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Efficacy of Fipronil 80 WDG Against Yellow stem borer, *Scirpophaga incertulas* (Walker) and Leaf folder, *Cnaphalocrocis medinalis* (Guenne) in Rice

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ABSTRACT

Field trials were conducted to evaluate the efficacy of fipronil 80 WDG at different doses against yellow stem borer, *Scirpophaga incertulas* (Walker) and leaf folder, *Cnaphalocrocis medinalis* (Guenne) in rice during *kharif* 2004 and 2005 at Warangal, Andhra Pradesh, India. Three doses of fipronil 80 WDG @ 30, 40, 50 g *a.i.* ha^{-1}, fipronil 5 SC @ 50 g *a.i.* ha^{-1}, monocrotophos 36 SL @ 450 g *a.i.* ha^{-1}, chlorpyriphos 20 EC @ 300 g *a.i.* ha^{-1} were included as insecticide treatments along with an untreated control. Fipronil 80 WDG @ 40 g *a.i.* ha^{-1} was effective against stem borer and leaf folder in rice with 15.36% increase in yield over untreated control. Fipronil 80 WDG @ 30 g *a.i.* ha^{-1}, monocrotophos, fipronil 5 SC were equally effective against stem borer while fipronil 80 WDG at all the three doses and fipronil 5 SC were equally effective against leaf folder.

Key words : Efficacy, Fipronil, Leaf folder, Rice, Stem borer.

Rice has 385 species of insect pests causing 31.5 to 86.0 per cent losses in yield (Gunathilagaraj and Kumar, 1997). Apart from sucking pests which harbour rice plant at its early stages, stem borer and leaf folder are the two important pests which cause severe damage and yield loss. The yellow stem borer, *Scirpophaga incertulas* (Walker) has assumed the number one pest status and attacks the crop at all stages of its growth (Pasalu *et al*., 2002). It causes deadhearts at active tillering stage and white ears at harvest stage which can lead to complete failure of the crop (Karthikeyan and Purushothaman, 2000). Leaf folder larvae feed on green matter by scraping it from leaf blade; affected leaves show white streaks and results in significant loss in yield (Shrivastava, 1989). Farmers continue to depend on the use of insecticides for their management. However, large scale use of insecticides at higher doses had led to adverse effects on non-target organisms, pesticide residues in food, toxic effects on human beings and environmental pollution. This necessiated the testing of newer insecticides for controlling these pests. Hence, the present study was taken up to test the relative efficacy of fipronil 80 WDG at different doses against stem borer and leaf folder in rice.

MATERIAL AND METHODS

Three doses of fipronil 80 WDG *viz.*, 30, 40, 50 g *a.i.* ha^{-1} were evaluated against stem borer and leaf folder in rice at Agricultural Research Station, Warangal during *Kharif* 2004 and 2005. Other insecticide treatments *viz.,* fipronil 5 SC @ 50 g *a.i.* ha^{-1}, monocrotophos 36 SL @ 560 g *a.i.*ha^{-1}, chlorpyriphos 20 EC @ 500 g *a.i.* ha^{-1} and an untreated control were also kept for comparison.

The trials were laid out in Randomised Block Design involving the seven insecticide treatments in plots of 25m^2 each with three replications. The test varieties 'BPT 5204' (during 2004) and 'Kavya' (during 2005) were transplanted at a spacing of 15 x10 cm. All recommended agronomic practices were followed to maintain good plant stand. The test insecticides were applied twice during 2004 and thrice during 2005 with a high volume knapsack sprayer by mixing required quantities of test insecticids in water to make spray fluid equivalentes to 375 l ha^{-1}. Pest incidence was closely monitored and first spraying was done when pest infestation crossed economic threshold levels. Pre-spraying count was taken followed by insecticide application. Spraying was repeated thereafter at 10 days interval. Observations were taken by discarding two rows on

Table1. Efficacy of fipronil 80 WDG on yellow stem borer in rice.

