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Assessment of Sugarcane Varieties at Various Maturity Levels Using Physical Properties

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ABSTRACT

The objective of the study was to extract sugarcane juice, identify the ideal stage of maturity and assess its acceptability using sensory analysis. The sugarcane cultivars (Co86032, 85R186 and 83R23) were procured from regional sugarcane and rice research station, rudrur, Telangana state were purposefully selected for the study which was carried out in 2021–2022. These types were gathered in the eighth, tenth and twelve months of maturity. The findings showed that physical characteristics like sucrose in brix% and juice obtained grew more prominent as one aged. Thus, for sensory examination 12th month maturity stage was chosen. Out of all the varieties that were evaluated the experimental sample SCR2-83R23 showed better acceptability than the experimental sample SCR1-85R186 and control SCO-Co86032. Because of improved sweetness, a deeper flavor profile and superior overall juice obtained are important components of consumer choice and sensory pleasure the SCR2-83R23 variant is probably more widely accepted.

Keywords: *Sugarcane varieties, maturity stages, physical properties, height, weight, girth, HR brix, brix%, pol reading, temperature, juice obtained, sensory evaluation.*

Introduction

The sugarcane (*Saccharum officinarum*) is a large vegetation in the *Graminae* family. Sugarcane and its products are mentioned in ancient Indian mythological texts extending back more than 3,000 years. The Sanskrit term 'SARKARA,' from which the word '*SACCHARUM*' appears to be derived also refers to saccharine substances (Singh *et al*., 2014). Sugarcane, belonging to the *Saccharum spp*. genus holds significant economic value globally primarily as a fundamental resource for the manufacturing of sugar, alcohol, yeast and other related products. The economic yield of this culture is determined by the production of sucrose, reducing sugars that are utilized in the creation of molasses and also fiber which can serve as an energy source inside the plant. The sugarcane stem consists of a series of internodes at various physiological phases, including immature (top), maturation (middle) and mature (bottom) internodes. As the stem matures the sucrose concentration becomes more uniform throughout its many parts (Pereira *et al*., 2017). Technological measures are commonly employed to monitor the maturity of sugarcane in the industry. These indexes assess the quality of the raw material (Pereira *et al*., 2017). The age of maturity is determined by the unique requirements of the industry. Early maturing varieties in different countries have different ripening times. In India they ripe at 8-10 months, in Indonesia at 10-11 months, in Columbia at 12-14 months and in Mauritius at 9-10 months.

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At the beginning the amount of sugar stored as sucrose is small and gradually increases as growth progresses. As the plant matures its vegetative growth slows down and the rate at which the internodes (the sections between leaves or branches) elongate decreases. At the same time the levels of sugar and fiber in the plant increase significantly. The sucrose levels in the plant reach a peak and then start to decrease as the season progresses primarily due to respiratory loss. Early maturing cultivars offer various advantages to both producers and the sugar industries. These methods offer a dependable and effective way to achieve higher sugar production at the start of the season. They also help conserve the raw materials needed for a particular crop cycle and enable an earlier start to the harvesting and processing season, ultimately ensuring profitability (Wagih *et al.,* 2004). The financial significance of sugarcane juice production suggests that it has the potential to be a lucrative enterprise, given that measures are taken to maintain its freshness during storage (Samreen *et al*., 2017). It is of great use in the treatment of medical disorders connected to urine. It maintains a clean urine flow and assists the kidneys in performing their tasks in the correct manner. According to Kaavya *et al.* (2019) studied that it is also helpful in cases of burning micturition caused by high acidity, gonorrhoea, an enlarged prostate and cystitis. According to Chauhan *et al*. (2002) panelists awarded sugarcane juice immediately after preparation sensory scores ranging from 7.5 to 8.5 for appearance, flavor and overall acceptability; these scores decreased substantially as storage time progressed. According to Richa *et al*. (2010) the flavor score of sugarcane juice was decreased from 7 to 3.4 after 15 days due to the loss of volatile aromatic substances and a decrease in pH which are responsible for flavor.

Materials and methods

The sugarcane varieties were obtained from the Rudrur, Regional Sugarcane and Rice Research Station in Nizamabad. The varieties that gathered were Co86032, 85R186 and 83R23. These cultivators were collected according to their distinct maturity stages, specifically at the 8th, 10th and 12th month. The following parameters were conducted for each of the selected phases of maturity.

Height: The sugarcane stalks were collected and after harvesting followed by cleaning was measured by using tape and noted in centimeters (Chauhan, 2021).

