

assessment of loss caused by top shoot Borer (*Scirpophaga excerptalis* Walk) and stem Borer (*Chilo tumidicostalis* Hamps. and *Chilo auricilius* Dudgeon)

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ABSTRACT

An experiment on assessment of loss caused by Top Shoot Borer (*Scirpophaga excerptalis* Walk.) and Stem Borers (*Chilo tumidicostalis* Hampson and *Chilo auricilius* Dudgeon) was carried out. The Top Shoot Borer (TSB) infested canes contain 2% less sucrose than the Stem Borer (SB) infested canes. It would be economic if the control measures are taken when there are 5% infestations by each of TSB and SB in respect of the cane weight and sucrose content together. When the cane weight is alone considered, it would not be economic to engage labourers if SB and TSB infestations are below 20% and 10% respectively. Thus it is suggested that mechanical control operation would be profitable to keep infestation below economic injury level.

INTRODUCTION

Pests cause severe damage to crops to such an extent and frequency that they often result in economic and social changes in many places (Rai and Rai, 1979). It has been estimated that a large amount of losses are caused by weeds (33%), followed by plant diseases (20%), insects (25%) and rodents (6%). Records of variable damages caused by borers were available. Schaff (1975) reported in Jamaica that bored internodes produced 45% less sugar than undamaged internodes. Studies elsewhere in Mexico showed an average loss of 300g of sugar per metric ton of cane for every 1% of internodes infested; this combined with loss of nearly 15,000 tons from 9,00,000 tons of cane (Humbert, 1976). Economic losses caused by the pest amount to some 20% of the total production of sugarcane. (Planal Sugar Annual Report p-40. 1977).

Damage to a particular crop is the sum total of the effects of all the prevailing pests. The sugarcane crop is affected by four species of stem borers, one species of top shoot borer, one species of root borer, two or more species of white grubs and three species of sap suckers (Karim and Islam, 1976). Apart from the damage caused by various major and minor pests the loss due to TSB was reported earlier (Miah *et al.*, 1980). The present paper describes the damage caused by SB and economic injury level of SB & TSB.

MATERIALS AND METHODS

Ten infested and non infested plants of several commercially cultivated sugarcane varieties were weighed and crushed individually and sugar recovery studied with polarimeter. The decrease in cane weight and sucrose content of these varieties cultivated at Sugarcane Research Institute (SRI) experiment farm was recorded. Since infestation level differs with varieties the loss of cane was calculated according to the following formula (Miah *et al.*, 1980). Percent cane loss = $\frac{A - (B + C)}{A} \times 100$, where

A = Estimated weight of millable healthy cane in the field

B = Total weight of infested canes,

C = Total weight of infestation free cane

Again,

B = a x b x c, where

a = Total no. of cane in the area,

b = Percent infested canes.

c = weight of infested canes.

Loss in terms of sugar was assessed as follows :

Percent sugar loss = $\frac{A_1 - (B_1 + C_1)}{A_1} \times 100$, where

A₁ = Estimated sugar produced from one acre @ 11% available sugar.

B₁ = Sugar from infestation free cane @ 11% available sugar.

C₁ = Sugar from infested cane and B₁ = A₁ - C₁.

Again C₁ = a x 0.14 x 0.09, where a = Expected weight of infested cane.

0.14 = Weight reduction factor of infested cane.

0.09 = Percent available sugar in infested cane.

RESULTS AND DISCUSSION

Loss of TSB and SB may be termed as two dimensional because the infestation reduces yield as well as the sucrose content. Moreover, the rate of reduction varies with the intensity of attack as well as the tolerance which is an important component of varietal resistance. Loss caused to the several cane varieties by SB and TSB was reported earlier which showed that on an average 2% sucrose is reduced by Top Shoot Borer (Miah, *et al.*, 1980). Therefore, it was apparent that TSB was more damaging than the other if infested at later stage of growth.

Growers are affected by these insects because of reduced weight of canes. The loss in weight per cane varies from 0.1 lb to 0.7 lb with varieties (Miah, *et al.*, 1980). Considering 400 mds as total yield of canes per acre, extent of infestation upto 100% and average weight loss 14% the loss per acre would be 56 mds due to one species of insect only. This agrees with the results obtained in Louisiana, where 1.5 tons of cane per acre were reduced due to borer infestation. (Hensely, S.D. 1971).

Last year, it was observed in the farmers fields of Carews & Co. Darsana, that 80% canes were infested by several plant boring insects (personal observation). In such a case, the grower may apprehend a minimum loss of 48 mds of canes/acre which would be equal to Tk. 576/-. Since Top shoot borer infested canes had about 2% less sucrose, production of sugar from one acre of such heavily infested cane field would be reduced by a factor, 24.3%.

The damage caused by TSB and SB are shown in tables 1 & 2, which show that total loss in terms of cane and sugar increased with the increasing level of infestation.

