

Evaluation of Tobacco Intercropping as Botanical Pesticide in Controlling Borer Pests in Sugarcane

M. Abdullah, M. A. Alam, M.A.Rahman and M. N. A. Siddiquee

Bangladesh Sugarcane Research Institute
Ishurdi, Pabna, Bangladesh

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ABSTRACT

A field experiment was conducted to evaluate the efficacy of eight tobacco varieties viz., NC-95, K-326, Motihari, Jati, DV, CCDV, CC Sesmeria and Korban 60 as intercrop with sugarcane against borer complex at two locations in the cropping season 2004-2005. Results revealed that all test varieties intercropped with sugarcane controlled early shoot borer showing 39.59 to 69.38% efficacies over non-intercropped sugarcane. Sugarcane intercropped with Jati, Motihari and K 326 following the incorporation of their residues in soil showed 64.97, 54.22 and 45.37% efficacies respectively over non-intercropped sugarcane to control top shoot borer. Data recorded in November showed the highest efficacies (32.37% and 57.21%) in Jati intercropped sugarcane to suppress stem borer infestation at both locations. The lowest rootstock borer infestation was observed in Motihari intercropped sugarcane showing 59.61% efficacy over non-intercropped sugarcane. Sugarcane intercropped with tobacco varieties produced higher yield than non-intercropped sugarcane.

Keywords: Sugarcane, Tobacco intercropping, botanical pesticide, borer pests

INTRODUCTION

Sugarcane is a major cash crop in Bangladesh but its production per unit area is considerably lower than many other sugarcane producing countries of the world. Sugarcane pests specially borers are serious problem in cane cultivation. Among major pests, top shoot borer (*Scirpophaga excerptalis* Walker), stem borer (*Chilo tumidicostalis* Hampson) and rootstock borer (*Emmalocera depressella* Swinhoe) are the most destructive. Alam (1967) reported that these pests alone can cause damage ranging from 20-60% under field conditions. Considerable yield losses which are estimated to be around 20% in cane yield and 15% in sugar recovery have also been reported (Avasthy, 1983). Due to their infestation, losses in yield incurred every year are estimated to be 21-48% by top shoot borer (Karim and Islam, 1977), 8.2-12.6% by stem borer, *Chilo tumidicostalis* Hampson (Khanna *et al.* 1957), 8.55% (Miah *et al.* 1986) and upto 10% by rootstock borer (Gupta and Avasthy, 1952).

Sugarcane is usually intercropped with other crops such as wheat, sugarbeet, egyptian clover and tobacco. 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 field grown with wheat. Baliddawa (1985) reported that population of several pests was 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 lone sugarcane 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 pest including cultural and mechanical control. Botanical insecticides have recently been used to control a variety of insect pests in field crops. Several commercially produced botanical compounds have exhibited enormous potential as insecticides. Tobacco has pungent smell and their residues influence in sugarcane ecosystem. In Bangladesh, it is not known because no appreciable work has been done to determine the effect of inter

cropping with tobacco on the incidence of insect pests of sugarcane crop. Therefore, the experiment was undertaken to evaluate tobacco variety/varieties effective as botanical pesticides in controlling borer complex through inter-cropping with sugarcane.

MATERIALS AND METHODS

The experiment was conducted to evaluate eight tobacco varieties viz. NC-95, K-326, Motihari, Jati, DV, CCDV, CC Sesmeria and Korban 60 as intercrop (Figure 1) against sugarcane borers in two locations viz., Regional Sugarcane Research Station (RSRS), Thakurgaon and Kushtia Sugar Mills, Kushtia in the cropping season 2004-2005. The experiment was set up in the month of November with variety Isd 20 in paired row. The experiment was laid out in RCB design with 8 varieties and one control (without tobacco) and replicated thrice. The plot size was 7m × 7m. Block to block distance was 2m and plot to plot distance was 1m. Tobacco seedlings were raised in seedbeds in October and transplanted at the main field in December 2004. Tobacco seedlings were planted at a distance of 60 cm in rows between paired row canes. After transplanting tobacco seedlings in the field live irrigation was applied. All types of intercultural operations like weeding, mulching, fertilizer application and irrigation were done as and when necessary. Data on early shoot borer (ESB) infestation were recorded in March. When tobacco plants became dry just after yellowing of leaves the whole plants were incorporated into the soil at the base of plants. Data on top shoot borer (TSB) and stem borer (SB) infestation were recorded twice, one in July/August and the other in November while for rootstock borer (RSB) data were taken only in November 2005. Yield of cane was recorded at harvest.



