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BIOPESTICIDAL MANAGEMENT OF YELLOW STEM BORER (*SCIRPOPHAGA INCERTULAS* WALKER) IN RICE

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ABSTRACT
An experiment was conducted during the year 2010 – 11 and 2011 – 12 to manage the stem borer in rice with biopesticides. The symptoms inflicted by stem borer in rice *i.e.* Dead Heart (DH) and White Ear Head (WEH) was found minimum (10.75 and 11.25%, resp.) in the plots managed by farmers with phorate 10 G. Although it did not differ significantly with the plots in which egg parasitoid, *Trichogramma japonicum* was released. *T. japonicum* exhibited 11.50 and 11.75% DH and WEH, respectively. The yield was also recorded maximum (31.7q/h) in the phorate treated plots followed by the plots in which egg parasitoid was released.

INTRODUCTION

Rice (*Oryza sativa* L.) is the staple food of the people of Jharkhand state. Among various reasons, which are responsible for low production of rice, insect pest complex are major factors for lowering down the yield. Kalode *et al*. (1995) reported that grain yield loss in rice due to insect pest in India has been estimated from 21 to 51 per cent varying from area to area as per variation in the agro climatic condition. More than 100 species of insects are known to attack rice crop, of which yellow stem borer (*Scirpophaga incertulas* Walker) is one of the most destructive pests of this crop and is widely distributed monophagous pest in the Indian subcontinent (Atwal and Dhaliwal, 2008). Severe infestation by yellow stem borer (YSB) often results in complete crop failure (Kushwaha, 1995). Synthetic insecticides are still the primary way to control YSB menace. Such over reliance on synthetic pesticides causes ecological adversities and health related problems (Kushwaha, 1995). All the more one should not expect an overnight change from chemicals to biologicals but the system of change must be gradual. Biopesticides are inherently less harmful than conventional pesticides. Biopesticides are clearly and mostly target specific in contrast to broad spectrum conventional chemical pesticides that kill almost all living organism. Biopesticides are effective in very small quantities and are often quickly biodegradable. It is evident that biopesticides can play an important role either as principal or as supplementary system in the control of agricultural pest (Ramarethinam, 2002). Among the biopesticide, the neem seed kernel extract is known to suppress the feeding, growth and reproduction of insects due to its biochemical (Natarajan and Sundaramurthy, 1990). *Bacillus thuringiensis* (Bt) is more commonly used against lepidopteran larvae. There are several successful reports of the inundative release of *Trichogramma japonicum* and *T. chilonis* against stem borer and leaf folder in different parts of the country (Mohanraj *et al.,* 1995; Shirke and Bade, 1997). In view of this the present experiment was conducted to evaluate the relative efficacy of different biopesticides belonging to different groups against the YSB in paddy.

MATERIALS AND METHODS

The field experiments were conducted during the *Kharif* season of 2010 - 11 and 2011 - 12 at 10 farmers' fields by Gramin Vikas Trust - Krishi Vigyan Kendra, Godda (Jharkhand) to find out the efficacy of 04 (four) treatments including farmers' practice against yellow stem borer in rice under on farm testing (OFT) activity of the KVK. The trials were laid out in RBD with 04 (four) treatments (T_1: Release of egg parasitoid, *Trichogramma japonicum i.e. Tricho* card @ 50000/h; T_2: Application of *Bacillus thuringiensis* subsp. *Kurstaki,* Halt @ 1.5 kg/h; T_3: Application of neem based formulation, Multineem 1500ppm @ 3.75L/h and T_4: Farmers' practice *i.e.* application of Phorate 10 G @ 10kg/h). Twenty five days old seedlings of paddy variety MTU - 7029 popularly known as *Swarna* were transplanted in the last week of July with the spacing 20 x 15cm in the plot size of 250m^2. All the treatments were applied at 30 and 50 days after transplanting after the visual observations of the damage symptoms. Spray solution @ 750L/h was used with Knapsack Hand sprayer for spraying. Post spraying observation on Dead Heart (DH) and White Ear Head (WEH) inflicted by stem borer were recorded at 10 days after spraying on 20 randomly selected hills from each plot. Two season's data on different aspects of experiment and grain yield were recorded separately. Finally the data were statistically analyzed after appropriate transformations according to Gomez and Gomez (1984) to test the sig-