Girth: The circumference of sugarcane stalks was measured using a measuring tape and reported in centimeters (Chauhan, 2021).

Cane weight: A sample of sugarcane stalks was chosen and weighed using an electronic weighing balance. The average weight was then measured and stated in grams (Chauhan, 2021).

HR Brix: Collected composite juice samples from multiple canes in the field. Next, carefully add a small amount of the composite juice sample onto the Hand Refractometer and recorded the Brix measurement. The HR Brix meter is equipped with graduations ranging from 0 to 32 percent (Chauhan, 2021).

Brix%: Brix is the measurement of the total amount of solids in juice, expressed as a percentage. Brix encompasses both sugars and non-sugars. Brix levels can be determined manually by a meter called hydrometer which measures the density of the juice.

Pol reading: The sucrose percentage represents the exact amount of cane sugar that is found in the juice. The determination of sucrose percentage was achieved by employing a polarimeter, so the phrase "pol percentage" is also used (Chauhan, 2021).

Temperature: The temperature was noted down after the extraction of the sugarcane juice at different maturity stages i.e., 8th month, 10th month and 12th month by using thermometer.

Juice obtained: The quantity of juice extracted from the machine by inserting sugarcanes was then gathered in a container and measured by weight. The juice was quantified by assessing the maturity phases specifically the 8th, 10th and 12th month (Chauhan, 2021).

Preparation of sugarcane juice and other juices

Extraction of sugarcane juice: Prior to processing, the sugarcane had an initial cleaning operation to eliminate dry leaves, tops and a portion of the roots. Additionally, the bottom side of the sugarcane was examined for any damaged or infected nodes which were promptly removed. The sugarcane is sliced into pieces measuring 2.5 feet in length and then cleaned with tap water using a mechanical washer. The skin and nodes were scraped using a specialized stainless steel (SS) knife with a curved blade. The purified harvested sugarcane was thereafter subjected to a 2-minute mechanical washing process. Following this the sugarcane was surface dried on perforated stainless steel trays utilizing fans. The sugarcane juice was extracted using a double extraction process utilizing a mechanical crusher constructed of stainless steel (SS). The extracted juice underwent filtration using an SS screen to remove large impurities followed by filtration through a four-fold clean muslin cloth. The juice was thereafter utilized in the process of beverage preparation.

Extraction of lemon juice: Lemons were acquired from the local market. The fruits underwent a process of sorting, grading, washing under clean tap water, draining to remove excess water and finally surface drying. The lemons were cut in half using stainless steel blades on a preparation table (SS) and the juice was squeezed using a manually operated equipment (Manual fruit squeezer). The juice was subsequently strained using a quadruple layer of muslin cloth to eliminate any coarse fibrous matter from the juice. Finally, the juice was placed into PET bottles and sealed with sterile caps. They were gradually cooled to room temperature using running tap water, allowed to dry on the surface and finally labelled. The bottles were stored under refrigerator for future use in beverage preparation.

Extraction of ginger juice: Ginger that was freshly harvested was washed, peeled by hand, sliced into little pieces and then ground in a mixer with twice as much water as the original quantity. After that, the slurry was filtered through the double-folded muslin cloth and it was stored for two hours in a cylindrical-shaped glass container in order to allow the sediment to settle to the bottom. After that the clear extract is filtered through muslin cloth that has been folded four times. The juice was then placed in PET bottles. Thereafter, the bottles were marked. With the intention of using them for the manufacture of beverages in the future the bottles were kept at refrigerate temperature. Figure 1 the unit operations of sugarcane juices were given.

