

Efficacy of new insecticide molecules against major pests of rice

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ABSTRACT

A field experiment was conducted during the year 2012-13 in two cropping seasons viz Kharif 2012 and Rabi 2012-13 at Agricultural Research Station, Ragolu using rice cultivar MTU 7029 during Kharif and MTU 1010 during Rabi for testing the insecticide molecules Sutathion (triazophos) @ 750 ml/ha and 1250 ml/ha, sulfaxaflor @ 313 ml/ha and 375 ml/ha, buprofezin @ 800 ml/ha, chlorantriliniprole @ 150 ml/ha, acephate @ 667 g/ha and monocrotophos @ 1390 ml/ha with untreated control. The pooled results of two crop seasons revealed that all the tested insecticides were significantly superior and on par with each other in reducing stem borer and leaf folder populations. All the tested insecticides were also safe to spider population except sulfaxaflor.

Keywords: Rice; stem borer; leaf folder; insecticides

INTRODUCTION

With the continued increase in the human population and losses of arable land there is an ever increasing need to increase rice production per unit of land. Over 800 insect species have been indentified damaging either standing or stored rice (Grist and Lever 1969). In India stem borer accounts for 30 per cent of the total losses due to insect pests while plant hoppers for 20 per cent, gallmidge for 15 per cent and leaf folder for 10 per cent in rice system (Dhaliwal et al 2004). Use of insecticides

has positive impact on rice production (Misra and Parida 2004) since stem borer and leaf folder cause heavy losses to rice crop. Therefore present study would provide information to the farming community on effective insecticides to control them and their safety to natural enemies.

MATERIAL and METHODS

A field experiment was conducted at Agricultural Research Station, Ragolu village, Srikakulam district in Andhra

Pradesh during Kharif and Rabi 2012-13. The experiment was laid out in RBD with three replications for testing nine treatments. The variety Swarna (MTU 7029) was grown during Kharif and Cotton Dora Sannalu (MTU 1010) was grown in Rabi. Thirty day old seedlings were planted in 5 × 4 m size plots. The crop was maintained with standard agronomic practices. Knapsack sprayer with a spray volume @ 500 l/ha was used. The insecticidal treatments used were T1 (Sutathion 40 EC @ 750 ml/ha), T2 (Sutathion 40 EC @ 1250 ml/ha), T3 (sulfaxaflor 24 EC @ 313 ml/ha), T4 (sulfaxaflor 24 EC @ 375 ml/ha), T5 (buprofezin 20 EC @ 800 ml/ha), T6 (chloranthriniliprole 18.5 SC @ 150 ml/ha), T7 (acephate 75 SP @ 667 g/ha), T8 (monocrotophos 36 WSC @ 1390 ml/ha) and T9 (control, water only).

Two blanket sprays were given first at 15 days after transplanting and second at booting stage. Remaining sprays were given when the pest reached economic threshold level. During Kharif the sprayings were done on 15, 32 and 70 DAT and during Rabi on 15 and 40 DAT.

Observations on incidence of stem borer (dead hearts) and gall midge (silver shoots) were taken from 20 randomly selected hills per plot after 15 days of each application. For leaf folder, total leaves per hill and damaged leaves were counted on 20 random plants per pot. The white ears incidence was observed at pre-harvest stage. The data on pest information was converted to percentage by the following formula:

$$\% \text{ dead hearts/silver shoots/white ears} = \frac{\text{Total number of dead hearts /silver shoots/white ears}}{\text{Total number of tillers/panicle}} \times 100$$

The damaged leaves and total leaves from 20 randomly selected hills were

observed in each plot. The percentage of leaf damage was calculated as follows:

$$\% \text{ incidence} = \frac{\text{Number of damaged leaves}}{\text{Total number of leaves}} \times 100$$

Grain yield was recorded plot-wise after deleting border rows and expressed as kilograms per hectare.

The data thus obtained from all the observations were subjected to appropriate statistical analysis.

