ORIGINAL RESEARCH ARTICLE OPEN ACCESS

Compatibility Studies of Insecticide and Fungicide Molecules against Major Pests and Sheath Blight in Rice

K. Karthikeyan

Regional Agricultural Research Station, Kerala Agricultural University, Pattambi.
Corresponding author: entokarthi_65@hotmail.com

Received: 9th February, 2015; Accepted: 28th May, 2015

Abstract

Three insecticide molecules flubendiamide + buprofezin (0.25 ml/lit), triazophos (0.30 ml/lit) and two fungicide molecules hexaconazole (2 ml/lit) and tricylazole (0.60 g/lit) were tested alone as well as in combination with an untreated control against stem borer, whorl maggot, leaffolder and sheath blight during the year 2013-14 at Regional Agricultural Research Station, Pattambi. The pooled results of two crop seasons revealed that flubendiamide + buprofezin followed by combination of triazophos + tricylazole recorded lowest incidence of dead hearts (0.53, 1.07%) and triazophos + tricylazole combination also recorded lowest incidence of white ear (3.90%) and whorl maggot (0.15%). Incidence of whorl maggot was low in all insecticides and in combination treatments. Leaffolder damage was low in flubendiamide + buprofezin and triazophos + tricylazole combination treated plants with 2.08 and 2.75 per cent damaged leaves, respectively. Sheath blight incidence was low in triazophos + tricylazole and tricyclazole treated plots (19.00 and 25.63 %). The grain yield was highest in flubendiamide + buprofezin (3355 kg/ha) followed by flubendiamide + buprofezin + hexaconazole (3268 kg/ha), triazophos + hexaconazole (3143 kg/ha) and triazophos + tricylazole (3116 kg/ha) treated plots.

Key Words: Flubendiamide+Buprofezin, Triazophos, Hexaconazole, Tricyclazole, Stem borer, Whorl maggot, Leaffolder.

Introduction

Rice is an important staple crop of Asia. The losses in rice due to insect pests account at least 20 per cent in India (Pathak *et al.,* 1982). More than 100 insect pests attack rice crop, out of which 20 are major pests (Pathak and Dhaliwal, 1987). Individual effects of insecticides were studied widely but very little information is available for combined effects of pesticides (Singh, 2000). Interactions between different groups of pesticides (fungicides, insecticides and herbicides) can lead to better management of sheath blight of rice (Prakash *et al*., 2013). Keeping this in view, trials were laid out to evaluate the new insecticide and fungicide molecules against major rice pests and sheath blight disease.

Materials and Methods

Two field experiments were conducted at Regional Agricultural Research Station, Pattambi, Kerala Agricultural University during 2013-2014 involving two cropping seasons *viz., kharif* 2013 and *rabi* 2014. Twenty five days old seedlings of variety 'Jyothi' were transplanted in plot size of 7 x 3 m with a spacing of 20 x 15 cm at the rate of two seedlings per hill. The experiment included nine treatments with two insecticides and two fungicide molecules alone as well as in combination with an untreated control. The treatments were replicated four times. The details of treatments and their dosages are given in Table 1. The sprays were made at 30, 50 and 80 DAT with a hand sprayer of 10 litres capacity. The observations were made a day before spraying and a week after spraying on per cent tiller damage (dead heart) at vegetative stage and white ear at reproductive stage for yellow stem borer (*Scirpophaga incertulas* Walker) and per cent damaged leaves in case of whorl maggot (*Hydrellia philipinna* Ferrino), leaffolder (*Cnaphalocrocis medinalis* Guenee) and per cent sheath blight incidence. The grain yield was recorded in kg/ha and the experiments were laid out using completely randomized block design (RBD). The means were compared for significance using CD at 0.05 probability level.