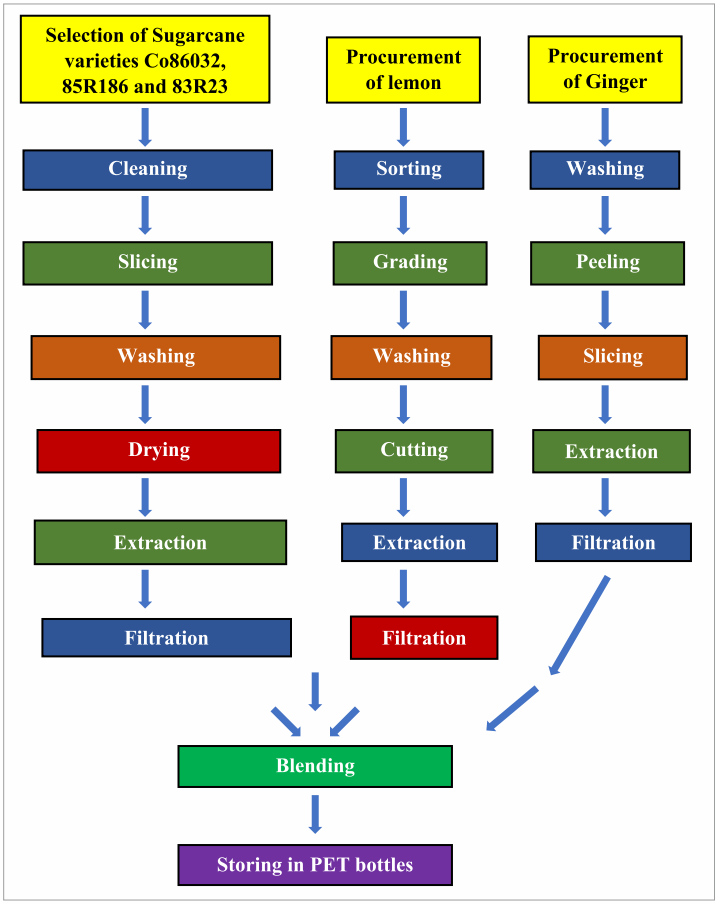

Figure 1 Unit operations for the preparation of sugarcane juice

Sensory evaluation: By using 9-point hedonic scale the sugarcane juice was evaluated by 20 semi trained panel members (Meilgaard *et al*., 1999).

Results and Discussion

Finalization of sugarcane varieties based on the maturity stages

Height: The sugarcane varieties height was observed in 8th month of maturity period i.e., SCO-8 (175.00±0.00), SCR1-8 (270.00±0.00) and SCR2-8 (200.00±0.00). When the sugarcane varieties reached the 10th month of maturity stage their height were 190.20±0.00 cm for SCO-10, 295.00±0.00 cm for SCR1-10 and 233.00±0.00 for SCR2-10 respectively. The height of sugarcane varieties was SCO-12, SCR1-12 and SCR2-12 was 220.10±0.00 cm, 315.20±0.00 cm and 260.10±0.00 cm respectively at 12th month of maturity period which was depicted as the highest among all the maturity stages. The difference was statistically significant at a significance level of p≤0.05.

According to the data presented in Table 1 the height of the sugarcane varieties was gradually increased from the eighth month of maturity stage to the tenth month of maturity stage with the highest height were being recorded in the twelfth month of maturity stage. The difference in the height of various sugarcane varieties at different maturity stages can be attributed to a combination of genetic variation, environmental conditions, agricultural practices, maturity stages and disease resistance. Each variety possesses unique genetic traits that dictate its growth potential which had resulted in significant height differences.

Environmental factors such as soil quality, water availability and climate further influence these growth patterns. Additionally, the specific cultivation techniques employed including fertilization, irrigation and pest control play a crucial role in determining the growth rates of the sugarcane. The data also reflects the height at different maturity stages indicated that some varieties reach their maximum height earlier or later in their growth cycle. Finally, varieties with higher disease resistance tend to grow taller and healthier compared to those more susceptible to infections and infestations. Understanding these factors is essential for selecting suitable sugarcane varieties, optimizing cultivation methods and improving crop yields.

Tahsin Ashraf *et al.* (2020) explained that the average height of the sugarcane cultivars Co80036, Co-86032, COVSI-9805, Co-8014, and COM-0265 was discovered to be 206 cm, 159.7 cm, 174.4 cm, 176 cm, and 202.2 cm, respectively. The millable cane variety Co-86032 had a range of 132 cm to 200 cm which was the lowest among the tested types. The maximum range observed was 140 cm to 300 cm.

Table 1 Height of sugarcane varieties at different maturity stages

S.No	Sample	Height (cm)
1	SCO-8	175.00^{a}±0.00
2	SCR1-8	270.00^{g}±0.00
3	SCR2-8	200.00^{c}±0.00
4	SCO-10	190.20^{b}±0.00
5	SCR1-10	295.00^{h}±0.00
6	SCR2-10	233.00^{e}±0.00
7	SCO-12	220.10^{d}±0.00
8	SCR1-12	315.20^{i}±0.00
9	SCR2-12	260.10^{f}±0.00
10	**Mean**	239.85
11	**SE**	0.00
12	**CD**	0.00
13	**CV(%)**	0.00

Note: Values are expressed as mean ± standard deviation of three determinations.