RESULTS and DISCUSSION

Yellow stem borer

Vegetative stage: During Kharif 2012-13 the treatment Sutathion 40 EC 1250 ml/ha significantly reduced the dead hearts

(Table 1) at vegetative stage (5.32%) followed by chloranthriniliprole 18.5 SC @ 150 ml/ha (5.26%), Sutathion 40 EC @ 750 ml/ha (5.08%) and sulfaxaflor 24 SC @ 375 ml/ha (5.0%). During Rabi 2012-13 the dead hearts were significantly reduced by sulfaxaflor 24 SC @ 313 ml/ha (9.0%) followed by Sutathion 40 EC @ 750 ml/ha (7.0%), acephate 667 g/ha (5.7%), sulfaxaflor 24 SC @ 375 ml/ha (5.7%) and Sutathion 40 EC @ 1250 ml/ha (5.2%) which were superior than other treatments and untreated control which recorded significantly higher percentage of dead hearts ie 20.1 per cent. In mean data the dead hearts were significantly lowest in Sutathion 40 EC 1250 ml/ha with 5.25 per cent DH and it was on par with sulfaxaflor 24 SC @ 375ml/ha with 5.35 per cent DH followed by acephate 667 g/ha (5.89%), Sutathion 40 EC @ 750 ml/ha (6.04%), monocrotophos 36 WSC @ 1390 ml/ha (7.44%) and sulfaxaflor 24 SC @ 313 ml/ha (7.85%) compared to untreated control which recorded 13.72 per cent DH.

Reproductive stage: During Kharif 2012 all the treatments significantly reduced the yellow stem borer incidence at reproductive stage. Among them sulfaxaflor 24 SC @ 375 ml/ha proved most superior with 2.05 per cent white ears followed by chloranthriniliprole 18.5 SC @ 150 ml/ha (3.46%), monocrotophos 36 WSC @ 1390 ml/ha (4.22%), acephate 667 g/ha (4.79%), Sutathion 40 EC @ 1250 ml/ha (4.89%), Sutathion 40 EC @ 750 ml/

ha (4.89%) and sulfaxaflor 24 SC @ 313 ml/ha (5.28%). During Rabi 2012-13 chloranthriniliprole 18.5 SC @ 150 ml/ha proved the best treatment in reducing white ears (0.78% WE) followed by monocrotophos 36 WSC @ 1390 ml/ha (1.1%) compared to other treatments and untreated control (7.0%). Significantly lower stem borer damage at reproductive stage was observed in chloranthriniliprole 18.5 SC @ 150 ml/ha with 2.12 per cent WE followed by sulfaxaflor 24 SC @ 375 ml/ha with 2.59 per cent WE, acephate 667 g/ha with 2.66 per cent, Sutathion 40 EC @ 1250 ml/ha with 2.92 per cent, Sutathion 40 EC @ 750 ml/ha with 3.84 per cent, buprofezin 20 EC @ 800 ml/ha with 3.95 per cent and sulfaxaflor 24SC @ 313 ml/ha with 4.03 per cent compared to untreated control which recorded 9.62 per cent white ear damage.

Leaf folder

Incidence of leaf folder was observed only during Kharif 2012 (Table 2). At 50 DAT except sulfaxaflor 24 SC @ 313 ml/ha all other treatments significantly reduced the leaf folder damage. Among these Sutathion 40 EC @ 1250 ml/ha was found superior with 53.35 per cent reduction over control followed by sulfaxaflor 24 SC @ 375 ml/ha with 43.2, Sutathion 40 EC @ 750 ml/ha with 42.87, chloranthriniliprole 18.5 SC @ 150 ml/ha with 37.96, acephate 667 g/ha with 36.02, buprofezin 20 EC @ 800 ml/ha with 32.4 and

Table 1. Effect of insecticides on dead hearts and white ears caused by stem borer on rice