Figure1 : Field view of tobacco intercrop with paired row sugarcane

RESULTS AND DISCUSSION

It is observed that early shoot borer (ESB) infestation was nill at RSRS Thakurgaon (Table 1). Statistically no significant deference was observed in tobacco-intercropped sugarcane and non-intercropped sugarcane for ESB infestation at KSM, Kushtia (Table 2). Tobacco intercropped plots had ESB infestation, which ranged from 2.97 to 5.86% whereas Jati intercropped with sugarcane, had the lowest (2.97%) ESB infestation. The efficacy ranged from 39.59 to 69.38% among the intercropped tobacco varieties in which Jati intercropped with sugarcane showed the highest efficacy (69.38%) to control ESB at KSM, Kushtia. Varun *et al.* (1994) reported that growing of odouriferous crops such as ajawin, garlic, coriander, onion and mentha as intercrop in sugarcane significantly reduced the incidence of early shoot borer. Top

shoot borer infestation ranged from 8.85 to 16.07% among tobacco intercropped sugarcane while non-intercropped sugarcane showed 16.20% TSB infestation at RSRS Thakurgaon (Table 1). The lowest TSB infestation (8.85%) was observed in plot intercropped with K 326 followed by Jati (9.30%) at RSRS Thakurgaon. The efficacy ranged from 1.67 to 45.37% among the intercropped tobacco varieties in which K 326 intercropped with sugarcane showed the highest efficacy (45.37%) to control TSB at RSRS Thakurgaon. TSB infestation at Kushtia varied from 5.77 to 16.10% among tobacco intercropped sugarcane where the lowest TSB infestation (5.77%) was observed in plot intercropped with Jati followed by Motihari (7.54%) and K 326 (8.24%) (Table 2). The efficacy ranged from 1.64 to 64.97% among the intercropped tobacco varieties in which Jati intercropped with sugarcane showed the highest efficacy (64.97%) to control TSB at KSM, Kushtia. 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 to control top shoot borer which is similar with results of present study.

Significant differences were observed between tobacco intercropped sugarcane and non-intercropped sugarcane for SB infestation at RSRS Thakurgaon. Data collected in August show all tobacco intercrops controlled SB significantly over non-intercropped sugarcane but all tobacco intercropped sugarcane showed at par among each other (Table 1). The infestation of SB ranged from 4.63 to 6.27% among tobacco intercropped sugarcane while non-intercropped sugarcane showed 12.00% SB infestation at RSRS Thakurgaon. The efficacy ranged from 47.75 to 61.42% among the intercropped tobacco varieties in which CC Sesmeria intercropped with sugarcane showed the highest efficacy (61.42%) to control SB at RSRS Thakurgaon. The infestation of SB was very low in July at Kushtia (Table 2). No significant differences were observed among tobacco intercropped sugarcane and non-intercropped sugarcane for SB infestation in November that ranged from 17.22 to 24.33% at RSRS Thakurgaon. The efficacy ranged from 0.62 to 32.72% among the intercropped tobacco varieties in which Jati intercropped with sugarcane showed the highest efficacy (32.72%) to control SB at RSRS Thakurgaon. The infestation of SB ranged from 15.49 to 39.19% among tobacco intercropped and non-intercropped plots in November at Kushtia. The lowest SB infestation (15.49%) was observed in sugarcane intercropped with Jati that was statistically significant over non-intercropped sugarcane at KSM Kushtia. The efficacy ranged from 0.03 to 57.21% among the intercropped tobacco varieties in which Jati intercropped with sugarcane showed the highest efficacy (57.21%) to control SB at KSM Kushtia. Abdullah *et al.* (2006) reported that when tobacco plant powder applied @ 100 kg ha⁻¹ in planting, March, May and August gave upto 18.10% efficacy to control stem borer which shows similarity with the results of some tobacco varieties of present study.

No significant result was observed in reducing RSB infestation at both locations. RSB infestation was very high at Thakurgaon, which ranged from 74.13 to 88.59% among tobacco intercropped sugarcane and non-intercropped sugarcane (Table 1). The efficacy ranged from 0.17 to 16.32% among the intercropped tobacco varieties in which DV intercropped with sugarcane showed the highest efficacy (16.32%) to control RSB at RSRS Thakurgaon. RSB infestation at Kushtia was low, which varied from 3.57 to 8.84% among tobacco intercropped sugarcane and non-intercropped sugarcane where the lowest RSB infestation (3.57%) was observed in plots intercropped with Motihari variety followed by Jati variety. The efficacy ranged from 3.85 to 59.61% among the intercropped tobacco varieties in which Motihari intercropped with sugarcane showed the highest efficacy (59.61%) to control RSB at KSM Kushtia. Abdullah *et al.* (2006) reported that when tobacco plant powder applied @ 100 kg ha⁻¹ in planting, March, May and August gave the highest efficacy of 40.49% to control rootstock borer infestation which shows similarity with the results of some tobacco varieties of present study.

