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Decay in juice quality due to staling under different climatic conditions

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Abstract- The deterioration in juice quality as a result of post harvest deterioration of sugarcane has a direct bearing on sugar quality and its recovery. author in present study has discussed the magnitude of post harvest deterioration of a late maturing variety of Uttar Pradesh during different climatic conditions in respect to Brix%, Pol%, Titrable acidity, R.S.%, Ph, apparent and sucrose purity .

Key words: Harvest, Stalk, Staling, Enzymatic.

INTRODUCTION

As we are aware that quality and recovery of sugar is directly dependent upon the quality of sugarcane available for crushing, to avoid deterioration in juice quality there should be minimum time lag between harvesting of cane and its crushing however, with the present system of cane delivery to the mills, it has been observed that in many cases the sugarcane remains dumped at the cane centers or in the field of the individual farmers for considerable period of time. Due to this staling of sugarcane ,decay in juice quality takes place which adversely affects the quality and recovery of sugar.1-3

In the early part of twentieth century, it was thought that the harvested cane kept for a week or will have higher sugar content than it did have at the time of harvesting. it is an established fact that sugarcane quality and in turn the juice quality begins to deteriorate no sooner the sugarcane is harvested, since once the stalk cut no further synthesis of sucrose takes place and only accumulated sucrose gradually deplete .As such, the earlier concept having no scientific significance has altogether changed and the post harvest deterioration of sugarcane is seriously viewed. The extent of such losses increases with time and are mostly dependent upon the ambient temperature, humidity and variety of sugarcane.

Since due to considerable change in the weather condition i.e. extreme hot or cold climatic conditions, present investigations were carried out in two different phases and climatic conditions i.e. one comprising months from November –February(Cold climatic conditions) and another from March-May(Hot climatic conditions).

MATERIAL AND METHODS

The sugarcane variety selected for the present study was CoS 91269. Fresh cane samples of CoS 91269 variety were harvested at the predetermined periods and in each case six lots of harvested cane were prepared. They were kept in open as is done in sugar factories so as to expose them to atmosphere. The cane samples after weighment were crushed in laboratory crusher and the resultant juices were analysed in fresh condition termed as 00hour sample. The above mentioned sugarcane were there after weighed, crushed and analysed after every 24 hours upto 120 hours.

The weighment of cane samples were carried out in order to access loss in weight due to release of moisture while the juice samples were analyzed for various quality parameters for eg. Brix%, Pol%, Titrable acidity, R.S.%, Ph, apparent and sucrose purity so as to access quantum of decay in juice quality due to staling. The analysis was carried out either as per ICUMSA prescribed procedures or according to Indian standard code and practices.

During the analysis 'A'class glassware of Borosil/ vensil make and chemicals and reagents of E-Merck/Ranbaxy quality were used. The principle equipments used during the analytical endeavour were automatic purity analyzer,Autopol-880 of Rudolph make, UV-VIS double beam spectro photometer,UV-2600 of Chemito make and WTW make digital pH Meter .

RESULT AND DISCUSSION

The average analytical data pertaining to these experiments has been presented in Table 1&2. Table No.1 has been drawn on the basis of experiments carried out in hot climatic conditions i.e. during summers and Table No. 2 has been drawn on the basis of experiments carried out in cold climatic conditions i.e. during winters.

LOSS OF WEIGHT PERCENT ORIGINAL WEIGHT

A perusal of the data contained in tables indicates that there is considerable reduction in the cane weight due to drayage , particularly during the hot climatic conditions .It is evident from the data that for 120 hours duration the weight loss during the summers was around 11% whereas during winters although it was lower but significant being around 5.0%.

