



Assessment of comparative hardness of sugarcane varieties at nodes and internodes

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ABSTRACT

Assessment of comparative hardness of sugarcane was done using compression testing machine with tension compression proving ring. Hardness of nodes and internodes of three early and four mid late cane varieties was assessed. Nodes were observed to be harder than internodes. Data on node and internode hardness showed that amongst early and mid late varieties, hardness of both node and internode of CoLk 8102 was maximum (0.82 and 0.67 kN force was required for breaking node and internode respectively) indicating it to be the hardest amongst the cane varieties tested. Data on hardness of each node and internode from top to bottom at 10 & 12 month crop age revealed that nodes and internodes at 12 months were harder than the nodes and internodes at 10 month crop age.

Hardness is one of the parameters which determine processing quality of sugarcane. At any given power input, soft cane gives higher juice extraction compared to hard cane. Force required for bending and chewing, are some of the crude indicators of relative hardness. Attempts have been made for measurement of rind hardness of sugarcane (Puri and Venkatraman, 1929; Mungomery, 1936). Only rind hardness is not a correct indicator but it is the whole cane section (rind and pith) which offers total resistance while crushing. Cochran (1974) studied the tensile and compressive modulus of elasticity for the internode of sugarcane samples placed in longitudinal direction using Tinus Olsen testing machine with Ames dial gauge and durometer. But, this

is not analogous to actual crushing conditions, where the canes are crushed radially. Baboo and Singh (1988) used compression testing machine for compressive strength of jaggery. The present study was undertaken to assess the hardness of sugarcane both at node and internode for different varieties.

METHODS AND MATERIALS

Compression testing machine having attachment of tension-compression proving ring and circular disc (7 cm dia.) with the listed specifications (Table-1) was used for this purpose.

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Table 1 Details of compression testing machine and proving ring

Compression Testing Machine	
Catalogue No.	AIM 302
Capacity and range	0-250 kN x 1.0 kN
Proving Ring	
Catalogue No.	AIM 283
Capacity and range	0-2 kN x .0047 kN

Each sample was placed radially between flat plates, one fixed and attached with the proving ring and other one moving while operating compression testing machine manually. The compression force was applied radially and the load required to just break the specimen was measured on proving ring dial gauge which was calibrated in kilo Newton (kN). The data thus obtained were subjected to statistical analysis with six number of replications.

Selection of specimen

(a) Variety and sample size

Two cane stalks were randomly selected from early maturing varieties (CoJ 64, CoLk 7810 & CoS 687) and mid late varieties (CoLk 8102, CoS 767, CoLk 8001 and Co 1148) at 12 month of age. Individual samples were prepared by cutting 2 cm pieces of internode (middle portion) and 2 cm pieces of node (1 cm each on either side of nodal mark). Node and internode samples were drawn from top, middle and bottom portion of the sugarcane stalk.

(b) Crop age

Node and internode samples of cane variety CoS 767 were numbered from top to bottom and drawn for assessing the hard-

ness at 10 and 12 month of age. Cane stalk at 12 month age had more number of nodes and internodes compared to 10 month stalk.

RESULTS AND DISCUSSION

Analysis of variance (ANOVA) for a one way classification of data on hardness of different varieties of sugarcane at node and internode was made independently. Node was found to be harder than internode (2.00 to 2.10 times in early and 1.22 to 2.05 in mid late varieties) and showed significant difference. At internodes, hardness of varieties was found significant while it was insignificant for nodal values. However, in early maturing varieties, nodes of cane variety CoLk 7810 (0.80) was hardest and amongst mid late varieties, node of CoLk 8102 (0.82) was observed to be the hardest and softest that of CoLk 8001 (0.65). for internode hardness, CoLk 8102 (0.67) again had maximum hardness value followed by CoS 767 (0.52) and CoJ 687 (0.36) recorded minimum value of hardness (Table 2). Results showed that amongst all early and mid late varieties evaluated, the hardness of node and internode of CoLk 8102 was maximum.

Nodes from bottom of cane stalk were found harder compared to nodes from top portion, but for no definite trend (Figs 1&2). The results revealed that sugarcane stalk of 12 month age was more harder compared to 10 months.

CONCLUSION

Sugarcane variety CoLk 8102 was found to be the hardest amongst the varieties taken for experiment. It was also noted that cane stalks at 12 month crop age are harder than the cane stalks at 10 month age.

