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Sensory Evaluation of optimized and Stabilized Sugarcane Juice

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Abstract: Sugarcane (Saccharum officinarum), is a giant grass belonging to the family graminae. Mythological texts of India dating back over 3000 years ago, mention the name of sugarcane and its products. The Sanskrit word 'SARKARA' from which the word 'SACCHARUM' seems to have been derived also indicates the antiquity knowledge of sugarcane in India (Lakshmikantham, 1983). In general sugarcane juice is spoiled quickly by the presence of sugars (Krishnakumar and Devadas 2006).In present investigation an attempt has been made to preserve sugarcane juice with the help of hurdle technology. Sugarcane variety CoP 32320 has been selected for preparing sugarcane juice. Fresh sugarcane juice preserve with the help of optimized parameter and hurdle technology. The quality of Sugarcane beverage evaluated by sensory evaluation in interval of every 15 days for 180 days although sugarcane beverage were hot fill and aseptic pack in air tight jar so aseptically withdrawal of sample has been taken for avoiding contamination in aseptic environment. The sensory parameters of colour, flavour, taste and overall acceptability were evaluated with 10 trained panelist based on 9 point Hedonic rating scale with maximum score considered as the best for optimized sugarcane juice.

Keyword- Sugarcane Juice, sensory evaluation, quality

Introduction

The total production of sugarcane in India has been increased from 355 M tonnes during 2012-13 to 360 M tonnes during 2013-14 .In India maximum cane area is to be found in Uttar Pradesh among the different states of the country. In 2013-14, sugarcane was planted in 5.35 million hectares across the country out of which 1 million hectares was in Maharashtra and over 2 million hectares in Uttar Pradesh, official estimates show (Directorate of Economic and Statistics, Ministry of Agriculture). Uttar Pradesh and Maharashtra are the two largest sugarcane producing states in the country, accounting for more than 80 per cent of the annual crop production.The sugarcane plant is composed of four principal parts, the leaf, the stalk, the root system and the flower. The stalk is approximately cylindrical and is composed of number of section or internodes (king et al. 1965). The sugar content of cane is dissolved in juice contained in millions of plant cells each one of which must be ruptured for the juice to be expressed (Mathur, 1975). However, processing and marketing of sugarcane juice is limited by its rapid deterioration **(Prasad & Nath, 2002; Yusof, Shian, & Osman, 2000).** Development of effective treatments or procedures to keep the fresh quality of sugarcane juice would allow it to be more widely marketed, and would enhance its quality and safety as well. Considerable efforts have been aimed at stabilizing the juice quality during processing and distribution. The most widely used method for delaying

deterioration is blanching before juice extraction **(Margherita & Giussani, 2003)** and addition of antioxidant agents **(Ozoglu & Bayindirli, 2002).** Blanching treatment is usually performed by exposing vegetables or fruits to hot or boiling water for several seconds or minutes **(Kidmose & Martens, 1999; Margherita & Giussani, 2003; Severini, Baiano, De Pilli, Romaniello, & Derossi, 2003)**. The most widespread antioxidant and acidify agent used in juice processing is ascorbic acid **(Choi, Kim, & Lee, 2002; Pizzocarno, Torreggiani, & Gilardi, 1993).** In view of above information, the present investigation was envisaged to select a suitable high yielding variety of sugarcane for juice production and evaluate the juice quality on the basis of sensory parameters.

MATERIAL METHOD

SOURCE OF MATERIAL

Sugarcane variety **(COP3230)** was collected from crop research center (CRC) pantnagar, Udham Singh Nagar. After the pretreatment of sugarcane stalk the sugarcane was crushed in a three-roller crusher to get the raw juice. °Brix, and total solids were measured using standard methods - Refractometer method, colorimetric method, respectively. Deola a natural clarificant is also procured from local market of pantnagar. The citric acid, ascorbic acid, and pectin is purchased from R.K Scientific Rudrapur.