Means with the same coloumn followed by a common letter donot differ

Significantly at (p≤0.05)

SCO-8: Co86032 sugarcane variety of 8th month
SCR1-8: 85R186 sugarcane variety of 8th month
SCR2-8: 83R23 sugarcane variety of 8th month
SCO-10: Co86032 sugarcane variety of 10th month
SCR1-10: 85R186 sugarcane variety of 10th month
SCR2-10: 83R23 sugarcane variety of 10th month
SCO-12: Co86032 sugarcane variety of 12th month
SCR1-12: 85R186 sugarcane variety of 12th month
SCR2-12: 83R23 sugarcane variety of 12th month

4.1.2 **Girth:** The girth values of sugarcane varieties at the maturity stage of the eighth month was SCO-8 (1.80±0.00) cm, SCR1-8 (1.53±0.05) cm and SCR2-8 (1.13±0.05) cm. The girth values of sugarcane varieties at the maturity stage of the tenth month was SCO-10 (2.20±0.00) cm, SCR1-10 (2.46±0.05) cm and SCR2-10 (2.36±0.05) cm. At the 12th month of maturity the girth of sugarcane varieties was measured as follows: SCO-12 (2.60±0.00) cm, SCR1-12 (2.80±0.00) cm and SCR2-12 (2.80±0.00) cm. The difference was statistically significant at a significance level of p≤0.05. From Table 2 it was abundantly evident that the girth values were increased as the development phases progressed. This progressive increase in girth was indicated that the natural growth and development of the sugarcane plants as they accumulate more biomass and develop thicker stems over time. The consistent increase in girth measurements suggested that the plants are healthy and developing as expected which is critical for optimal sugar production and overall yield.

Tahsin Ashraf *et al.* (2020) stated revealed that the maximum and minimum diameters such as Co-80036-cm, Co-86032, COVSI-9805, Co-8014 and COM-0265 were 2.54 to 3.18, 2.7 to 4.13, 2.76 to 3.97, 2.22 to 3.66 and 2.7 to 3.84 respectively.

4.1.3 **Cane weight:** The sugarcane varieties weight was observed in the 8th month of maturity for SCO-8 (0.97±0.01) kg, SCR1-8 (0.98±0.00) kg and SCR2-8 (0.87±0.00) kg which was recorded as the lowest among all other maturity stages. At the 10th month of maturity the weight of the sugarcane varieties was as follows: 1.01±0.00 kg for SCO-10, 1.56±0.05 kg for SCR1-10 and 1.00±0.00 kg for SCR2-10. The weight of sugarcane varieties at different stages of maturity specifically SCO-12, SCR1-12 and SCR2-12 was found to be 1.24±0.00 kg, 2.05±0.00 kg and 1.04±0.00 kg, respectively at the 12th month of maturity. This weight was the highest among all the maturity stages. The difference was statistically significant at a significance level of p≤0.05.

The weight of sugarcane varieties varied significantly at different stages of maturity due to several factors. At the 12th month of maturity the weight was the highest for all three varieties this peak weight is likely due to the full maturation of the sugarcane where the plants have had sufficient time to absorb nutrients and water from the soil, leading to optimal growth and development. Conversely, the lowest weight was observed at the 8th month of maturity the sugarcane plants have not yet fully matured resulted in less biomass accumulation. At the 10th month of maturity the weight was intermediate reflected the transition phase where the plants are still growing and developing but have not reached their maximum potential. The differences in weight across these stages can be attributed

to the varying rates of nutrient uptake, photosynthesis and environmental conditions affecting growth.
Sanghera *et al.* (2023) explained that the cane weight was single cane wt. (kg) 1.50 for CoPb 95 and 1.20 for Co 238. Given the current circumstances, where the widely cultivated Co 238 type of sugarcane is susceptible to red rot disease in Punjab, it was advisable for sugarcane farmers in the state to consider replacing it with the CoPb 95 variety as a suitable alternative. Farmers choose this seed variety because to its early maturation, great productivity and superior quality as well as its reduced susceptibility to insect pests and diseases.

