

## Original Research Article

# Bio-efficacy of Spinetoram 0.8% GR against Leaf Folder *Cnaphalocris medinalis* on Paddy (Order:Lepidoptera Family: Pyralidae)

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## ABSTRACT

A field experiment was conducted to determine the bio-efficacy of Spinetoram 0.8% GR against leaf folder *Cnaphalocris medinalis* on paddy (Order:Lepidoptera Family: Pyralidae) during *Kharif* 2017 and *Kharif* 2018. The treatments were: T<sub>1</sub>- spinetoram 0.8%GR @ 60 g/ha; T<sub>2</sub>- spinetoram 0.8%GR @ 65 g/ha; T<sub>3</sub>- spinetoram 0.8%GR @ 70 g/ha; T<sub>4</sub>- chlorantraniliprole 0.4%GR @ 4 kg/ha; T<sub>5</sub>- cartap hydrochloride 4%GR @ 10 kg/ha and T<sub>6</sub> - untreated check. From the pooled data, all the treatments are effective in controlling leaf folder damage and significant increase in yield but among the tested chemicals spinetoram 0.8%GR @ 70 g/ha shows complete control of leaf folder after 20 DAT. Followed by spinetoram 0.8%GR @ 65 g/ha and spinetoram 0.8%GR @ 60 g/ha which at par chlorantraniliprole 0.4%GR shows lowest percent of leaf folder damage. Natural enemies population was low in insecticidal treatments than compared to untreated check.

### Keywords

Efficacy, Leaf folder, Paddy and spinetoram

## Introduction

Rice (*Oryza sativa* L.) is one of the world's most important crops providing a staple food for nearly half of the global population (FAO, 2004). The crop is vulnerable to attack by more than 100 species of insects and among them 15- 20 species of insects can cause economic damage (Heong and Hardy, 2009) and caused 21 to 51 per cent yield loss (Arora and Dhaliwal, 1996). Over 100 species of insect pests attack rice ecosystem in various stages of the crop, in which Brown plant hopper *Nilaparvata lugens* (Stal) (BPH), white-backed planthopper *Sogatella furcifera*

(Hoverth) (WBPH), green leafhopper *Nephotettix virescens* (Distant) (GLH), yellow stem borer *Scirpophaga incertulas* and leaf folder *Cnaphalocoris medinalis* are the major insect pests of paddy (Noor and Hussain, 2016)

Rice leaf folder or rice leaf roller, *Cnaphalocrocis medinalis* Guenée (Lepidoptera: Crambidae) is also an important pest of rice and is widely distributed throughout Asia (e.g., India, Pakistan, Bangladesh, Sri Lanka, China, Korea, Japan, Philippines, Indonesia; Hill 1983). The *leaf folder* infestation may cause

more than 50% of leaf damage with significant yield losses. Economic injury levels at the heading stage were 4.2% damaged leaves and 1.3 larvae per plant (Heong 1994). Rice leaf folder (*C. medinalis*) larvae causes a plant injury by folding leaves and scraping off the green mesophyll tissue, and farmers usually respond by applying insecticides, even at very low infestation levels (Heong *et al.*, 1994)

Judicious use of insecticides and alternation of chemicals with a different mode of action is suggested to reduce insecticide resistance. So, the newer insecticide molecules with a diversified mode of action against these pests will significantly play a vital role in insecticide resistance management. Spinetoram is a semi-synthetic active ingredient representing the spinosyn chemical class of insecticides. This molecule has demonstrated higher levels of efficacy compared to that of spinosad against lepidopterous pests, thrips and leafminers in a broad range of horticultural and agricultural crops. Spinetoram is established for spinosyn chemistry (Dripps *et al.*, 2008, 2011; Sparks *et al.*, 2008)

## Materials and Methods

The field experiment was conducted in randomized block design (RBD) with 6 treatments and 4 replications at Agriculture Research Station, Gangavathi during *kharif* 2017 and *kharif* 2018. The experimental site was located at 76° 32' E longitude and 15° 15' N latitude with an altitude of 419 m above mean sea level. Experimental details are enlisted in table 1.