Pre-treatment and Extraction of Sugarcane Juice

the fully matured sugarcane stalk were harvested from crop research centre of Pantnagar the the sugarcane stalk was cut in small pieces in order to make pre-treatment process convenient . After cutting of sugarcane stalk the small pieces was peeled and scrubbed with the help of knife then sugarcane stalk pieces were washed and blanched in hot water at temperature of 100℃ for 5 minutes in Oder to inactivate enzymatic activity during the processing of juice and also prevent the discolouration of sugarcane juice. The pre-treated sugarcane stalk pieces were passes through sugarcane juice extractor roller and juice was collected in stainless steel and filtered through double layer of muslin cloth. The filtered juice was used for further processing of stabilization.

Experiments were conducted to stabilizing the sugarcane juice by hot filling method and to identify the process variables and their experimental range. Sugarcane stalk is treated with hot water for blanching in Oder to suppress enzymatic activity then juice was extracted with the help of crusher then juice were filtered by muscline cloth then the filtered juice was treated with ascorbic acid, citric acid , deola after that pectin were added in amount of (.05mg/100ml) the magnetic stirrer were used in order to achieve homogenize mixing of all of the component in juice and after that juice was heated at temperature of 80℃ in closed environment for suppressing aroma and flavor losses of fresh sugarcane juice after that when juice temperature reached 80℃ the hot juice filtered with the help of filter paper and rapidly transfer in glass bottles of borosil while it was too hot

and then seal the bottles and rapidly cool it up to 20℃ by spraying the water on bottles then place the botlles in storage temperature range (10℃, 20℃, 30℃) in incubator.

Table 1. Independent Variables in RSM

Independent variables	Code	Coded level		
Ascorbic acid (mg/100 ml)	X1	-1	0	+1
Citric acid (mg/100 ml)	X2	-1	0	+1
Deola (ml/100ml)	X3	-1	0	+1
Storage Temperature (℃)	X4	-1	0	+1

RESULT AND DISCUSSION

Storage study of stabilized sugarcane juice for sensory parameters

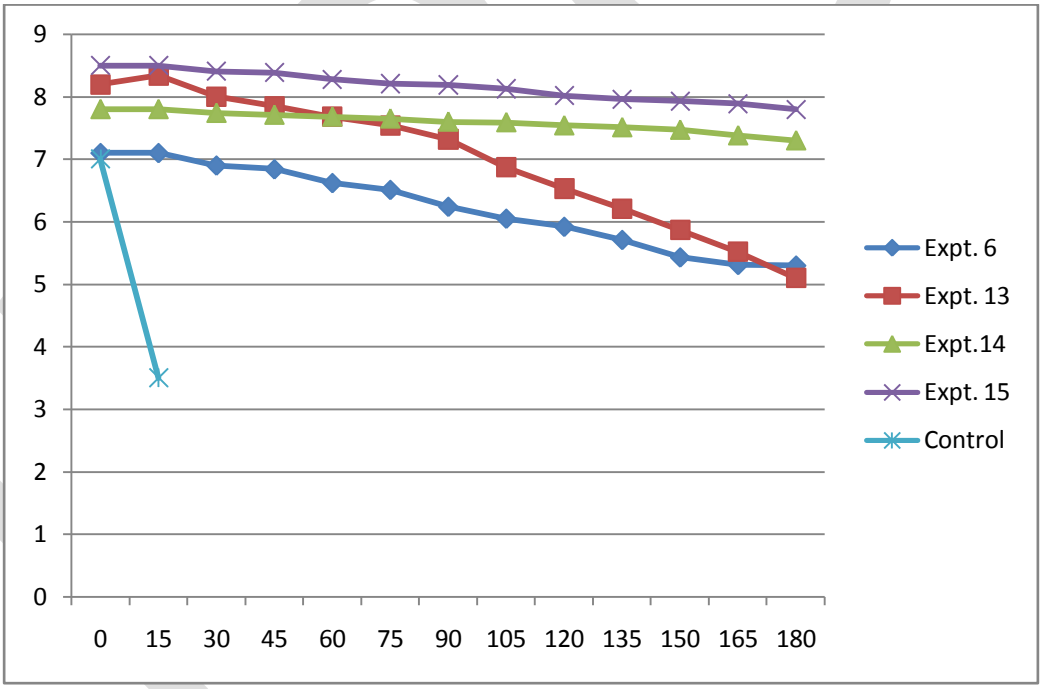
Color

The initial color score for the sugarcane juice sample of Expt. 6, Expt.13, Expt. 14, and Expt.15 was ranged from 7.1 to 8.5 for 0 days after the treatment while control sample have color score 7 The color decreased significantly ($P<0.01$) during storage of sugarcane juice between 0 to 180 days. It was found very little effect due to Combination of blanching of stems and addition of ascorbic acid, citric acid showed an enhancive effect in preventing colour change by indicating the lowest score changed similar result found by (**Lin Chun Mao *et al.* 2007)** during the study of preservation of sugarcane juice.

