

Association of Some Leaf Endowments with the Sugar Content of Sugarcane

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ABSTRACT

Seventeen sugarcane clones including ten advanced promising strains and seven commercial varieties were examined for possible association of their leaf characters viz. leaf area and specific leaf weight, with sugar content. Significant varietal difference were observed in respect of leaf area, specific leaf weight, recoverable sucrose and reducing sugar content indicating clonal variability in these parameters. Results further indicated no significant positive correlation between specific leaf weight and recoverable sugar content ($r = 0.34$), and leaf area and recovery ($r = 0.03$). A significant negative correlation was, however, obtained between recovery and reducing sugar content ($r = -0.50$). The usefulness of different leaf parameters of sugarcane for selecting higher sugar varieties has been discussed.

INTRODUCTION

Selection of high sugar variety of sugarcane is of prime importance all over the world. Conservative estimate show that, under Bangladesh situation, a sugarcane variety with even 0.5% higher recovery and occupying 20% acreage amounts to about 2000 tons of additional sugar valued at about Tk. 20 million in an average crushing season. Efforts for identifying suitable morphological parameters having association with the sugar content of juice and other desirable quality characteristics have been intensified in recent years (Rao, *et al.*, 1981; Rosario and Musgrave, 1974; Rosario *et al.*, 1977; Singh and Reddy, 1980).

The significance of morphological parameters including leaf endowments lies in the fact that once rightly identified such parameters could be used as important selection - tools at convenient times during the growing season of sugarcane as opposed to conventional recovery determinations done at the maturity stage. In the present investigation, 17 selected sugarcane clones including some commercial standards have been examined for their leaf area and specific leaf weight and possible association of these two parameters with the ultimate recovery of sugar.

MATERIALS AND METHODS

The experiment was conducted at the Sugarcane Research & Training Institute (SRTI), Ishurdi during 1984-85 crop season. Selected sugarcane clones were planted in one - meter- apart rows in the autumn (November). Twelve rows of cane 11 m long were planted for each clone. The experiment was laid out in a Randomized Block Design with three replications. In addition to normal weeding, mulching and plant protection measures, the crop was uniformly fertilized with NPK fertilizers @ 125, 125 & 110 kg per hectare of N, P_2O_5 & K_2O respectively. Leaf area (A) was determined according to Mongelard (1968) formula :

$$A = 3/4 BW \times L$$

where, BW = the greatest width of leaf, and

L = the length of the leaf.

Fifteen leaves obtained from the 4th, 5th and 6th position (considering the spindle as leaf number 1) represented a replicate. Specific Leaf Weight - Dry (SLW_D) was determined from the same leaves (used for leaf area determination) with a stainless steel metallic block measuring 80 mm x 12.5 mm. Two pieces of leaves were taken from the either side of the mid-rib. Thirty such pieces comprised of a replicate. The leaf- pieces were oven- dried at 80°C until constant weight and SLW_D was calculated as weight per unit area and expressed in mg cm⁻². For juice quality analyses, five cane stalks selected for leaf- area and SLW_D determinations were crushed in a power crusher and recoverable sugar was determined by Horn's Dry Lead method (Spencer & Meade, 1945). Juice from the same sample was taken to determine the reducing sugar in the laboratory by Lane and Eynon method (Anon, 1970). While the juice quality was determined from October through December at monthly intervals, the leaf- area and SLW_D determination were made from August through December. The data reported are thus averaged across season.

RESULTS AND DISCUSSION

A significant clonal variation was observed in respect of leaf area and specific leaf weight. The highest (505.95 cm²) leaf area, was recorded with the promising strain I-156/66 and the lowest (335.01 cm²) with I-96/74. One of the recent SRTI-bred varieties viz., Isd-16 showed considerable improvement in respect of leaf area and specific leaf weight (Table 1.)

The highest SLW_D was recorded with the promising clone I-491/76 followed by I-41/75 and the lowest with Isd-1/53, the oldest SRTI-bred variety. Correlation studies indicated a positive association between leaf area and specific leaf weight

Table 1. Leaf area, specific leaf weight- dry (SLW_D), recoverable sugar and reducing sugar content of seventeen sugarcane clones.

Clone	Leaf Area (cm ²)	SLW _D (mg cm ⁻²)	Recoverable sugar (%)	Reducing sugar (%)
Isd-1/53	386.81 cde	5.94 f	8.89 fg	0.37 bcd
Isd-2/54	403.80 bcde	6.47 def	9.19 def	0.31 de
Isd-9/57	404.14 bcde	7.39 be	9.60 cd	0.36 bcd
Isd-16	450.95 abc	7.23 cde	10.90 cd	0.23 f
Isd-17	384.12 cde	6.53 cdef	9.73 c	0.36 bcd
Co 975	348.76 de	7.26 cde	9.67 cd	0.45 a
Co 1158	376.71 cde	6.39 ef	8.56 g	0.41 ab
L. Jaba-C	429.87 abcd	6.68 cdef	9.08 ef	0.36 bcd
Nagarbari	451.43 abc	7.29 cd	9.06 eg	0.33 cd
Kushtia	389.51 cde	7.09 cde	9.80 c	0.33 cd
I-156/66	505.95 a	6.73 cdef	9.23 def	0.34 bcd
I-18/74	439.89 abc	7.10 cde	9.67 cd	0.32 de
I-59/74	356.86 de	7.31 cd	9.10 cf	0.36 bcd
I-96/74	335.01 e	6.55 cdef	10.37 b	0.26 ef
I-106/74	381.03 cde	6.43 def	9.42cde	0.46 a
I-41/75	471.64 ab	8.14 ab	9.59 cd	0.40 abc
I-491/76	482.52 ab	8.37 a	9.78 c	0.34 bcd

which was not, however, statistically significant. The test clones also revealed significant variation in respect of recoverable sugar and reducing sugar content in juice. Variety Isd-16 showed the highest (10.90%) recovery followed by I-96/74 (10.37%) and the lowest was recorded with co 1158 (8.56%). The highest reducing sugar content was, however, recorded with I-106/74 (0.46%) while the lowest with Isd-16 (0.23%). Data revealed a positive correlation between SLW_D and recoverable sugar ($r=0.34$). This was not however, statistically significant. A similar insignificant

relationship was found between recoverable sugar and reducing sugar contents ($r=-0.50$) (Table 1).

Rosario and Musgrave (1974) reported that the specific leaf weight was a good index of selection for high net carbon exchange in sugarcane. Rao *et al*, (1981) reported increasing significance and usage of parameters viz., leaf area and leaf area index in sugarcane breeding and varietal selection programme. Leaf area and specific leaf weight have also been used to identify early and late maturing cane (Anon, 1983). Results obtained in the study indicated considerable significance of specific leaf weight for qualitative improvement of sugarcane juice.

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