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BIO-EFFICACY OF CERTAIN INSECTICIDES AGAINST RICE STEM BORER, *SCIRPOPHAGA INCERTULUS* (WALKER)

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ABSTRACT : Spray of Cartap hydrochloride 75SG @ 375 g.a.i./ha was found most effective and minimum dead hearts of 0.66 and 0.73 per cent and 0.26 & 0.24 per cent were respectively recorded on 7th and 15th day after Ist and IInd application and was at par with higher dose of Cartap hydrochloride @ 750 g.a.i./ha (with respective damage of 0.75 and 0.83 and 0.34 & 0.33 per cent) and Fipronil 5 SC @ 25 ml/ha (with respective damage of 0.91 & 1.05 per cent and 0.53 & 0.50 per cent) on the same dates after Ist and IInd applications. Minimum white ear incidence of 0.18 per cent and 0.20 per cent was recorded on 7th and 15th day of 3rd application in Cartap hydrochloride 75 SG @ 375 g a.i. ha^{-1} treated plots and was at par with Cartap hydrochloride 75 SG @ 750 g. a.i. ha^{-1} (0.25 & 0.26 per cent), Fipronil 5 SC @ 25 ml ha^{-1} (0.43 & 0.45 per cent) and Cartap hydrochloride 75 SG @ 318.75 g. a.i. ha^{-1} (0.44 & 0.46 per cent). The remaining treatments were found effective and significantly superior over untreated control.

Key words : Bio-efficacy, *Scirpophaga incertulus*, incidence, *Oryza sativa*.

INTRODUCTION

Rice (*Oryza sativa*) is world staple food for large proportion especially inside East Asia and Indonesia. In India rice is cultivated in 44.10 m ha with production of 131.3 mt and average productivity of 3.0 t/ha (Ferrer, 2011). Pasalu *et al* (2007) have reported yellow stem borer as a pest of national significance which cause significant yield loss across the rice eco-system. Alam *et al* (1992) estimated the maximum stem borer infestation of (20.79%) in deep water followed by low land (12.60%) and medium land (7.83%). Yellow stem borer is a major rice damaging species in Eastern part of India as well as in Uttar Pradesh, which cause low production of rice in fragile eco-systems (Senapati and Panda, 1999). Therefore, the present study was conducted to test the efficacy of certain insecticides against yellow rice stem borer.

MATERIALS AND METHODS

For evaluating the bio-efficacy of insecticides the experiments were conducted during *Kharif* 2010 at Students' Instructional Farm, NDUAT Campus, Kumarganj, Faizabad (U.P.) India. Thirty days old seedlings of rice variety 27P77 were transplanted in 2nd fortnight of July under Randomized Block Design in 5 x 4 m plot size with 5 replications. At the time of transplanting spacing of 20 cm between row to row and 15 cm between plant to plant was maintained. All agronomical practices were adopted to raise a good crop. Soluble granules of Cartap hydrochloride 75 SG were sprayed in the standing crop under sufficient moisture in field. Amount of insecticides *viz*. 4 doses of Cartap hydrochloride soluble granules, Cartap hydrochloride 50 per cent SP, Lambda cyhalothrin 2.5 EC and Fipronil 5 SC were measured and diluted separately in the required amount of water (based on the crop stage) and sprayed thoroughly with the help of foot sprayer. First application of the treatment was done at 30 days after transplanting (DAT) followed by the second and third applications on 45 & 60 DAT, respectively. The data on dead heart (DH) and white ears (WE) caused by yellow stem borer were recorded at one day before and 7 and 15 days after treatment. For calculating the per cent damage total numbers of tillers/ panicles and damaged tillers/panicles (DH/WE) were counted in quadrate on 12 randomly selected hills at three places in each plot. The data were converted into per cent (DH/WE) with the help of the following formulae:

$$\text{Dead hearts } \% = \frac{\text{Number of damaged tillers/12 hills}}{\text{Total number of tillers (healthy + damaged)/12 hills}} \times 100$$

$$\text{White ears} = \frac{\text{Number of damaged tillers/12 hills}}{\text{Total number of panicles (healthy + damaged)/12 hills}} \times 100$$

Arc sine values and Critical Difference were also calculated to test the significance of mean for the treatments difference at 5 per cent level probability.

