Nature Environment and Pollution Technology
An International Quarterly Scientific Journal

ISSN: 0972-6268	Vol. 15	No. 1	pp. 233-235	2016

Original Research Paper

Compatibility and Efficacy of Insecticide and Fungicide Combinations on Major Pests and Sheath Blight of Paddy

V. Visalakshmi*†, M. R. B. Raju*, A. Upendra Rao*, K. Madhu Kumar* and N. Hari Satyanarayana**
*Agricultural Research Station, Ragolu-532 484, Srikakulam District, A.P., India
**Agricultural Research Station, Amadalavalasa-532 185, Srikakulam District, A.P., India
†Corresponding author: V. Visalakshmi

Nat. Env. & Poll. Tech.
Website: www.neptjournal.com
Received: 12-03-2015
Accepted: 25-04-2015

Key Words:
Compatibility
Fungicides
Insecticides
Pests and diseases
Rice

ABSTRACT

Field experiments were conducted during *kharif* 2012 and 2013 at Agricultural Research Station, Ragolu, Srikakulam district, Andhra Pradesh to assess the efficacy and compatibility of five insecticides and two fungicides at recommended concentrations. The evaluation was done as a tank mix in various insecticide and fungicide combinations for their efficacy against sheath blight, stem borer, leaf folder and brown plant hopper, for the purpose of reducing the application cost in the event of simultaneous occurrence of both pest and disease during any stage of crop growth period. Among different combinations tested during *kharif 2012,* Flubendamide @0.25mL/L in combination with Trifloxystrobin 25% + Tebuconazole 50% (Nativo 75%) 0.4g/L recorded less sheath blight incidence (27.33%) and less pest incidence i.e., leaf folder (2.0% leaf damage) followed by Chlorpyriphos @2.5mL/L + Propiconazole @2.0mL/L (30.13%, 7.92%) and Chlorantriniliprole @0.3mL/L + Propiconazole @1.0mL/L (32.42%, 8.13%) and Flubendamide @ 0.25mL/L + Propiconazole @1.0mL/L (35.17%, 1.59%) compared to other combinations and untreated control. During *kharif* 2013 also, Flubendamide @0.25mL/L in combination with Trifloxystrobin 25% + Tebuconazole 50% (Nativo 75%) 0.4g/L recorded less sheath blight incidence (29.01%) with significant reduction of brown plant hopper (2.0/hill) and stem borer as white ears (2.8%) followed by Chlorantriniliprole @0.3mL/L + Trifloxystrobin 25% + Tebuconazole 50% (Nativo 75%) 0.4g/L with 29.36% sheath blight and 4.19% dead hearts and 2.4% white ears. Chlorpyriphos @2.5mL/L + Trifloxystrobin 25% + Tebuconazole 50% (Nativo 75%) 0.4g/L followed by Profenophos @2mL/L + Propiconazole @1mL/L were the safest combinations for natural enemies in rice ecosystem. All the combinations recorded significantly higher yields compared to untreated control.

INTRODUCTION

Rice is a major food of the world and more than half of the population subsists on it. It is the main livelihood of rural population living in subtropical and tropical Asia and hundreds of million people living in Africa and Latin America (Sidhu et al. 2014). Asia accounts for about 90% of world's rice area and production. India is the world's largest producer and consumer of rice next to China. In India, the area under rice cultivation in the state of Andhra Pradesh is 3628 thousand hectares with production of 11510 thousand tones with a productivity of 3173kg/ha. Stem borer and brown plant hopper are the worst pests which can cause severe damage and yield loss to the rice crop in the later stage (Chormule et al. 2014). Moreover, occurrence of pests and diseases together in rice, demands the necessity of insecticidal and fungicidal application at the same place and time in combination. In many areas, sheath blight, brown plant hopper, leaf folder and stem borer occur at the same stage of the crop growth. Therefore, a combined application of effective insecticides and fungicides is a practical necessity. In rice growing areas of Andhra Pradesh farmers are regularly going for 2-3 sprays in rice crop, and mixed combinations of insecticides and fungicides is a common practice. Keeping in view, the present study was undertaken with effective and recommended insecticides like Choranthriniprole 18.5%SC, Chlorpyriphos 20%EC, Cartap hydrochloride 50%SP, Flubendamide 480SC @0.3mL/L, Profenophos 50EC and fungicides like Propiconazole and Nativo (Trifloxystrobin 25% + Tebuconazole 50%) at recommended rates to find their efficacy on brown plant hopper, leaf folder and stem borer and sheath blight as well as the compatibility of the test insecticides and fungicides.

