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Minimization of Breakdown of Sugar in Stalecanes

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ABSTRACT

A trial with four treatments in a randomized block design with three replications was conducted at Sugarcane Research & Training Institute farm to study the effectiveness of some easily available means to minimize the breakdown of sugar into invert sugar. The variety Isd.16 was used for this investigation. Harvested canes covered with 7.0 cm thick trash significantly increased purity and the breakdown of sugar into invert sugar was significantly reduced. Recovery was also found to be highest. Reducing sugar increased with the increase of the period of staleness of the harvested cane.

INTRODUCTION

Recovery of sucrose is affected by many factors such as poor variety, disease, insect-pests infestation, environmental factors etc. In addition to that the largest individual loss is due to inversion of sugar in cut canes during the time-lag between harvesting and crushing. The reason of inversion of sugar into reducing sugar is an enzyme known as invertage which present in green tops as well as cane stalks. The concentration of the invertage is higher at the apex and minimum at the basal internodes of canes. There is change of a change in the concentration with growth and maturity of the plant and has differential effect on deterioration of harvested cane during different period of the season (Thatcher, 1921). The major losses of sugar due to inversion in stalecanes occur in top portions only (Farooque, 1964). Certain ferments (like invertage) have the property of hydrolyzing or inverting sucrose. Sucrose itself is not directly fermentable, but after the inversion of the invert sugar it is readily fermented (Spencher & Meade, 1945).

Several authors have investigated this problem from different angles. Some authors stated that the organisms *Leuconostoc* spp. enter into the cut end of stalecanes and lower down the pH of juice resulting in the breakdown of sugar into invert sugar and hence suggested to spray 1% formalin (Bose *et, al.,* 1974; Parthasarathy, 1972). Other scientists considered it to be a physiological process of drying up and suggested water spraying and covering with thrash (Fogliata, 1977; Kapur and Kumar, 1976; Sjngh and Chatterjee, 1972).

Though formation of invert sugar due to staleness of cane under Bangladesh agroclimatic conditions is more than any other countries of the world. This aspect of problem has not been investigated. The present investigation was, therefore, undertaken to study the effectiveness of some easily available means to minimize breakeown of sugar into invert sugar.

MATERIALS AND METHODS

An experiment was conducted at Sugarcane Research & Training Institute farm following randomized complete block design comprising four treatments with three replications. The cane variety Isd.16 was used for the present investigation and the plants were grown under rainfed condition following all standard management fertilization and other intercultural practices. The trial was conducted during the month of December.

Random samples of 840 canes, representing average cane stand of the field were harvested, detrashed and made 84 bundles consisting of ten canes in each bundle for each sample. Then all 84 bundles were randomly grouped into four groups for four treatments on the day of harvest. Twelve such bundles, three bundles from each group representing four treatments with three replications were chemically analysed on each day at an interval of 24 hours starting from the date of harvest as 00 hours over a period of seven days. The chemical analysis was done following Horne's Dry Lead method (Horne, 1903). The four treatments were as follows :

T_0 — Canes exposed to sun (control).
T_1 — Canes sprayed with 1% formalin solution only once on the first day.
T_2 — Canes sprayed with water at 24 hours interval for the whole period of trial,
T_3 — Canes covered with about 7.0 cm thick sugarcane trash.

Composite juice of each sample was collected to determine the reducing sugar. Reducing sugar was determined following Lane and Eynon method (Anon., 1970).

RESULTS AND DISCUSSION

Canes covered with 7.0 cm thick trash significantly increased purity compared to all treatments (Table 1), though water spraying and trash covering influenced

Table 1. Effect of different treatments in respect of recovery % cane, purity % cane and reducing sugar.

Treatment	Recovery %	Purity %	Reducing Sugar
T_0**	10.21 a*	82.10 a	1.07 b
T_1	10.19 a	82.74 a	1.03 b
T_2	10.36 a	83.11 a	0.94 ab
T_3	10.59 a	84.74 b	0.92 a
S. E. of means	0.12	0.40	0.03

*Means figures followed by same letter are not significantly different at 5% level as determined by DNMR test.

**T_0=Control
T_1=1% Formalin spraying
T_2=Water spraying
T_3=Trash covering

reducing sugar at the same level. Covering of the harvested cane with trash was reported to reduce post harvest deterioration and recommended for large scale usage by Fogliata (1977). Spraying of water also lowered down the rate of production of reducing sugar though not significantly different from control. This work agrees with that of Kapur and Kumar (1976). However, Bose *et. al.* (1974) reported that increase in reducing sugar percent cane can be checkcd to a marked extent if the cut canse are stored after treatment with formalin- Reducing sugar increased with the increase of the period of staleness of cane (Table 2).

Table 2. Effect of staleness of harvested canes in respect of % recovery, % purity and reducing sugar.

Variables	Treatments	Staleness of harvested canes (hours)						
		0	24	48	72	96	120	144
Recovery % cane	T_0	11.11	11.30	10.93	10.36	10.12	9.18	8.49
	T_1	10.67	11.30	10.59	10.84	10.84	9.27	7.82
	T_2	10.77	10.79	11.19	10.69	10.51	9.53	8.95
	T_3	10.80	10.87	11.67	11.30	10.71	9..85	8.93
		LSD. (5%)=0.87						
Purity % cane	T_0	88.44	87.61	86.19	82.97	80.97	76.24	72.27
	T_1	88.00	88.12	85.78	85.03	83.91	77.37	70.95
	T_2	87.65	86.31	87.38	84.16	82.99	78.80	74.49
	T_3	87.80	87.32	88.32	86.93	83.91	80.60	78.27
		LSD. (5%)=2.98						
Reducing Sugar	T_0	0.43	0.50	0.57	0.96	1.49	1.59	1.94
	T_1	0.48	0.50	0.57	0.95	1.12	1.62	1.96
	T_2	0.46	0.45	0.51	0.91	1.15	1.58	1.78
	T_3	0.45	0.51	0.52	0.64	0.98	1.41	1.70
		LSD. (5%)=0.23						

Significantly higher purity was observed when the stalecanes were covered with the trash (Table 1). This indicated that probable inversion of sugar is less in this treatment. Highest recovery was found in the treatment where canes were covered with the trash though did not differ significantly from the control or other treatments (Table 1) which agrees with the findings of Ali *et. al.* (1980) because the rate of inversion of sucrose into invert sugar was low.

Since, lowest reducing sugar and highest purity and recovery percent were obtained in the treatment when the stalecanes were covered with trash in lsd.16 and results with Co.1158 (Ali *et. al.*, 1980) showed similar trend, it may thus be suggested that covering harvested cane with 7.0 cm deep trash would retain sucrose recovery.

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