Table 1. Assessment of loss due to top shoot borer infestation.

Infested cane sticks.	Cane loss by weight %	Sugar loss by weight %	Loss due to TSB attack			(Taka)
			Cane loss	Sugar loss	Total loss	
100	14.0	29.6	672	5209.60	5881.60	
90	12.5	26.7	600	4699.20	5299.20	
80	11.3	23.7	540	4171.20	4711.20	
70	9.5	20.7	456	3643.20	4099.20	
60	8.5	17.8	408	3132.80	3540.80	
50	7.0	14.8	336	2604.80	2940.80	
40	5.5	11.9	264	2094.40	2358.40	
30	4.3	8.9	204	1566.40	1770.40	
20	3.0	5.9	144	1038.40	1182.40	
10	1.5	3.0	72	528.00	600.00	
5	0.8	1.5	36	264.00	300.00	
0	0.0	0.0	0	0.00	0.00	

* Basic parameters of calculations :

- Yield/acre—400 mds.
- Available sugar—11%
- Yield of sugar/400 mds cane—44 md.
- Price of cane Tk. 12.00/md.
- Price of sugar—Tk. 10.00/seer.

The profit of pest control measures and the economic threshold of adopting plant protection measures vary with the several inputs in the different countries. In Bangladesh mechanical control measures for SB & TSB are usually followed, which require during one crop season 10 labourers for one acre of land.

This costs about Tk. 100. Therefore, the use of labour would be economic if the infestation is 5% or above (table 1 & 2). It is worth mentioning that overall loss in-

cluding cane and sugar due to 5% infestation exceeds Tk. 100/-. But if the benefit of farmer alone is considered, then the grower may not apparently be benefitted by engaging labourers if SB & TSB infestations are below 20% and 10% respectively towards the end of the season. But the infestation towards the end resulted from the infestation during the earlier part of the season. Therefore, mechanical control would pay in the long run because pest control operation, in stead of increasing the yield saves the loss of yield which would otherwise have occurred owing to pest attack (Rai and Rai, 1979). Thus it is suggested that mechanical control operation in the early stage of plant growth would be profitable to keep infestation below economic injury level.

Table 2. Assessment of loss due to stem borer infestation.

Infested cane stick.	Cane loss by weight %	Sugar loss by weight %	Loss due to SB attack		(Taka)
			Cane Loss	Sugar loss	Total loss
100	7.33	18.00	351.84	3056.00	3407.84
90	6.60	15.70	316.00	2764.00	3080.80
80	5.86	13.89	278.40	2404.00	2722.40
70	5.13	12.16	246.24	2140.00	2386.24
60	4.47	10.41	216.00	1892.00	2046.56
50	3.67	8.68	178.16	1556.00	1704.16
40	2.93	6.93	140.64	1224.00	1360.64
30	2.19	5.22	105.12	920.00	1025.12
20	1.46	3.48	70.08	612.00	682.08
10	0.73	1.75	35.04	308.00	343.04
5	0.30	0.86	17.28	142.00	159.28
0	0.00	0.00	0.00	0.00	0.00

Basic parameters of calculations :

- Yield/acre — 400 mds.
- Available sugar — 11%
- Yield of sugar/400 mds cane — 44 mds.
- Price of cane — Tk. 12.00/md.
- Price of sugar — Tk. 10.00/seer.

REFERENCES

- Hensely, S.D., 1971. Management of sugarcane borer population, a decade of change. Entomophaga 16 : 133-46.
- Humbert, R.P. R.P., 1976. Integrated pest control surges ahead, World farming 18 (12) : 20-21, 40.
- Karim, M. A. and Islam, M.N., 1976. Sugarcane insect pests and their natural enemies recorded in Bangladesh. Proc. Annual Convention, Bangladesh Society of Sugarcane Technologists, 1974-76, p. 32-68.
- Miah, M.A.H., Khuda, A.K.M.Q.E., Khan, A.Z., Shahjahan. M., 1980. Economic aspects of Sugarcane Borers. A paper presented at the Annual Convention of Bangladesh Society of Sugarcane Technologist, Jaipurhat, April 11-12, 1980.

- Rai, S. and Rai. L., 1979. Intricacies of pest management -I, Pestology, 3(7) : 9-11.
- Shajahan, M., 1979. Agricultural Policy in Sugarcane Zones. Publication No. 7. Sugarcane Research Institute, Ishurdi, Pabna, p. 15.
- Schaff, A.C., 1975. Hand book of pest of sugarcane. Tech. Bull. 1/75 Sugar Industry Research Institute, Mandeirille.
- Summers, T.E., Orsenigo, J.R., Kidder, G., 1976. Field monitoring to determine threshold of economic loss due to the sugarcane borer, *Diatrea saccharalis*. Proceeding of American Society of Sugarcane Technologists, 6 (New series) : 148-49.