Impact of Cut to Crush Interval

on Sucrose Contents and Strategies to Enhance Sugar Recovery

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Abstract:

Sugarcane is a perishable commodity and must be processed in to sugar quickly after it is harvested. Post-harvest sucrose losses have been reported from many cane producing countries due to delayed crushing as a major concern. In this context to assess the impact of delayed cut to crush interval, the present study was conducted with seven promising sugarcane varieties at Fatima Sugar Mills Limited, Kot Addu, Muzaffargarh. Impact of delay in cut to crush in % cane weight and % sucrose contents were assayed from 0-120 hrs at 24 hrs interval after harvest to check the magnitude of losses in cultivable sugarcane varieties suitable of area. The results of the study indicated that the clones CPF-246, HSF-240 and HSF-242 recorded lowest average % cane weight losses of 4.56, 4.72 and 4.86 respectively and varieties CPF-246, HSF-240 and CP-77-400 recorded lowest sucrose % losses of 0.41, 0.50 and 0.58 respectively and were found to possess tolerance to post harvest deterioration.

Keywords: Sugarcane **.** Delayed . Interval . Deterioration

Introduction:

Sugarcane industry is considered one of the organizedsectors. This sector is among the countries leadingeconomicenterprises. Sugar is mainly extracted from sugarcane and sugar beet. Studies have indicated that nearly 20-30% of totalsucrose synthesized by sugarcane plant is lost during variousstages of raw material handling and sugar millsprocessing. Thepost-harvest sugar loss is one of the most alarming problems of sugar industry and has attracted widespread attention in the recent years. The published reports indicatingloss of recoverable sugar following cane harvest began toappear towards the end of the 19thcentury (Cross and Belile, 1914, 1915). According to these authors, Went and Geerligs from Java reported deterioration of sugarcane in 1894.

Early workers emphasized the importance of time lag between harvesting and milling as well as storage environment in deterioration process. Browne & Blouin (1907) in java reported considerable drop in juice purity during storage of cane, however, no scientific explanation was advocated. Indian scientists (Magdum and Kadam, 1996; Solomon *et al*, 1997; 2007; Solomon 2000; Siddhant *et al*., 2008, Srivastava *et al*., 2006, 2009) reviewed the work on post-harvest deterioration of sugarcane. Their work highlighted the importance of lose reduction technology in improving sugar productivity especially in Asian countries where this is a serious problem.

The harvesting of sugarcane in Punjab generally starts from the month of November and continues till March or in certain cases expands up to April as per recommendation of the government and availability of raw materials. First, the post-harvest sugar loss is one of the most alarming problems of sugar industry and has attracted wide spread attention in the recent years. Second, globally 70% of white crystal sugar comes from sugarcane, which popularized the crop as wonderful crop. *(Reddy and Madhuri, 2014)* studies have indicated that nearly 20-30% of total sucrose synthesized by sugarcane plant is lost during various stages of raw material handling and sugar mill processing (Cross and Belile, 1914, 1915).

The significance of the study based on the two ends, first at the farmers end in Pakistan payment to the farmers is made on weight basis, so the delay in supply of harvested cane to the sugar industries causes loss in weight which could lead to major economic loss to cane growers and on mills side Sugar is the main product of sugar industry, delay in cut to crush interval reduces sugar production and causes huge losses to sugar industry.

Further, the following causes to increased cut to crush interval and responsible to deteriorate the sugar recovery %.

- Manual harvesting.
- Delayed in loading and transportation of harvested cane from field to sugar mills.
- Time lag of sugarcane loaded trollies outside the sugar Mills.
- Unfavorable environmental conditions (temperature, frost etc.)
- Lack of mechanical harvesting and crushing schedule.
- Unsatisfactory hygienic conditions of processing units.

Objective is to work out strategies to save the both ends and to identify such site specific sugarcane genotypes with better juice quality maintenance during post-harvest period.

Material and Methods:

The experiment was conducted in Randomized complete block design (RCBD) at Fatima Sugar Mills Limited, Sanawan, Kot Addu during crushing season 2014-15. Three replications were made and seven treatments consist of the varieties most abundantly found in the area selected including CPF-246, HSF-240, CP-77-400, SPF-234, CPF-247, HSF-242 and SPF-213. Sowing was done on February 15, 2014 under 4 feet dual row sowing method with plot size of 4 x 20 ft. A recommended dose of fertilizers $N:P_2O_5:K_2O$ applied were 225:125:125 respectively.

Data taken as average % weight loss and % loss in sucrose percent was the average of losses from 0-120 hours. While the Magnitude of Weight and Sugar Losses at 120 hours was converted to loss in terms of money both for the farmers and mill owners.

