

Efficacy of Tobacco Extracts in Controlling Sugarcane Borers

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ABSTRACT

A field experiment was conducted at Bangladesh Sugarcane Research Institute, Ishurdi, Pabna to evaluate the efficacy of tobacco leaf extracts against top shoot borer of sugarcane in the cropping season 2005-2006. Extracts from eight tobacco varieties viz. NC-95, K-326, Motihari, Jati, DV, CCDV, CC Sesmeria and Korban 60 were sprayed in the sugarcane field. Pooled data showed that all tobacco extracts (T₁-T₈) sprayed in March, May and July gave 22.74 to 36.90% efficacy to control top shoot borer but Motihari leaf extract (T₉) applied in March to July gave the highest efficacy of 57.96% over untreated. On the other hand tobacco extracts from variety NC-95 and CCDV showed 26.75% and 59.83% efficacy to control stem borer and rootstock borer respectively. Increased yield were recorded in treated plots compared to untreated plots.

Keywords: Sugarcane, tobacco extracts, borers

INTRODUCTION

Sugarcane is a major cash crop in Bangladesh. Among the factors causing low productivity of sugarcane, the insect pests constitute the major factor. Considerable yield losses which are estimated to be around 20% in cane yield and 15% in sugar recovery have been reported (Avasthy, 1983). Among 70 insect pests attacking sugarcane, Top shoot borer (TSB), *Scirpophaga excerptalis* Walker, Stem borer, *Chilo tumidicostalis* Hampson and Rootstock borer, *Emmalocera depressella* Swinhoe are the three of the most destructive. 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). The indiscriminate uses of chemical pesticides have resulted in adverse effects like resistance (Saxena *et al.*, 1992, Armes *et al.*, 1992), ecological imbalance, health hazards and resurgence of secondary pest. 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. Also, 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. The objective of the study was to find out the efficacy of tobacco extracts, a botanical product in controlling TSB, SB and RSB and to find out suitable tobacco varieties effective as botanical pesticides in controlling the target pests.

MATERIALS AND METHODS

An experiment was conducted to evaluate the efficacy of tobacco extract against sugarcane borers at Bangladesh Sugarcane Research Institute (BSRI), Ishurdi, Pabna during the cropping season 2005-2006. Plantation was done on 03.01.06 with sugarcane variety Isd 34. The experiment was laid out in a randomised complete block (RCB) design with three replications. There were 10 treatments including one control. The plot size was 6m × 6m. Blocks were 2m apart from each other while the plot border was 1 m. Eight tobacco varieties viz. NC-95, K-326, Motihari, Jati, DV, CCDV, CC Sesmeria and Korban 60 were included in the study. All intercultural operations like fertilization, irrigation, weeding, mulching, earthing up etc. were done as and when required. Tobacco extracts were prepared in the laboratory. An amount of 250 g tobacco leaf powder was dipped in 1 liter of water over night and collected tobacco extract was allowed for steam boiling to reduce the volume one fourth for each tobacco variety. Each plot needed 25 ml concentrated tobacco extract with 2 litre of water for spray (6.94 kg powder per one spray ha⁻¹) on sugarcane plants with a Knap-sack sprayer in March, May and July. Among the treatments, one treatment (T₉) where 250 g Motihari leaf powder was dipped in one litre of water over night (normal extract: without steam boiling) and sprayed in March to July, once a month where 100 ml normal extract mixed with 2 litre of water to spray a

plot (13.88 kg powder per one spray ha⁻¹). Data were taken in May, July, August and November for top shoot borer infestation and July, August and November for stem borer infestation. Data on rootstock borer infestation were recorded from 5 uprooted clumps/plots at harvest.

