

Influences of Different Repellent Intercrops for the Management of Sugarcane Borer Pests

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ABSTRACT

An experiment was conducted at Regional Sugarcrop Research Station, Bangladesh Sugarcrop Research institute, Gazipur during cropping season 2008-2009 to study the effectiveness of five different repellent crops as intercrop with paired row sugarcane planting system against borer pests. Results revealed that all the tested intercrops incorporated with sugarcane reduce the top shoot borer and stem borer infestation. Among all intercrops tobacco showed the best performance in reducing top shoot borer infestation (78.9% efficacy) followed by early and late variety of marigold (68.84% efficacy). The same results was also found in case of stem borer in reducing percent infestation as well as increasing cane yield.

Key words: Repellent crop, intercropping, infestation, top shoot borer and stem borer

INTRODUCTION

Sugarcane is a long duration crop of about 12-18 months from planting to harvest. The cane yield is markedly influenced by many factors like soil fertility, climate, variety, cultural practices, presence of pests and diseases and environmental stress. Among them, pests are known to inflict considerable losses in cane yield as well as sugar output (David and Nandagopal, 1986). Various insect pests like borers, suckers and underground feeders cause severe damage in cane cultivation. In Bangladesh about 60 species of sugarcane insect pests are identified and can cause about 20% yield loss and 15% sugar loss every year (Alam *et al.*, 2003) in our country. Every year losses of yield incurred due to top shoot borer infestation is 21-48% (Karim and Islam, 1977) and due to stem borer 8.2-12.6% (Khanna *et al.*, 1957). To increase the crop productivity, management of insect-pest is of great importance. Due to diversity in agro-ecological conditions, the importance of insect pests varies and therefore, management strategy should be adopted accordingly. Several management strategies have been developed through research and development work. In order to save environment from pesticide pollution, use of bio-pesticides and intercropping have been given utmost attention which can be used as a potential component in Integrated Pest Management (IPM). Chemical pesticides are highly toxic, hazardous and expensive. The indiscriminate use of chemical pesticide has arisen many serious problems including genetic resistance of pest species, toxic residues, increasing cost of production and environmental pollutions. On the other

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hand intercropping by selected crops is almost economic, available to everywhere and well as environmental friendly option.

Intercropping with repellent crops is one of the suggested control tactics to refrain from insect pest access to the sugarcane according to Integrated Pest Management (IPM). The intercrops of mung, mash, methi in sugarcane was successful in getting additional income to the farmers. Intercropping has been used by subsistence farmers not only to increase crop yields but also to suppress weeds and reduce pest populations (Abate, 1991). Moreover, addition of organic matter in many forms in the soil can help to prevent the damage of the main crop (Mando *et al.*, 1999). Garlic (*Allium sativum* L.), linseed (*Linum usitatissimum* L.), oliseed (*Brassica campestris* L.), sarson and methi (*Trigonella foenumgraecum* L.) were intercropped with sugarcane on ridges (Ahmed *et al.*, 2008) at the time of setts placement where garlic and sarson intercropped plots showed significantly higher germination and less bud damage in comparison with other intercrops and sugarcane alone. Bhullar *et al.* (2006) suggested that sunflower can also be grown as intercrop in spring cane without any adverse effect on sugarcane. Therefore, this study was undertaken to find out the effectiveness of some repellent crops which may repel the borer pest of sugarcane approaching IPM.

MATERIALS AND METHODS

The study was carried out in research farm of Regional station, Bangladesh Sugarcrop Research Institute, Gazipur during the cropping season 2008-09 with different repellent intercrops to manage the different sugarcane borer pests. This was designed as Randomized Complete Block (RCB) having 3 replications with plot size 4m x 6m. Block to block distance was 1.5m and plot to plot 1m. The treatments were as follows-

- T₀= Control (sole paired row cane)
- T₁= Marigold (Year round variety) as an intercrop in PRC
- T₂= Marigold (Early + Late variety) as an intercrop in PRC
- T₃= Garlic as an intercrop in PRC
- T₄= Turmeric as an intercrop in PRC
- T₅= Tobacco as an intercrop in PRC