Treatment	% Dead Hearts			% White hearts		
	Kharif	Rabi	Mean	Kharif	Rabi	Mean
T1	5.08 (12.8)	7.0 (15.1)	6.04	4.89 (12.5)	2.79 (9.0)	3.84
T2	5.3 (13.3)	5.2 (13.1)	5.25	3.88 (11.3)	1.95 (8.0)	2.92
T3	6.69 (14.7)	9.0 (17.2)	7.85	5.28 (11.8)	2.77 (8.8)	4.03
T4	5.0 (12.8)	5.7 (13.8)	5.35	2.05 (8.2)	3.12 (9.2)	2.59
T5	6.78 (14.9)	16.5 (23.5)	11.64	5.50 (13.3)	2.39 (8.5)	3.95
T6	5.26 (13.2)	16.6 (23.59)	10.93	3.46 (10.8)	0.78 (4.5)	2.12
T7	6.07 (14.2)	5.7 (13.7)	5.89	4.79 (12.6)	4.96 (12.6)	4.88
T8	5.88 (13.7)	15.05 (22.83)	7.44	4.22 (11.8)	1.1 (6.0)	2.66
T9	7.23 (15.5)	20.2 (26.7)	13.72	12.24 (20.48)	7.0 (15.3)	9.62
F-test	S	S	S	S	S	S
CV	2.22	15.76	12.82	18.46	15.70	17.08
CD	9.88	5.71	3.97	3.71	5.12	4.42

Figures in parenthesis are arc sin transformed values

T1 (Sutathion 40 EC @ 750 ml/ha), T2 (Sutathion 40 EC @ 1250 ml/ha), T3 (sulfaxaflor 24 EC @ 313 ml/ha), T4 (sulfaxaflor 24 EC @ 375 ml/ha), T5 (buprofezin 20 EC @ 800 ml/ha), T6 (chloranthriniliprole 18.5 SC @ 150 ml/ha), T7 (acephate 75 SP @ 667 g/ha), T8 (monocrotophos 36 WSC @ 1390 ml/ha) and T9 (control, water only), S= Significant

monocrotophos 36 WSC @ 1390 ml/ha with 28.67 per cent reduction over control.

At 80 DAT significantly lower leaf folder incidence was observed for sulfaxaflor 24 SC @ 375 ml/ha with 44.73 per cent reduction over control followed by Sutathion 40 EC @ 750 ml/ha with 43.72, Sutathion 40 EC @ 1250 ml/ha with 36.57 and chloranthriniliprole 150 ml/ha with 35.11 and acephate 667 g/ha with 30.71 per cent reduction over control.

Natural enemies: During Rabi 2012-13 the treatments Sutathion 40 EC, buprofezin 20 EC, chloranthriniliprole 18.5 SC, acephate 75 SP and monocrotophos 36

WSC proved safe to natural enemies like spiders except sulfaxaflor 24 SC (20.7 to 21.3/10 hills) compared to 29/hill in control (Table3). Jaafar et al (2013) also reported that newer insecticides viz indoxacarb 15.8 EC at 30 g ai/ha, chloranthriniliprole 18.5 SC at 30 g ai/ha, cartap hydrochloride 50 SP at 500 g ai/ha and fipronil 5 SC 625 ml/ha were found to be safe to natural enemies in the rice ecosystem. Misra (2008) reported that the newer insecticides like rynaxpyr 20 EC at 40 g ai/ha was found to be safe to natural enemies. Shanwei et al (2009) evaluated the newer insecticide chloranthriniliprole 20 SC at 40 g ai/ha which was highly safe to beneficial arthropods in the field.

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Table 2. Effect of insecticides on the dead leaves caused by leaf folder on rice in Kharif

Treatment	Dead leaves			
	50 DAT	% reduction over control	80 DAT	% reduction over control
T1	10.58 (18.7)	42.87	6.14 (14.3)	43.72
T2	8.64 (20.2)	53.35	6.92 (15.3)	36.57
T3	14.23 (22.1)	23.16	9.05 (17.4)	17.05
T4	10.52 (18.9)	43.2	6.03 (14.1)	44.73
T5	12.52 (20.7)	32.4	9.12 (17.5)	16.41
T6	11.49 (19.8)	37.96	7.08 (15.4)	35.11
T7	11.85 (20.1)	36.02	7.56 (16.0)	30.71
T8	13.21 (21.2)	28.67	8.12 (16.5)	25.57
T9	18.52 (25.5)	-	10.91 (19.1)	-
F-test	S		S	
CV	24.87		11.62	
CD	4.12		3.23	

