

**Eco-friendly Management of Rice leaf folder (*Cnaphalocrocis medinalis*) Guenee (Pyralidae:
Lepidoptera) in South Tripura, India.**

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ABSTRACT

The present field experiment was conducted to evaluate the field release of egg parasitoid, Trichogramma chilonis Ishili (Hymenoptera, Trichogrammatidae), applications of neem product and monocrotophos 36 WSC for control of rice leaf folder (Cnaphalocrocis medinalis) under agro-ecosystem of South Tripura during 2008 and 2009. The rice variety "naveen" (duration 125) was considered for the experiment. The rice leaf folder damage in untreated plots was 13.8% and 22.7% whereas in treated plots in varied from 5.3% - 10.5% and 7.7% - 16.5% in winter and summer seasons respectively. The four to six releases of T. chilonis (@1 lakh/ha) followed by Economic Threshold Level (ETL) based application of NSKE (5%) and monocrotophos (1.0 lt/ha) alone or in combination could effectively reduced the leaf folder damage and gave higher grain yield in comparison to untreated plots. The four inundative releases of T. chilonis followed by ETL based 3 sprays of monocrotophos was found to be superior over all treatment as well as control with only 5.3 per cent leaf folder damage and highest grain yield (52.90 qt/ha) during winter and leaf folder damage 7.7per cent and highest grain yield (56.20 qt/ha) during summer of 2008-09. The present finding may benefit the practicing rice farmers as substitute for control of rice leaf folder by reducing use of chemical insecticides.

Key words: *Cnaphalocrocis medinalis*, Monocrotophos, NSKE, Pests Management, *Trichogramma chilonis*.

Introduction

Rice leaf folder considered as pest of minor importance have increased in abundance assuming second to brown plant hopper, *Nilaparvata lugens* (Stal) at international level and whose pest status change concomitantly with rice production practices, control measures should spare natural enemies. Indiscriminate use of insecticides resulted in the problems of contamination of food stuff with pesticide residues, environmental pollution, annihilation of natural enemies leading to secondary pest resurgence and subsequent loss in yield and increase cost of pesticides (Krishnaiah, 1995). The used of plant derivatives which are less expensive and relatively safe to non target species has evoked keen interest as an alternative control measure (Saxena 1997). However, utility and effectiveness of inundative releases of *Trichogramma* as component of integrated pest management against rice insect pest have not been critically assessed in India. Therefore, an attempt has been made to evaluate the effect of *T chilonis* alone or in combination with botanicals and chemical insecticides for the management of *Cnaphalocrocis medinalis* in Tripura condition.

Materials and Methods

The experiment was conducted under rainfed situations at three different location of South Tripura district. Twenty days old seedlings of naveen rice variety was transplanted (SRI system) in the main field during winter and summer season in 2008 and 2009 respectively. There were five treatments evaluated in three field trials at Dudhpushkurini, Mogpushkurini and Mirza village of South Tripura, Tripura. Releases of egg parasitoid, *T chilonis* was initiated with appearance of the leaf folder moth in the experimental plots which coincided with 30 days after transplanting (DAT) and subsequent in 7 days of interval. Nucleus culture of *T chilonis* was obtained from the Biocontrol laboratory of State Biocontrol Laboratory, Dept of Agriculture, Govt of Tripura, West Tripura. The parasitized eggs of *Corcyra cephalonica* (Staiton) mounted on card pieces were cut into small bits and stappled to the underside of the rice leaf @ 1.0 lakh parasitoids/ha in field. The spraying of liquid formulation was done with high volume knapsack sprayer and the quantity of spray fluid used was 1ltr./ha. The sprays were given based on ETL (5% leaf damage in vegetative and 10% leaf damage in flowering stage at 7 days interval) on 61, 67 and 75 DAT during summer and winter season. The efficacy of different treatments was assessed at weekly interval on 10 hills selected at randomly per plot. The grain yield was recorded for individual treatment and computed into yield per hectore.

Treatment:

T₁ = *Trichogramma Chilonis* @ 1 lakh per ha alone (6 Release)

T₂ = *Trichogramma Chilonis* @ 1 lakh per ha alone (4 Release)

T₃ = *Trichogramma Chiloni* @ 1 lakh per ha alone (4 Release) with Monocrotophos 36 WSC @ 1ltr per ha (3 spray)

T₄ = *Trichogramma Chilonis* @ 1 lakh per ha alone (4 Release) with NSKE (5%)

T₅ = Farmers Practice (Chlorpyrifos @ 1 ml/ltr of water) as control (one spray)

Statistical Analysis: The experiment was laid out in a Randomized Block Design (RBD) with five replication and collected data were analyzed statistically by using SPSS-16 computer based software.

