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Screening of Newer Insecticides Against Major Insect Pests of Rice

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Abstract
Field experiment was conducted at Agriculture Research Station, Sakoli, Dist. Bhandara (M.S.) during *Kharif* 2015 to screen newer insecticides for efficacy against major insect pests of rice. Among the various insecticide screened, flubendiamide 240% g/L plus thiacloprid 240% g/L was found most promising against gall midge followed by rynaxypyr 20 SC, thiacloprid 240 SC and flubendiamide 480 SC. Flubendiamide 480 SC, dinotefuran 20 SG, thiacloprid 240 SC, flubendiamide 240% g/L plus thiacloprid 240% % g/L and rynaxypyr 20 SC were comparatively more effective against dead heart. However, results clearly indicated that, dinotefuran 20 SG was exhibited most promising and significantly superior insecticide with 3.64 % white earhead incidence, which was at par with flubendiamide 240% g/L plus thiacloprid 240% % g/L (3.72 %) and rynaxypyr 20 SC (4.13 %). The highest incidence of white earhead was noticed in untreated control (13.18 %). Rynaxypyr 20 SC was best treatment in reducing leaf folder incidence followed by flubendiamide 240% g/L plus thiacloprid 240% g/L, flubendiamide 480 SC, dinotefuran 20 SG and thiacloprid 240 SC. Highest population of spider was recorded in untreated control (0.25 no./hill) followed by flubendiamide 240% g/L plus thiacloprid 240% % g/L (0.18 no./hill). Treatment thiacloprid 240 SC recorded significantly higher yield (36.17 q/ha) over other treatments and untreated control (21.00 q/ha) and it was at par with rynaxypyr 20 SC (33.00 q/ha).
Keywords : Rice, major insect pests, efficacy, newer insecticides.

Introduction :

Over 90 per cent of the world's rice is produced and consumed in Asia and about 2 billion people obtained 60-70 percent of their energy intake from rice and its products (Rai, 2004). Rice occupies largest area amongst all food crops in India. In India, rice grows in about 43.9 million ha area with a production of 104.8 million tones and productivity 2390 kg/ha (rice) during 2015-16. The total area in Maharashtra state was 15.57 lakh ha with annual rice production of 36.54 (52.95 rough rice) lakh tones and the average productivity was 2.35 (3.40 rough rice) tones/ha during 2015-16 (Anonymous, 2016). Among the various factors, insect pests are the main causes of low yields of rice in India (Matteson, 2000 and Behura *et al.*, 2011). Rice crop is attacked by more than 100 species of insects, but 20 species are of economic importance (Kalode, 2005). Insect-pests *viz.,* gall midge, stem borer, leaf folder and plant hoppers are the major constraints in achieving desired level of rice yield. The yield losses caused by insect pests in rice have been reported to the tune of 25 per cent (Dhaliwal *et al.*, 2010). Insecticide use continues to be a strategic component of rice pest management. Farmers find it easy and suitable to apply insecticides as the results are quick and sometimes very effective compared to most other available options. Experiments on the efficacy of synthetic pesticides of different new brands have been carried out by several authors like Kushwaha, 1995, Wakil, *et al.*, 2001, Kulagod, *et al.*, 2011, Kartikeyan, *et al.*, 2012, Chanu and Sontakke, 2015, etc. Effective insecticides with targeted action against multiple pests as well as individual pest specific action are now being focused upon for application particularly in rice fields with multiple pest scenario. Hence, efforts were made to assess the relative field efficacy of newer insecticides against major insect pests of rice at Agriculture Research Station, Sakoli, Dist. Bhandara (M.S.) during *Kharif* 2015.

