

Technical Note

Sugar Distribution in Sweet Stalk Sorghum

ABSTRACT

Among the seventeen cultures of sweet stalk sorghum screened for their juice and sugar content at two different stages, IS 9889 contained the highest percentage of total sugars. Sugar content was found to increase from the soft dough stage to the dead ripe stage. Analysis of the internodes revealed that the midportions of the stalk contained higher amounts of sugars than the other parts.

INTRODUCTION

To cope with the existing energy crisis, attention is now being focused on renewable energy sources (NAS, 1976). One such source is sweet stalk sorghum. Because of its high sugar content, it may be used for production of sugar, syrup (Coleman, 1970) and for alcohol (Anon., 1981). Hence studies were undertaken (1) to select high sugar-containing sweet sorghum, (2) to find out the distribution of sugar in the internodes, and (3) to fix the stage of cutting.

MATERIALS AND METHODS

Seventeen cultures of sorghum were grown during summer 1982 in Tamil Nadu Agricultural University. The stalks of IS 9889 at dead ripe stage

were cut at the nodes and numbered serially from the bottom for internode analysis. After stripping off the leaves, head and peduncles, the stalks of seventeen cultures of sweet sorghum at two stages, soft dough and dead ripe stage, were also cut. All the samples were dried at 70 °C and powdered in a cyclotec mill with a sieve of 60 mesh and used for analysis. Juice was extracted from two plants of each variety and analysis of sugars was carried out in the extractable juice.

For syrup preparation, juice from the high-sugar containing variety, IS 9889, was extracted in a hand extractor after stripping off the leaves and the outer portion of the stem at the dead ripe stage.

The total sugar content was estimated using the phenol-sulphuric acid method of Dubois *et al.* (1956) and reducing sugars by the Nelson-Somogyi method (Somogyi, 1952). Sucrose and dextrose were estimated by the glucose oxidase method (White, 1964) and fructose by using resorcinol (Snell & Snell, 1961). All the analyses were done in duplicate and the values given are the average of two analyses.

RESULTS AND DISCUSSION

Table 1 shows that in all the varieties the total sugar content increased from the soft dough stage to the dead ripe stage (t -value = 4.55) but there was no significant difference in reducing sugars (t -value = 0.1) between these two stages. Cultures containing high total sugars had varying amounts of reducing sugars. In both stages, IS 9889 contained the higher percentage of total sugars. Cultures IS 707, IS 9889, IS 9890, IS 6962 and MS 8389 are suitable for the production of syrup because of their high total sugar and low reducing sugar content.

Extractable juice per plant varied from 24.0 to 76.5 ml. Although the juice content was low in IS 707, IS 9639, IS 9889 and PR 4579 (30 ml per plant), the total sugar content was found to be high, 7.6 mg per 100 ml juice. This observation may be due to the inverse relationship between the juice content of the plant and sugar content of the juice.

The number of internodes in sorghum stalks varied from variety to variety. Highly significant positive correlation ($r = +0.84$) was found to exist between the total sugar percentage and the weight of the corresponding internodes. In IS 9889, the total sugar content was found to increase to a maximum from the lower internodes to the middle and then gradually decreased in the upper internodes. The sucrose content

TABLE 1
Sugar Content of the Sorghum Stalks at Different Stages of Maturity^a

<i>Cultures</i>	<i>Total sugars</i>		<i>Reducing sugars</i>	
	<i>Soft dough</i>	<i>Dead ripe</i>	<i>Soft dough</i>	<i>Dead ripe</i>
IS 707	25.6	41.4	10.8	2.6
IS 714	40.0	48.4	24.0	25.8
IS 724	32.0	42.4	26.0	34.2
IS 9639	39.0	45.2	23.0	21.2
IS 9889	48.0	48.5	20.8	4.0
IS 9890	44.0	46.6	8.7	2.4
IS 15455	30.0	40.0	20.8	30.6
IS 19273	16.6	40.4	3.8	5.6
IS 6962	20.0	45.8	8.0	3.0
PR 4579	32.8	38.4	13.0	7.0
PR 49171	31.2	37.6	10.0	13.0
MS 8388	35.0	37.0	11.2	15.8
MS 8389	30.4	35.0	14.8	3.0
E NO 26	21.6	43.0	14.8	15.0
E NO 32-1	25.6	41.4	7.4	20.9
E NO 32-3	15.2	36.4	7.7	15.6
E NO 143-2	23.2	36.4	10.0	20.2
Mean	30.0	41.4	13.8	14.1
SD	9.9	4.3	6.7	10.2

^a Expressed as percentage on oven dry basis.

TABLE 2
Percentage of Sugar in Internodes of Sweet Stalk Sorghum^a

<i>IS 9889 internodes</i>	<i>Total sugars</i>	<i>Sucrose</i>	<i>Reducing sugars</i>	<i>Glucose</i>	<i>Fructose</i>
1	40.0	35.6	2.4	0.6	1.6
2	49.6	46.1	3.4	1.1	2.1
3	54.4	48.5	3.4	1.8	1.2
4	54.4	48.6	5.4	2.3	2.5
5	52.8	46.1	4.8	2.5	2.2
6	52.8	45.7	4.8	1.8	2.6
7	46.4	42.0	2.8	1.0	1.5
8	44.8	41.0	2.6	1.3	1.2
9	41.6	33.0	6.6	2.3	3.7

^a On dry weight basis.

also showed a similar trend in the internodes (Table 2). Though variations in reducing sugars glucose and fructose were observed at different internodes, no specific trend could be observed. The syrup prepared from the processed juice (alternate freezing and thawing followed by centrifugation) had no salt taste in comparison to that prepared from the raw juice. Roasted peanut and bengal gram candies prepared from this syrup were found to be as good as cane sugar syrup candies in taste and flavour.

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