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EFFECT OF HARVESTING TIME AND STORAGE CONDITION ON POST HARVEST DETERIORATION IN DIFFERENT GENETIC TRAITS OF SUGARCANE

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ABSTRACT

Sugarcane (*Saccharum officinarum L.*) occupies a major position among the commercially cultivated crop in India. Sugar Industry is the second largest organized industry in our country. In Maharashtra sugarcane crop production is higher but low productivity as compared to North India (Utter Pradesh). The objective of this research was to evaluate the effect of mismanagement in harvesting and delay in transporting of harvested cane. An experiment was conducted at research farm of Sugarcane Research Centre, Central Research Station, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra) The experiment involved namely varieties CO 86032 (V_1) and COC 671 (V_2), sampling months January (H_1), February (H_2), storage condition (S) cane stored in shade (S_1), stored in sunlight (S_2), period after harvest (at 0, 8, 12, 24, 36 and 49 hrs after harvest) in split plot design with three replications. Among the sugarcane varieties COC 671 was recorded higher brix, pol percent and CCS percent but loss in moisture % was more in variety CO86032 so the stale cane weight and juice extraction (%) was more in variety CO86032. Sugar recovery was higher in variety COC671.

Keywords **:** Sugarcane, Genetic traits, Post Harvest losses, Magnitude of Post Harvest losses, Quality of CCS.

Introduction

The sugar accumulated in the stem of sugarcane represents a balance between synthesis of sugar and its utilization. A well ripened harvested crop may lose its sugar with few days after harvest, which tends to increase further due to ambient temperature, pre harvest burning, harvest and transportation injuries and microbial infestation. Sucrose losses after the harvest of sugarcane and during the subsequent milling operation are one of the most serious problems in many sugar processing mills in India staling beyond 24 hrs. (Patel *et al*., 1990) result in considerable losses in cane weight due to moisture loss and reduction in juice sucrose content due to inversion (Solomon, 2002).

The reduction in cane weight between 7.4 to 17.0 percent and sugar recovery by about 2.0 percent at different places in India, due to staling of cane for 96 hours. The post-harvest cane deterioration affects both growers because of loss in weight and sugar industry due to reduced recovery.

The stale cane reduces not only the recoverable sugar but also create losses by reducing mill and boiling house capacities. It also increases loss of sugar in molasses, soon after the harvest of sugarcane, endogenous invertase enzyme gets activated and act as a cause of deterioration. The other type of deterioration which is known as biodeterioration caused by microorganisms mainly *Leuconostoc mesenteroids* also takes place. These organisms convert sucrose into polysaccharides, such as dextran organic acids etc. Besides loss of sucrose, in presence of dextran even in very small amount creates problem of filtration, clarification, crystallization and alters the shape of sugar crystals thereby affecting the quality of sugar (Gupta, 1981).

Production of sugarcane as per Department of Food and Public Distribution in 2020-2021 was 399.25 lakh ton. India is second largest producer of sugarcane (18.18%) and sugar (15.81%) in the world next to Brazil. However, the country is also largest consumer of sugar (15.93%) of the world and 7th larger exporter of sugar (2.80%) to 113 countries of the world (2015-2016 April to January). Therefore its needed to concentrate on reducing postharvest losses of sugarcane by scientifically working on harvesting time and storage conditions.

Materials and Methods

A field experiment was conducted in three replications. Two promising varieties CO86032 and COC671 were harvested first time at 1st and 3rd January, respectively, second time CO86032 and COC671 were harvested at 16th and 18th February respectively. Crop was harvested with cane cutting knife, 360 mill able canes were tied together in bundles. In this way 36 bundles made of each variety separately. Cane bundles were labeled properly and similar procedure of harvesting of cane was followed each variety at both time of sampling i.e., January and February. Fresh

weight of each bundle was noted down before storage. Harvested canes were stored in two different conditions i.e., 18 bundles in shade covered by trashes and 18 bundles of on ground surface in sunlight for both the varieties, the storage conditions were applied to each variety at both the time of sampling. Cane was stored in shade and sunlight up to 48 hours after the harvest. Quality component of cane was analyzed periodically. Analysis of cane quality was done at 0 hours (fresh cane), 8 hours, 12 hours, 24 hours, 36 hours and 48 hours, after the harvest. One bundle of cane was considered as one replication. In this way three bundles stored in shade and three bundles stored in sunlight were taken for quality analysis of each variety. Each bundle was crushed separately on cane crusher and fresh juice analysis was done periodically, 0 hours (fresh cane), 8, 12, 24, 36 and 48 hours after harvest as per treatments.

Randomized sampling was done and 360 canes of each variety were harvested randomly from plot a one time. Ten canes were tied together in a bundle, thus 36 bundles of each variety made and labeled. For juice analysis one bundle was taken as one replication. For three replications, three bundles from shade and three bundles from sunlight were taken for juice analysis. In which quality component were loss in moisture (%), juice extraction (%), fiber content, juice pH, juice brix, reducing sugar, juice Pol (%), purity (%) and commercial cane sugar (CCS%) at interval of 0, 8, 12, 24, 36 and 48 hours after harvest.