Table 1: Effect of biopesticides on the incidence of rice stem borer

Treatments	Stem borer incidence (%)						Yield (q/ha)			Cost of plant protection measures (Rs./ha)
	2010 - 11		2011 - 12		Mean					
	DH	WEH	DH	WEH	DH	WEH	2010 - 11	2011 - 12	Mean	
Trichogramma japonicum	10.50 (18.37)	13.00 (21.00)	12.50 (20.43)	10.50 (18.63)	11.50 (19.40)	11.75 (19.82)	30.5	31.5	31.0	175.00
Bacillus thuringiensis	13.50 (21.42)	14.50 (22.30)	15.50 (23.04)	12.50 (20.26)	14.50 (22.23)	13.50 (21.28)	29.4	30.0	29.7	3564.0
Multineem	16.00 (23.33)	15.50 (23.20)	14.00 (21.80)	14.00 (21.62)	15.00 (22.57)	14.75 (22.41)	26.9	28.7	27.8	2100.00
Farmers' practice (phorate 10G)	09.50 (17.47)	12.50 (20.60)	12.00 (20.00)	10.00 (18.08)	10.75 (18.74)	11.25 (19.34)	31.2	32.1	31.7	1300.00
CD (P = 0.05)	1.26	0.68	0.53	0.78	0.90	0.73	1.01	0.77	0.89	

DH: Dead Heart; WEH: White Ear Head. Figures in parentheses are arc sine transformed values.

nificance level of treatments

RESULTS AND DISCUSSION

The result of field experiments conducted by Gramin Vikas Trust - Krishi Vigyan Kendra, Godda (Jharkhand) revealed that mean value of Dead Heart formed by stem borer varied from 10.75 to 15.00 per cent (Table 1). The treatments differed significantly in reducing the DH value. The minimum mean Dead Heart (10.75 %) was found in the plots managed by farmers' with the application of phorate 10G. Although it was found to be at par with the plots in which egg parasitoid, *Trichogramma japonicum* was released. The Dead Heart in this plot was observed 11.50%. Data regarding to White Ear Head (WEH) presented in Table 1 indicated that mean value of WEH was found in between 11.25 and 14.75%. Application of phorate 10G (Farmers' practice) was found to be most effective (11.25%) followed by *Trichogramma japonicum* (11.75%) but the difference between these two treatments were found to be non significant. The grain yield of the rice was also recorded maximum (31.7q/h) in the phorate treated plots while the yield was recorded 31.0q/h in the plots where egg parasitoid, *Trichogramma japonicum* was released. The statistical difference between two of them was found non significant. The total cost of plant protection measures applied for lowering the incidence of YSB was also calculated minimum (Rs. 175/h) in the egg parasitoids released plots while the farmers' cost in applying phorate was Rs. 1300/h (Table 1). It means their investment is much more than egg parasitoid in achieving the almost same result. In the present investigation application of phorate 10G was found to be most effective in reducing the incidence of yellow stem borer of rice although in every respect it was found to be at par with *Trichogramma japonicum*. Similar observations were also reported by Gupta *et al*. (2006) who have found granules of phorate and carbofuran effective against stem borer. Balasubramanian *et al*. (1994) studied the effectiveness of inundative release of *Trichogramma japonicum* and *Trichogramma chilonis* as a componenet of rice IPM and found the result promising. Similarly multilocational evaluation of three releases of *T. japonicum* and *T. chilonis* @ 50000 and 100000/h respectively at weekly inyervals starting from 20 days after transplanting resulted in reduction in stem borer and leaf folder incidence, increased parasitism in both the species and higher yields in parasitoid released plots comparable with insecticide schedule and Bt sprayed plots (PDBC, 2000 - 2001). Khan and Kumar (2005) also found inundative release of *Trichogramma* spp. @ 100000/h superior over the lower doses in reducing the incidence of YSB in rice. Therefore, to minimize the environmental and health problems related with the application of synthetic chemical insecticides like Phorate 10G, bioagent like *Trichogramma japonicum* an egg parasitoid may be used for successful management of yellow stem borer in paddy field.

Figure 1: An OFT plot in which *Trichogramma japonicum* was released

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