

Evaluation of phenyl pyrazole for the management of yellow stem borer *Scirpophaga incertulas* Walker in rice

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ABSTRACT

Field experiment was conducted at Banaras Hindu University research farm, Varanasi, on hybrid rice variety PHB 71 during *Kharif* season of 2012 to study impact of granular formulation of phenyl pyrazole on rice yellow stem borer, *Scirpophaga incertulas* (Walker). Results revealed that in terms of efficacy against stem borer, overall performance of various spraying insecticidal treatments based on the mean indicated that treatment with Fipronil 0.6 per cent GR @ 60g a.i./ha was the most effective and significantly superior over all other treatments in reducing the dead hearts to minimum level of 3.40 per cent. Fipronil 0.6 per cent GR @ 50g a.i./ha stood second in order of effectiveness which recorded 4.45 per cent dead hearts. The Carbofuran 3 GR @ 750g a.i./ha. proved least effective in which higher per cent of dead hearts of 5.08 were observed. The untreated control recorded 6.88 per cent dead hearts.

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INTRODUCTION

Rice (*Oryza sativa* L.), the most important cereal crop of India, is grown in an area of 47.7 million hectares with a production of 85.5 million tons (Anonymous, 2003). To cope with ever challenging insect pest problems in rice, the farmer needs to have the latest technological advancements in pest management. Integration of varietal technology, cultural methods and utilization of insecticides is the most important and effective tool available to the rice farmer. The yellow stem borer is the serious pests of rice in South and South-East Asia, Japan and Korea and causes heavy yield losses. Pesticides are commonly used to manage rice pests. Use of insecticides has positive impact on rice production (Misra and Parida, 2004). Rice production is linearly correlated with insecticide use in rice. Application of insecticide increased

the paddy yield of Basmati-385 by 42.6 to 54.5 per cent over control and cost benefit ratio of 1:7 to 1:14 was obtained (Khan *et al.*, 2010). Since rice borers cause heavy loss to rice crop, therefore, present studies were conducted for evaluation of new chemical molecules for the management of *Scirpophaga incertulas* Walker, in rice.

MATERIAL AND METHODS

The investigations were carried out at the Research Farm Department of Entomology, Banaras Hindu University, Varanasi (U.P.) during *Kharif*, 2012. The edaphic and climatic conditions of experimental site under which the experiments were conducted alongwith the techniques applied and materials used are being described here with.

Cultural practices followed for growing rice, variety,

PHB 71 was sown in seedbed on 19.6.2012. Seedlings were raised by adopting recommended agronomic practices. The experiment carried out with the treatments like Fipronil 0.6 per cent GR @ 40g a.i./ha, Fipronil 0.6 per cent GR @ 50g a.i./ha, Fipronil 0.6 per cent GR @ 60g a.i./ha, Fipronil 0.3 per cent GR @ 60g a.i./ha, Carbofuran 3 GR @ 750g a.i./ha, Cartap HCl 4 per cent GR @ 750g a.i./ha. Treatments were replicated thrice in randomized block design. In the present experiment, yellow stem borer was monitored at regular intervals and when damage reached the economic threshold level (ETL), granule application of pesticides was done. Granular formulations were mixed with sand and applied to the three plots of treatment in three replications treated at a time. To avoid intermixing of treatment, about 20 to 30 cm thick false bund boundaries were prepared all around the plots having the treatments of granular insecticides. The observations on the dead hearts were recorded on ten hills selected randomly for each plot and tagged. Dead hearts (DH) were recorded one day before granule application and 7, 14, 21, 28, 42 days after application. Dead hearts recorded on hill basis were expressed in per cent by using the same formula mentioned as under :

$$\text{Per cent dead hearts} = \frac{\text{Total no. of dead hearts/hill}}{\text{Total no. of tillers/hill}} \times 100$$