Result and Discussion

In the present investigation post harvest deterioration of two varieties was studied. COC 671 is early maturity variety while CO86032 is a mediate variety. Variety COC 671 recorded significantly higher brix, Pol (%), CCS (%) and reducing sugar as compared to CO 86032. However, CO 86032 recorded significantly higher purity (%) as compared to COC671. This variation in juice quality was observed because COC 671 is high sugar and early maturity variety and it starts maturity from 10 months age. COC 671 required 12 months for maturity but extended harvesting time improved the quality of juice. Similar results were reported by Patel *et al*. (1990), Vaidya *et al*. (1992) and Solomon (2002). Genetic variability causes differentiate behavior of genotypes to post harvest deterioration (Kadam *et al*. and Shinde *et al*., 1985). Variety CO 86032 recorded significantly higher fiber content than variety COC 671. This noticeable difference was due to genetically make up of plant. Such evidence was reported by Singh *et al.* (2002). Variety CO 86032 recorded significantly higher stale cane weight as compared to variety COC 671. This was because of less moisture loss from cane variety CO8632 on storage after harvest. Similar result was reported by Singh *et al.* (2002).

Table 1 : Juice quality parameters (Brix, Pol, CCS and Purity) as influenced by different treatments.

Treatment	Brix	Pol %	CCS %	Purity %
Variety				
V_1CO 86032	22.18	20.70	14.65	93.15
V_2 COC 671	23.07	21.07	14.73	90.99
SE +_	0.01	0.02	0.01	0.05
CD at 5%	0.03	0.07	0.03	0.14
Sampling time				
H_1(January)	21.90	19.69	13.70	89.92
H_2(February)	23.34	22.01	15.68	94.33
SE +_	0.01	0.02	0.01	0.05
CD at 5%	0.03	0.07	0.03	0.14
Storage Condition				
S_1(Stored in shade)	22.59	20.84	14.71	92.23
S_2(Stored in sunlight)	22.65	20.86	14.68	91.92
SE +_	0.01	0.02	0.01	0.05
CD at 5%	0.03	NS	NS	0.14
Period after harvest				
C_0(0 hours)	22.40	20.86	14.78	93.05
C_1 (8 hours)	22.43	20.86	14.77	92.97
C_2 (12 hours)	22.51	20.90	14.78	92.77
C_3 (24 hours)	22.63	20.97	14.74	92.25
C_4 (36 hours)	22.79	20.80	14.61	91.24
C_5 (48 hours)	22.97	20.72	14.47	90.17
SE +_	0.02	0.04	0.02	0.09
CD at 5%	0.06	0.11	0.06	0.25
GM	22.62	20.85	14.69	92.07

Significantly higher values of brix, pol, commercial cane sugar and purity were observed when sugarcane crop was harvested in February month than January month.

Cane stored in shade recorded significantly lower brix than cane stored in sunlight. While cane stored in shade recorded significantly higher purity than cane stored in shade. Whereas there was no significant effect on Pol and commercial cane sugar due to cane store in shade or sunlight. Fresh cane recorded significantly higher brix than rest of the period after harvest. Each delay successive period i.e., 8, 12, 24, 36 and 48 hours recorded significantly lower brix. The higher Pol (%) was observed in fresh cane (C_0) and 8 hours

after harvest (20.86) which was found significantly higher than 48 hours (C_5) and remained at par with other treatments.

Significantly higher CCS (14.78 %) was recorded in fresh cane (C_0) and up to 12 hours period (C_2) and found significantly superior than rest of the periods (C_3, C_4 and C_5).

Interaction effect of variety X period after harvest (V X C) on brix of cane juice.

COC 671 in combination with cane crushing at 48 hours after harvest recorded significantly, higher brix (23.47) of cane juice over other treatment combinations. Variety COC 671 in combination with different crushing time recorded significantly higher brix of cane juice over variety CO 86032 under the same situation of crushing time. Variety CO86032 in combination with crushing time at just after, 8 hours after harvest and 12 hours after harvest being at par with each other.

Table 2 : Interaction effect of variety X period after harvest (V X C) on brix of cane juice.

Treatment	Period after harvest					
	C_0	C_1	C_2	C_3	C_4	C_5
Variety						
V_1	22.01	22.03	22.07	22.16	22.31	22.48
V_2	22.80	22.82	22.95	23.10	23.26	23.47
SE(m)+_	0.03					
CD at 5%	0.08					

When cane of sugarcane variety COC671 crushed 48 hours after harvest (V_2C_5) was recorded significantly higher brix (23.47) of cane juice than rest of the interactions between sugarcane variety and period after harvest for cane crushing.

In respect of purity (%), higher purity (%) was observed in C_0period and farm significantly superior over rest of the treatments except (C_2).

Conclusion

From the entire analysis it was observed that :

1. Timely harvesting of matured sugarcane (varieties COC671 and CO86032) improves the quality of sugarcane, juice ultimately result in higher yield of sugar.
2. Harvesting of cane before maturity declined the quality of juice.
3. Cane crushed within 24 hours after harvest reduced deterioration in quality of cane.
4. Stored cane deteriorated slowly under shade than in sunlight.

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Source: Website of Department of Food and Public Distribution, Data on sugar recovery (%) has been taken from *website of IISR, Lucknown* (2020-2021).