Figures in parenthesis are arc sin transformed values

T1 (Sutathion 40 EC @ 750 ml/ha), T2 (Sutathion 40 EC @ 1250 ml/ha), T3 (sulfaxaflor 24 EC @ 313 ml/ha), T4 (sulfaxaflor 24 EC @ 375 ml/ha), T5 (buprofezin 20 EC @ 800 ml/ha), T6 (chloranthriniliprole 18.5 SC @ 150 ml/ha), T7 (acephate 75 SP @ 667 g/ha), T8 (monocrotophos 36 WSC @ 1390 ml/ha) and T9 (control, water only), S= Significant

Table 3. Effect of insecticide sprays on the spider population (in Rabi) on plants and yield of rice (Kharif and Rabi)

Treatment	# of spiders/10 hills (30 DAT)	Yield (tons/ha)	
		Kharif	Rabi
T1	23.7	5.45	5.84
T2	24.7	4.95	5.60
T3	21.3	5.55	5.80
T4	20.7	5.4	5.40
T5	26.7	4.95	5.20
T6	27	5.4	6.20
T7	29.7	5.35	5.20
T8	28.3	5.4	6.50
T9	29.0	4.10	4.60
F-test	S	S	S
CV	10.19	8.2	15.12
CD	4.58	0.95	1.45

Figures in parenthesis are arc sin transformed values

T1 (Sutathion 40 EC @ 750 ml/ha), T2 (Sutathion 40 EC @ 1250 ml/ha), T3 (sulfaxaflor 24 EC @ 313 ml/ha), T4 (sulfaxaflor 24 EC @ 375 ml/ha), T5 (buprofezin 20 EC @ 800 ml/ha), T6 (chloranthriniliprole 18.5 SC @ 150 ml/ha), T7 (acephate 75 SP @ 667 g/ha), T8 (monocrotophos 36 WSC @ 1390 ml/ha) and T9 (control, water only), S= Significant

Yield: During Kharif all the treatments recorded significantly higher yield (Table 3) than control except buprofezin EC 800 ml/ha. Highest yield recorded in sulfaxaflor 24 SC @ 313ml/ha was 5.55 tons/ha followed by Sutathion 40 EC @ 750 ml/ha (5.45 t/ha), sulfaxaflor 24 SC @ 375 ml/ha, chloranthriniliprole 150 ml/ha and monocrotophos 36 WSC with 5.4 tons/ha each and acephate 667 g/ha (5.35 tons/ha) compared to 4.10 tons/ha in untreated control.

During Rabi 2012-13 significantly highest yield was recorded in the treatment monocrotophos 36 WSC @ 1390 ml/ha with 6.5 tons/ha followed by chloranthriniliprole 150 ml/ha (6.2 tons/ha). Remaining treatments were at par with control (4.6 tons/ha.)

The results are in agreement with the findings of Chakraborty (2012) who reported that chloranthriniliprole 0.4 G @ 40 and 50 g ai/ha could effectively control stem borer complex and increase the grain yield. The effectiveness of Sutathion at 750 and 1250 ml/ha, sulfaxaflor at 313 and 375 ml/ha, chloranthriniliprole 150 ml/ha, monocrotophos 36 WSC and acephate 667 g/ha in reducing yellow stem borer incidence was reported by Bhanu et al (2014) and Karthikeyan and Christy (2014) and on leaf folder by Karthikeyan and Christy (2014). The newly tested molecules have been added to the list of new generation insecticides like cartap hydrochloride,

acephate 95 per cent SG, buprofezin 20 per cent + acephate 50 per cent and flubendamide 4 per cent + buprofezin 20 per cent (Karthikeyan and Christy 2014).

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