MATERIALS AND METHODS

The experiments were conducted during *kharif* 2012 and 2013 seasons at Agricultural Research Station, Ragolu, Srikakulam district, Andhra Pradesh. Five insecticides viz., Choranthriniprole 18.5%SC, Chlorpyriphos 20%EC, Cartap hydrochloride 50SP, Flubendamide 480SC@0.3mL/L and Profenophos 50E @0.3mL, 2.5mL/L, 2g/L, 0.25mL/L and

2mL/L respectively and two fungicides viz., Trifloxystrobin 25% + Tebuconazole 50% (Nativo 75%) 0.4g/L and Propiconpazole 25EC @1.0mL/L were evaluated as tank mix of insecticide and fungicide combinations for their efficacy against brown plant hopper, leaf folder and stem borer and sheath blight as well as to investigate their compatibility as tank mix application for the purpose of reducing the application cost in the event of simultaneous occurrence of both disease and pests during any stage of crop growth period. The rice variety PLA 1100 was transplanted during *kharif* 2012 and 2013 season with 11 treatments and three replications in randomized block design. A spacing of 20 × 15cm was adopted in a gross plot size of 12sq. m.

The pests and disease was first noticed in the experimental plots during maximum tillering stage during both the seasons and reached ETL near booting stage, hence sprayings were given once at booting and second at 50% flowering stages. A spray fluid of 500 L/ha was used to ensure thorough coverage of the crop. Stem borer and gall midge total tillers and number of dead hearts/silver shoots recorded on 20 plants at random per plot at vegetative stage. Total number of panicle bearing tillers and white ears due to stem borer were recorded at pre-harvest stage on 20 plants at random per plot and the % dead hearts/silver shoos/white ears was calculated by using the following formula.

$$\text{Percent dead hearts/silver shoots/white ears} = \frac{\text{Total no.of dead hearts/silver shoots/white ears from 20 hills}}{\text{Total number of tillers from 20 hills}} \times 100$$

For brown plant hopper, number of hoppers per hill were recorded per 20 hills at random per plot. The percent disease incidence was calculated from the data collected from 20 hills of each treatment in each replication as per the standard evaluation system (IRRI 1996). The data of percent pest and disease incidence were transformed into arc sine values before the statistical analysis. The grain yield was recorded from each gross plot and calculated to kg/ha.

RESULTS AND DISCUSSION

During *kharif* 2012, the data revealed that among different insecticide and fungicide combinations used for the control of sheath blight, leaf folder, Flubendamide @0.25mL/L in combination with Trifloxystrobin 25% + Tebuconazole 50% (Nativo 75%) 0.4g/L has recorded less sheath blight incidence (27.33%) and leaf folder damage (2.0% leaf damage) closely followed by Chlorpyriphos @2.5mL/L + Propico nazole @2.0mL/L (30.13%, 7.92%), Chlorantriniliprole @0.3mL/L + Propiconazole @1.0mL/L (32.42%, 8.13%) and Flubendamide @0.25mL/L + Propiconazole @1.0mL/L (35.17%, 1.59%) compared to other combinations and untreated control, whereas 47.58% sheath blight damage and 3.36% leaf folder damage was observed in untreated control.

During *kharif* 2013, the incidence of leaf folder was very low. The insecticide Flubendamide @0.25mL/L in combination with Trifloxystrobin 25% + Tebuconazole 50% (Nativo 75%) 0.4g/L has recorded less sheath blight incidence (29.0%) and also lesser stem borer incidence in terms of percent white ears (2.8%) and less brown plant hopper/hill (2.0) closely followed by Chloranthriniliprole @0.3mL/L + Trifloxystrobin 25% + Tebuconazole 50% (Nativo 75%) 0.4g/L with 29.36% sheath blight, less stem borer in terms of 4.19% dead heart and 2.4% white ears, Chloranthri niliprole @0.3mL/L + Propiconazole @1mL/L (34.39% sheath blight, 1.82% DH, 1.6% WE) and Chlorpyriphos @2.5mL/L + Propiconazole @1mL/L with 32.23% sheath blight and 2.4% white ears.

The tested combinations were physically compatible at laboratory and did not record any phytotoxic symptoms under field conditions during both the years. The results confirm that the insecticide and fungicides involved in the trial are compatible in all combinations from the point of sheath blight, stem borer, leaf folder and brown plant hopper. The overall results revealed that tank mixing of insecticides with fungicides involved in the present study did not reduce the efficacy of the fungicides against sheath blight and that of the insecticides against stem borer, leaf folder and brown plant hopper. Hence, they are compatible with each other for spray application to control the rice pest and diseases.