HR Brix: The HR brix values of sugarcane varieties vary significantly at different stages of maturity highlighting the influence of maturity on sugar accumulation in the canes. At the 8th month of maturity the values are the lowest with SCO-8 at 17.00±0.00, SCR1-8 at 15.00±0.00 and SCR2-8 at 14.00±0.00 reflected the early stages of sugar formation when the canes are still developing. Conversely, at the 10th month the brix values are slightly lower with SCO-10 at 19.21±0.00, SCR1-10 at 17.27±0.05 and SCR2-10 at 18.53±0.05 indicated a significant sugar accumulation has occurred it has not yet reached its peak.
At the 12th month of maturity the brix values are highest with SCO-12 recorded 22.22±0.00, SCR1-12 at 19.00±0.00 and SCR2-12 at 21.81±0.00. This increase was due to the extended growth period which allowed for greater photosynthesis and sugar storage in the canes. The difference was statistically significant at a significance level of p≤0.05. This progressive increase in brix values enhanced the importance of allowing sugarcane to reach full maturity to maximize sugar content, crucial for industries relying on high-sucrose crops.

Brix%: The lowest brix percentage was observed in the 8th month of maturity period, specifically in the SCO-8 (16.35±0.05) stage, the SCR1-8 (14.57±0.05) stage and the SCR2-8 (16.03±0.05) stage during the maturity period. When the sugarcane varieties reached the tenth month of maturity stage their brix percentage was 18.03±0.05 cm for SCO-10, 17.03±0.05 cm for SCR1-10 and 17.33±0.05 cm for SCR2-10 respectively. At the 12th month of maturity the brix percentage of sugarcane varieties was 21.32±0.00 cm, 19.92±0.00 and 20.21±0.00 respectively. This was the highest among all the maturity stages. Therefore, the lowest brix percentage was seen in 8th month of maturity stage and highest was seen in 12th month of maturity stage in sugarcane varieties. The difference was statistically significant at a significance level of p≤0.05.

Pol reading: The pol reading of sugarcane varieties was observed in the 8th month of the maturity period, with SCO-8 at 73.00±0.00, SCR1-8 at 70.00±0.00 and SCR2-8 at 69.00±0.00 which was recorded as the lowest among all other maturity stages. The pol reading of the sugarcane varieties were 78.00±0.00 for SCO-10, 72.00±0.00 for SCR1-10 and 75.00±0.00 for SCR2-10 when they reached the 10th month of maturity. The pol reading of sugarcane varieties at various maturity stages were 81.00±0.00, 78.00±0.00 and 80.00±0.00 respectively in the 12th month of the maturity period. This was the highest reading among all the maturity stages. The difference was statistically significant at a significance level of p≤0.05.
The differences in pol reading for different sugarcane types at various maturation stages can be ascribed to multiple variables. By the 12th month of growth sugarcane plants usually attain their maximum sucrose content leading to the highest reported pol readings. This occurs because as the sugarcane reaches maturity the rate of photosynthesis intensifies resulted in a greater build-up of sugars in the stalk. In contrast, the 8th month signified a preliminary phase of growth in which the plants are still maturing and the sucrose level is relatively lower. The decreased sugar concentration leads to lower pol values. By the 10th month, the plants have grown more compared to the 8th month but they have not yet reached the highest level of sucrose accumulation found at 12th month. Hence, the different types of sugarcane demonstrated a distinct pattern of escalating sucrose concentration as they mature reached its highest point at the 12th month and declining early at 8 months.
In their study, Sanghera *et al*. (2023) provided data on the CoPb 95 variety which was characterized by early maturation. At 8 months, this variety contains 14.96% sucrose with a purity of 85.56%. After 10 months, the sucrose content increases to 17.11% with a purity of 89.58%.

Temperature: During the 8th month of maturity stage the temperature was significantly lower recorded as 24.00±0.00°C for SCO-8, SCR1-8 and 26.00±0.00°C for SCR2-8. This drop in temperature is likely attributed to the cooler climatic conditions during this period and the sugarcane earlier developmental stage which involves lower metabolic rates. Similarly, the temperatures recorded in the 10th month 25.00±0.00°C for SCO-10, 26.00±0.00°C for SCR1-10 and 27.00±0.00°C for SCR2-10 reflected a gradual increase as the plants progress toward maturity and as environmental temperatures rise. The observed temperature variations in sugarcane varieties at different maturity stages can be attributed to both environmental and physiological factors.
In the 12th month of the maturity period the temperature of the sugarcane varieties was at its highest with SCO-12, SCR1-12 and SCR2-12 recorded temperatures of 28.00±0.00°C, 28.33±0.00°C and 29.00±0.00°C respectively. The difference was statistically significant at a significance level of p≤0.05. This increase in temperature could be due to the cumulative effect of seasonal changes and the plant's physiological processes as it reaches full maturity. As sugarcane matures its metabolic activities intensify which may result in higher internal temperatures. Overall, these temperature trends are influenced by a combination of plant development stages and external climatic conditions with the highest temperatures coinciding with the final maturity phase.