RESULTS AND DISCUSSION

The efficacy of different granular insecticides against rice yellow stem borer was judged on the basis of observation recorded on per cent dead hearts on 7, 14, 21, 28, 42 day after treatment. The data presenting dead hearts incidence due to infestation by *S. incertulas* under field conditions are given in Table 1. The result revealed that all the insecticide treatments recorded significantly lower per cent of dead heart as compared to the untreated control up to 42 DAT. At 7th day after treatment, the dead heart observed in different granular insecticides, the per cent dead hearts ranged from 4.34 to 5.37 per cent as against 6.78 per cent in untreated control. Among the insecticide tested, the drenching with Fipronil 0.6 per cent GR @ 60g a.i./ha proved to be most effective and superior over all the rest of the treatment and recorded lower (4.34 %) dead hearts. The treatment with Fipronil 0.6 per cent GR @ 50g a.i./ha stood second in order of efficacy and recorded 4.93 per cent dead hearts. Significant difference existed among the rest of the treatments.

On 14th day after treatment, the dead heart observed in different granular insecticides, the per cent dead hearts ranged from 3.41 to 5.04 per cent as against 6.81 per cent in untreated control. Among the insecticide tested the drenching with

Table 1 : Evaluation of new chemical molecules for the management of <i>Scirpophaga incertulas</i> , in rice								
Treatments	Dose (g.a.i./ha)	(%) dead hearts						Mean
		ADBT	7DAT	14DAT	21DAT	28DAT	42DAT	
Fipronil 0.6 (%) GR	40	6.890 (15.21)	4.97 (12.87)	4.200 (11.826)	3.91 (11.40)	4.11 (11.69)	4.41 (12.11)	4.32 (11.99)
Fipronil 0.6 (%) GR	50	6.920 (15.25)	4.93 (12.83)	4.440 (12.164)	4.23 (11.86)	4.33 (12.00)	4.35 (12.03)	4.45 (12.17)
Fipronil 0.6 (%) GR	60	6.347 (14.57)	4.34 (12.01)	3.410 (10.641)	3.30 (10.47)	2.99 (9.95)	2.87 (9.74)	3.4 (10.62)
Fipronil 0.3 (%) GR	60	6.68 (14.97)	5.21 (13.18)	5.01 (12.934)	4.22 (11.84)	4.25 (11.89)	4.31 (11.97)	4.6 (12.37)
Carbofuran 3GR	750	6.82 (15.13)	5.23 (13.21)	5.040 (12.973)	4.93 (12.82)	4.99 (12.90)	5.21 (13.18)	5.08 (13.02)
Cartap Hcl 4 (%) GR	750	6.850 (15.17)	5.37 (13.39)	4.327 (12.006)	3.98 (11.50)	4.08 (11.64)	4.19 (11.80)	4.38 (12.07)
Untreated control		5.74 (15.04)	6.78 (15.08)	6.81 (15.127)	6.9 (15.22)	6.92 (15.24)	7.02 (15.35)	6.88 (15.20)
S.E. ±		0.183	0.112	0.013	0.023	0.042	0.009	0.039
C.D. (P=0.05)		NS	0.159	0.039	0.070	0.127	0.028	0.119

**Figures in parenthesis are arsine transformed values, DAT – Days after treatment, ADBT – A day before treatment, NS = Non significant

Table 2 : Influence of fipronil 0.6 (%) GR on yield of rice				
Treatments	Dose (g a.i./ha)	Mean yield of paddy (q/ha)	Increase over control (q/ha)	Percent increase over control
Fipronil 0.6 (%) GR	40	50.12	12.14	31.96
Fipronil 0.6 (%) GR	50	58.09	20.11	52.95
Fipronil 0.6 (%) GR	60	61.15	23.17	61.00
Fipronil 0.3 (%) GR	60	60.11	22.13	58.27
Carbofuran 3G	750	54.03	16.05	42.26
Cartap Hcl 4 (%) GR	750	48.18	10.20	28.86
Untreated control		37.98		
S.E. ±		0.01		
CD (P=0.05)		0.03		

