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Maturity Behaviour and Variation in Brix along Sugarcane Stalklengths

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Sugarcane (*Saccharum* spp.) is the major source of raw material for the production of refined sugar in Nigeria. Maturity test is a common agronomic practice in most sugarcane growing regions of the world. For example, the Nigerian Sugar Company, Bacita (lat. 9°) which accounts for over 80% of the country's domestic sugar production rely on Brix tests for determining cane maturity (Odofin, 1978). Even though percent Brix values have been determined for some local and exotic varieties in Niveria, information on the distribution of juice concentrations on the stalklengths of these varieties is not available. The percent Brix or total soluble solids (T.S.S) is an important parameter in determing sugarcane juice quality. The hand refractometer is capable of giving indications of the solid content usually approximating those obtained by drying (Meade and Chen, 1977).

Several factors including fertilization, age of cane and level of irrigation have been shown to affect sugarcane juice quality (Clements, 1983; Thomas, 1978). It is generally accepted that concentration of the juice of the above ground joints of sugarcane stalk is higher near the base and decreases towards the top (Alexander, 1973; Van Dillenwjn, 1952). However, the reports of Hoffman (1980) on the distribution of concentrations along stalklengths produced by second ratoon seedlings from sugarcane field in Argentina showed that the percent Brix of juice was low at joints near the base which increased to a maximum towards the top of the cane stalklenghts. Normally, this condition happens in case of deteriorating canes, such as over matured and lodged cane. In this study an investigation was made on the juice concentration of ten sugarcane varieties including three locals, four promising exotics and three commercial varieties.

The study was conducted on portions of the Unilorin Sugar Research Institute's farm at Bolorunduro village, Ilorin. The Experiment was set up with ten varieties in RCB design with four replications having plot size of two rows of 5m by 1.5m. Three exotic varieties Co 957, Co 1001 and Co 997 are presently standard commerical varieties in Nigeria while DB 95/47, S 47/15 and Co. 961 are promising clones.

The experimental plots were hand weeded twice before formation of leaf canopy, while basal NPK fertilization was carried out at a weeks after planting using sugar estates

standard rates of 120 kg N/ha, 60 K_2O and 60 P_2O_5/ha. Supplementary irrigation was applied during the dry months of the year using sprinklers. At twelve months after planting, ten healthy stalks (a medium type of clump) were selected randomly from the experimental plots for Brix analysis. A field hand refractometer was used to determine Brix (total soluble solids) in the internodes as described by Meade and Chen (1977). The readings were then classifed as base (1st-5th internode); middle (6th-10th internode and top 11th-15th internode).

A significant difference was observed for juice concentration in varieties Co 961, DB 95/57, D 47/15, BJ 6547 and LSI 087 (Tables 1 and 2). The Brix was high at the base and low at top joints. Various authors (Alexander, 1973; Van Dillenwjn, 1952) have reported the distribution of juice along stalklengths to be highest at the base which decreased towards the top of the cane. The reason suggested include the synthesis of sucorse at growing points and consequent storage at older intermodes. Six of the ten varieties tested in this study showed results consistent with these reports. An exotic variety BJ 6547 and one local variety LSI 054, had highest Brix values in their middle stalk lengths (Tables 1 and 2). This may be due to sampling errors, over matured and or lodged canes. This observation differs from the reports of Hoffman (1980) who obtained low percent Brix values at joints near the base which increased to a maximum towards the top stalklengths.

Table 1. The juice concerntration of ten sugarcane varieties (Plant cane).

	Brix (%) Variety									
Stalk region	Co 957	Co 1001	Co 997	Co 961	DB 95/57	D 47/15	BJ 6547	LSI 054	LSI 026	LSI 087
Base	20.1a	18.0a	19.8a	17.6a	16.6a	14.0a	17.1a	17.0b	17.6a	15.0a
Middle	20.0a	14.9b	18.3ab	14.5b	16.1a	12.3a	18.1a	18.5ab	15.5b	13.9b
Top	20.0a	14.3b	16.0c	9.5c	12.8b	9.4c	13.9c	15.5c	14.5bc	11.3c

Means followed by the same letter(s) in any column are not significantly different by the DNMRT.

Table 2. The juice concerntration of ten sugarcane varieties (First ratoon).

	Brix (%)									
Stalk region	Co 957	Co 1001	Co 997	Co 961	DB 95/57	D 47/15	BJ 6547	LSI 054	LSI 026	LSI 087
Base	21.8a	20.3a	20.8a	21.2a	21.0a	16.5a	17.7a	21.1a	18.1a	17.6a
Middle	21.6a	19.0ab	19.1ab	21.5a	20.0ab	15.0b	17.5a	20.7a	18.4a	14.6b
Top	20.8a	17.8c	17.5c	20.8a	17.3c	12.8c	13.9b	20.2a	15.4b	13.2bc

Means followed by the same letter(s) in any column are not significantly different by the DNMRT.

There was no statistical difference observed for variety Co 957 at all iternodes. Co 957 is a prominent commerical variety grown in large hectares in almost all the sugar estates in Nigeria. It is known to tiller profusely, has shorter internodes, thin stalks, rapid growth and high sucrose and cane yield (Agbana, 1991). These desirable agronomic characteristics might be responsible for the uniform Brix values observing along its stalk length.

The Brix values observed at the stalk length of BJ 6547, LSI 026 and LSI 054 sugarcane varieties showed highest juice concentrations in their middle stalklengths. Although the reason for this phenomenon is difficult to explain it has practical agronomic implications for sugarcane production in this region which still rely extensively on Brix tests for determining cane maturity. In Nigeria the ratio of the base stalklength to the top is used dertermining tests in sugarcane (Anon., 1990). From these observations it can then be said that maturity tests for varieties with uniform Brix values among its stalk length will indicate pseudo-high maturity test values which might lead to premature harvesting of young canes.

Also topping which is a common practice in sugarcane harvesting might equally results into considerable loss of yield especially sucrose. Maturity tests for varieties with low Brix values at the base might cause delay in harvesting and loss of sucrose especially in flowering varieties. Because of these variations, maturity tests for sugarcane varieties should be interpreted with care while the behaviour of other existing varieties is suggested for further study.

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