While in control sample the sensory colour score for 0 days 7 and after 15 days it was found 3 because of Browning was observed in the control with a rapid decrease treatment Fresh sugarcane juice appeared olive-green and showed clear signs of degreening during processing and storage. Visually, juice extracted from unblanched stems was a little darker in color than that from blanched stems. A change of color score during the storage as compared to control sample has been showed in Fig 4.110

Table 4.50 Color score for sugarcane juice for sensory evaluation

No. Days	0	15	30	45	60	75	90	105	120	135	150	165	180
Expt. 6	7.1	7.1	6.9	6.84	6.62	6.51	6.24	6.05	5.92	5.71	5.43	5.31	5.3
Expt. 13	8.2	8.34	8	7.85	7.68	7.54	7.32	6.87	6.53	6.21	5.87	5.52	5.1
Expt.14	7.8	7.8	7.74	7.71	7.68	7.65	7.6	7.59	7.54	7.51	7.47	7.38	7.3
Expt. 15	8.5	8.5	8.41	8.39	8.28	8.21	8.19	8.13	8.02	7.96	7.93	7.89	7.8
Control	7	3.5											



Color Score

Storage Period in Days

Fig 4.110 Changes in color score of sugarcane juice during storage

Flavour

The initial flavour score for the sugarcane juice sample of Expt. 6, Expt.13, Expt. 14, and Expt.15 was ranged from 7.2 to 8.1 for 0 days after the treatment while control sample have flavour score 6 The flavour decreased significantly ($P<0.01$) during storage of sugarcane juice between 0 to 180 days. It was found very little effect due to Combination of blanching of stems and addition of ascorbic acid, citric acid showed an enhancive effect in preventing colour change by indicating the lowest score changed similar result found by (**Lin Chun Mao *et al.* 2007)** during the study of preservation of sugarcane juice.

While in control sample the flavour score was decreased from 6 to 2.8 after 15 days. This decrease could be due to due to high level of acid that reacts with the product unpleasant volatile odour and could be due to the slight fermentation of juice and gas production. There has been significant decline in flavour score of sugarcane juice similar result found by **Reddy (2004)** stated that the loss of volatile aromatic substances responsible for flavour Also presence of preservatives had lead to significant changes. A change of flavour score during the storage as compared to control sample has been showed in Fig 4.111

Table 4.51 Color score for sugarcane juice for sensory evaluation

No. Days	0	15	30	45	60	75	90	105	120	135	150	165	180
Expt. 6	7.2	7.15	7.02	6.95	6.91	6.87	6.75	6.41	6.38	6.25	5.87	5.52	5.1
Expt. 13	7	6.97	6.91	6.87	6.82	6.71	6.65	6.14	5.98	5.74	5.24	5.12	5
Expt.14	8.1	7.97	7.84	7.71	7.58	7.45	7.32	7.19	7.06	6.93	6.8	6.67	6.5
Expt. 15	8.1	8.03	7.96	7.89	7.82	7.75	7.68	7.61	7.54	7.47	7.4	7.33	7.2
Control	6	2.8											

