

Assessment of Loss in Yield of Cane and Sugar due to Ratoon Stunting Disease in a Sugarcane Clone

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ABSTRACT

An experiment was conducted to assess the preliminary losses in yield of cane and sugar of a promising clone I-156/66 due to Ratoon Stunting Disease (RSD). Observations were made in plant and ratoon crop during 1982-83 and 1983-84 respectively. Significant losses on yield of cane due to RSD were 21.70% in plant crop and 28.12% in first ratoon crop. Height of cane was slightly reduced in diseased cane, 5.53% in plant and 13.47% in ratoon crop.

No significant loss in sucrose percent in between healthy and RSD infected cane was found in plant and first ratoon crop. The calculated mean loss in sugar yield was found to be 14.50% in plant crop and 38.63% in ratoon crop mainly due to decrease in yield of cane by RSD. However, the calculated loss on sugar yield due to the disease was significant in ratoon crop but not in plant crop.

INTRODUCTION

Ratoon stunting disease (RSD) caused by a coryneform bacterium (Teakle, 1974; Gillaspie *et al.* 1974 and Recaud, 1977) has so far been reported from 46 sugarcane growing countries of the world (Ahmed *et al.* 1979). The disease alone can reduce the yield of cane and sugar significantly in plant and subsequent ratoon crops (Stieb, 1971; Koike, 1974 and Rossler, 1974). Agnihotri (1983) and Chu and Lee (1968) reviewed the works of some authors and stated that RSD was responsible for the so called deterioration or running out of several commercial varieties. Hughes (1974) reported that in a dry year, a smaller mill area lost 30 of its crop due to the disease in Southern Queensland. Singh (1974) cited the reference of Forbes *et al.* (1974) who reported the loss in yield of plant cane of six varieties from 11.5% to 25.1% while the loss in the first ratoon ranged from 25.1 to 46.2%. In Bangladesh, Ahmed *et al.* (1979) tested 51 clones of which 31 showed RSD infection of varying percentages. Four clones including I-156/66 were found to be highly susceptible showing 75% infected stalks. The most widely cultivated clones Co. 1158 and Co. 975 showed 27 and 29 percent infection respectively. He also stated that the low cane yields obtained in Bangladesh and their severe decline in ratoon crops may be partly attributed to RSD. Though the disease showed high incidence in some clones, losses due to the disease have not been estimated previously. But it is of prime importance to estimate the loss due to particular disease before suggesting measures for control. This work is therefore, mainly aimed at preliminary assessment of losses in yield of cane and sugar of a promising but highly RSD susceptible clone I-156/66.

MATERIALS AND METHODS

I-156/66, a clone highly susceptible to RSD was selected for the experiment to determine the losses in yield of cane and sugar in plant and ratoon crop. The experiment was conducted at

Hijalgar Farm of Carew's & Co. Darsana. The seed materials were collected from a plot which had almost cent percent infected stalks of the clone 1-156/66. The diseased stalks were ensured by splitting the canes at random and observation of orange reddish discoloration of vascular bundles in the nodal region at the level of wax band (Stiendl, 1961). To obtain healthy cane for comparison as control, long hot water treated (50°C for 3 hrs.) canes and diseased canes were planted. The experiment was set up in RCB design. Two hundred three budded setts were planted in four replicated plots having 5 lines of 5 meter rows in each plot. As the injury from long hot water treatment for RSD control may reduce cane survival to an unacceptable levels (Benda and Recaud, 1977) four hundred number of three-budded setts were planted in four replicated plots similar to diseased plots just to ensure approximately similar number of plant population in healthy plots and diseased plots. The experiment was conducted under rainfed condition and normal care was taken. Fertilizer application was made in recommended doses of urea (3 maunds in 2 splits), TSP (3 maunds at planting) and M. P. (2 maunds in 2 splits) for Carew's farm. Sterilized cane cutting knives and implements were used during sett preparation, mechanical control and harvesting of canes both in plant and ratoon crops. Thirteen month old canes were harvested in December, 1983 and RSD incidence was recorded in one hundred canes, twenty five from each healthy and diseased plots. Weight of two hundred canes, fifty from each replication and height of hundred canes, twenty five from each replication of healthy and diseased plots were taken at harvest and the mean height and weight/cane were calculated. The sucrose percent of healthy and diseased cane was obtained by analysing 10 cane stalks from each replicated plot.

Ratooning of the experiment was done in January, 1984 and was harvested after 11 months in the last week of November, 1984. Data were taken on weight of canes, height of stalks, incidence of RSD infection and sucrose percent in healthy and diseased canes.

Finally the loss in yield of cane and sugar of the clone was determined in both plant and ratoon crops.

RESULTS AND DISCUSSION

The loss in yield of cane due to RSD in plant crop (21.70%) and first ratoon crop (28.12%) are significant (Table I). Singh (1974) reported average loss in yield (36.5%) in ten varieties where the loss ranged 23.9 to 68.6%. Stieb (1971) reported average yield loss for two plant cane and one ratoon crop due to RSD to be 15.74% (5.1 MT/acre) and 36.55% (10.2 MT/acre) respectively.

The height of cane in plant and first ratoon crop was reduced to 5.53% and 13.47% respectively due to RSD (Table I). Similar loss of 6.7% in height of cane in plant crop of ten varieties was also reported by Singh (1974).