Treatments :

T0 - Control

- T₁ - NC- 95 leaf extract @ 12.5 gm/ L water (March + May + July)
- T₂ - K- 326 leaf extract @ 12.5 gm/ L water (March + May + July)
- T₃ - Motihari leaf extract @ 12.5 gm/ L water (March + May + July)
- T₄ - Jati leaf extract @ 12.5 gm/ L water (March + May + July)
- T₅ - DV leaf extract @ 12.5 gm/ L water (March + May + July)
- T₆ - CCDV leaf extract @ 12.5 gm/ L water (March + May + July)
- T₇ - CC Sesmeria leaf extract @ 12.5 gm/ L water (March + May + July)
- T₈ - Korban-60 leaf extract @ 12.5 gm/ L water (March + May + July)
- T₉ - Motihari leaf extract (250 g leaf + 1 L water) (March - July, once a month)

RESULTS AND DISCUSSION

The results reveal that top shoot borer (TSB) infestation ranged from 1.99 to 7.26% among the plots sprayed with tobacco extracts where the untreated plots had 8.55% infestation in May and they did not vary significantly over control (Table 1). The lowest infestation of TSB (1.99%) was observed in plots (T₉) sprayed with (normal leaf extract mixed with water) Motihari variety giving 76.73% effectiveness over control followed by same variety (T₃) (concentrated leaf extract mixed with water) in May. The plot (T₉) that received 2 spray (March and April) gave better results compared to one spray in March. Significant differences were observed among the treatments for TSB infestation in July where tobacco varieties viz., NC 95, K 326, Jati, Korban 60 and Motihari showed 44.44 to 52.19% effectiveness to control TSB. In August TSB infestation varied from 3.19 to 7.40% among the treated plots where control plot had 8.87% TSB infestation and showed statistically at par. The lowest infestation (3.19%) was observed in plots (T₉) sprayed with Motihari extract that showed 64.04% effectiveness over untreated control. Significant differences were observed among the treatments for TSB infestation in November (at harvest) where TSB infestation varied from 8.37 to 16.29% among the treated plots and tobacco varieties viz., NC 95, K 326, DV, CCDV, Korban 60 and Motihari (T₉) showed 22.27 to 50.94% effectiveness to control TSB. The lowest infestation (8.37%) was observed in plots (T₉) sprayed with Motihari extract that showed 50.94% effectiveness over untreated control. Pooled data showed 17.26 to 36.90% efficacy when extract of all tobacco varieties sprayed (concentrated leaf extract mixed with water) to control TSB but Motihari extract (normal leaf extract mixed with water) gave the highest efficacy of 57.96% over control. Abdullah *et al.* (2006) reported that when tobacco plant powder applied @ 80 kg ha⁻¹ in planting, March, May and August found 34.61% efficacy to control top shoot borer which coincides with results of present study.

In case of stem borer (SB), no significant difference was observed among the treatments at different times (Table 2). Stem borer infestation was very low in July. Data collected in August showed that tobacco varieties viz., NC 95, K 326, Jati, CCDV and Motihari (T₉) showed 22.37 to 58.97% effectiveness to control SB. The lowest SB infestation (4.64%) was observed in plots (T₉) sprayed with Motihari extract that showed 58.97% effectiveness over untreated control. Data recorded at harvest showed that tobacco varieties viz., NC 95, CCDV and Motihari (T₉) showed 18.71 to 26.75% effectiveness to control SB. Abdullah *et al.* (2006) reported that when tobacco plant powder applied @ 100 kg ha⁻¹ in planting, March, May and August gave up to 18.10% efficacy to control stem which have similarities with the results of present study. In case of Rootstock borer (RSB), significant differences were observed among the treated plots at harvest where RSB infestation varied from 8.03 to 16.45% and the efficacy ranged from 17.71 to 59.83% over untreated control (Table 2). The lowest RSB infestation (8.03%) was observed in plots sprayed with the extract of CCDV tobacco variety that showed 59.83% effectiveness followed by 8.40% infestation in Korban 60 and 8.48% infestation in NC-95 with 57.98% and 57.58% effectiveness respectively and they are statistically similar. 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. No significant differences were observed in yield among the treated and untreated plots at harvest but treated plots gave higher yield compared to untreated plots. The yield of cane ranged from 78.33 to 99.72 t ha⁻¹ among the treated plots

and the untreated plots had an yield of 75.00 t ha⁻¹ (Table 3). The highest yield of 99.72 t ha⁻¹ was recorded in plots sprayed with tobacco variety Jati followed by 88.34 t ha⁻¹ in Motihari (T₉). Thus, it may be concluded that tobacco leaf extract could be used as a good botanical control against TSB, SB and RSB but more research is needed to determine the proper dose and time of application.