Results and Discussion

Effect on stem borer

The results of the first crop season (*kharif* 13) showed that per cent incidence of yellow stem borer (dead heart) was very low in flubendiamide + buprofezin treated plots with 0.23 per cent followed by triazophos @ 0.3 ml/lit with 0.80 per cent, combination of both insecticides and fungicide *viz*., flubendiamide + buprofezin + hexaconazole, triazophos + hexaconazole, triazophos + tricylazole and flubendiamide + buprofezin + hexaconazole recorded dead

hearts with 1.06, 1.08, 1.54 and 1.83 per cent, respectively, while fungicide treated plots suffered higher dead heart damage (Table 2). For white ear damage, all treatments showed significant reduction over untreated control (Table 2). During the second crop season (*rabi* 2013-14) triazophos + tricylazole suffered low dead heart damage caused by stem borer with 0.60 per cent followed by flubendiamide + buprofezin (0.83%) and flubendiamide + buprofezin + hexaconazole (0.78%) (Table 3). In case of white ear damage, flubendiamide + buprofezin treated plots recorded low incidence of white ear (3.03%) followed by triazophos + tricylazole (4.37%), flubendiamide + buprofezin + tricylazole (4.60%), flubendiamide + buprofezin + hexaconazole (4.71%), respectively, as given in Table 3. The pooled analysis of both the two crop seasons showed that flubendiamide + buprofezin was more effective showing 92.84 per cent reduced dead heart over control followed by triazophos + tricylazole with 85.54 per cent reduced dead heart over control. The incidence of dead hearts was also low in all other combinations of insecticides and fungicides (83.78-81.76%) and white ear incidence was low in insecticides in flubendiamide + buprofezin and triazophos + tricylazole with 49.35 and 49.2 per cent over control and all combinations reduced white ear incidence by 31.56 - 39.35 per cent over control (Table 4). Chlorantraniliprole (0.3 ml / lit) in combination with hexaconazole (2 ml / lit) caused less incidence of stem borer (Bhuvaneswari and Raju, 2013).

Effect on Whorl maggot

The whorl maggot incidence was significantly low in all treatments except control during the first crop *kharif* 2013 (Table 2). Similar results were obtained in second crop season also with low incidence of whorl maggot in all treatments (Table 3). The pooled data of both the crop seasons also showed that all insecticides and their combination with fungicides reduced whorlmaggot incidence from 28. 34 to 34.74 per cent over control as in Table 4.

Effect on Leaf folder

The leaf folder incidence during *kharif* 2013 was low in flubendiamide + buprofezin treated plots (4.15 %) followed by triazophos + tricyclazole and triazophos + hexaconzole treated plots with 5.12 and 5.93 per cent, respectively (Table 2). During second crop season, flubendiamide + buprofezin treated plots showed nil incidence of leaffolder followed by triazophos + tricyclazole (0.37%), flubendiamide + buprofezin + tricylazole (0.63%), triazophos (0.69%) and triazophos + hexaconazole (0.71%), respectively (Table 3). The pooled analysis of both the crop seasons showed that flubendiamide + buprofezin treated plots reduced incidence of leaffolder by 64.32 per cent over control followed by triazophos + tricyclazole and triazophos + hexaconazole (3.32%) flubendiamide + buprofezin + hexaconazole causing 52.83 and 41.17 per cent over control (Table 4). Studies corroborates with Prajapati *et al.,* (2005) who reported that triazophos in compatible with carbendazim and tricylazole was found effective against leaf folder. Raju *et al*., 1988 reported that combined spraying of monocrotophos with fungicides edifenphos, mancozeb, and carbendazim was effective against leaffolder. Combination of edifenphos with quinalphos and carbendazim with phosalone caused high mortality of rice leaf folder (Kalpana, 1992).

Effect on Sheath Blight

Sheathblight was low in triazophos + tricylazole treated plots (10.40%) followed by triazophos + hexaconazole (20.60) and tricylazole (22.50%) treated plots (Table 2). In the second crop season, triazophos + hexaconazole recorded lowest incidence of sheath blight (26.25%) followed by triazophos + tricylazole (27.50%) and tricylazole (28.75%) (Table 3). The pooled analysis of both the crop seasons showed that triazophos + tricylazole recorded lowest incidence of sheath blight with 80.04 per cent reduction over control followed by triazophos+hexaconazole and tricylazole with 75.38and 73.07 per cent over control, respectively (Table 4). Combination of insecticide pymetrozine (0.5g/lit) with hexaconazole recorded less incidence of sheath blight (Bhuvaneswari and Raju, 2013).