The findings are in conformity with Bhuvaneswari & Krishnam Raju (2013), where it was reported that the combination of Chloranthriniliprole @0.3mL/L and Hexaconazole @2mL/L gave less sheath blight, stem borer and leaf folder incidence in rice crop. Singh et al. (2010) reported that combination of insecticides (Indoxicarb, Cartap hydrochloride) and fungicides (Tricyclozole, Iprobenphos) were biologically as effective as their individual treatments against neck blast, leaf folder and stem borer in rice. Prajapati et al. (2005) reported that Triazophos (20%EC) @0.02% alone and mixed with Carbendizm (50%WP) @0.05% and Tricyclozole (75%WP) @0.04% was found effective in controlling leaf folder as well as white backed plant hoppers. Bhatnagar (2004) reported the combination of Cartap hydrochloride and Tricyclozole was effective in reducing the damage of rice leaf folder and blast and found to be compatible. Chormule et al. (2014) reported that Flubendamide 480 SC @30g a.i./ha and Cartap hydrochloride 50 SP @375g a.i./ha alone have shown better results against stem borer in rice crop.

Table 1: Efficacy of insecticide and fungicide combinations against major pests and diseases of rice.

S. No.	Insecticide and fungicide tank mixtures	Kharif 2013				Kharif 2012	
		Stem borer dead hearts (%)	BPH Population (%)	Stem borer White ear (%)	Sheath blight Incidence (%)	Leaf folder leaf damage (%)	Sheath blight Incidence (%)
1	Choranthriniprole 0.3ml/l + Propiconazole 1.0ml/l	1.82 (7.42)	2.8	1.6 (5.75)	34.39 35.81	2.02 (8.13)	32.42 (34.71)
2	Choranthriniprole 0.3ml/l + Nativo 0.4g/l	4.19 (11.73)	2.7	2.4 (8.9)	29.36 32.69	2.51 (9.1)	37.79 (37.93)
3	Chlorpyriphos 2.5ml/l + Propiconazole 1.0ml/l	4.4 (12.11)	3	1.7 (7.39)	32.23 34.09	1.86 (7.92)	30.13 (36.00)
4	Chlorpyriphos 2.5ml/l + Nativo 0.4g/l	3.43 (10.53)	2.4	2.47 (8.97)	39.4 38.79	2.5 (9.1)	37.02 (41.09)
5	Flubendamide 0.25 ml/l + Propiconazole 1.0ml/l	5.57 (13.37)	2.7	1.6 (5.75)	37.32 37.64	1.59 (7.27)	35.77 (36.73)
6	Flubendamide 0.25 ml/l + Nativo 0.4g/l	4.73 (12.66)	2	2.8 (7.52)	29.01 (32.46)	2 (8.13)	27.33 (31.52)
7	Cartap hydrochloride 2.0g/l + Propiconazole 1.0ml/l	1.7 (7.09)	1.7	5.07 (12.75)	38.27 (38.22)	1.83 (7.71)	35.89 (36.80)
8	Cartap hydrochloride2.0g/l + Nativo 0.4g/l	4.37 (11.98)	2.4	1.53 (7.03)	47.02 (28.19)	1.75 (7.71)	37.05 (37.49)
9	Profenophos2.0ml/l + Propiconazole 1.0ml/l	1.7 (7.09)	1.7	5.07 (12.75)	38.27 (38.22)	2.29 (8.72)	38.84 (38.55)
10	Profenophos2.0ml/l + Nativo 0.4g/l	4.72 (12.5)	2.5	1.02 (5.78)	39.29 (38.79)	1.71 (7.49)	43.28 (41.14)
11	Control	8.57 (17.02)	3.3	6.89 (15.05)	49.88 (44.93)	6.36 (14.64)	47.58 (43.61)
	Significance	Sig.	Sig.	NS	Sig.	Sig.	Sig.
	CV (%)	18.2	25.64		19.5	24.39	29.48
	CD (0.05)	4.33	1.2		14.8	4.14	9.36

Thus, the effectiveness of the tested fungicides was not hindered by mixing with the insecticides. All the insecticide and fungicide combinations recorded significantly higher yields compared to control.

ACKNOWLEDGEMENT

The authors are highly thankful to the authorities of ANGRAU and DRR (ICAR), Hyderabad for providing necessary infrastructural facilities and financial support to conduct this research work.

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