Slight increase in sucrose percentage was obtained in diseased cane in plant crop (Table I). Similar result was reported in the clone L62-96 which had higher sucrose content in diseased cane than healthy one though it was not significant (Koike, 1974). The cause of slight increase of sucrose percentage in diseased cane was unknown. However, in ratoon crop, decrease of 14.75% sugar was found in diseased cane compared to healthy one though it was not significant. Chu and Lee (1968) cited the reference of Lee and Liu who reported 20% loss of sucrose due to RSD in first ratoon crop.

Table 1. Effect of RSD on height, yield of cane, sucrose and calculated loss on sugar yield.

Clone	Treatment	Height of cane (cm)		Weight of cane (kg)		Sucrose %		Calculated loss on sugar yield	
		Mean	% loss	Mean	% loss	Mean	% loss	Mean	% loss
I-156/66 (Plant crop)	Healthy	267.4		1.06		15.26	8.34	0.161	
	Diseased	252.6	5.53 (NS)	0.83	21.70*	16.53	(NS)	0.137	14.50 (NS)
(Ratoon crop)	Healthy	167.7		0.64		13.83		0.088	
	Diseased	145.1	13.47 (NS)	0.46	28.12*	11.79	14.75 (NS)	0.054	38.63*

NS - Not significant, * Significant at 5% level as per t-test, ** Significant at 1% level as per t-test.

On the basis of yield of cane and sucrose percent, the calculated loss on sugar yield was found to be 14.50 and 38.63 in plant and ratoon crops respectively (Table 1). This loss is mainly due to loss in yield of cane caused by the disease. This result is in agreement with the findings of average loss of 41.2% in sugar yield of ten varieties (Singh, 1974) suggesting that the loss on yield of sugar was mainly due to the loss in cane yield.

In this study, losses on yield of promising clone I-156/66 are quite considerable both in plant and first ratoon crops. The calculated loss in sugar yield due to disease in cane yield in infected plant and first ratoon crop was also appreciably high. Observation on RSD infection in plant and first ratoon crop of the promising clone I-156/66 treated in hot water at 50°C for 3 hours and planted showed no symptom of RSD as this treatment fully cured the disease (Stiendl, 1961) while cent percent infection was noticed in plots planted with RSD infected cane.

In Australia, the standard practice is to treat whole stalks in hot water at 50°C for 3 hours for production of disease free seeds on a farm scale (Stiendl, 1974). Thus it may be suggested that the losses in yield of cane due to RSD can be greatly minimised with seed sources treated at 50°C for 3 hours.

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REFERENCES

- Agnihotri, V. P. 1983. Diseases of Sugarcane. First Edition, Oxford and IBH Publishing Co. 66 Janpath, New Delhi 110001., 363 p.

- Ahmed, H. U.; Khan, M. A. and Rahman, M. H. 1979. Ratoon Stunting Disease-A New Record in Bangladesh. *Sugarcane Pathologists' Newsletter*, **22**(23):23-24.
- Benda, G. T. A. and Recaud, C. 1977. The use of Heat Treatment for Sugarcane Disease Control. *Proc. ISSCT*, **16**: 483-496.
- Chu, H. T. and Lee, S. M. 1968. Ratoon Stunting Disease Control in Taiwan. *Proc. ISSCT*, **13**: 1124-1129.
- Gillaspie, A. G. Jr., Davis, R. E. and Worley, J. P. 1974. Nature of the Ratoon Stunting Disease Agent. *Proc. ISSCT*, **15**: 218-224.
- Hughes, C. G. 1974. The Economic Importance of Ratoon Stunting Disease. *Proc. ISSCT*, **15**: 213-217.
- Koike, H. 1974. Interaction Between Diseases on Sugarcane: Sugarcane Mosaic and Ratoon Stunting Disease. *Proc. ISSCT*, **15**: 258-265.
- Recaud, C.; Sullivan, S. and Autrey, J. C. 1977. Interception of RSD-associated Bacterium in Quarantine. *Sugarcane Pathologists Newsletter*, **19**: 19-20.
- Rosler, L. A. 1974. The effect of Ratoon Stunting Disease on Three Sugarcane Varieties under Different Irrigation Regimes. *Proc. ISSCT*, **15**: 250-257.
- Singh, G. R. 1974. Studies on the yield of cane and Juice Quality due to Ratoon Stunting Disease of Sugarcane in India. *Indian Sugar*, **24** (7): 623-629.
- Stieb, R. J. 1971. Reaction to Ratoon Stunting Disease of New Sugarcane Varieties Grown Commercially in Louisiana. *Proc. ISSCT*, **14**: 985-990.
- Stiendl, D. R. L. 1961. Ratoon Stunting Disease. In *Sugarcane Diseases of the World*. J. P. Martin, E. V. Abbott and C. G. Hughes (eds). Vol. I. Elsevier Publishing Co. Amsterdam. pp. 433-459.
- Stiendl, D. R. L. 1974. Ratoon Stunting Disease-History, Distribution and Control. *Proc. ISSCT*, **15**: 210-212.
- Teakle, D. S. 1974. The Causal Agent of Ratoon Stunting Disease (RSD). *Proc. ISSCT*, **15**: 225-233.