There was an untreated control in each replication for the comparative evaluation of the efficacy of different treatments. The insecticides application as soil and sprays were taken up based on seasonal occurrence

and Economic Threshold Level (ETL) of leaf folder. Two sprays were taken at an interval of 10 days. All the untreated plots were sprayed with water.

The leaf folder damage was recorded based on the total number of leaves and number of leaves damaged per 10 hills before each spray and after 3, 10 days and 20 days of each spray and the data was converted as leaf folder percentage. The yield per plot was recorded at harvest. The data were analyzed statistically by using Randomized block design (RBD) and after that data were subjected to angular and square root transformation.

$$\text{Percent leaf damage} = \frac{\text{Total leaves} - \text{Infested leaves} \times 100}{\text{Total leaves}}$$

## Results and Discussion

### Rice leaf folder

The experiment was conducted at Agricultural Research Station, Gangavathi on the efficacy of Spinetoram 0.8% GR against leaf folder *Cnaphalocris medinalis* on paddy during *kharif* 2017 and *kharif* 2018. From the pooled data 2017-18 it was confirmed that leaf folder infestation ranges from 1.84 to 2.07. After the treatment imposition there was reduction in leaf folder damage in all the treatments observed at 3, 10 and 20 days after the first and second application. Among all the treatment the lowest leaf damage was observed in spinetoram 0.8%GR @ 70g/ha was 1.57 per cent at par with spinetoram 0.8%GR @ 65g/ha (1.64 %) and spinetoram 0.8%GR @ 60g/ha (1.67 %). Followed by Cartap hydrochloride 4%GR @1000g / ha which was recorded 1.82 per cent damage and all the treatments were superior over untreated control (2.08 %) was recorded 3 days after the first application (Table 2).

**Table.1** Treatment details

SI.No	Treatments	Dosage (g or ml/ha)
T <sub>1</sub>	Spinetoram 0.8%GR	60
T <sub>2</sub>	Spinetoram 0.8%GR	65
T <sub>3</sub>	Spinetoram 0.8%GR	70
T <sub>4</sub>	Chlorantriliniprole 0.4%GR	40
T <sub>5</sub>	Cartap hydrochloride 4%GR	1000
T <sub>6</sub>	Control	---

**Table.2** Bioefficacy of spinetoram 0.8% GR against leaffolder *Cnaphalocris medinalis* on paddy

Treatments	Dosage g a.i/ha	Per cent leaffolder damage/hill							
		First spray				Second spray			
		Before spray	3DAS	10DAS	20DAS	Before spray	3DAS	10DAS	20DAS
Spinetoram 0.8%GR	60	2.05 (3.23)	1.67 (7.43)	1.36 (6.71)	0.05 (1.33)	0.98 (5.69)	0.75 (4.96)	0.41 (3.66)	0.065 (1.45)
Spinetoram 0.8%GR	65	2.07 (8.27)	1.64 (7.35)	1.32 (6.60)	0.02 (0.79)	1.08 (5.97)	0.65 (4.63)	0.31 (3.18)	0.018 (0.65)
Spinetoram 0.8%GR	70	1.95 (8.03)	1.57 (7.20)	1.26 (6.46)	0.00 (0.00)	1.07 (5.95)	0.62 4.530.62 (4.53)	0.35 (3.39)	0.010 (0.48)
Chlorantriliniprole 0.4%GR	4	1.99 (8.11)	1.93 (7.98)	1.54 (7.13)	0.10 (1.85)	1.14 (6.13)	0.87 (5.35)	0.62 (4.54)	0.016 (2.32)
Cartap hydrochloride 4%GR	10	1.84 (7.80)	1.81 (7.72)	1.46 (6.94)	0.15 (2.21)	0.96 (5.63)	0.88 (5.40)	0.57 (4.35)	0.38 (3.18)
Control	---	1.97 (8.07)	2.08 (8.29)	2.15 (8.43)	2.23 (8.58)	1.21 (6.32)	1.26 (6.44)	1.24 (6.40)	1.36 (6.70)
S.em ±		0.006	0.011	0.009	0.012	0.008	0.009	0.011	0.09
CD		0.020	0.035	0.028	0.03	0.023	0.02	0.03	0.27
CV		0.65	1.27	1.22	5.74	1.42	2.11	3.88	5.86