Material and Methods :

In this trial, during *Kharif* 2015, two newer insecticides *viz.*, DPX-RAB 55 (DPX-RAB 55 106 SC) and flubendiamide 240% g/L plus thiacloprid 240% g/L (Belt Expert 480 SC-g/L) were evaluated *vis a vis* recommended insecticides *viz.,* flubendiamide (Fame 48% SC), thiacloprid (Alanto 24% SC), rynaxypyr (Coragen 20 SC) and dinotefuran (Osheen 20 SG) at specified dosages for their efficacy to assess their relative efficacy against insect pests on rice. DPX-RAB 55 belongs to the novel chemical group of mesoionic insecticides and is a potent nAChR inhibitor that blocks nerve transmission causing lethargy in plant hoppers. It shares a binding site with other IRAC Group 4 insecticides. However, the new chemical interacts in a unique way with the α2-nAChR, eliciting distinct physiological responses. Belt expert (flubendiamide 240% g/L plus thiacloprid 240% % g/L) is a combination product with a broad spectrum action against chewing as well as sucking pests. Untreated control treatment without any insecticide application was also included for comparison.

These seven treatments were replicated thrice each and laid out in Randomized Block Design (RBD). Popular rice variety PKV HMT was transplanted with spacing of 20 cm X 15 cm and the gross plot size was maintained at 20 m^2. A blanket application of all the treatments was given at 15 DAT, except DPX RAB-55 treatment and untreated control. Subsequently applications of individual treatments were done at 36 DAT based on pest incidence exceeding the economic threshold level guidelines. The DPX RAB-55 treatment was applied only once during 36 DAT. The insecticides were applied as high volume sprays @ 500 litres of spray fluid /ha. Observations on insect pest incidence and spider were recorded following standard procedural protocols. At the time of harvest, the grain yield from net plot leaving 2 border rows on all sides and converted into yield per hectare.

Result and Discussion:

Fubendiamide 240% g/L plus thiacloprid 240% g/L followed by rynaxypyr 20 SC, thiacloprid 240 SC and flubendiamide 480 SC with 10.31, 10.44, 10.57 and 11.44 % silver shoots, respectively, were most promising against gall midge and superior over untreated control with 14.54% silver shoots. In case of stem borer, the treatments with flubendiamide 480 SC was observed the most effective with minimum dead heart incidence of 1.45 % followed by dinotefuran 20 SG (1.85%), thiacloprid 240 SC (1.93%), flubendiamide 240% g/L plus thiacloprid 240% g/L (2.05%) and rynaxypyr 20 SC (2.08%). The maximum dead heart incidence was noticed in untreated control with 2.99%. However, dinotefuran 20 SG was exhibited most promising and significantly superior insecticide with 3.64 % white earhead incidence, which was at par with flubendiamide 240% g/L plus thiacloprid 240% g/L (3.72 %) and rynaxypyr 20 SC (4.13 %). The highest incidence of white earhead was noticed in untreated control (13.18 %). Rynaxypyr 20 SC was best treatment in reducing leaf folder incidence with 2.09 % damage as against 3.75 % damage in untreated control. This insecticide was closely followed by flubendiamide 240% g/L plus thiacloprid 240% g/L, flubendiamide 480 SC, dinotefuran 20 SG and thiacloprid 240 SC with 2.13, 2.34, 2.38 and 2.46 % leaf folder damage, respectively, but did not differ significantly with one another. Meager incidence of green leaf hopper, brown plant hopper and white backed plant hopper was noticed in this trial during *Kharif* 2015 and there were no significant difference in their incidence in different treatments. Highest population of spider was recorded in untreated control (0.25 no./hill) followed by treatment of flubendiamide 240% g/L plus thiacloprid 240% g/L (0.18 no./hill). Treatment thiacloprid 240 SC recorded significantly higher yield (36.17 q/ha) over other treatments and untreated control (21.00 q/ha) and it was at par with rynaxypyr 20 SC (33.00 q/ha). This was followed by flubendiamide 240% g/L plus thiacloprid 240% g/L (28.17 q/ha), dinotefuran 20 SG (27.67 q/ha) and flubendiamide 480 SC (27.00 q/ha).

