

Assessment of Management Modules against Yellow Stem Borer in Paddy

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ABSTRACT

Yellow stem borer (YSB) is one of the most serious and monophagous pest of paddy in India. Field experiments were carried out to assess the different management modules against the yellow stem borer in paddy during the Kharif season of 2019 and 2020. The results on efficacy of modules revealed that during both the years the minimum 'Dead Heart' (DH) (10.1 and 11.4% during the year 2019 and 2020, respectively) was recorded in M3 (clipping of terminal shoots at the time of transplanting and application of cartap hydrochloride 50 SP) followed by M2 (11.9 and 14.5% during the year 2019 and 2020, respectively) in which 1st application was done with fipronil 0.3G and 2nd with NSKE 5% and M1 (19.6 and 20.9% during the year 2019 and 2020, respectively) i.e. farmers' practice where only carbofuran 3G was applied. 'White Ear Head' (WEH) was also recorded minimum in M3 (11.6 and 12.1% in the year 2019 and 2020, respectively) followed by M2 (13.3 and 16.4% in the year 2019 and 2020, respectively) and M1 (20.8 and 22.4% in the year 2019 and 2020, respectively) in paddy. Maximum yield (33.8 and 43.1 q/ha during the year 2019 and 2020, respectively) was also recorded in Module 3 practiced clipping of terminal shoots and spraying with cartap hydrochloride 50 SP with the highest BC(Benefit: Cost) ratio 1.52:1 and 1.94:1 in the year 2019 and 2020, respectively. The overall results of the present study indicating the overall superiority of M3 (clipping of terminal shoots at the time of transplanting and two applications of cartap hydrochloride 50 SP at 40 and 60 DAT) in all the aspects i.e. DH, WEH, yield and BC ratio.

KEYWORDS

Paddy, Yellow stem borer, Management modules

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INTRODUCTION

Paddy (*Oryza sativa*) occupies the prominent place in Indian agriculture (Singh *et al*, 2017). The production and productivity of paddy is low in Jharkhand and as well as in India as compared to world production (Singh *et al*, 2009). Amongst various constraints for low productivity of paddy, the infestation of insect pests which attack the crop right from nursery till the harvest of the crop causing about 25 – 30% of loss (Murlidharan and Pasalu, 2006). Among various insect pests yellow stem borer (YSB), *Scirpophaga incertulas* (Walker) is quite serious as it can cause 25 – 30% damage to the crop, which leads to 'Dead Heart' (DH) in vegetative stage and 'White Ear Head' (WEH) with chaffy grain during heading stage (Rubia *et al*, 1996). Use of synthetic insecticides is a common method of pest control in paddy among the farmers. But, the indiscriminate use of insecticides have resulted in a number of undesirable side effects such as development of resistant in insects pests, environmental pollution and health hazards to farmers (Holland *et al*, 2000). Due to these constraints researchers developed an alternative, economical and eco-friendly integrated approach of insect control (Chatterjee *et al*, 2009). The basic idea of the research problem is to reduce

the application of synthetic insecticides and use of cultural, botanical and chemical methods in an integrated approach. In this context present study was planned to assess management modules including botanical, cultural and chemical methods for the management of YSB in paddy.

MATERIALS AND METHODS

The experiments were carried out during the Kharif season of the year 2019 and 2020 at 10 farmers' field in the village Mahu-atand (Sunderpahari block) and Kerabadi (Pauriahaat block) of the district Godda (Jharkhand) by GVT – Krishi Vigyan Kendra, Godda under on farm testing (OFT) activity of the KVK. Three suggested pests management modules including farmers' practices were tested against YSB in paddy (Table 1). The trials were laid out in RBD with 03 treatments (modules) in 10 replications during both the years. Twenty five days old seedlings of paddy (Variety: MTU – 7029) were transplanted in 2nd week of August with the spacing 20 cm x 15 cm in the plot size of 5 m x 4 m. All the other agronomical practices were followed to raise a good and healthy crop as suggested by Choudhary *et al* (2017).

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Table 1: Details of pest management modules against yellow stem borer in paddy

Pest Management Modules	Details
M1	Farmers' practice (Carbofuran 3 G, 30 kg/ha, 2 – 3 times)
M2	1 st application with Fipronil 0.3G (20 kg/ha) at 40 DAT* followed by 2 nd application with NSKE 5% at 60 DAT
M3	Clipping of terminal shoots at the time of transplanting and two spraying with cartap hydrochloride 50 SP (2 g/litre water) at 40 and 60 DAT

*DAT= days after transplanting

Observations on infestation of yellow stem borer as Dead Heart (DH) and White Ear head (WEH) were recorded on 10 randomly selected hills from three central rows at fortnightly interval after implementation of treatments. The per cent DH and WEH were calculated by using the formula given below (Heinrichs *et al*, 1985):

Per cent Dead Heart = (No. of damaged tillers/Total no. of tillers) × 100

Per cent White ear Head = (No. of damaged productive tillers/Total no. of productive tillers) × 100

The percent infestation of damage was transformed in to arc sine values for analysis.