Grain Yield

During the first crop season (*kharif* 2013), flubendiamide + buprofezin recorded highest yield with 3636 kg/ha followed by flubendiamide + buprofezin + hexaconazole (3357 kg/ha), triazophos + tricylazole (3232 kg/ha), triazophos + hexaconazole (3048 kg/ha) sprayed plots (Table 2). During the second season, *rabi* 2013-14, triazophos sprayed plots recorded highest yield of 3813 kg/ha followed by triazophos + hexaconazole sprayed plots 3238 kg/ha (Table 3).The pooled analysis of both the seasons also showed that highest grain yield was recorded in flubendiamide + buprofezin with 19.48 per cent increase over control followed by flubendiamide + buprofezin + hexaconazole, triazophos + hexaconazole and triazophos + tricyclazole with 16.38, 11.93 and 10.97 per cent increase over control, respectively (Table 4).

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Table 1. Details of treatments with doses

Treatments	Name of the insecticides	Dosage @ ml/gm/litre
T1	Flubendiamide + Buprofezin	0.25
T2	Triazophos	0.30
T3	Hexaconazole	2.00
T4	Tricyclazole	0.60
T5	Flubendiamide+Buprofezin+Hexaconazole	0.25 + 2.00
T6	Flubendiamide+Buprofezin+Tricyclazole	0.25+0.60
T7	Triazophos+Hexaconazole	0.30 + 2.00
T8	Triazophos+Tricyclazole	0.30 + 0.60
T9	Control	

Table 2. Per cent incidence of rice pests during *kharif* 2013 season

Treat-ments	Treatments @ Kg/ml/ ha	Stem borer		Whorl maggot	leaffolder	Sheath blight	Grain yield (Kg/ha)
		(DH%) 50DAT	(WE%) 80 DAT	(DL%) 30 DAT	(DL%) 65DAT	85 DAT(%)	
1	Flubendiamide + Buprofezin	0.23*	4.78	5.88	4.15*	80.25	3636*
		(0.03)	(0.21)	(0.24)	(0.20)	(1.15)	
2	Triazophos	0.80*	4.86	5.53	8.54	88.50	2676
		(0.05)	(0.19)	(0.24)	(0.22)	(1.25)	
3	Hexaconazole	3.39	5.12	4.14	7.13	42.50	2500
		(0.18)	(0.23)	(0.21)	(0.27)	(0.50)	
4	Tricyclazole	2.13	4.60	5.99	9.05	22.50*	1869
		(0.15)	(0.22)	(0.24)	(0.30)	(0.42)	
5	Flubendiamide+Buprofezin+Hexaconazole	1.83	4.63	4.62	5.82	45.50	3357*
		(0.14)	(0.22)	(0.21)	(0.24)	(0.57)	

6	Flubendiamide+Buprofezin+Tricyclazole	1.06	5.92	5.12	9.52	44.20	2387
		(0.10)	(0.23)	(0.23)	(0.31)	(0.54)	
7.	Triazophos + Hexaconazole	1.08*	3.83	3.77	5.93	20.60*	3048
		(0.09)	(0.20)	(0.20)	(0.24)	(0.17)	
8.	Triazophos + Tricyclazole	1.54	3.42	3.25*	5.12	10.40*	3232*
		(0.12)	(0.18)	(0.15)	(0.21)	(0.12)	
9.	Control	6.04	6.64	6.21	9.08	95.60	2687
		(0.24)	(0.26)	(0.25)	(0.31)	(1.30)	
	CD (0.05%)	0.07	0.09	0.08	0.09	0.20	790