Seedlings of all intercrops except garlic were raised in seedbed at RSRS farm and transplanted as per treatment. In case of garlic direct seeding was followed between two cane rows. Recommended time of sowing and spacing were followed in all intercrop. Fertilizers, irrigation and other intercultural operations were done as and when necessary to raise a good crop. Data on borer infestation especially for top shoot borer and stem borer were recorded from May to November according to monthly monitoring. Percent infestation was computed by counting total cane and infested canes for individual plot by using the formula:

$$\% \text{ Borer infestation} = \frac{\text{Number of infested cane/plot}}{\text{Total number of cane/plot}} \times 100$$

Data on yield parameter was also recorded. All parameters were analyzed statistically by using MSTAT-C software for analysis of variance after transformation as per necessity. ANOVA was made by F- variance test and the differences between treatment means were compared by LSD test (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Top Shoot Borer (TSB) infestation

Efficacy of different treatments on Top Shoot Borer (TSB) infestation during May to July is presented in Table 1. In May, the lowest TSB infestation (0.37%) was recorded in Tobacco intercropped plot followed by Marigold early and late variety (0.89%) and turmeric intercropped plot (1.57%) and they are statistically similar. The highest TSB infestation was found from control plot (2.53%) followed by marigold year round variety intercropped plot (2.09%). In June and July, the similar trends were found among all treatments with few exceptions. Accordingly, Tobacco intercropped plot showed the highest efficacy (78.9%) in controlling TSB infestation over control. From the results it was found that all repellent crop repelled the TSB infestation but tobacco intercropped plot performed best than others. Early and late variety of marigold intercropped tobacco plot also performed well which was more or less similar (68.84%) in efficacy as tobacco intercrop. This result was similar to the findings of Abdullah *et al* (2006) where tobacco variety 'Jati' intercropped with sugarcane showed the highest efficacy to control TSB at Kushtia Sugar Mill (KSM), Kushtia, Bangladesh.

Table1. Effects of different repellent crops in controlling TSB of sugarcane at RSRs Farm, Gazipur, 2008-09

Treatments	Percent TSB infestation and efficacy						
	May		June		July		Mean (% efficacy)
	Mean (Ln+1)	% efficacy over control	Mean (Ln+1)	% efficacy over control	Mean (Ln+1)	% efficacy over control	
T ₀ = Control (PRC only)	2.53 a (1.59)	-	2.46 a (1.57)	-	1.58 a (1.25)	-	-
T ₁ = Marigold (Year round variety in PRC)	2.09 a (1.44)	17.39	1.02 ab (0.95)	58.54	0.99 ab (0.99)	37.34	37.76
T ₂ = Marigold (Early +Late variety in PRC)	0.89 ab (0.94)	64.82	0.50 b (0.71)	79.67	0.60 ab (0.77)	62.03	68.84
T ₃ = Garlic in PRC	2.08 a (1.44)	17.79	2.09a (1.24)	15.04	1.00 ab (1.00)	36.71	23.18
T ₄ = Turmeric in PRC	1.57 ab (1.25)	37.94	0.91ab (0.91)	63.01	0.55 ab (0.74)	65.19	55.38
T ₅ = Tobacco in PRC	0.37 b (0.61)	85.37	0.45 b (0.67)	81.71	0.48 b (0.86)	69.62	78.90
CV %	57.31	-	47.13	-	67.94	-	

*Figures in the parentheses are transformed as per SQRT. Means having same letter(s) in a column did not differ significantly by LSD test.

*(Ln+1) - log transformation.

