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Biochemical analysis and sensory evaluation of naturally preserved sugarcane juice

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Abstract: Sugar cane juice was preserved naturally i.e. no traditional chemical additives were added during the production process. Sugarcane Juice was pasteurized just after extraction and its pH was maintained at 4.3 by the addition of citric acid. Pasteurized juice was filled hot in sterilized glass bottles and was stored at room temperature for four months. Physiochemical, microbial and sensory evaluation of the sugar cane juice samples were carried out after fifteen days interval. The developed product was attractive in color, flavor and refreshing with uniform consistency. Bottled juice samples were merely accepted up to a storage period of 120 days.

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INTRODUCTION

Sugarcane juice is a popular refreshing drink in many parts of country. It is extracted by crushing the sugarcane between roller drums and served with or without ice. Peoples love the sugar cane juice. It is sold fresh by road side vendors only, as the juice starts to turn black very quickly because of oxidation. Sugarcane juice is great for recharging energy because it is rich in carbohydrate and iron. Green-typed tropical sugarcane is sweetest and juiciest. Being a nutritious product containing natural sugars, minerals and organic acids, sugarcane juice has many medicinal properties. It strengthens the stomach, kidneys, heart, eyes, and brain**.** It is advised to hepatitis patients by doctors to drink as much of it as possible[1].

Sugarcane juice is available almost throughout the country but juice composition may vary according to cane variety, geographical location, cultural practices, maturity at harvest and also mechanical treatment during harvesting and transportation. The principal constituents of cane juice are sugars, salts, organic acids and other organic non-sugars such as proteins[2]. Extracted juice from the canes turns dark brown and marked sedimentation appears during storage. Conventional heat processing imparts the taste of jaggery and the delicate flavor of juice is adversely affected[3]. Bucheli and Robinson[4] reported that the polyphenol oxidase is the major enzyme involved in the discoloration of sugarcane juice, which can be improved by heat inactivation of enzyme. Addition of citric acid or ascorbic acid to juice also gave good pleasant dull orange color to juice[5]. Addition of lemon and ginger followed by pasteurization and preservation with sulphurdioxide also reduced physico-chemical changes during storage of ready-to-serve bottled sugarcane juice[6].

Hygiene standards are usually not maintained during the transport of sugarcanes from field to the point of extraction and preparation of juice. Further the juice is consumed unpasteurised therefore it is possible that the sugarcane juice is contaminated and pose health hazards. Main objective of this research work is to provide hygienic sugarcane juice to peoples and encourage the industrialists to start sugarcane juice production on commercial scale.

MATERIALS AND METHODS

The sugar cane juice used was extracted from washed sugarcane by passing through a roller mill to squeeze the juice. Fresh sugarcane juice was collected in sterilized screw capped container and was processed just after collection. Juice was filtered by muslin cloth and pasteurized at 90 ^{o}C for five minutes. The pH of pasteurized juice was adjusted to 4.30 with citric acid. The final juice chemistry was 21.2 % TSS, 4.30 pH and total acidity 0.63 % as citric acid. All the waxy material was removed from the top during pasteurization and was hot filled in sterilized glass bottles of 250 milliliters. No conventional food preservative was added at any stage of the production of the sugarcane juice. Filled bottles were then processed in boiling water for 25 minutes.

Bottles were stored at room temperature and its physicochemical, microbial and sensory characteristics were measured. Stored bottles were analyzed at 15 days interval for up to 120 days. TSS, pH, total acidity, total plate counts, yeasts and molds growth were studied. A panel of six judges following the nine-point hedonic scale also evaluated sensory characteristics of the naturally preserved sugarcane juice. Sensory evaluations were carried out by the method described by larmond (1977)[7] and microbial analysis were done according to the methods as

described by FAO (1992)[8]and APHA (2005)[9] while the total soluble solids by digital refractometer Atago RX - 1000 Japan, pH by digital pH meter Hanna Germany and total acidity as citric acid was measured by the method described in AOAC (2000)[10].

RESULT AND DISCUSSION

Results regarding changes in physiochemical, microbial and sensory evaluations are shown in table 1 and table 2 respectively. Results of all the quality parameters tested indicate that the product was remained quite stable and acceptable and no oxidative and deteriorative changes were observed during the study period as were found usually in unprocessed sugarcane juice. Regarding the chemical analysis of the samples, there was gradual decrease in pH during storage and increase in total acidity .After 120 days of storage, pH decreases from 4.3 to 4.05.Similarly total acidity in fresh juice after pasteurization was 0.63 % while it was gradually increased.

Table 1: Effect of storage time on the ph, acidity, T.S.S, Tpc and yeast, molds.

Storage Time (Days)	pH	Total Acidity %	T.S.S. %	TPC (cfu/ml)	Yeast &Mold (cfu/ml)
0	4.30	0.63	21.2	3 X 10^3	04
15	4.30	0.63	21.2	Nil	Nil
30	4.28	0.65	21.2	Nil	Nil
45	4.20	0.68	21.2	Nil	Nil
60	4.16	0.70	21.1	Nil	Nil
75	4.13	0.73	21.1	Nil	Nil
90	4.09	0.80	21.1	Nil	Nil
120	4.05	0.84	21.1	Nil	Nil

Table 2: Effect of storage time on sensory characteristics of natural Sugar cane juice

Parameters	Storage Time (Days)							
	0	15	30	45	60	75	90	120
Appearance	09	09	09	09	09	09	09	09
Taste	08	08	08	07	07	07	07	07
Overall acceptability	08	08	08	07	07	07	07	07

1=extremely dislike, 2=Strong dislike, 3=Moderate dislike, 4=Slight dislike, 5=Neutral, 6=slight like, 7=Moderate like, 8=Strong Like, 9 = extremely like

The total soluble solids at the time of filling were measured at 21.2%. There was negligible change in the TSS while after storage period of 120 days, were decreased to 21.1 % from 21.2 %. All the results were in accordance with the results of Chauhan and Mao Lin Chun[11,12]. Regarding microbial growth, the results were also encouraging. It is very likely that some phenolic compounds and esters could be formed due to fermentation process initiated by microorganisms and that they could greatly influence the sensory attributes (Gil-Mun oz, 1999; Plata, 2003) [13, 14] but from the tabulated results it is obvious that product was free from such type of compounds. This could be appreciated in the results of this study, since the product obtained from sugarcane juice was considered to have good quality according to the sensory evaluation test.

Total plate count, yeast and molds count in fresh juice were 3 X $1o^3$ cfu / ml and 04 cfu / ml respectively while after pasteurization, no growth of these microorganisms was found in the samples. Pasteurization had killed these microorganisms as shown in the table 1. Sensory evaluation regarding appearance taste and overall acceptability were carried out and mentioned in table 2.

The good sensory results of all the parameters also indicate that there was no microbial contamination during processing and storage. Naturally preserved juice remained highly acceptable in appearance, taste and overall acceptability up to storage period of 120 days.

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