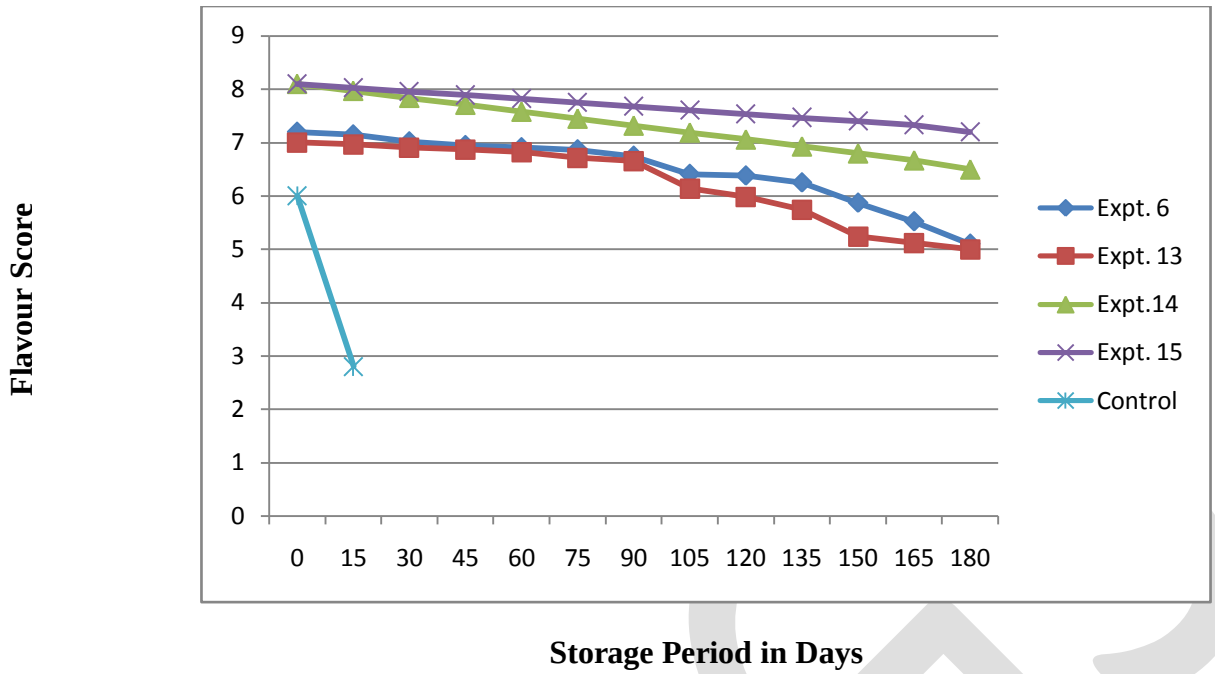


Fig 4.111 Changes in flavour score of sugarcane juice during storage

Taste

The initial taste score for the sugarcane juice sample of Expt. 6, Expt.13, Expt. 14, and Expt.15 was ranged from 7.3 to 9.2 for 0 days after the treatment while control sample have taste score 7. The taste decreased significantly ($P<0.01$) during storage of sugarcane juice between 0 to 180 days. It was found very little effect due to Combination of blanching of stems and addition of ascorbic acid, citric acid showed an enhancive effect in preventing colour change by indicating the lowest score changed similar result found by (**Lin Chun Mao *et al.* 2007)** during the study of preservation of sugarcane juice.

While in control sample the taste score was decreased from 7 to 3.4 after 15 days this decrease could be due to the loss of volatile aromatic substances responsible for taste and due to decreases in pH the juice became more acidic as stated by **Reddy (2004)**. Also presence of preservatives had lead to significant changes. A change of taste score during the storage as compared to control sample has been showed in Fig 4.112

Table 4.52 Taste core for sugarcane juice for sensory evaluation

No. Days	0	15	30	45	60	75	90	105	120	135	150	165	180
Expt. 6	7.3	7.15	7	6.85	6.7	6.55	6.4	6.25	6.1	5.95	5.8	5.65	5.3
Expt. 13	8.7	8.45	8.2	7.95	7.7	7.45	7.2	6.95	6.7	6.45	6.2	5.95	4.6
Expt.14	8.1	8.05	8	7.95	7.9	7.85	7.8	7.75	7.7	7.65	7.6	7.55	7.1
Expt. 15	9.2	9.13	9.06	8.99	8.92	8.85	8.78	8.71	8.64	8.57	8.5	8.43	7.6
Control	7	3.4											

