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Management of paddy stem borer in kharif paddy in Kheda district of Gujarat

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ABSTRACT

The comparative efficacy of granular insecticides was evaluated on paddy at farmers' fields in the Kheda district of Gujarat. The white ear heads were lower (1.70%) in the plots treated with T_3 [25 kg cartap hydrochloride 4G/ha at 20 day after transplanting (DAT) and second application at 45 DAT] and it was closely followed by T_2 (20-25 kg carbofuran 3G/ha at 25 DAT and second application of 20-25 kg cartap hydrochloride 4G/ha at 45 DAT) (2.30%) and better than T_1 (20 kg cartap hydrochloride 4G/ha at 10-12 DAT) (8.80%). The insecticidal applications significantly increased the grain yield of rice as compared to T_1-treated plots.

Keywords: Paddy stem borer; granular insecticides; dead hearts; white ears

INTRODUCTION

Rice (*Oryza sativa* L) is a staple food crop of paramount importance to more than half of the global population with regard to food value and is consumed by more than 60 per cent of the world's population. Among all the cereals it occupies second position next to wheat. It contains easily digestible high quality starch, protein and vitamins of 'B' group. Besides the food value it acts as a valuable source of many byproducts. Rice is grown extensively in tropical and subtropical regions of the world. Geographically most of the rice cultivated area in the developing world is found in Asia. Among the various rice growing countries India occupies a very important position. It is extensively grown in most of the states except a few like Himachal Pradesh, Rajasthan and Jammu-Kashmir where the area under this crop is limited. In India rice covers the largest area of about 45 Mha producing 99.18 MT with a productivity of 2178 kg/ha. In Gujarat most of the area under rice crop is confined to middle and south Gujarat comprising the districts of Kheda, Anand, Vadodara, Dahod, Godhra, Ahmedabad, Surat, Valsad, Dang and Navsari covering an area of about 0.75 Mha with the production of 1.30 MT and a productivity of 1744 kg/ha (http://dacnet.nic.in/eands/latest_2006.htm).

A number of insect pests damage rice crop from sowing to harvest causing considerable yield losses. As many as 128 different species of insect pests have been reoprted to attack rice crop (Ahmed 1981) of which the stem borers, rice leaf-folders, leaf hoppers, plant hoppers and rice grasshoppers are the most important and cause significant damage. Yellow stem borer, *Scirpophaga incertulas* Walker is one of the dominant species of stem borer. It is widely distributed and monophagous pest in the Indian subcontinent (Lal 2006). It is considered as the most important pest of paddy causing damage in nursery as well as in transplanted crop. The newly emerged young larva of yellow stem borer primarily enters the leaf sheath and feeds on green tissue for 2-3 days after which it enters into the basal part usually 5 to 10 cm above water/ground level and feeds inside the stem causing drying of central shoot known as 'dead heart' in young plants. Boring at heading stage usually occurs at the peduncle node and the white ear head is formed (Gupta et al 2006).

The farmers apply insecticides to control the stem borers. However most of the growers use scheduled insecticidal applications irrespective of insect pest attack which imposes a serious negative impact on the environment. Excessive use of pesticides may lead to the destruction of biodiversity. In the present study the efficacy of cartap hydrochoride 4G was studied against stem borer in paddy during kharif season.

MATERIAL and METHODS

The study was conducted during kharif 2011 to 2013 at the farmers' fields. Total 27 farmers were selected from major paddy growing villages of Gujarat namely Garmala, Sokhada and Dethali based on the area covered (80-90%) under paddy with three treatments and 3 replications. The treatments were T_1 [20 kg cartap hydrochloride 4G/ha at 10-12 days after treatment (DAT)], T_2 (20-25 kg carbofuran 3G/ha at 25 DAT and 2nd application of 20-25 kg cartap hydrochloride 4G/ha at 45 DAT) and T_3 (25 kg cartap hydrochloride 4G/ha at 20 DAT and 2nd application at 45 DAT). During spraying due care was taken to prevent insecticidal drift. Granular insecticides were applied after mixing in 10 kg sand/acre. The observations on dead heart and white ear formation due to yellow stem borer were taken on five randomly selected hills/plot. The percentage of dead hearts/white ears was worked out. Grain yield/plot was also recorded at harvest and it was converted into q/ha for comparison. The economics of each treatment was also worked out on the basis of cost-benefit ratio. White ear heads percentage was calculated by using following formula:

$$\text{White ear heads (\%)} = \frac{\text{Number of white ear heads}}{\text{Total number of tillers (Dead hearts + healthy tillers)}} \times 100$$

RESULTS and DISCUSSION

On the basis of pooled data of 2011 to 2013 (Table 1) of experiments conducted it was found that the T_3 (25 kg cartap hydrochloride 4G/ha at 20 DAT and 2nd application at 45 DAT) and T_2 (20-25 kg carbofuran 3G/ha at 25 DAT and 2nd application of 20-25 kg cartap hydrochloride 4G/ha at 45 DAT) treatments had very less stem borer incidence (1.70 and 2.30% respectively) whereas in case of treatment T_1 it was 8.80 per cent. The highest paddy grain yield was recorded in T_3 (45.11 q/ha) followed by T_2 (43.55 q/ha) and T_1 (20 kg cartap hydrochloride 4G/ha at 10-12 DAT) (41.41q/ha). Reason for higher yield in T_3 could be due to minimum damage through insects (stem borers, leaf folders etc).

The benefit-cost ratio was higher in T_3 than the T_2 and T_1 treatments. The benefit-cost ratios of T_3, T_2 and T_1 pots were observed to be 1:1.64, 1:1.56 and 1:1.44 respectively. Average net return per hectare under T_3 was Rs 21434, under T_2 was Rs 18954 while under T_1 it was Rs 15784.

Panda et al (2004) evaluated fipronil at various dose levels against rice stem borer and observed that its application significantly reduced dead hearts and produced more tillers and higher grain yield.

Prasad et al (2005, 2007) determined efficacy of insecticides in controlling rice stem borer and found that cartap hydrochloride followed by chlorpyriphos, fipronil and carbofuran were most effective in controlling stem borer infestation and increasing crop yield.

CONCLUSION

The plots treated with T_3 (25 kg cartap hydrocholride 4 G/ha at 20 DAT and 2nd application at 45 DAT) gave higher yield (45.11 q/ha) than the treatments T_2 and T_1 (43.55 and 41.41q/ha respectively). In terms of economics the highest net return was also obtained under treatment T_3 followed by T_2. The highest benfit-cost ratio was also found with T_3 followed by T_2. The results revealed that the plots treated with 25 kg cartap hydrochloride 4G/ha at 20 DAT and 2nd application at 45 DAT had the lowest white ears percentage and produced maximum paddy yield than other treatments.

Therefore it is suggested that for the management of paddy stem borer farmers should apply 25 kg cartap hydrocholride 4 G/ha at 20 DAT and 2nd application at 45 DAT in paddy to avoid resistance, resurgence and environmental contamination.

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Table 1. Efficacy of different treatments against stem borer on paddy during year 2011 to 2013 (pooled data)

Parameter	Treatment		
	T_1	T_2	T_3
White ear heads (%)	8.80	2.30	1.70
Production per unit (q/ha)	41.41	43.55	45.11
Net return (profit) (Rs/unit)	15784	18954	21434
B:C	1:1.44	1:1.56	1:1.64

T_1= 20 kg cartap hydrochloride 4G/ha at 10-12 DAT, T_2= 20-25 kg carbofuran 3G/ha at 25 DAT and 2nd application of 20-25 kg cartap hydrochloride 4G/ha at 45 DAT, T_3= 25 kg cartap hydrochloride 4G/ha at 20 DAT and 2nd application at 45 DAT

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