Juice obtained: The lowest juice obtained was observed in 8th month of maturity period i.e., SCO-8 (0.31±0.00) L, SCR1-8 (0.40±0.00) L, SCR2-8 (0.30±0.00) L. When the sugarcane varieties reached the 10th month of maturity stage their juice obtained was 0.43±0.00 L for SCO-10, 0.35±0.00 L for SCR1-10, and 0.44±0.00 L for SCR2-10, respectively. The juice obtained from sugarcane varieties was SCO-12, SCR1-12, SCR2-12 was 0.54±0.00 L, 0.56±0.00 L, 0.65±0.00 L respectively at 12th month of maturity period which was depicted as the highest among all the maturity stages. The difference was statistically significant at a significance level of p≤0.05.
The Table 2 observed that there was an increase in juice yield from sugarcane varieties at the 12th month of maturity can be attributed to several factors related to the development of the plant. As sugarcane matures, the stalks undergo a series of physiological changes that enhance their juice content. During the later stages of maturity, the plant accumulates more sucrose in its stalks, leading to higher juice yields. This is due to the extended period for photosynthesis and nutrient accumulation, which contributes to the growth and sugar content of the cane.

In contrast, at the 8th month of maturity the sugarcane stalks are still in the earlier stages of development which resulted in lower juice yields. The plants have not yet reached their full capacity for sucrose accumulation and juice production. At the 10th month, while the sugarcane was approaching maturity the yields are still lower compared to the 12th month. This variability may be due to the natural fluctuations in growth rates and the accumulation of sugars which can affect the juice yield. The 12th month represented the optimal point where the cane has reached its maximum sugar content and juice yield making it the most productive stage for harvesting.

According to Chauhan *et al.* (2002) it was determined that the cultivar CoP 92226 produced the highest juice was obtained, which amounted to 56.41%. The juice output from other cultivars varied from 48.38 to 56.14% (CoJ 64, CoP 84211, CoS 687, CoS 767, CoP 84212, CoP 90223 and CoP 93227). The differences in juice production can be ascribed to factors such as the type of fruit, farming techniques, and the method used for crushing.

Table 2 and Figure 2 demonstrated that the measurements of girth, cane weight, HR brix, brix%, temperature and juice obtained all exhibited a gradual increase from the 8th month maturity stage to the 12th month maturity stage. The highest values were observed in the 12th month maturity stage, surpassing those of the 10th and 8th month maturity stages. The difference was statistically significant at a significance level of p≤0.05. Consequently, the samples from the 12th month of maturity were chosen for further investigation. The samples were further denoted as control- Co86032 sugarcane variety (SCO), experimental samples as 85R186 sugarcane variety (SCR1) and 83R23 sugarcane variety as SCR2.

Table 2 Physical properties at different maturity stages of sugarcane varieties

S.No	Sample	Girth (cm)	Cane weight (Kg)	HR Brix	Brix%	Temperature (⁰C)	Juice obtained(L)
1	SCO-8	1.80^{c}±0.00	0.97^{b}±0.01	17.00^{c}±0.00	16.37^{c}±0.05	24.00^{a}±0.00	0.31^{b}±0.00
2	SCR1-8	1.53^{b}±0.05	0.98^{c}±0.00	15.00^{b}±0.00	14.57^{a}±0.05	24.00^{a}±0.00	0.40^{d}±0.00
3	SCR2-8	1.13^{a}±0.05	0.87^{a}±0.00	14.00^{a}±0.00	16.03^{b}±0.05	26.00^{c}±0.00	0.30^{a}±0.00
4	SCO-10	2.20^{d}±0.00	1.01^{e}±0.00	19.21^{g}±0.00	18.03^{f}±0.05	25.00^{b}±0.00	0.43^{e}±0.00
5	SCR1-10	2.46^{f}±0.05	1.56^{g}±0.05	17.27^{d}±0.05	17.03^{d}±0.05	26.00^{c}±0.00	0.35^{c}±0.00
6	SCR2-10	2.36^{e}±0.05	1.00^{d}±0.00	18.53^{e}±0.05	17.33^{e}±0.05	27.00^{d}±0.00	0.44^{f}±0.00
7	SCO-12	2.60^{g}±0.00	1.24^{f}±0.01	22.22^{i}±0.00	21.32^{i}±0.00	28.00^{e}±0.00	0.54^{g}±0.00
8	SCR1-12	2.80^{h}±0.00	2.05^{h}±0.00	19.00^{f}±0.00	19.92^{g}±0.00	28.33^{f}±0.00	0.56^{h}±0.00
9	SCR2-12	2.80^{h}±0.00	1.40^{f}±0.00	21.81^{h}±0.00	20.21^{h}±0.00	29.00^{g}±0.00	0.65^{i}±0.00
10	**Mean**	2.18	1.23	18.22	17.86	26.37	0.44
11	**SE**	0.02	0.01	0.01	0.03	0.11	0.00
12	**CD**	0.06	0.03	0.04	0.09	0.33	0.00
13	**CV(%)**	1.75	1.65	0.15	0.32	0.73	1.28