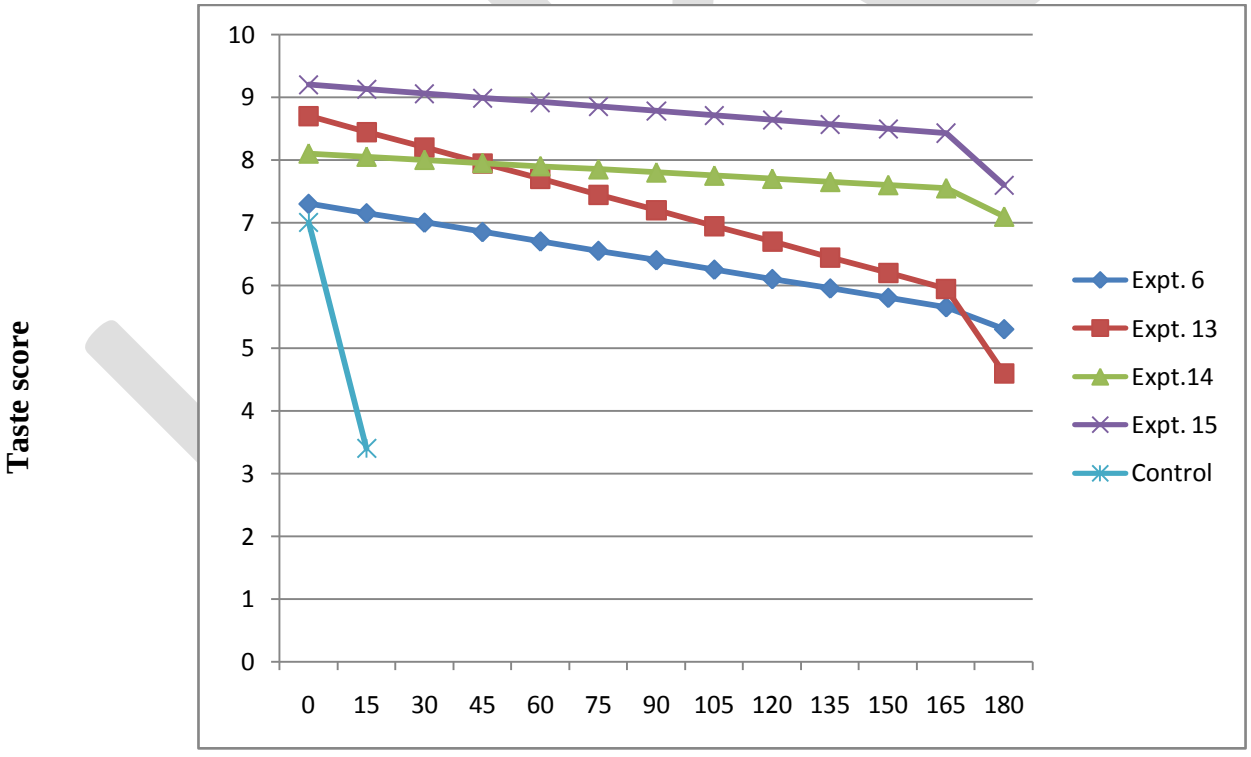


Fig 4.112 Changes in taste score of sugarcane juice during storage

Appearance

The initial taste score for the sugarcane juice sample of Expt. 6, Expt.13, Expt. 14, and Expt.15 was ranged from 7.2 to 8.5 for 0 days after the treatment while control sample have taste score 6.5. The taste decreased significantly ($P<0.01$) during storage of sugarcane juice between 0 to 180 days. It was found very little effect due to Combination of blanching of stems and addition of ascorbic acid, citric acid showed an enhancive effect in preventing colour change by indicating the lowest score changed similar result found by (**Lin Chun Mao *et al.* 2007)** during the study of preservation of sugarcane juice.

While in control sample at 0 days the score of appearance was 6.5 and it was found 2.85 after 15 days of storage because of browning occurred in sugarcane juice due to increasing PPO activity and invert sugar the colour of sugarcane juice become darker it was decreased its appearance score similar result found by (**Lin Chun Mao *et al.* 2007)**. A change of appearance score during the storage as compared to control sample has been showed in Fig 4.113

Table 4.53 Appearance score for sugarcane juice for sensory evaluation

No. Days	0	15	30	45	60	75	90	105	120	135	150	165	180
Expt. 6	7.2	7.09	6.98	6.87	6.76	6.65	6.54	6.43	6.32	6.21	6.1	5.99	4.52
Expt. 13	7.5	7.29	7.08	6.87	6.66	6.45	6.24	6.03	5.82	5.61	5.4	5.19	4.9
Expt.14	7.9	7.77	7.64	7.51	7.38	7.25	7.12	6.99	6.86	6.73	6.6	6.47	6.31
Expt. 15	8.5	8.47	8.44	8.41	8.38	8.35	8.32	8.29	8.26	8.23	8.2	8.17	7.8
Control	6.5	2.85											