Such deterioration of sugarcane is important in India from farmers point of view also as price of cane is paid on weight basis.5

EFFECT ON APPARENT AND SUCROSE PURITY

It is evident from the tables that the juice quality undergoes a substantial change as far as the pol% or sucrose purity is concerned. The results obtained from the experiments indicate significant decrease in apparent and sucrose purity in both the cases.it may also be observed that the apparent and sucrose purity drops are much higher in summers than in winters .The total apparent and sucrose purity drops are more than 20% during hot climatic conditions and an average around 10% during cold climatic condition. Such drops in sugar content thus speaks as to why there occurs a considerable decrease in recovery of sugar if the sugarcane is allowed to remain dumped for considerable period of time particularly ,during the hot climatic conditions.

CHANGE IN REEDUCING SUGAR CONTENT OF JUICES

A perusal of data reveals considerable increase I reducing sugar content of the juices due to chemical as well as enzymatic inversion of sucrose.

The results obtained from the tables indicate that there was a gradual increase in reducing sugar content up to 24 hours as indicated by the values of R.S./1000 Brix. However, after 48 hours there was a statistically significant increase in reducing sugar content in summer being about 100% of the original but was much more lower being around 25% in winters .

The magnitude of increase in reducing sugar content thus indicates about the quantum of inversion of sucrose which appears to be much more prominent in hot climatic conditions.

CHANGE IN Ph AND TITRABLE ACIDITY OF JUICES:

It is evident from the data contained in the tables that in almost all the cases during winters or summers there is a gradual fall in Ph and increase in titrable acidity of the juices.

The overall decrease in ph was observed to be 0.24 unit in winters and in summers it was slightly higher being around 0.27 unit, after 120 hours. However, the increase in titrable acidity of juice was significant particularly after 72 hours and it can be perused from the data that rise in acidity after 72 hours upto 120 hours was around 3 and 4 units during winters and summers respectively ,which is almost 36% and 45% of the overall increase in titrable acidity during 120 hours in winters and summers.

CONCLUSION:

Investigation carried out in order to access effect of staling on sugarcane and on juice quality during different climatic conditions reveal considerable reduction in cane weight due to drayage, significant decrease in apparent purity ,sucrose purity and ph, increase in brix, titrable acidity and reducing sugar content of the juices even after only 24 hours of staling .However, magnitude of such deterioration is much more pronounced during the hot climatic conditions than during the cold climatic conditions. Further studies on preventive measures for controlling the post harvest deterioration of sugarcane are in progress

TABLE-1

Average Change in sugarcane juice quality(in hot climati conditions)

Duration Particular	%weight loss	Brix%	Pol%	Apparent Purity	Sucrose purity	pH	Titrable acidity	R.S./1000 Brix
00 hrs	-	22.10	19.45	87.97	86.96	5.21	24.6	2.92
24 hrs	2.7	22.27	19.05	85.54	83.64	5.17	26.5	3.55
48 hrs	4.9	22.76	18.66	81.98	78.94	5.12	28.5	5.83
72 hrs	6.8	23.13	17.93	77.51	74.06	5.08	31.1	8.52
96 hrs	8.8	23.61	17.05	72.23	69.34	5.03	33.4	12.35
120 hrs	11.5	24.46	16.01	65.38	62.48	4.94	35.7	17.70

TABLE-2

Average Change in sugarcane juice quality (in cold climatic conditions)

Duration Particular	%weight loss	Brix%	Pol%	Apparent Purity	Sucrose purity	pH	Titrable acidity	R.S./1000 Brix
00 hrs	-	19.02	16.12	84.67	83.73	5.40	17.9	3.14
24 hrs	1.3	19.13	16.02	83.65	82.61	5.38	18.5	3.53
48 hrs	2.4	19.30	15.88	82.24	80.66	5.34	19.3	3.93
72 hrs	3.3	19.41	15.61	80.35	77.65	5.28	20.4	4.73
96 hrs	4.2	19.70	15.20	77.14	74.61	5.21	22.4	5.77
120 hrs	5.0	20.00	14.67	73.58	70.07	5.16	22.4	7.26

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