

Transmission of Ratoon Stunting Disease and its Effect on Yield of Sugarcane

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ABSTRACT

An experiment was conducted on sap transmission of Ratoon Stunting Disease (RSD) and its effect on yield of seven varieties/promising clones at Sugarcane Research & Training Institute Farm during the crop year 1984-85. Sap transmission was found successful by dipping healthy setts for a minute in the juice extracted from RSD infected canes. The disease infection was found in 60-100% canes of different varieties/strains by this method. The yield loss of the varieties Isd.2/54, Isd.16, Isd.17, L. Jaba-C and the strains I.59/74, I.491/76 and Nagarbari were 16.04%, 53.23%, 23.07%, 6.17%, 24.00%, 7.14%, and 1.44% when RSD infection was 80%, 60%, 100%, 96%, 100%, 100%, and 76% respectively.

INTRODUCTION

Ratoon stunting disease has so far been reported from 46 sugarcane growing countries of the world (Ahmed *et.al.* 1979). The disease is caused by a coryneform bacterium (Teakle, 1974; Gillaspie *et. al.* 1974 and Recaud *et.al.* 1977) and is responsible for the so called deterioration or running out of several commercial varieties (Hughes, 1956; Abbott, 1959 and Steindl, 1961). RSD was also reported in 31 out of 51 tested varieties/strains in Bangladesh (Ahmed *et. al.* 1979).

The disease is transmitted through infected setts and also mechanically through harvesting implements contaminated with the pathogenic bacterium of infected canes. The top cutter blades and sticker chains of harvesters may spread the disease from infected leaves while cutting the seedcane (Gillaspie, 1970). The disease can be transmitted by inoculating roots of young plants with juice from diseased plants (Hughes & Steindl, 1956). Singh (1973) reported that the disease was transmitted by dipping healthy setts in infected cane juice for 30 minutes.

Agnihotri (1983) reviewed the work of some authors and reported that RSD caused 20% yield reduction in the variety NCo 310 and POJ 2878. In Louisiana (USA), a yield loss of about 50% has been reported by several investigators. (Schexnayder and Abbott, 1957). Forbes *et. al.* (1960) reported the loss in yield of plant cane of six varieties, viz. CP. 36-105, CP. 44-101, CP. 43-47, CP. 44-155, CP. 43-193 and CP. 48-103 from 11.5% to 25.1%, (av. 19.1%) while in the first ratoon from 25.1% to 46.2% (av.37.36%) Rahman *et. al.* (1985) also found 14.50% and 38.65% reduction in yield in plant and ratoon crop respectively in a promising strain, I.156/66. It is generally accepted that the varieties/strains differ in their susceptibility or tolerance to the disease and consequent yield loss. This experiment was undertaken to verify sap transmission into the setts by dipping and to study the reaction of seven varieties/strains in Bangladesh.

MATERIALS AND METHODS

Seven promising varieties/strains viz., Isd-2/54, Isd-16, Isd-17, L.Jaba-C, I-59/74, I-491/76 and Nagarbari were tested in this experiment and planted in December, 1984 at SRTI experimental farm. The RSD free seedcanes of the noted varieties were collected from the 1st generation hot water treated (50°C/3hrs) crop of SRTI farm. One hundred three eye-budded setts of each variety/strain were prepared by sterilized cutting knives from the disease free stalks after checking the internal symptoms on slicing some portion of cane. Then 50, out of 100 setts were dipped for a minute in infected juice which was extracted from the RSD infected canes of the strain I-156/66. Proper care was taken for cleanliness of canes and extracting machine. Similarly rest 50 setts of each variety were dipped in distilled water for a minute for plantation to serve as control. Later on all the setts dipped in infected juice and distilled water were planted in separate lines side by side in a spacing of 1m x 5m. The crop was grown for 13 months in the field and separate sterilized implements were used for treated and control lines during cultural operation to avoid knife transmission of RSD bacteria if any. Data on RSD infection by dipping healthy setts in infected juice were taken at harvest during middle of February, 1986. Yield record of the RSD inoculated canes and the canes from the control plots were also taken to assess the difference in yield. After harvesting, 25 inoculated canes were selected at random for each variety/strain from the inoculated lines and observed for internal symptoms of RSD in different cane varieties and percentage of infection was calculated out. The weight of all canes obtained from the inoculated lines and healthy lines (control) were taken and average weight/stalk and percentage of yield decline due to RSD was calculated out.

RESULTS AND DISCUSSION

The transmission of RSD by dipping healthy setts for a minute in juice extracted from the RSD infected canes was found successful as it produced 60%-100% RSD infected canes in different cane varieties (Table 1). Transmission by dipping healthy setts in infected juice for 30 minutes was also reported by Singh (1973). The effect of RSD on the yield of cane is shown in Table 1. The losses in yield of cane due to RSD varied from 1.44% to 54.23% with an average of 26.41% which is higher than that found (av. 19.17%) by Forbes *et. al.* (1960). But this loss was less than that found by Singh (1974) who reported the average loss in yield of 10 varieties of plant cane to be 36.5% varying from 23.9 to 68.6% or that found by Schexnayder and Abbott (1957) finding 50% loss. In Bangladesh, similar yield loss of about 4.50% has been reported in a promising strain I-156/66 (Rahman *et. al.* 1985).

Marked difference were noted in the effect of RSD on different cane varieties. It is evident from the result (Table 1) that decline in yield of cane is very minimum i.e., 1.44%, 6.17% and 7.14% having 76%, and 100% RSD infection in the strain/variety Nagarbari, L.Jaba-C and I-491/76 respectively. This proved that they are more tolerant to the disease in respect of yield decrease. On the other hand the variety Isd-17 and the strain I-59/74 showed 23.07% and 18.07% decline in yield when RSD infection was 100% on stalk basis. The variety Isd-16 was found more tolerant to sap transmission compared to the rest but the effect of the disease was very prominent on declining the yield.

Table 1. Percent infection of RSD and its effect on yield of cane.

Varieties/ strains	% of RSD by dipping in infected juice	Nos. and weight of cane from healthy line (control)			Nos. and weight of cane from inoculated line			Loss in yield of cane(%)
		Total canes (Nos.)	Total weight (kg)	Av. wt./ cane (kg)	Total canes (Nos.)	Total weight (kg)	Av. wt./ cane (kg)	
Isd-2/54	80	175	141	0.81	157	107	0.68	16.04
Isd-16	60	115	145	1.26	82	118	0.69	45.23
L.Jaba-C	96	165	133	0.81	141	107	0.76	6.17
Isd-17*	100	26	17	0.65	10	5	0.50	23.07
Nagarbari	76	172	118	0.69	112	76	0.68	1.44
I-59/74	100	207	172	0.83	163	126	0.68	18.07
I-491/76	100	203	171	0.84	189	147	0.78	7.14
Mean	87.42	151.85	128.14	0.84	122.0	98.0	0.68	19.04

Numbers of cane are minimum due to jackle damage in the variety.

It was found that sap transmission of RSD was possible even by dipping the healthy sets for a minute in the juice extracted from RSD infected canes. Mean losses in yield of the seven varieties was 19.04% having 87.42% mean infection on stalk basis. The variety Nagarbari, L.Jaba-C and the strain I-491/76 having 76%, 96% and 100% RSD infection respectively showed minimum losses 1.44%, 6.17% and 7.14% in yield proving their tolerance to RSD to decline yield.

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