Results and Discussion:

The losses in weight were collected in significant intervals after 24, 48, 72, 96 and 120 hours then their average was calculated. Data obtained revealed that the minimum losses were found in CPF-246 (4.56%) and maximum in CPF-247 (5.13). These results are also similar to Ingale *and Khalate* (1997) who also mentioned 7-10% losses in weight of sugarcane from 24-48 hours.

1. Average weight loss of four months (Season 14-15)

Variety/Hours	% Loss in cane weight during 120 hours						Average% weight loss
	0	24	48	72	96	120	
CPF-246	0.0	1.76	3.07	4.49	6.09	7.42	4.56
HSF-240	0.0	1.93	3.37	4.65	6.05	7.61	4.72
CP-77-400	0.0	2.04	3.5	5	6.43	7.88	4.97
SPF-234	0.0	2.06	3.75	5.14	6.56	7.92	5.09
CPF-247	0.0	2.11	3.7	5.27	6.57	8.03	5.13
HSF-242	0.0	1.94	3.53	4.89	6.27	7.69	4.86
SPF-213	0.0	2	3.52	5.03	6.51	8.01	5.01
Average							4.91

2. Average Sucrose Loss of four months (Season 14-15)

Sucrose losses were also collected in significant intervals after 24, 48, 72, 96 and 120 hours and their average was calculated. Data revealed that the minimum losses in sucrose content were found in CPF-246 (0.41%) and maximum in HSF-242 (0.78%). These results are in relation to Abdelkarim D. Elfadil and Mahdi K. Mohamed (2015) who found that sucrose losses are directly proportion to time lag between harvesting and crushing.

Variety/Hours	**% Loss in sucrose during 120 hours**						**% loss in sucrose (%)**
	0	24	48	72	96	120	
CPF-246	10.2	10.2	10.2	10.1	9.88	9.79	0.41
HSF-240	10	9.83	9.71	9.64	9.57	9.51	0.50
CP-77-400	10	9.93	9.86	9.7	9.59	9.42	0.58
SPF-234	10.19	10.07	9.94	9.81	9.66	9.5	0.69
CPF-247	10.65	10.58	10.4	10.3	10.2	10	0.65
HSF-242	10.1	9.92	9.82	9.67	9.43	9.32	0.78
SPF-213	9.45	9.33	9.17	9.04	8.89	8.76	0.69
Average							0.61

3. Magnitude of Weight and Sugar Losses at 120 hours

The results compiled in terms of value loss both in weight and sugar indicate that minimum loss i.e., 205 Rs per ton was recorded in CPF-246 and maximum loss i.e., 231 Rs per ton in CPF-247. While the average loss in sucrose % per day calculated as per cane crushing of the mills indicates that the minimum loss was recorded in CPF-246 which is Rs. 2202150 and maximum in HSF-242 with loss of Rs. 3662300.

Sr. No.	Variety	Loss of Farmer By Weight(Per Ton)			Loss of Sugar (per 1000 TCD)			
		Av. % Wt. Loss	Wt. loss in Kg per ton	Monetary Loss (Rs.)	Loss in Sugar Recovery (%)	Loss of Sugar in Tons	Loss By Sugar Bags	Valuation (Rs.) of Loss per Day
1.	CPF-246	4.56	45.6	205	0.41	41.6	831	2202,150
2.	HSF-240	4.72	47.2	212	0.50	50.2	1,004	2,660,600
3.	CP-77-400	4.97	49.7	224	0.58	58.1	1,162	3,079,300
4.	SPF-234	5.09	50.9	229	0.69	69.1	1,382	3,662,300
5.	CPF-247	5.13	51.3	231	0.65	65.5	1,310	3,471,500
6.	HSF-242	4.86	48.6	219	0.78	78.7	1,574	4,171,100
7.	SPF-213	5.01	50.1	225	0.69	69.1	1,382	3,662,300

Conclusion:

Sugar recovery mainly depends on cane quality, efficiency of mills, planting and harvesting dates as well as staling due to delay in crushing after harvest. 0-120 hours cut to crush delay can cause loss of Rs. 220 per ton of cane supplied to the sugar mills (farmer point of view) and 0.41-0.78 unit loss in recovery (sugar industry point of view).

Among the varieties CPF-246, HSF-240 and CP 77-400 has showed less post harvest deterioration and % cane weight loss. So these varieties are in favor of farmer as well as for sugar industry. So, in view of high post harvest weight and sugar losses with consequently lower recovery in many sugar units in Punjab, it is suggested that the time between cut-to-crush should be reduced to 48-72 hours for manually harvested whole-stalk**.**

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