Note: Values are expressed as mean ± standard deviation of three determinations.

Means with the same coloumn followed by a common letter donot differ

Significantly at (p≤0.05)

SCO-8: Co86032 sugarcane variety of 8th month
SCR1-8: 85R186 sugarcane variety of 8th month
SCR2-8: 83R23 sugarcane variety of 8th month
SCO-10: Co86032 sugarcane variety of 10th month
SCR1-10: 85R186 sugarcane variety of 10th month
SCR2-10: 83R23 sugarcane variety of 10th month
SCO-12: Co86032 sugarcane variety of 12th month
SCR1-12: 85R186 sugarcane variety of 12th month
SCR2-12: 83R23 sugarcane variety of 12th month

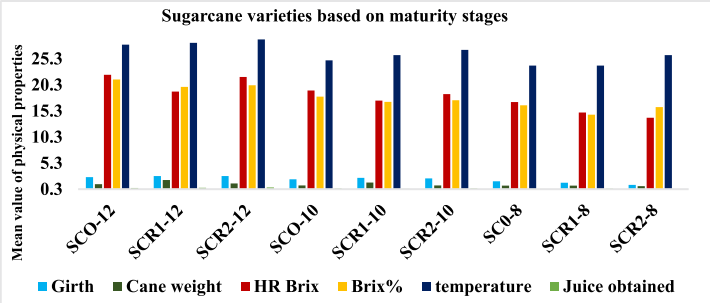

Figure 2 Physical properties of sugarcane varieties based on different maturity stages

Note: SCO-12th month: Co86032 sugarcane variety
SCR1-12th month: 85R186 sugarcane variety
SCR2-12th month: 83R23 sugarcane variety
SCO-10th month: Co86032 sugarcane variety
SCR1-10th month: 85R186 sugarcane variety
SCR2-10th month: 83R23 sugarcane variety
SCO-8th month: Co86032 sugarcane variety
SCR1-8th month: 85R186 sugarcane variety
SCR2-8th month: 83R23 sugarcane variety

Sensory evaluation of sugarcane juices: Among the three samples, the highest average sensory score for colour was given to SCR1 (8.95±0.03) followed by SCO (7.99±0.03) and then SCR1 (7.96±0.05). The mean sensory ratings for appearance were ranked in ascending order as follows: 8.98±0.04 (SCR2), 8.00±0.00 (SCR1) and 7.01±0.03 (SCO).

The average sensory score for the control sample in terms of aroma was 8.00±0.00. Among the other two samples SCR1 had the lowest score of 7.96±0.05 while SCR2 had the highest score of 8.98±0.03. The average sensory ratings for taste were as follows: SCO (8.93±0.04), SCR1 (7.95±0.05) and SCR2 (9.00±0.00). The average sensory score for the taste parameter reached its peak in SCR2 of the sugarcane variety sample. The mean sensory ratings for after-taste were ranked in ascending order as follows: 7.00±0.00 (SCO) < 7.96±0.04 (SCR1) < 8.95±0.05 (SCR2). The average sensory ratings for consistency were highest in SCR2 (8.97±0.04) and lowest in SCO (7.00±0.00). The mean sensory scores were overall acceptability, with SCR2 scoring 9.00±0.00, SCR1 scoring 7.96±0.04 and SCO scored 7.52±0.04. Figure 3 indicated that SCR2 outperformed both the control and experimental samples in terms of all sensory measures. The discrepancy was statistically significant at a threshold of significance of p≤0.05.