\*Value in parenthesis are Angular transformed value

**Table.3** Bioefficacy of Spinetoram 0.8% GR against natural enemies of leaf folder *Cnaphalocris medinalis* on paddy

Treatments	Dosage g or ml/ha	No. of natural enemies/plant					
		Before application		After first application		After second application	
		Mired	Greenlacewings	10 DAS	20 DAS	10 DAS	20 DAS
Spinetoram 0.8%GR	60	0.81 (1.34)	1.05 (1.43)	0.96 (1.40)	0.99 (1.41)	0.68 (1.29)	1.11 (1.45)
Spinetoram 0.8%GR	65	0.82 (1.34)	1.09 (1.44)	0.87 (1.36)	0.90 (1.38)	0.69 (1.30)	1.15 (1.46)
Spinetoram 0.8%GR	70	0.79 (1.34)	1.05 (1.43)	0.81 (1.34)	0.82 (1.35)	1.06 (1.43)	0.70 (1.30)
Chlorantriliprole 0.4%GR	4	0.80 (1.34)	1.01 (1.41)	0.82 (1.35)	0.80 (1.34)	0.71 (1.31)	1.00 (1.41)
Cartap hydrochloride 4%GR	10	0.78 (1.33)	0.96 (1.40)	0.80 (1.34)	0.79 (1.33)	0.65 (1.28)	0.93 (1.39)
Control	---	0.79 (1.34)	1.09 (1.44)	0.87 (1.36)	0.91 (1.38)	0.72 (1.31)	1.31 (1.51)
Sem+		0.014	0.041	0.014	0.013	0.01	0.06
CD		NS	NS	0.04	0.04	0.034	0.19
CV				3.17	3.08	3.17	11.62

Value in parenthesis are square root transformed values

The similar trend was followed after 10 days and 20 days after the first spray the minimum damage was recorded in spinetoram 0.8%GR @ 70g/ha was 1.26 per cent and zero per cent, respectively.

The observation taken after second spray shows that leaf folder damage was reduced in all the treatments except untreated control (1.36 %) was noticed 20 days after spray. The lowest damage was observed in the plot treated with spinetoram 0.8%GR @ 70g/ha and spinetoram 0.8%GR @ 65g/ha was 0.010 per cent and 0.018 per cent, respectively. Followed by spinetoram 0.8%GR @ 60g/ha was noticed as 0.065 per cent.

The present findings are in line with Yasutaka *et al.*, 2012 who reported that spinetoram has excellent insecticidal activity against thrips, leafminer flies, whiteflies and lepidopteran insects. Dash *et al.*,1996 reported that effective control of rice pests by application of granular and sprayable insecticidal formulation.

### **Impact on natural enemies**

The predators like mirids and green lace wing was observed in rice ecosystem during cropping season. It was observed that natural enemies population was non significant in all the treatments one before spray that is population was uniformly distributed over all the treatments. The population of predatory mirid bugs and spiders were comparatively low in all the insecticidal treatment when compared with untreated check where the population of natural enemies was increased throughout the cropping period (Table 3). From the pooled data 2017-18 it was noticed that natural enemies population was decreased by application of insecticides. The present findings were in line with Karthikeyan *et al.*, (2008) also reported that insecticides treatment caused a significant decrease in

natural enemy population. Similarly, Shanwei *et al.*, 2009 also evaluated the newer insecticide, chlorantraniliprole 20 SC at 40 g a. i. / ha and found that it was highly safe to beneficial arthropods in rice field.

All the tested chemicals are found effective against leaf folder damage but among tested chemicals spinetoram 0.8% GR @ 70g/ha highly superior over all the treatments followed by spinetoram 0.8% GR @ 65g/ha and spinetoram 0.8% GR @ 60g/ha molecules were effectively and economically used for the management of leaf folder.

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