Stem Borer (SB) infestation

Efficacy of different treatments on Stem Borer (SB) infestation during July to November is presented in Table 2. Results indicated that mean percent infestation of stem borer in different treatments of repellent intercrop varied from 0.42 to 1.99 in July, 2.29 to 7.84 in September and 2.84 to 9.68 in November, respectively. Moreover, a significant variation showed in case of stem borer infestation in intercropped plot as compared to control plots. In July it was found that all repellent crop performed better in reducing the stem borer infestation but tobacco and marigold (early and late variety) showed the best performance in controlling stem borer (0.42% infestation) followed by garlic (0.52%) and turmeric (0.62%). But there was no significant difference in the treatment rather than control. In September, marigold (early and late variety) intercropped plot showed the lowest percent infestation (2.29%) followed by tobacco (2.67%) which are statistically similar. In November, the highest performance i.e. the lowest infestation was found from tobacco intercropped treatment with 2.84% infestation only. Accordingly, among the entire repellent crop the highest per cent efficacy (71.83%) was also recorded from tobacco intercrop in comparison with rest four. The results were in agreement with the findings of the Abdullah *et al.* (2006) who studied that some tobacco varieties are incorporated with sugarcane to suppress borer infestation, where the efficacy percent was ranged from 47.75 to 61.42% against stem borer. Sattar and Salihah (2001) also suggested to growing turmeric around sugarcane field to repel borer pests and termites.

Table 2. Effects of different repellent crops in controlling SB of sugarcane at RSRS Farm, Gazipur, 2008-09

Treatments	Percent SB infestation and efficacy						
	July		September		November		Mean (% efficacy)
	Mean	% efficacy over control	Mean	% efficacy over control	Mean	% efficacy over control	
T ₀ = Control(PRC only)	1.99 a (1.41)	-	7.84 a (2.79)	-	9.68 a (3.11)	-	-
T ₁ = Marigold (Year round variety in PRC)	0.45 b (0.67)	77.39	4.36 ab (2.08)	44.39	7.41 ab (2.72)	23.45	48.41
T ₂ = Marigold (Early +Late variety in PRC)	0.42 b (0.64)	78.89	2.29 b (1.51)	70.79	5.00 bc (2.23)	48.35	66.01
T ₃ = Garlic in PRC	0.52 b (0.72)	73.87	4.37 ab (2.09)	44.26	4.65 bc (2.16)	51.96	56.70
T ₄ = Turmeric in PRC	0.62 b (0.78)	68.84	5.97 ab (2.44)	23.85	8.85 ab (2.97)	11.30	34.66
T ₅ = Tobacco in PRC	0.42 b (0.64)	78.89	2.67 b (1.63)	65.94	2.84 c (1.68)	70.66	71.83
CV %	77.04	-	47.01	-	36.13	-	-

*Figures in the parentheses are transformed as per SQRT. Means having same letter(s) in a column did not differ significantly by LSD test.

Yield parameters

The total number of tiller, millable cane production and yield of cane are presented in Table 3. No significant difference was found among all treatments in any parameter. The highest number of tillers ($85.35 \times 10^3 \text{ha}^{-1}$) was recorded from sugarcane intercropped with tobacco followed by early and late variety marigold ($78.47 \times 10^3 \text{ha}^{-1}$). Similar trend was also found in case of millable cane ($71.95 \times 10^3 \text{ha}^{-1}$) production. The highest cane yield (107.8 t/ha) was delivered from sugarcane intercropped with tobacco followed by sugarcane intercropped with garlic (101.80 t/ha). Thirumurugan and Koodalingam (2005) reported that tobacco intercropped with sugarcane had significantly lower borer incidence and produced higher cane yield than sugarcane as a sole crop which reflect the higher cane yield of the present study.

Table 3. Effects of different treatments on yield parameters of sugarcane at RSR Farm, Gazipur, 2008-09

Treatments	Yield contributing characters		
	Tiller ($\times 10^3 \text{ha}^{-1}$)	Millable Cane ($\times 10^3 \text{ha}^{-1}$)	Yield (t ha^{-1})
T ₀ = Control(PRC only)	73.13	64.72	85.17
T ₁ = Marigold (Year round variety in PRC)	71.46	54.93	85.49
T ₂ = Marigold (Early +Late variety in PRC)	78.47	66.94	94.07
T ₃ = Garlic in PRC	78.40	68.40	101.60
T ₄ = Turmeric in PRC	75.18	68.20	96.12
T ₅ = Tobacco in PRC	85.35	71.95	107.80
CV %	14.76	15.82	16.92

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