Treatment	Dose g *a.i.*/ha	No. of deadhearts 10 hills^{-1}								
		2004				2005				
		Pre Spraying	10 DAS$_I$	7 DAS$_{II}$	Mean	Pre Spraying	10DAS$_I$	9 DAS$_{II}$	7 DAS$_{III}$	Mean
Fipronil 80 WDG	30	6.6	5.4	2.7	4.0	13.0	26.0	14.3	3.3	14.6
Fipronil 80 WDG	40	7.5	6.4	2.8	4.6	15.0	21.7	13.3	3.0	12.7
Fipronil 80 WDG	50	8.7	8.7	3.3	6.0	15.7	26.0	16.7	3.7	15.4
Fipronil 5 SC	50	5.6	2.8	2.7	4.5	19.0	24.0	15.3	3.3	14.2
Monocrotophos 36 SL	560	6.7	6.5	3.0	4.8[a]	15.0	25.3	13.7	5.0	14.7
Chlorpyriphos 20 EC	500	8.1	4.6	2.8	3.8[a]	16.0	27.7	13.7	4.7	15.3
Untreated Control	-	9.1	10.9	3.5	7.2[b]	18.0	28.7	18.7	2.7	16.7
F-Test		-	*	-	*	-	*	*	-	*
SEm ±		1.05	1.08	0.3	0.74	2.48	0.96	1.39	0.56	0.65
CD (P=0.05)		-	3.3	-	2.3	-	3.0	4.3	-	2.0

* Significant at 5% level
DAS – Days after spraying

Table 2. Efficacy of fipronil 80 WDG on leaf folder in rice.

Treatment	Dose g *a.i.*/ha	No of leaf folder damaged leaves/10 hills						
		2004		2005				
		Pre Spraying	10 DAS$_I$	Pre Spraying	10DAS$_I$	9 DAS$_{II}$	7 DAS$_{III}$	Mean
Fipronil 80 WDG	30	5.3	5.0	25.3	45.0	18.7	6.0	23.2
Fipronil 80 WDG	40	6.0	2.3	26.0	42.0	17.0	5.3	21.4
Fipronil 80 WDG	50	6.7	3.0	25.0	47.0	16.0	4.3	22.4
Fipronil 5 SC	50	6.7	4.0	28.7	46.0	17.3	4.7	22.7
Monocrotophos 36 SL	560	7.0	4.3	30.7	52.0	22.0	5.3	26.4
Chlorpyriphos 20 EC	500	6.3	4.0	27.7	59.3	23.0	4.7	29.0
Untreated Control	-	4.0	6.7	32.0	61.7	25.0	5.3	30.7
F-Test		-	*	-	*	*	-	*
SEm ±		0.79	0.68	2.02	1.58	1.46	0.45	0.61
CD (P=0.05)		-	2.1	6.2	4.9	4.5	-	1.9

* Significant at 5% level
DAS- Days after spraying

all sides as border rows. Total number of dead hearts and leaf folder damaged leaves on ten randomly selected hills per plot were recorded before I spray and 7-10 days after each spray. The yield was recorded plot wise and converted to per hectare basis. Data on pest incidence and yield were subjected to analysis of variance test.

RESULTS AND DISCUSSION

Relative efficacy of different doses of fipronil 80 WDG in comparison with fipronil 5 SC, monocrotophos 36 SL, chlorpyriphos 20 EC was tested against *S. incertulas and C. medinalis* during *Kharif* 2004 and 2005 and the results are presented in Tables 1 - 3.

Efficacy against stem borer

During 2004, pretreatment count of stem borer infestation ranged from 5.6 to 9.1 dead hearts per 10 hills. Ten days after first spraying, the damage ranged from 2.8 to 10.9 dead hearts in different treatments and the differences were significant. Fipronil 5 SC @ 50 g *a.i.* ha^{-1} recorded least incidence of 2.8 dead hearts followed by chlorpyriphos (4.6) and fipronil 80 WDG @ 30 g *a.i.* ha^{-1} (5.4). However, there was no significant variation among different treatments consequent to second spray. Mean efficacy during the season (Table1) indicated that, all the insecticide treatments recorded lower incidence of stem borer than untreated control and were equally effective against stem borer (3.8 – 6.0 deadhearts 10 hills^{-1}) with lowest damage of 3.8 deadhearts in chlorpyriphos followed by fipronil 80 WDG @ 30 g *a.i.* ha^{-1} (4.0).