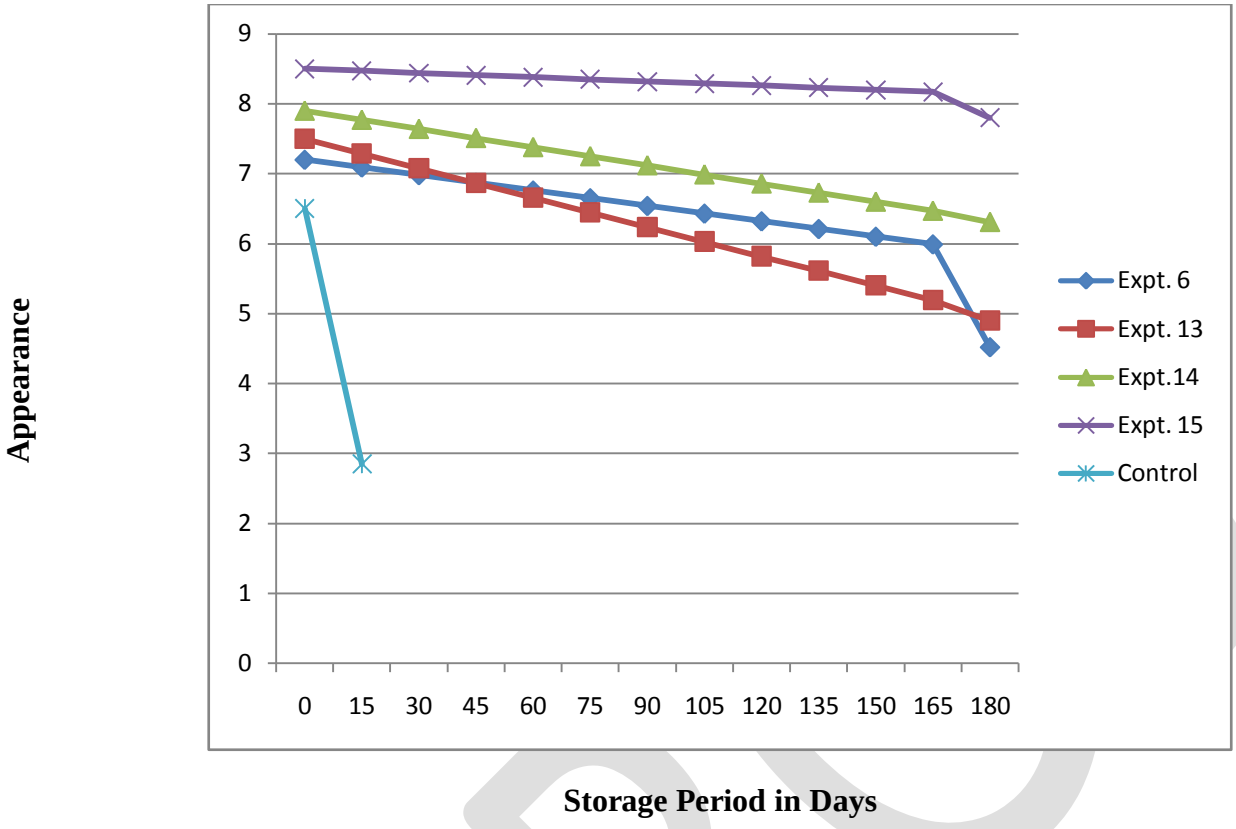


Fig 4.113 Changes in Appearance score of sugarcane juice during storage

Overall acceptability

due to little changes in colour, taste, flavour and its appearance although change was very minute due to the treatment of sugarcane juice.