Fipronil 0.6per cent GR @ 60g a.i./ha proved to be most effective and superior over all the rest of the treatments and recorded lower (3.41 %) dead hearts. The treatment with Fipronil 0.6 per cent GR @g 40a.i./ha stood second in order of efficacy and recorded 4.20 per cent dead hearts. Significant difference existed among the rest of the treatments. After three weeks of treatment, the dead heart observed in different granular insecticides, the per cent dead hearts ranged from 3.30 to 4.93 per cent as against 6.9 per cent in untreated control. Among the insecticide tested the drenching with Fipronil 0.6 per cent GR 60g a.i./ha proved to be most effective and superior over all the rest of the treatment and recorded lower (3.30 %) dead hearts. The treatment with Fipronil 0.6 per cent GR @ 40g a.i./ha stood second in order of efficacy and recorded 3.91 per cent dead hearts. Significant difference existed among the rest of the treatment. Later on after four weeks of treatment, the dead heart observed in different granular insecticides the per cent dead hearts ranged from 2.99 to 4.99 per cent as against 6.92 per cent in untreated control. Among the insecticides tested the drenching with Fipronil 0.6per cent GR @ 60g a.i./ha proved to be most effective and superior over all the rest of the treatment and recorded lower (2.99 %) dead hearts. The treatment with Cartap HCl 4per cent GR @ 750g a.i./ha stood second in order of efficacy and recorded 4.08 per cent dead hearts.

On 42 days after treatment the dead heart observed in different granular insecticides the per cent dead hearts ranged from 2.87 to 5.21 per cent as against 7.02 per cent in untreated control. Among the insecticide tested the drenching with Fipronil 0.6per cent GR @ 60g a.i./ha proved to be most effective and superior over all the rest of the treatment and recorded lower (2.87 %) dead hearts. The treatment with Cartap HCl 4per cent GR @ 750g a.i./ha stood second in order of efficacy and recorded 4.19 per cent dead hearts. Significant difference existed among the rest of the treatments.

Overall performance of various insecticidal treatments as granular application based on the mean dead hearts indicated that treatment with Fipronil 0.6per cent GR @ 60g a.i./ha was the most effective and significantly superior over all other treatments in reducing the dead hearts to minimum level of 3.4 per cent of dead harts. The granular performance of the treatments were in the order of Fipronil 0.6per cent GR @ 60g a.i./ha > Fipronil 0.6per cent GR @ 40g a.i./ha > Cartap HCl 4per cent GR @ 750g a.i./ha > Fipronil 0.6per cent GR @ 50g a.i./ha > Fipronil 0.3per cent GR @ 60g a.i./ha > Carbofuran 3 GR @ 750g a.i./ha. Dhaka *et al.* (2009) has documented the effectiveness of fipronil against rice stem borer both as foliar application and granular application, due to its systemic activity and persistent toxicity. In the present findings, a similar result was obtained which is in line with Panda *et al.* (2004) also. A similar finding was also done by Kulagod *et al.* (2011) who reported that Cartap hydrochloride

50 SP @1 g/lit and fipronil 2.5 ml/lit recorded lowest per cent of white ears and leaf damage, respectively.

In case of granular application, the highest yield of rice (61.15 q/ha) was obtained in the treatment with Fipronil 0.6per cent GR @ 60g a.i./ha (Table 2). This treatment recorded 23.17 q/ha and 61.15 per cent increase in yield over control. The next best treatment was Fipronil 0.3per cent GR @60g a.i./ha which recorded 60.11 q/ha yield of rice and 22.13 q/ha, 58.27 per cent increase in yield over control. The next best treatment was Fipronil 0.6per cent GR @ 50g a.i./ha which recorded 58.09 q/ha yield with 20.11 q/ha and 52.95 per cent increase over control and was found at par with Carbofuran 3 GR @ 750g a.i./ha (54.03 q/ha). This was followed by the treatment with Fipronil 0.6 per cent GR @50g a.i./ha (58.09 q/ha) and Fipronil 0.6per cent GR @40g a.i./ha (50.12 q/ha). The untreated control recorded lowest of 37.98 q/ha yield of rice. The results are in agreement with Dash *et al.* (2004) and Panda *et al.* (2004) who reported that the fipronil and cartap hydrochloride recorded the highest grain yield with the maximum increase over the untreated control. Jena (2004) also reported that fipronil was found promising in controlling the pest as well as increasing rice grain yield. It could be concluded that granular formulation of fipronil can be recommended for the suitable management of yellow stem borer.

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