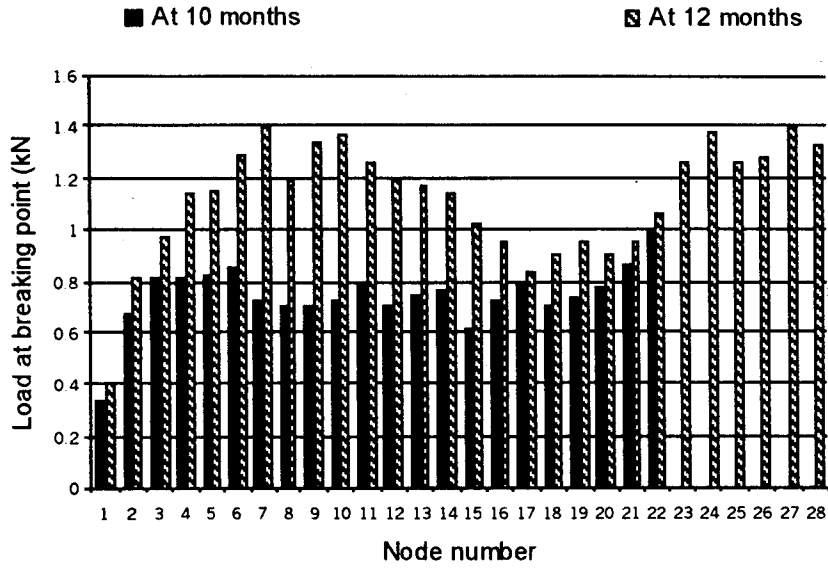


Fig. 1 Node hardness at 10 and 12 month crop age

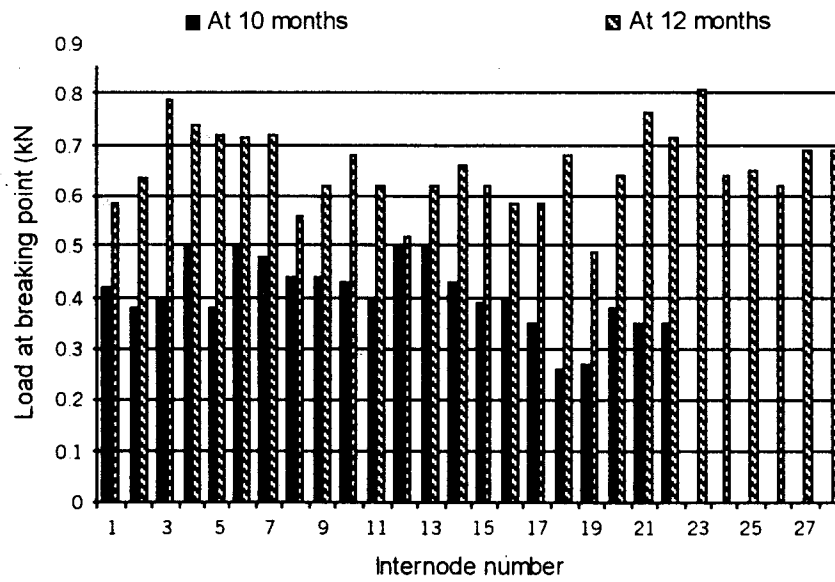


Fig. 2 Internode hardness at 10 and 12 month crop age

Table 2. Comparative hardness of stalk of different sugarcane varieties at 12 month crop age

Sl. No.	Variety	Hardness (load at breaking point, kN)		Ratio of node hardness to internode hardness
		Node	Internode	
Early variety				
1	CoJ 64	0.77 ± 0.04*	0.37 ± 0.04 (6)	2.08
2	CoLk 7810	0.80 ± 0.05 (6)	0.38 ± 0.05 (6)	2.11
3	Cos 687	0.72 ± 0.07 (6)	0.36 ± 0.06 (6)	2.00
Mid late variety				
4	CoLk 8102	0.82 ± 0.06 (6)	0.67 ± 0.10 (6)	1.22
5	Cos 767	0.77 ± 0.05 (6)	0.52 ± 0.07 (6)	1.48
6	CoLk 8001	0.65 ± 0.04 (6)	0.38 ± 0.07 (6)	1.71
7	Co 1148	0.79 ± 0.04 (6)	0.38 ± 0.08 (6)	2.05
CD at 5%		NS	0.261	2.05

* Values are mean ± SEM and values in parentheses denote the number of samples

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