at 50,000/ha from August to September significantly reduced the incidence of paddy stem borer in trials at farmer's field in Punjab (1). Similarly, in rice leaf folder, the folded leaves recorded in August was 3.1% compared to 8.4% in control 3.3%, FL observed in September was low compared to 12.6% in the control plot. Folded leaves recorded during October were low (4.6%) as compared to 19.1% in the control. Overall reduction in the folded leaves varied from 60.8 to 71.5% during the season of peak activity of the rice leaf folder. Baitha et al. (2) reported 25—33% parasitization at 25 C and upto 60% at 30 C. There was an inverse relation between temperature and development of *T. japonicum.* Saika and Parameshwaran (3) reported that either five releases of *T. chilonis* alone or four releases of egg parasitoid, followed by application of Bt reduced rice leaf folder damage.

Table 1 indicates the lower incidence of rice stem borer and leaf folder in the plot where *T. japonicum* and *T. chilonis* were released at 75,000/ha dead heart count observed in August was 2.6% as compared to 12.2% in control; 1.5% DH recorded in September was low compared to 10.6% in control plot. White ear head population recorded in October was 2.9% over control (4.3%). The overall reduction in the damage of tillers over the control varied from 68.2 to 78.3% during the season. In rice leaf folder, the folded leaves recorded in August was 3.3% compared to 8.4% in control; 2.4% FL observed in September was lower compared to 12.6% in control plot. Folded leaves recorded during October were low (3.1%) as compared to 19.1% in control. Overall reduction in the folded leaves varied from 70.3 to 78.8% during the season of peak activity of rice leaf folder.

Table 1 indicates the lower incidence of stem borer and rice leaf folder in the plot where, *Trichogramma*

japonicum and *T. chilonis* were released at 100,000/ha. Dead heart count observed in August was 3.3% as compared to 12.2% in control. Similarly, 1.3% DH recorded in September was low compared to 10.6% in control. White ear head population observed in October was 1.8% over the control (4.3%). The overall reduction in the damage of the tillers over the control varied from 78.1 to 82.1% during the season. Similarly, in rice leaf folder, the folded leaves recorded in August was 4.8% compared to 8.4% in control. FL observed in September (3.5%) was lower in comparison to 12.6% in control. Folded leaves recorded during October were low (3.4%) as compared to 19.1% in control. Overall reduction in the folded leaves varied from 76.6 to 84.6% during the season of peak activity of the rice leaf folder. Similar observations were also made by Bentur et al. (4) who reported that four to nine releases of *T. japonicum* at 100,000/ha starting for 20—38 DAT resulted in a 3.7 to 59% decrease in leaf damage, seven to nine releases of *T. chilonis* and *T. japonicum* at 100,000/ha/week proved as effective as the standard insecticides for the control of stem borer and leaf folder.

It can be concluded that for long duration varieties of rice like NDR359 ten releases of *T. japonicum* and *T. chilonis* at 50,000, 75,000 and 100,000/ha at weekly interval from August to October were proved to be effective for the control of rice stem borer and rice leaf folder.

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