Results and Discussion

All the treatments were significantly superior over control in reducing leaf folder damage (Table 1 and 2). The per cent leaf folder damage in treated plots range from 5.3 to 10.55% against 13.5% during winter of 2008-09 (Table 1). Whereas, the per cent leaf folder damage in treated plots range from 7.7 to 16.5% against 21.5% in control during summer of 2008-09 (Table 2).

The release of *T chilonis* (4 times) followed by ETL based monocrotophos sprays recorded lowest per cent leaf folder damage 5.3% and 7.7% against 13.5% and 21.5 % in untreated plots during winter (Table 1) and Summer (Table 2) season of 2008-09 respectively. Release of *T chillonis* (4 times) + monocrotophos spray (thrice) excelled over all other treatments in reducing leaf folder damage in both the seasons. Neem seed extract @ 2% and monocrotophos @ 0.4 kg a.i./ha proved effective against *C. medinalis* giving a moderate pest suppression in between the maximum protection by chemicals and the neem derivatives alone in field conditions (Nanda *et al.*, 2000). The grain yield varied significantly from 4.6 t/ha to 5.0 t/ha in treated plots with 4.3 t/ha in untreated plots during *summer* season (Table 1). Maximum grain yield of 52.9 qt/ha was recorded in treatment with (*T chilonis* four releases + monocrotophos spray). The same trend was observed in winter season with highest grain yield of 56.2 qt/ha in T₃ against mean yield of 49 qt/ha in control plots.

Evidently the release of *T. chilonis* substantially suppressed the infestation level of leaf folder. Sivasundaram *et al.* (2008) reported that biological control approach is now gaining importance due to

its greater reliability, safety and ecological as well as economic sustainability. Balagurunathan and Rabindra (2001) reported 8.0 to 40.0 per cent reduction of rice leaf folder damage through the releases of *T. chilonis*. Nathan *et al.* (2004) recorded that combination of neem seed kernel extract and *Bacillus thuringiensis* were effective in controlling the leaf folder *C. medinalis*.

The present findings on relatively safer effect of neem seed kernal extract on predators of leaf folder was in agreement with earlier reports of Kareem *et al.* (1988) who reported that the predatory mirid and spider population were significantly lower in insecticide treated plots than in neem treated plots. The NSK water extract was known to cause no effect on parasitisation of *Plutella xylostella* eggs by *Trichogramma* sp. in field condition (Klemmn & Schmutter, 1993). The study revealed that egg parasitoid may be effectively utilised in combinations with NSKE, Monocrotophos for controlling rice leaf folder which were also found to be eco-friendly. Suitable parasitoid release schedule, selection of insecticide resistant strains, development of biocontrol tactics against other key pests will enhance the utility of inundative release of *Trichogramma* in rice.

Table 1. Impact of IPM on rice leaffolder damage (%) and grain yield (qt/ha) during winter season

Treatment	Leaf folder damage (%)	Reduction of leaf folder damage (%) over control	Grain Yield (qt/ha)	Increase yield (qt/ha) over control
T ₁	9.83 ^{bcd} (3.14)	3.67	48.38 ^b	5.15
T ₂	10.55 ^b (3.25)	2.95	46.58 ^{bcd}	3.35
T ₃	5.30 ^e (2.30)	8.20	52.90 ^a	9.67
T ₄	10.03 ^{bc} (3.17)	3.47	47.20 ^{bc}	3.97
T ₅	13.5 ^a (3.67)	--	43.23 ^e	-
S. Ed (±)	0.73		0.94	
CD (5%)	1.56		2.02	

Data are mean of four replication, Figures in parentheses are square root transform values.

Column means followed by the same are not significantly different (at 5%) by LSD.

Table 2. Impact of IPM on rice leaffolder damage (%) and grain yield (qt/ha) during summer season of

Treatment	Leaf folder damage (%)	Reduction of leaf folder damage (%) over control	Grain Yield (qt/ha)	Increase yield (qt/ha) over control
T ₁	14.6 ^{bc} (3.82)	6.40	54.60 ^b	5.35
T ₂	16.5 ^b (4.06)	5.0	52.05 ^{cd}	2.80
T ₃	7.7 ^e (2.77)	13.80	56.2 ^a	6.95
T ₄	11.75 ^d (3.43)	9.75	53.00 ^c	3.75
T ₅	21.5 ^a (4.64)	-	49.25 ^e	-
S.Ed (±)	1.32		0.72	
CD (5%)	2.82		1.55	

Data are mean of four replication, Figures in parentheses are square root transform values.

Column means followed by the same are not significantly different (at 5%) by LSD.

Conclusion

It can be concluded that the four inundative releases of *T. chilonis* followed by ETL based 3 sprays of monocrotophos was found to be superior over control in reducing leaf folder damage and highest grain yield both in winter and summer rice. Moreover, 6 releases of *T. chilonis* alone or in combination also have a promising effect in reduction of leaf folder damage and can contribute to good grain yield as compared to control plots.

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