The present findings are in agreements with the results of Singh and Singh (2015) who revealed that flubendiamide 39.35 SC @ 24 g a.i./ha was found quite effective against the gall midge and yellow stem borer.

The result of the present investigation showed that the flubendiamide 480 SC was most effective control against dead heart incidence. The present findings are in agreement with the results of Hugar *et al.,* (2009) who showed that flubendiamide 500 SC @ 24 g a.i./ha was effective against rice yellow stem borer. Similarly, Subba Rao *et al.*, (2010) reported that Takumi 20WG (flubendiamide) @ 35 g a.i./ha proved to be the most effective treatment in reducing the stem borer population. Prasad *et al.,* (2010) exhibited flubendamide 480 SC @ 24 g a.i./ha was effective against yellow stem borer on deep water rice variety. Similarly, Prasad *et al.,* (2014) reported that flubendamide 20 WDG @ 175 g/ha was effective against yellow stem borer on semi deep water rice. Chakraborty (2012) stated that new generation pesticide like flubendiamide 480 SC together with the application of neem seed kernel extract (NSKE) 5%, neem leaf extract (NLE) 5%, deltamethrin 1% + triazophos 35% was most promising against yellow stem borer on rice.

Sekh *et al.,* (2007) exhibited that flubendamide 480 SC @ 24 and 30 g a.i./ha provided effective control against yellow stem borer and leaf folder. Similarly, Sandhu and Dhaliwal (2016) stated that, Fame 480 SC (flubendiamide 39.35%) @ 50 ml/ha proved to be better option for management of two major pests of rice i.e. stem borer and leaf folder. Netam (2015) found flubendiamide 24%+thiacloprid 24% (48%) SC @ 200 ml/ha was the most effective in reducing the number of dead hearts and white ear heads population per hill followed by flubendiamide 48% SC @ 125 ml/ha were at par for reducing the incidence of dead hearts and white ear heads, respectively over untreated control. However, for the control of leaf folder, flubendiamide 24% + thiacloprid 24% (48%) SC@ 200 ml/ha showed lower leaf damage with minimum incidence of leaves over untreated control. Maximum population of spiders was observed under untreated control.

Kulagod *et al.,* (2011) reported that flubendamide 480 SC @ 0.2 ml/l was found effective for management of stem borer and leaf folder and harvested higher yield. Similarly, Girish *et al.,* (2015) recorded that flubendamide 480 SC @ 0.2 ml/l

proved for management of leaf folder and harvested higher yield. Devi and Singh (2016) exhibited that flubendamide 39.35 SC @ 24 g a.i./ha was found most effective against yellow stem borer and harvested highest grain yield.

The results are in conformity with the results of same trial carried out by ICAR- Indian Institute of Rice Research, Hyderabad at other 33 locations in the country during *Kharif* 2015 which exhibited the performance of flubendiamide 240% g/L plus thiacloprid 240% g/L was at par with the standard check insecticide rynaxypyr 20 SC against stem borer and leaf folder. Rynaxypyr 20 SC treatment yielded the highest, however all the insecticide treatments were at par and significantly superior to control (Anonymous, 2015).

Conclusion :

It may be concluded form the present study that, the new flubendiamide 240% g/L plus thiacloprid 240% g/L, flubendiamide 480 SC, dinotefuran 20 SG and rynaxypyr 20 SC afforded more effective management of gall midge, stem borer and leaf folder in less pesticide load per unit area. However, different insecticides should be used alternatively to avoid rick of development of resistant to insect pests.

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Table : Effect of insecticides on incidence of insect pests, natural enemies and yield of paddy *Kharif* 2015.

