

Efficacy of Marigold and Tulshi Plants against Sugarcane Top Shoot Borer

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ABSTRACT

A field experiment was conducted to evaluate the efficacy of marigold and tulshi plants as intercrop during the cropping season 2009-2010 and 2010-2011 at BSRI farm, Ishurdi, Pabna. Seven treatments were included in the study. Results revealed that all treatments including intercrop leaf extract spray, mechanical control controlled top shoot borer showing 50.45- 60.47% and 32.27-55.69% efficacy over non-treated sugarcane in two consecutive years. Sugarcane intercropped with marigold and tulshi plants produced higher yield than non-intercropped plots.

Key words: Sugarcane, top shoot borer, marigold, tulshi, intercrop

INTRODUCTION

Sugarcane is a major cash crop in Bangladesh but its production per unit area is considerably lower than that of many other sugarcane producing countries of the world. Sugarcane pests especially borers are serious problem in cane cultivation. Sugarcane top shoot borer, *Scirpophaga excerptalis* Walker (Lepidoptera: Pyralidae) is a serious pest throughout the cane growing areas of Bangladesh. The period of severe attack by top shoot borer is from March to October and it is the internal feeder attacking shoot of sugarcane. Its infestation in the field ranges from 10 to 100%. It causes severe losses both in cane weight and sucrose content in infested canes. The top shoot borer infested canes contained 2% less sucrose (Miah *et al.*, 1980). Loss in cane weight due to top shoot borer infestation varied from 12.29- 46.68% and loss in sugar recovery due to this pest have been estimated 8.44% (Alam *et al.*, 2006). The indiscriminate uses of chemical pesticides have been resulted in adverse effects like resistance (Saxena *et al.*, 1992, Armes *et al.*, 1992), ecological imbalance, health hazards and resurgence of secondary pests. Many synthetic chemicals have been recommended against this pest which are costly and sometimes not available. On the other hand, indigenous plant materials are economic and easily available in Bangladesh. There is no side effect in using botanical compounds/insecticides. Botanical products like neem derivatives have been reported to provide broad spectrum control of more than 200 species of phytophagous insects (Ascher, 1993). Botanical products are environmentally safe and non- hazardous.

Sugarcane is usually intercropped with other crops such as potato, onion, garlic, tomato, cabbage, mungbean, chickpea, wheat etc. According to Razzaq *et al.* (1978), wheat and chickpea reduced the production of millable sugarcane stalks but, had no significant influence on yield. Kalra *et al.* (1975), observed the incidence of pink-borer to be high in sugarcane grown with wheat. Baliddawa (1985) reported that population of

several pests depressed under conditions of plant species diversity. Risch (1984) found intercropping as a measure for the control of insect pests. Misra and Hora (1982) observed that the incidence of top borer was significantly higher in sugarcane alone than grown with wheat, potato, coriander or mustard. Masih *et al.* (1988) reported that the highest incidence of borer infestation was observed in sugarcane as sole crop and wheat intercropped with sugarcane showed minimum pyrrilla and borer infestation.

Many synthetic chemicals are recommended against sugarcane pests. Botanical insecticides have recently been used to control a variety of insect pests in field crops. Several commercially produced plant derived compounds have exhibited enormous potential as insecticides. Marigold and tulshi plant grown as intercrop with sugarcane may repel the pests from feeding on sugarcane due to pungent smell and their residues may decrease the pesticide load in sugarcane ecosystem. In Bangladesh, no appreciable work has been done to determine the effect of intercropping on the incidence of insect pests of sugarcane. The present study was aimed to assess the efficacy of marigold and tulshi plant in controlling sugarcane top shoot borer, which might be judicious and economical.

MATERIALS AND METHODS

The experiment was set up at the farm of Bangladesh Sugarcane Research Institute (BSRI), Ishurdi, Pabna during the cropping season 2009-2010 and 2010-2011. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. There were seven (7) treatments including one control. The unit plot size was 6m x 6m. Block to block distance was 2m and plot to plot distance was 1m. The sugarcane variety Isd 34 was used as planting material. Planting was done through conventional sett placement (end to end) in trenches in the month of November. Marigold and tulshi seedlings were raised in seedbeds in October and transplanted at the main field in November. Marigold and tulshi seedlings were planted at a distance of 60 cm in rows between paired row canes. After transplanting marigold and tulshi seedlings in the field life irrigation was applied. All types of intercultural operation like weeding, mulching, fertilizer application and irrigation were done as and when necessary.