The grain yield of each plot was recorded at the time of harvesting and converted in to q/ha.

The cost incurred on different parameters of agronomic practices viz. nursery management, preparation of land for transplanting, fertilizer application, cost of modules, harvesting etc. were pooled to analyze the cost of cultivation. Based on the current price of inputs used and the produce obtained during both the years, the net return/ha and BC (Benefit Cost) ratio was worked out.

The data collected from the experiments were statistically analyzed according to Gomez and Gomez and Gomez (1984) to test the level of significance of modules.

RESULTS AND DISCUSSION

The results of the field experiments conducted by GVT – Krishi Vigyan Kendra, Godda revealed that all the modules were significantly effective in reducing the infestation of paddy yellow stem borer as compared to the farmers' practice (Table 2). The per cent DH was recorded minimum (10.1 and 11.4 during the year 2019 and 2020, respectively) in M3 (clipping of terminal shoots at the time of transplanting and application of cartap hydrochloride 50 SP, 2 g/litre water) followed by M2 (11.9 and 14.5% during the year 2019 and 2020, respectively) in which 1st application was done with fipronil 0.3G and 2nd with NSKE 5% and M1 (19.6 and 20.9% dur-

ing the year 2019 and 2020, respectively) i.e. farmers' practice where only carbofuran 3G was applied. WEH was also recorded minimum in M3 (11.6 and 12.1% in the year 2019 and 2020, respectively) followed by M2 (13.3 and 16.4% in the year 2019 and 2020, respectively) and M1 (20.8 and 22.4% in the year 2019 and 2020, respectively).

Table 2: Effect of management modules on the infestation of yellow stem borer in paddy

Pest Management Modules	Dead Heart (DH %)		White Ear Head (WEH %)	
	2019	2020	2019	2020
M ₁	19.6 (26.1)	20.9 (27.2)	20.8 (27.2)	22.4 (28.2)
M ₂	11.9 (20.0)	14.5 (22.4)	13.3 (21.1)	16.4 (23.8)
M ₃	10.1 (18.4)	11.4 (19.7)	11.6 (19.6)	12.1 (20.3)
CD (P = 0.05)	0.27	1.64	0.45	2.65

Values in parentheses are arc sine transformed values

The grain yield data (Table 3) also revealed that all the modules were significantly superior over farmers' practice. The grain yield data indicated that M3 recorded the highest yield (33.8 and 43.1 q/ha during the year 2019 and 2020, respectively) followed by M2 (32.6 and 40.5 q/ha during the year 2019 and 2020, respectively) and M1 (30.3 and 36.3 q/ha during the year 2019 and 2020, respectively). Benefit cost ratio was calculated (Table 3) and the maximum BC ratio (1.52:1 and 1.94:1 in the year 2019 and 2020, respectively) was obtained in M3 followed by M2 (1.46:1 and 1.81:1 in the year 2019 and 2020, respectively) and M1 (1.35:1 and 1.61:1 in the year 2019 and 2020, respectively).

The overall results of the present study indicating the overall superiority of M3 (clipping of terminal shoots at the time of transplanting and two applications of cartap hydrochloride 50 SP at 40 and 60 DAT) in all the aspects i.e. DH, WEH, yield and BC ratio. Pathak (1977) also found clipping of ter-

minial shoots helpful in reducing the eggs laid at the leaf tips of paddy. The effectiveness of cartap hydrochloride 50 SP against rice pests has been reported by Mishra *et al* (2012), Choumule *et al* (2014), Omprakash *et al* (2017) and Rajadurai and Kumar (2017) also recorded maximum grain yield of

Table 3: Economic analysis of pest management modules against yellow stem borer in paddy

Pest Management Modules	Yield of paddy (q/ha)		Cost of cultivation (Rs./ha) for both the years	Gross Return (Rs/ha) (Rs. 1800/q)		Net return (Rs/ha)		BC Ratio	
	2019	2020		2019	2020	2019	2020	2019	2020
M ₁	30.3	36.3	40500	54540	65340	14040	24840	1.35:1	1.61:1
M ₂	32.6	40.5	40300	58680	72900	18380	32600	1.46:1	1.81:1
M ₃	33.8	43.1	40000	60840	77580	20840	37580	1.52:1	1.94:1
CD (P = 0.05)	0.69	1.93							

paddy in integrated module.

CONCLUSION

It has been concluded from the present study that clipping of terminal shoots at the time of transplanting and two spraying with cartap hydrochloride 50 SP (2g/litre water) may be recommended for the management of yellow stem borer in

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