Figures in parentheses are arcsine transformed values

*Figures followed by different letters are significantly different at p=0.05

Table 3. Per cent incidence of rice pests in *rabi* 2013-2014 season

Treatments	Treatments @ Kg/ml/ha	Stem borer		Whorl maggot	Leaffolder	Sheath Blight	Grain yield (Kg/ha)
		(DH%)50 DAT	(WE%)80 DAT	(%DL) 30 DAT	(DL%)-65DAT	(%)85DAT	
1	Flubendiamide + Buprofezin	0.83*	3.03*	7.23	0.00*	82.75	3074
		(0.05)	(0.17)	(0.27)	(0.00)	(1.16)	
2	Triazophos	1.60	6.61	6.02	0.69	90.00	3381
		(0.09)	(0.22)	(0.24)	(0.06)	(1.30)	
3	Hexaconazole	5.60	7.23	8.54	1.54	37.50	2798
		(0.15)	(0.28)	(0.30)	(0.09)	(0.36)	
4	Tricyclazole	6.50	8.03	8.10	1.06	28.75*	2786
		(0.20)	(0.29)	(0.29)	(0.11)	(0.56)	
5	Flubendiamide+Buprofezin+Hexaconazole	0.78	4.71	7.42	1.04	30.00	3179
		(0.05)	(0.21)	(0.28)	(0.05)	(0.58)	
6	Flubendiamide+Buprofezin+Tricyclazole	1.65	4.60	9.08	0.63	30.00	3119
		(0.09)	(0.20)	(0.33)	(0.06)	(0.57)	
7.	Triazophos+Hexaconazole	1.62	6.70	10.20	0.71	26.25	3238*
		(0.16)	(0.25)	(0.35)	(0.06)	(0.53)	
8.	Triazophos+Tricyclazole	0.60*	4.37*	7.27	0.37*	27.50*	3000
		(0.03)	(0.19)	(0.27)	(0.03)	(0.54)	
9.	Control	8.75	8.75	12.19	2.57	94.75	2929
		(0.24)	(0.32)	(0.30)	(0.16)	(1.37)	
	CD (0.05%)	0.14	0.12	0.13	0.14	0.10	489

Figures in parentheses are arcsine transformed values

*Figures followed by different letters are significantly different at p=0.05

Table 4. Pooled analysis of both crop seasons

Treatments	Treatments @ Kg/ml/ha	Stem borer		Whorl maggot	Leaffolder	Sheath Blight	Grain yield (Kg/ha)
		(DH%) 50 DAT	(WE%)80 DAT	(%DL) 30 DAT	(DL%)65DAT	(%)85DAT	
1	Flubendiamide + Buprofezin	0.53*	3.91*	6.26	2.08*	81.50	3355*
		(0.04)	(0.19)	(0.27)	(0.10)	(1.16)	
2	Triazophos	1.20	5.74	6.01	4.62	89.25	3029
		(0.10)	(0.21)	(0.26)	(0.15)	(1.28)	
3	Hexaconazole	4.50	6.18	6.34	5.06	40.00	2649
		(0.17)	(0.24)	(0.28)	(0.20)	(0.49)	
4	Tricyclazole	4.52	6.32	7.05	5.35	25.63*	2328
		(0.18)	(0.25)	(0.30)	(0.21)	(0.43)	
5	Flubendiamide+ Buprofezin+Hexaconazole	1.31	4.67	6.02	3.43	37.80	3268
		(0.10)	(0.21)	(0.25)	(0.14)	(0.53)	
6	Flubendiamide+ Buprofezin+Tricyclazole	1.36	5.26	6.60	5.12	37.10	2753
		(0.10)	(0.22)	(0.28)	(0.19)	(0.48)	
7.	Triazophos + Hexaconazole	1.35	5.27	6.00	3.32	23.43	3143*
		(0.10)	(0.23)	(0.26)	(0.14)	(0.36)	
8.	Triazophos + Tricyclazole	1.07*	3.90*	5.26	2.75*	19.00*	3116*
		(0.08)	(0.20)	(0.21)	(0.12)	(0.33)	
9.	Control	7.40	7.70	9.21	5.83	95.18	2808
		(0.24)	(0.28)	(0.36)	(0.22)	(1.34)	
	CD (0.05%)	0.07	0.07	0.07	0.07	0.10	808

Figures in parentheses are arcsine transformed values

*Figures followed by different letters are significantly different at p=0.05