Marigold extracts were prepared in the laboratory. Amount of 125 g marigold leaf mixed with 250 ml of water were blended to prepare marigold extract solution. The concentrated extracts mixed with 2 litre of water and sprayed on sugarcane plants with a Knap-sack sprayer in March, April and May in 36 m² plot twice a month. Data on top shoot borer infestation were recorded in April, May, and June and in October. The yield of cane per plot was recorded at harvest. All the recorded data were analyzed statistically using LSD.

Treatments

- T₀ - Control
- T₁ - Marigold plant as intercrop (November)
- T₂ - Marigold leaves extracts @ 35 kg ha⁻¹ (March to May, twice a month)
- T₃ - Tulshi Plant as intercrop (November)
- T₄ - Mechanical control (March + May)
- T₅ - T₁ + Mechanical control (March + May)
- T₆ - T₃ + Mechanical control (March + May)



Fig.1. Sugarcane intercropped with Marigold



Fig.2. Sugarcane intercropped with Tulshi plant

RESULTS AND DISCUSSION

From Table 1 the percent top shoot borer infestation in April (2010) indicated that there was significant difference in top shoot borer incidence among the plots treated with marigold and tulshi plants as intercrop, marigold leaf extract, mechanical control over untreated at BSRI Ishurdi, Pabna. Treatments showed 50.76 to 65.37% effectiveness in April. Infestation levels in May and June, 2010 were significantly different statistically compared to untreated control. The efficacy in May and June ranged from 50.19-64.80% and 47.34-64.49%, respectively. The percent top shoot borer infestation in October (2010) recorded in marigold and tulshi plants intercropped, marigold leaf extract, mechanical control treated plot had significant difference in reducing the top shoot borer infestation compared to untreated control plot. The lowest top shoot borer infestation (8.82%) was observed in plot intercropped with tulshi plant. The pooled values (50.45-60.47%) indicated that all the treatments showed more than 50 percent efficacy among the test treatments over control. Marigold plant as intercrop with mechanical control gave the highest efficacy of 60.47 percent in controlling top shoot borer. Abdullah *et al.* (2006) reported that when tobacco plant powder applied @ 80 kg ha⁻¹ in planting, March, May and August gave 34.61% efficacy in controlling top shoot borer.

Table 1. Effects of Marigold and Tulshi plant for the control of sugarcane top shoot borer (BSRI farm, Ishurdi, Pabna, 2009-2010).

Treatments	Percent top shoot borer infestation (Mean)				Pooled data (%efficacy)	Yield (tha ⁻¹) (% increase over control)
	April data	May data	June data	October data		
T ₁ : Marigold plant as intercrop	2.49b* (65.37)	2.77c (64.80)	6.34cd (61.71)	9.79b (47.73)	59.90	61.94a (26.95)
T ₂ : Marigold leaves extracts @ 35 kg ha ⁻¹ (March, April & May)	3.11b (56.74)	3.92b (50.19)	8.72b (47.34)	9.83b (47.52)	50.45	59.26a (21.46)
T ₃ : Tulshi plant as intercrop	2.54b (64.67)	3.03c (61.50)	6.42cd (61.23)	8.82b (52.91)	60.08	58.43a (19.76)
T ₄ : Mechanical control (March + May)	3.54b (50.76)	2.99c (62.01)	8.16bc (50.72)	10.68b (42.98)	51.62	61.01a (25.05)
T ₅ : Marigold plant as intercrop + Mechanical control (March + May)	2.52b (64.95)	3.02c (61.63)	5.88d (64.49)	9.21b (50.83)	60.47	65.55a (34.35)
T ₆ : Tulshi plant as intercrop + Mechanical control (March + May)	2.81b (60.92)	3.05c (61.24)	6.52cd (60.63)	8.94b (52.27)	58.76	64.26a (31.71)
T ₀ : Control	7.19a	7.87a	16.56a	18.73a	-	48.79b
LSD (5%)	1.212	0.611	2.008	1.699	-	9.437

* Figures followed by the same letter (s) are not significantly different at 5% level as per LSD test
Figures in parenthesis are percent effectiveness over control.