RESULTS AND DISSCUSSION

Effects of various insecticides against yellow stem borer were determined on the basis of the dead hearts/ white ears (DH/WE) incidence and are presented in Table 1. During the *Kharif* season 2010 the dead hearts (DH) at pre treatment were homogeneous throughout the experimental area, the observations showed non significant difference among the treatments that ranged from 1.78 to 1.90 per cent dead hearts. The first treatment was done at 30 days after transplanting.

At 7 days after first spraying (DAS) of insecticides the dead hearts varied from 0.66 to 2.33 per cent in which all the treatments were found effective and significantly superior over the untreated control. The most effective treatment recorded was Cartap hydrochloride 75 SG @ 375g a.i. ha^{-1} and was at par with higher dose of Cartap hydrochloride 75 SG @ 750 g a.i. ha^{-1} and Fipronil 5 SC @ 25 ml ha^{-1}. The treatments in order of efficacy were T_3 (0.66%)> T_4 (0.75%)> T_7 (0.91%)> T_2 (1.00%)> T_5 (1.09%)> T_6 (1.21%)> T_1 (1.38%)> T_8 (2.23%).

The dead hearts recorded at 15 DAS ranged from 0.73 to 2.80 per cent with minimum dead hearts in Cartap hydrochloride 75 SG @ 375 g a.i. ha^{-1} treated plots which was at par with higher dose of Cartap hydrochloride 75 SG @ 750 g a.i. ha^{-1} and with Fipronil 5 SC@25 ml ha^{-1}. All the remaining treatments were significantly superior over the untreated control.

At 7 days after 2nd spray (DASS) of insecticides the minimum dead hearts were recorded in Cartap hydrochloride 75 SG @ 375g a.i. ha^{-1} (0.26%) and it was at par with higher dose of Cartap hydrochloride 75 SG @ 750 g a.i. ha^{-1} (0.34%) and Fipronil 5 SC @ 25 ml ha^{-1} (0.53%). Rest of the treatments were more effective and significantly superior over the untreated control (3.36%).

At 15 DASS of insecticides the minimum dead hearts were recorded in Cartap hydrochloride 75 SG @ 375g a.i. ha^{-1} (0.24%). The dead hearts in other treatments showed significant difference except higher dose of Cartap hydrochloride 75 SG @ 750 g a.i. ha^{-1} and Fipronil 5 SC @ 25 ml ha^{-1} which were at par with each other and also with T_3. However, maximum dead hearts were recorded in untreated control (3.53%).

At 7 days after 3rd spray of insecticides plots treated with Cartap hydrochloride 75 SG @ 375g a.i. ha^{-1} registered the minimum white ears (0.18%), which was at par with higher dose of Cartap hydrochloride 75 SG @ 750 g a.i. ha^{-1} (0.25%), Fipronil 5 SC @ 25 ml ha^{-1} (0.43%) and T_2 Cartap hydrochloride 75 SG @ 318.75 g a.i. ha^{-1} (0.44%) while rest of the treatments showed

Table 1 : Effects of various insecticides on incidence of stem borer at vegetative and earing stage.