In the second season of study, stem borer incidence ranged from 13.0 to 19.0 dead hearts per 10 hills before spraying without any significant difference among the treatments. Data recorded nine days after first spray indicated that there was no reduction in dead hearts with respect to pretreatment counts. However, fipronil 80 WDG @ 40 g *a.i.* ha^{-1} recorded significantly lower dead hearts per 10 hills (21.7) followed by fipronil 5 SC (24.0) and was superior to other treatments. Subsequent to second spray, all the insecticide treatments were equally effective against stem borer than untreated control. Mean efficacy, during 2005, indicated the supremacy of fipronil 80 WDG @ 40 g *a.i.* ha^{-1} with lowest incidence of deadhearts of 12.7 per 10 hills. Fipronil 80 WDG @ 30 g *a.i.* ha^{-1}, fipronil 5 SC and monocrotophos 36 SL were at par with fipronil 80 WDG @ 40 g *a.i.* ha^{-1} against stem borer by registering 14.6, 14.2, 14.7 dead hearts, respectively. This is in accordance with Dash and Mukherjee (2003), who reported that fiproinl was effective against stem borers and gallmidges, Kuttalam *et al.* (2008) who found that fipronil 80 WDG @ 50 g *a.i.* ha^{-1} was most effective against stem borer and dose of 40 g *a.i.* ha^{-1} was on par with fipronil 5 SC at 50 g *a.i.* ha^{-1} with minimum deadhearts and white ear symptoms.

Table 3. Effect of fipronil 80 WDG on yield in rice.

Treatment	Dose g *a.i.* ha^{-1}	Yield (kg ha^{-1})#			Percent increase over control
		2004	2005	Mean	
Fipronil 80 WDG	30	5291	5712	5502	8.05
Fipronil 80 WDG	40	5382	6366	5874	15.36
Fipronil 80 WDG	50	5337	6071	5704	12.02
Fipronil 5 SC	50	5154	6195	5675	11.45
Monocrotophos 36 SL	560	5382	6113	5748	12.88
Chlorpyriphos 20 EC	500	5154	5415	5285	3.79
Untreated Control	-	5337	4847	5092	-
F-Test		-	*	*	
SEm ±		144.5	217.7	149.5	
CD (P=0.05)		-	671	461	

* Significant at 5% level

Figures are rounded off to nearest whole number

Efficacy against leaf folder

During 2004, pre-spraying damage by leaf folder ranged from 4.0 to 7.0 damaged leaves per 10 hills without any significant variation in the experimental block. Post-spraying damage level decreased, ranging from 2.3 to 6.7 among various treatments (Table 2). Fipronil 80 WDG @ 40 g *a.i.* ha^{-1} was effective against leaf folder which registered least damage of 2.3 damaged leaves. All the other treatments except fipronil @ 30 g *a.i.* ha^{-1} were equally effective at 40 g *a.i.* ha^{-1}. During the second season of study, leaf folder damage ranged from 25.0 to 32.0 damaged leaves per 10 hills before first spray. After spraying, there was no reduction in leaf folder damage with respect to pretreatment counts. Fipronil 80 WDG @ 40 g *a.i.* ha^{-1} was, however, superior in checking the leaf folder damage followed by dose of 30 g *a.i.* ha^{-1} and Fipronil 5 SC @ 50 g *a.i.* ha^{-1}. Even after second spray, almost similar trend of supremacy of fipronil 80 WDG and fipronil 5 SC over chlorpyriphos and monocrotophos was observed. Mean efficacy of insecticides against leaf folder revealed supremacy of WDG and SC formulations of fipronil. Fipronil 80 WDG was effective against leaf folder at all the three doses equally and registered 21.4 to 23.2 damaged leaves. Fipronil 5 SC with 22.7 damaged leaves was at par with WDG formulation. Monocrotophos was the next best insecticide which recorded 26.4 damaged leaves per 10 hills. Sekh *et al.* (2007) also reported that fipronil 80 WG @ 40 and 50 g *a.i.* ha^{-1} provided highly effective control of stem borer and leaf folder in rice.

Effect on Grain yield

Yield levels during 2004 did not show significant variation among different treatments, probably, due to low pest incidence during the crop period (Table 3). However, during 2005, all the insecticide treatments gave significantly more yield than untreated control except chlorpyriphos. Highest yield was recorded in fipronil 80 WDG @ 40 g *a.i.* ha^{-1} followed by fipronil 5 SC and monocrotophos 36 SL. Mean yield of two seasons also indicated similar trend with Fipronil 80 WDG @ 40 g *a.i.* ha^{-1} recording highest increase in yield of 15.36% over untreated control followed by 12.88% increase in monocrotophos.

The study revealed that fipronil 80 WDG @ 40 g *a.i.* ha^{-1} was effective against stem borer and leaf folder in rice with 15.36% increase in yield over untreated control. Fipronil 80 WDG @ 30 g *a.i.* ha^{-1}, monocrotophos, fipronil 5 SC were equally effective against stem borer while fipronil 80 WDG at all the three doses and fipronil 5 SC were equally effective against leaf folder.

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