Significant differences were observed in sugarcane yield in tobacco intercropped sugarcane over control plots at both locations. The yield of sugarcane recorded were 39.81 to 58.97 and 82.90 to 116.00 t ha⁻¹ at Thakurgaon and Kushtia respectively among tobacco intercropped sugarcane. Sugarcane intercropped with tobacco variety K 326 had the highest yield at both locations. Thirumurugan and Koodalingam (2005) reported that intercropped sugarcane had significantly lower shoot borer incidence and produced higher cane yield than sugarcane as sole crop which reflect the higher cane yield of the present study. Thus, it may be concluded that tobacco can be grown as intercrop following incorporation of tobacco residues into soil, which may be a good botanical control method against top shoot borer, stem borer and rootstock borer of sugarcane.

Table 1. Effects of different tobacco varieties against sugarcane borers, RSRS, Thakurgaon, 2005.

Tobacco varieties	% Infestation (mean)					Yield (t ha ⁻¹)
	ESB	TSB (16.11.05)	SB		RSB (16.11.05)	
			(28.8.05)	(16.11.05)		
NC-95	0.00	11.75 (27.47)*	4.75b (60.42)	21.47 (11.76)	79.24 (10.55)	58.14a**
K-326	0.00	8.85 (45.37)	4.80b (60.00)	20.16 (17.14)	87.64 (1.07)	58.97a
Motihari	0.00	16.07 (0.80)	5.25b (56.25)	24.12 (0.86)	76.67 (13.46)	39.81cd
Jati	0.00	9.30 (42.59)	5.12b (57.33)	16.37 (32.72)	87.80 (0.89)	58.23a
DV	0.00	12.23 (24.51)	6.12b (49.00)	24.20 (0.53)	74.13 (16.32)	44.99bc
CCDV	0.00	10.98 (32.22)	6.27b (47.75)	24.18 (0.62)	87.87 (0.81)	41.10cd
CC Sesmeria	0.00	15.93 (1.67)	4.63b (61.42)	24.11 (0.90)	88.44 (0.17)	53.75ab
Korban 60	0.00	10.20 (37.04)	5.90b (50.83)	17.22 (29.22)	80.31 (9.35)	49.35abc
Control	0.00	16.20	12.00a	24.33	88.59	35.17d
LSD (5%)	-	NS	2.340	NS	NS	9.650

ESB= Early shoot borer, TSB= Top shoot borer, SB= Stem borer, RSB= Rootstock borer

*Figures in parenthesis are percent effectiveness over control

**Figures followed by the same letter (s) are not significantly different at 5% level as per LSD test.

Table 2. Effects of different tobacco varieties against sugarcane borers, Kushtia Sugar Mills Ltd, Kushtia. 2005.

Tobacco varieties	% Infestation (mean)					Yield (t ha ⁻¹)
	ESB	TSB (23.11.05)	SB		RSB (23.11.05)	
			(28.7.05)	(23.11.05)		
NC-95	4.36 (55.05)	13.57 (17.61)*	0.77	35.39a** (0.22)	5.36 (39.37)	102.83abc
K-326	4.10 (57.73)	8.24 (49.97)	0.13	33.48ab (7.51)	4.14 (53.17)	116.00a
Motihari	4.69 (51.65)	7.54 (54.22)	1.88	36.19a (0.03)	3.57 (59.61)	105.58ab
Jati	2.97 (69.38)	5.77 (64.97)	0.65	15.49c (57.21)	3.91 (55.77)	104.09abc
DV	3.07 (68.35)	9.88 (40.01)	1.23	16.95c (53.18)	5.07 (42.65)	96.47bcd
CCDV	5.86 (39.59)	16.20 (1.64)	0.00	20.57bc (43.18)	8.50 (3.85)	82.90de
CC Sesmeria	3.88 (60.00)	13.83 (16.03)	2.27	34.71a (4.17)	7.72 (12.67)	82.73de
Korban 60	5.35 (44.85)	16.10 (2.25)	1.07	34.38a (5.03)	6.38 (27.83)	90.22cd
Control	9.70	16.47	1.01	36.20a	8.84	74.20e
LSD (5%)	NS	NS	NS	13.33	NS	14.31

ESB= Early shoot borer, TSB= Top shoot borer, SB= Stem borer, RSB= Rootstock borer

*Figures in parenthesis are percent effectiveness over control

**Figures followed by the same letter (s) are not significantly different at 5% level as per LSD test.

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