S. N.	Insecticide	Dose of formu-lation or product /ha	Gall midge (% Silver Shoot)			Stem Borer				Leaf folder (% Damage)			GLH No. /hill	BPH No. /hill	WBPH No. /hill	Spider No./hill			Yield (q/ha)
						Dead heart (%)			White ear-head (%)										
			30 DAT	51 DAT	Pooled	30 DAT	51 DAT	Pooled		25 DAT	46 DAT	Pooled	39 DAT	39 DAT	39 DAT	25 DAT	46 DAT	Pooled	
1	DPX-RAB 55	237.5 ml	12.80 (3.50)	14.45 (3.65)	13.63 (3.58)	1.97 (1.35)	2.35 (1.53)	2.16 (1.46)	7.08 (2.63)	3.28 (1.80)	3.36 (1.79)	3.32 (1.80)	3.30 (1.80)	5.27 (2.29)	5.93 (2.43)	0.10 (0.32)	0.10 (0.32)	0.10 (0.32)	24.83
2	Flubendiamide 240%-g/L + Thiacloprid 240%-g/L	250 ml	11.00 (3.28)	9.62 (2.93)	10.31 (3.14)	1.01 (1.00)	3.09 (1.71)	2.05 (1.41)	3.72 (1.91)	1.86 (1.35)	2.40 (1.52)	2.13 (1.44)	3.00 (1.72)	5.73 (2.38)	6.03 (2.46)	0.13 (0.36)	0.23 (0.47)	0.18 (0.42)	28.17
3	Flubendiamide 480 SC (g/L)	50 ml	9.91 (3.11)	12.98 (3.53)	11.44 (3.33)	1.04 (0.99)	1.85 (1.35)	1.45 (1.20)	4.66 (2.16)	2.56 (1.59)	2.11 (1.44)	2.34 (1.52)	3.00 (1.72)	5.87 (2.42)	6.33 (2.50)	0.10 (0.32)	0.20 (0.44)	0.15 (0.38)	27.00
4	Thiacloprid 240 SC(g/L)	250 ml	10.44 (3.23)	10.71 (3.20)	10.57 (3.23)	1.58 (1.25)	2.28 (1.50)	1.93 (1.38)	6.55 (2.49)	1.63 (1.27)	3.29 (1.72)	2.46 (1.53)	3.20 (1.77)	5.77 (2.40)	5.90 (2.42)	0.10 (0.32)	0.20 (0.44)	0.15 (0.38)	36.17
5	Rynaxypyr 20 SC	150 ml	9.18 (2.98)	11.69 (3.32)	10.44 (3.20)	1.50 (1.22)	2.66 (1.60)	2.08 (1.44)	4.13 (2.02)	2.04 (1.35)	2.14 (1.45)	2.09 (1.43)	3.43 (1.84)	5.60 (2.36)	6.53 (2.56)	0.10 (0.25)	0.17 (0.39)	0.13 (0.36)	33.00
6	Dinotefuran 20 SG	200 g	11.11 (3.33)	14.41 (3.63)	12.76 (3.51)	1.39 (1.17)	2.31 (1.48)	1.85 (1.35)	3.64 (1.91)	2.03 (1.38)	2.73 (1.64)	2.38 (1.53)	2.90 (1.69)	5.13 (2.27)	6.20 (2.49)	0.13 (0.36)	0.13 (0.36)	0.13 (0.36)	27.67
7	Untreated Control	-	14.66 (3.82)	14.42 (3.63)	14.54 (3.79)	2.13 (1.46)	3.85 (1.96)	2.99 (1.73)	13.18 (3.61)	3.45 (1.85)	4.06 (2.00)	3.75 (1.93)	3.67 (1.91)	6.33 (2.52)	7.00 (2.64)	0.17 (0.40)	0.33 (0.58)	0.25 (0.50)	21.00
	'f' test		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**S**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**S**	**S**
	SE (M)								0.19									0.03	2.32
	CD at 5%								0.58									0.10	7.16
	CV (%)								13.62									14.60	14.24

*Figures in parentheses are corresponding values of square root transformation.

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