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Effect Of Harvesting Time And Storage Condition On Post Harvest Deterioration In Quality Component Of Sugarcane

VIJAY. D. PATIL[1], K.R. YADAV[2], S.R. PATIL[3], DR. S.P. BHOI[4],A.D. KHOT[5]

[1,2,3,4,5]Assistant Professor, Department Agronomy

[1,2,3,4,5]Bharati Vidyapeeth's L.M.K College of Agriculture Kadegaon, District - Sangli, State-Maharashtra.

ABSTRACT

Sugarcane (*Saccharum officinarum L.*) occupies a major position among the commercial cultivated crop cultivated 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. For conducting an experiment at research farm of L.M.K College of Agriculture Kadegaon, District - Sangli, State-Maharashtra during 2020-21. 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 49hrs 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 CO 86032 so the stale cane weight and juice extraction (%) was more in variety CO 86032. Sugar recovery was higher in variety COC 671.

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)

Such a juice also creates problems in processing. 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.

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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 CO 86032 and COC 671 were harvested first time at 1st and 3rd January 2021, respectively, second time CO86032 and COC671were harvested at 16th and 18th February 2021 respectively. Crop was harvested with cane cutting knife, 360 millable canes were tied together in bundles. In this way 36 bundles made of each variety separately. Cane bundles were labelled 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), 8hours, 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 labelled. 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.

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RESULT AND DISCUSSION

In the present investigation post harvest deterioration of two varieties was studied. COC 671 is early maturity variety while CO86032 is an midlate variety. Variety COC 671 recorded significantly higher fiber content (%) than variety COC 671. Similar results were reported by Parthasarathy (1972) and Singh *et al.* (2002). Variety CO86032 recorded higher stale cane weight as compared to variety COC671. This was because of less moisture loss from cane variety CO86032 on storage after harvest. Similar results were reported by Gupta et al. (1967), Mercado *et al.* (1978), Kapur and Kanwar (1987), Lal *et al.* (1994 Singh *et al* (2002). Genetic variability causes differentiate behavior of genotypes to post harvest deterioration (Kadam *et al*., and Shinde *et al*., 1985).

Table1: Fiber content, loss in moisture per cent and stale cane weight as influenced by different treatments

Treatment	Fiber content (%)	Loss in moisture (%)	Stale cane weight (kg)
Variety			
V_1 CO 86032	13.68	2.30 (1.52)	9.77
V_2 COC 671	12.86	2.66 (1.56)	9.73
SE +_	0.10	0.024	0.01
CD at 5%	0.29	NS	0.03
Sampling time			
H_1 (January)	12.61	1.32 (1.25)	9.87
H_2 (February)	13.93	3.63 (1.83)	9.64
SE +_	0.10	0.02	0.01
CD at 5%	0.29	0.07	0.03
Storage Condition			
S_1 (Stored in shade)	12.75	1.41 (1.28)	9.86
S_2 (Stored in sunlight)	13.79	3.55 (1.80)	9.64
SE +_	0.10	0.02	0.01
CD at 5%	0.29	0.07	0.03
Period after harvest			
C_0 (0 hours)	12.00	0.00 (0.71)	10.00
C_1 (8 hours)	12.42	0.42 (0.92)	9.96

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C_2 (12 hours)	12.67	1.80 (1.42)	9.82
C_3 (24 hours)	13.58	2.91 (1.76)	9.71
C_4 (36 hours)	13.88	4.03 (2.04)	9.60
C_5 (48 hours)	15.08	5.71 (2.39)	9.43
SE +_	0.18	0.04	0.02
CD at 5%	0.49	0.12	0.06
GM	13.27	2.48 (1.54)	9.75

Significantly higher values of fiber content and stale cane weight in variety CO86032. The loss in moisture per cent due to variety were found non significant. The loss in moisture per cent was observed more when sugarcane crop was harvested in February month than January month.

Cane stored in shade recorded significantly higher fiber content and stale cane weight than cane stored in sunlight. Fiber content was significantly increased with increase in storage period of harvested cane. Cane crushed immediately 48 hours after harvest recorded significantly higher fiber content than rest of the period after harvest. The significantly higher stale weight was recorded immediately after harvest. Each delay successive period i.e., 8, 12, 24, 36 and 48 hours recorded significantly lower stale weight. The significantly lower moisture loss (0.00%) was observed in fresh cane (C_0) which was found increasing up to 48 hours (C_5) after harvesting.

Interaction effect of variety X period after harvest (S X C) on fiber content.

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.

Table2: Interaction effect of storage condition X period after harvest (S X C) on fiber content.

Treatment	**Period after harvest**					
	C_0	C_1	C_2	C_3	C_4	C_5
Variety						
S_1	12.00	12.17	12.08	12.75	13.17	14.33
S_2	12.00	12.17	13.25	14.42	14.58	15.83
SE(m)+_ CD at 5%	0.25 0.70					

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When cane stored in sunlight and crushed at 48 hrs after harvest (S_2C_5) recorded significantly higher fiber content (15.83) over other treatment combinations. Cane stored in both storage conditions and crushed immediately after harvest recorded similar fiber content which was the lowest value of fiber content (12.00).

CONCLUSION

From the entire analysis it was observed that

1) Timely harvesting of matured sugarcane (varieties COC671 and CO86032) improves the quality of sugarcane, 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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