Table 1. Effect of tobacco extract in controlling Top shoot borer (TSB) in sugarcane. BSRI, Ishurdi, Pabna. 2006.

Treatments (Tobacco varieties)	% TSB infestation (mean)				Pooled % infestation
	(23.5.06)	(23.7.06)	(27.8.06)	(23.11.06)	
T ₁ - NC 95	4.91 (42.57)	5.78cd** (46.03)	7.01 (20.97)	13.26ab (22.27)	7.74 (31.50)
T ₂ - K 326	5.31 (37.89)	5.95cd (44.44)	6.73 (24.13)	12.53abc (26.55)	7.63 (31.59)
T ₃ - Motihari	3.74 (56.26)	9.75ab (8.96)	6.84 (22.89)	14.59ab (14.48)	8.73 (22.74)
T ₄ - Jati	7.26 (15.09)	5.16d (48.18)	5.93 (33.15)	16.29ab (4.51)	8.66 (23.36)
T ₅ - DV	5.17 (39.53)	9.28abc (13.35)	7.40 (16.57)	12.84abc (24.74)	8.67 (23.27)
T ₆ - CCDV	3.98 (53.45)	6.84bcd (36.13)	6.05 (31.79)	11.63bc (31.83)	7.13 (36.90)
T ₇ - CC Sesmeria	5.92 (30.76)	8.37abcd (21.85)	7.07 (20.29)	16.05ab (5.92)	9.35 (17.26)
T ₈ - Korban 60	4.94 (42.22)	5.12d (52.19)	6.46 (26.83)	12.16bc (28.72)	7.17 (36.55)
T ₉ - Motihari*	1.99 (76.73)	5.44d (49.21)	3.19 (64.04)	8.37c (50.94)	4.75 (57.96)
T ₀ - Control	8.55	10.71a	8.87	17.06a	11.30
LSD (5%)	NS	3.75	NS	4.67	-

Figures in parenthesis are percent effectiveness over control

*Normal extract, ** Figures accompanied by the same letter are not significantly different at 5% level as per LSD test.

Table 2. Effect of tobacco extract in controlling Stem borer (SB) and Rootstock borer (RSB) in sugarcane. BSRI, Ishurdi, Pabna. 2006.

Treatments (Tobacco varieties)	% SB infestation (mean)			% RSB infestation (mean)
	(23.7.06)	(27.8.06)	(23.11.06)	(23.11.06)
T ₁ - NC 95	0.20	7.80 (31.03)	12.92 (26.75)	8.48cd** (57.58)
T ₂ - K 326	0.84	8.78 (22.37)	17.33 (1.76)	13.05abcd (34.72)
T ₃ - Motihari	0.52	9.20 (18.66)	15.13 (14.23)	14.41abc (28.04)
T ₄ - Jati	2.47	8.34 (26.26)	15.88 (9.98)	14.82ab (25.86)
T ₅ - DV	0.53	11.15 (1.41)	17.21 (2.43)	9.10bcd (54.48)
T ₆ - CCDV	0.84	8.64 (23.61)	13.26 (24.83)	8.03d (59.83)
T ₇ - CC Sesmeria	0.23	10.98 (2.92)	15.41 (12.64)	12.81abcd (35.92)
T ₈ - Korban 60	1.50	10.32 (8.75)	16.26 (7.83)	8.40cd (57.98)
T ₉ - Motihari*	1.49	4.64 (58.97)	14.34 (18.71)	16.45a (17.71)
T ₀ - Control	1.39	11.31	17.64	19.99a
LSD (5%)	NS	NS	NS	6.018

Table 3. Effects of tobacco extracts on the yield of sugarcane. BSRI, Ishurdi, Pabna. 2006.

Treatments (Tobacco varieties)	Yield (t ha ⁻¹)
T ₁ - NC 95	85.74
T ₂ - K 326	81.30
T ₃ - Motihari	84.26
T ₄ - Jati	99.72
T ₅ - DV	79.17
T ₆ - CCDV	78.33
T ₇ - CC Sesmeria	81.39
T ₈ - Korban 60	85.83
T ₉ - Motihari*	88.34
T ₀ - Control	75.00
LSD (5%)	NS

* Normal extract

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