From Table 2 it was found that infestation in marigold and tulshi plant intercropped, marigold leaf extract, mechanical control treated plots of April and May, 2011 at BSRI Ishurdi, Pabna had significantly different top shoot borer compared to untreated control. Results indicated that the highest control (56.75%) of top shoot borer was achieved in marigold plant as intercrop with mechanical control treated plots followed by marigold plant as intercrop (46.62%) in April. The highest control (56.36%) of top shoot borer was achieved in marigold plant as intercrop with mechanical control treated followed by marigold plant as intercrop (47.27%) in May. No significant difference was observed among the treatments in the month of June where the efficacy ranged from 22.06 – 46.56%. Significant difference was observed in October, 2011 where all treatments gave higher efficacy over untreated plots. The top shoot borer infestation showed the highest efficacy of 56.64% in marigold plant as intercrop with mechanical control treated plot. The pooled values (32.27-55.69%) revealed the highest (55.69%) efficacy in marigold plant as intercrop with mechanical control treated plot. Khorsheduzzaman *et al.* (1997) reported that when intercropping with single and double rows of coriander and marigold plant reduced the incidence of eggplant shoot and fruit borer which is an indication of effectiveness of intercrops in controlling insect pests. Use of plants as repellent or extract in sugarcane will help in safeguarding the natural enemies, diminish the chances of development of resistance to insecticides and minimizing the environmental hazards.

Table 2. Effects of Marigold and Tulshi plant for the control of sugarcane top shoot borer. (BSRI farm, Ishurdi, Pabna, 2010-2011).

Treatments	Percent top shoot borer infestation (Mean)				Pooled Data (% efficacy)	Yield (tha^{-1}) (% increase over control)
	April data	May data	Jun data	Oct data		
T ₁ : Marigold plant as intercrop	5.37b (46.62)	3.48bc (47.27)	3.73 (46.56)	5.37b (45.97)	46.60	55.93 (12.29)
T ₂ : Marigold leaves extracts @ 35 kg ha ⁻¹ (March, April & May)	7.36ab (26.84)	4.15b (37.27)	4.93 (29.36)	6.40b (35.61)	32.27	56.39 (13.21)
T ₃ : Tulshi plant as intercrop	6.15b (38.87)	4.02bc (39.09)	5.44 (22.06)	6.00b (39.64)	34.91	56.20 (12.83)
T ₄ : Mechanical control (March + May)	6.29b (37.49)	4.44b (32.73)	4.59 (34.24)	6.33b (36.32)	35.19	56.94 (14.31)
T ₅ : Marigold plant as intercrop + Mechanical control (March + May)	4.35b (56.75)	2.88c (56.36)	3.28 (53.01)	4.31b (56.64)	55.69	57.76 (15.96)
T ₆ : Tulshi plant as intercrop + Mechanical control (March + May)	6.26b (37.78)	4.11d (37.73)	4.62 (33.01)	6.33b (36.32)	36.21	53.70 (7.81)
T ₀ : Control	10.06	4.60a	6.98	9.94a	-	49.81
LSD (5%)	3.404	1.100	NS	3.240		NS

* Figures followed by the same letter (s) are not significantly different at 5% level as per LSD test
Figures in parenthesis are percent effectiveness over control.

Table 1 and 2 also showed that marigold and tulshi plants used in different ways numerically increased the yield of cane compared to untreated control plots in two cropping seasons. The highest (65.55 tha^{-1} and 57.76 tha^{-1}) yield was obtained in treatment T₅ (Marigold plant as intercrop with mechanical control) plot in both cropping season. The yield increase over control in different treatments varied from 19.76 to 34.35% in both seasons. Thirumurugan and Koodalingam (2005) reported that intercropped with sugarcane had significantly lower shoot borer incidence and produced higher cane yield than sugarcane as sole crop. The present study reflects their findings related to yield. Therefore, effective control of sugarcane top shoot borer could be achieved by using marigold plant as intercrop along with mechanical control.

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