Tr. No.	Treatment name	Dose (g/ml a.i. ha^{-1})	Mean per cent damage					
			Pre treatment	I st application (DH)		II nd application (DH)		III rd application (DH)	
				7 DAS	15 DAS	7 DAS	15 DAS	7 DAS	15 DAS
T_1	Cartap hydrochloride (Mortar 75 SG)	281.5	1.85 (7.88)	1.38 (6.75)	1.51 (7.08)	1.15(6.15)	1.10(6.02)	0.82(5.19)	0.86(5.32)
T_2	Cartap hydrochloride (Mortar 75 SG)	318.75	1.80 (7.71)	1.00 (5.74)	1.10(6.02)	0.61(4.48)	0.58(4.37)	0.44(3.80)	0.46(3.39)
T_3	Cartap hydrochloride (Mortar 75 SG)	375.0	1.91 (7.92)	0.66 (4.66)	0.73 (4.90)	0.26(2.92)	0.24(2.81)	0.18(2.43)	0.20(5.56)
T_4	Cartap hydrochloride (Mortar 75 SG)	750.0	1.78 (7.66)	0.75 (4.97)	0.83 (5.23)	0.34(3.34)	0.33(3.29)	0.25(2.86)	0.26(2.92)
T_5	Cartap hydrochloride 50 SP	500.0	1.88 (7.87)	1.09 (5.99)	1.25 (6.42)	0.72(4.87)	0.69(4.70)	0.59(4.40)	0.62(4.51)
T_6	Lambda Cyhalothrin 2.5 EC	12.5	1.84 (7.79)	1.21 (6.31)	1.39 (6.77)	0.92(5.50)	0.88(5.38)	0.75(4.97)	0.80(5.13)
T_7	Fipronil 5 SC	25.0	1.82 (7.75)	0.91 (5.47)	1.05 (5.88)	0.53(4.17)	0.50(4.05)	0.43(3.76)	0.45(3.84)
T_8	Untreated control	-	1.86 (7.84)	2.23 (8.58)	2.80 (9.62)	3.36(10.55)	3.53(10.52)	3.66(11.02)	4.06(11.62)
	SE m±		**0.17**	**0.13**	**0.13**	**0.11**	**0.11**	**0.10**	**0.09**
	CD at 5%		**NS**	**0.37**	**0.39**	**0.32**	**0.32**	**0.28**	**0.27**

Figures in parentheses indicates Arc sine value.

significant difference. The treatments in order of effectiveness were T_3 Cartap hydrochloride 75 SG @ 375g a.i. ha^{-1} (0.18%)> T_4 Cartap hydrochloride 75 SG @ 750 g a.i. ha^{-1} (0.25%)> T_7 Fipronil 5 SC @ 25 ml ha^{-1} (0.43%)> T_2 Cartap hydrochloride 75 SG @ 318.75 g a.i. ha^{-1} (0.44%)> T_5 Cartap hydrochloride 50 SP @ 500 g a.i. ha^{-1} (0.59%)> T_6 Lambda cyhalothrin 2.5 EC @ 12.5 ml ha^{-1} (0.75%)> T_1 Cartap hydrochloride 75 SG @ 281.5 g a.i. ha^{-1} (0.82%) and were significantly superior over the untreated control with (3.36%) white ears.

At 15 days after 3rd spray of insecticides white ears in different treatments varied from 0.20 to 4.06 per cent. The minimum incidence of white ears (0.20%) was recorded in Cartap hydrochloride 75 SG @ 375 g a.i. ha^{-1} treated plots which was significantly superior from other treatments except higher dose of Cartap hydrochloride 75 SG @ 750 g a.i. ha^{-1} (0.26%), Fipronil 5 SC @ 25 ml ha^{-1} (0.45%) and Cartap hydrochloride 75 SG @ 318.75 g a.i. ha^{-1} (0.46%). Cartap hydrochloride 75 SG @ 375 g a.i. ha^{-1} treated plots differed significantly from the plots treated with Cartap hydrochloride 50 SP @ 500 g a.i. ha^{-1} (0.62%), Lambda cyhalothrin 2.5 EC @ 12.5 ml ha^{-1} (0.80%) and Cartap hydrochloride 75 SG @ 281.5 g a.i. ha^{-1} (0.86%) respectively. All the insecticidal treatments were found significantly superior over untreated control.

All the insecticides tested against *Scirpophaga incertulas* were found significantly superior over untreated control. Out of seven tested insecticides Cartap hydrochloride 75 SG @ (375 g a.i. ha^{-1}) proved to be most effective followed by higher dose of Cartap hydrochloride 75 SG @ (750 g a.i. ha^{-1}) and Fipronil 5 SC (25 ml ha^{-1}) and gave maximum yield. This is in accordance with the findings of Sahithi and Mishra (2006), Singh *et al* (2005), Prasad *et al* (2005) and Lal (2006) who found Cartap hydrochloride 4G effective in controlling YSB damage.

The findings of Jena (2004) and Singh *et al* (2005) that Fipronil was most effective insecticide to check the stem borer infestation also stood third best insecticide for minimizing the YSB infestation in the present results.

The present findings are in partial agreement with the findings of Nayak and Rath (2007), who found Cartap hydrochloride 50 SP most effective in controlling yellow stem borer damage.

The Lambda cyhalothrin was also found effective and significantly superior over untreated control but the results could not be compared.

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