While in control sample the overall acceptability was 7 and it was decreased to 3 due to the score of control sample was declined significantly during storage owing to oxidative reaction to deteriorate the scores of colour, flavour, appearance as well as taste. These findings were accordance with **(Chauhan *et al.* 2002)**

This decrease could be due to due to high level of acid that reacts with the product unpleasant volatile odour and could be due to the slight fermentation of juice and gas production. There has been significant decline in taste score of sugarcane juice similar result found by **Reddy (2004)** stated that the loss of volatile aromatic

substances responsible for taste Also presence of preservatives had lead to significant changes. A change of overall acceptability during the storage as compared to control sample has been showed in Fig 4.114

Table 4.54 Overall Acceptability score for sugarcane juice for sensory evaluation

No. Days	0	15	30	45	60	75	90	105	120	135	150	165	180
Expt. 6	7.2	7.08	6.96	6.84	6.72	6.6	6.48	6.36	6.24	6.12	6	5.88	5.125
Expt. 13	7.56	7.38	7.2	7.02	6.84	6.66	6.48	6.3	6.12	5.94	5.76	5.58	4.9
Expt.14	8.52	8.45	8.38	8.31	8.24	8.17	8.1	8.03	7.96	7.89	7.82	7.75	7.125
Expt. 15	8.92	8.82	8.72	8.62	8.52	8.42	8.32	8.22	8.12	8.02	7.92	7.82	7.675
Control	6.5	3.12											

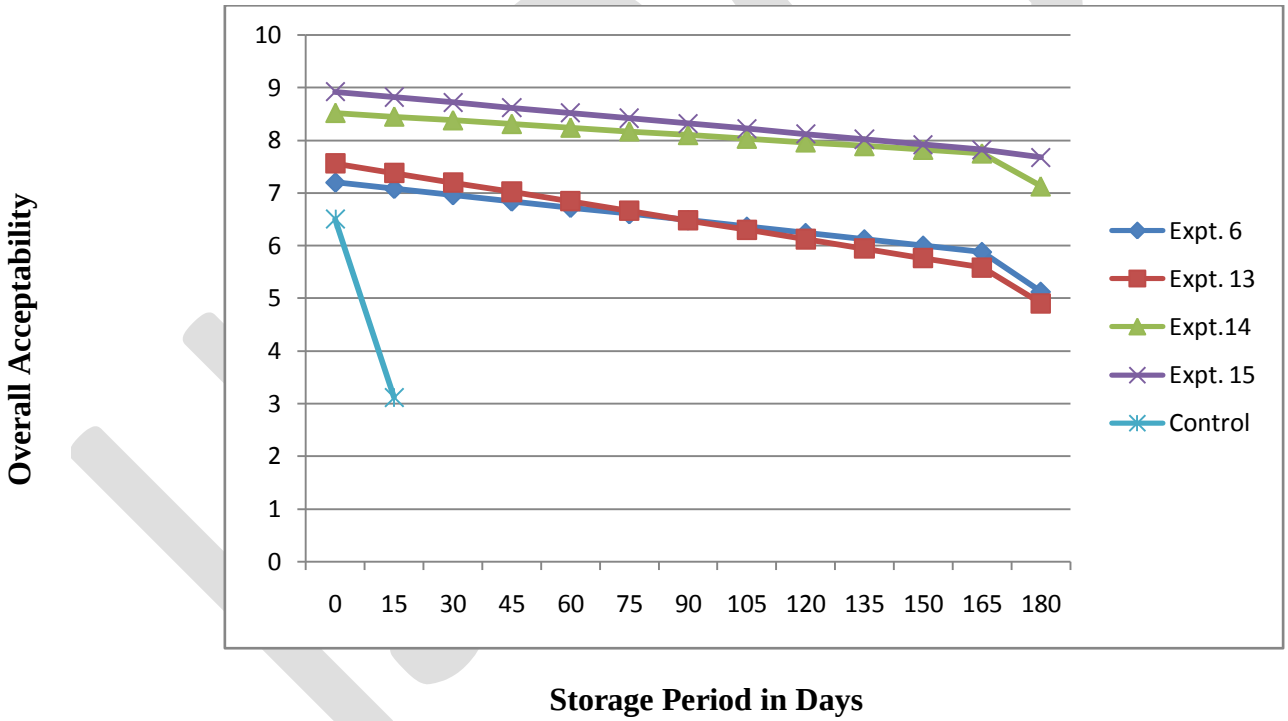


Fig 4.114 Changes in Overall Acceptability of sugarcane juice during storage

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