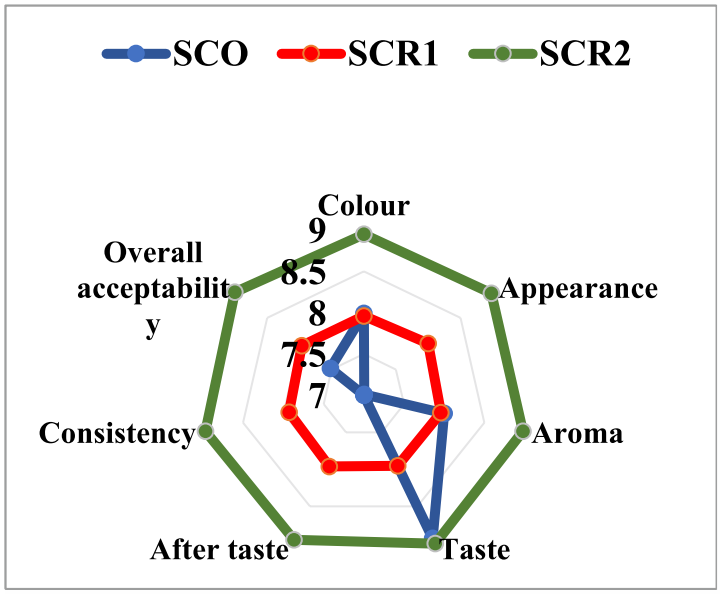

Figure 3 Mean sensory scores of different sugarcane juices

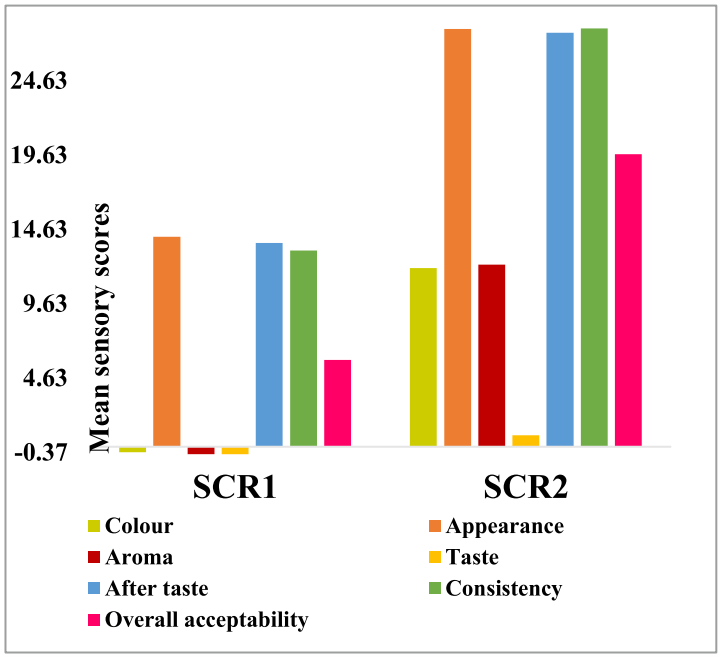

Figure 4 Percent change in mean sensory score of sugarcane juices

Note: SCO: Co86032 sugarcane variety
SCR1: 85R186 sugarcane variety
SCR2: 83R23 sugarcane variety

The average sensory scores of the samples SCR1 and SCR2 were compared to the control (SCO) and the percentage change in acceptability was shown in Figure 4. The mean sensory scores for the SCR1 sample showed an increase in appearance, after taste, consistency and overall acceptability by 14.12%, 13.71%, 13.20% and 5.85% respectively. However, there was a loss in colour (-0.37%), aroma (-0.50%) and taste (-10.97%) compared to the control (SCO). The mean sensory scores for SCR2 showed a rise in all categories including colour, appearance, aroma, taste, after taste, consistency and overall acceptability. The percent changes for these parameters were 12.01%, 28.10%, 12.25%, 0.78%, 27.85%, 28.14% and 19.68% correspondingly compared to the control (SCO). The sample SCR2 demonstrated higher acceptability than SCR1 in the experimental samples.

Health benefits: Sugarcane juice raises the body's protein level thereby preserving the kidneys' functionality and to some extent preventing cancer. Sugarcane juice is also beneficial in cases of infrequent urination, a weak stomach, heart, kidneys, eyes, brain and genital organ as well as fever. In addition to preventing and treating sore throats, colds and flu and it strengthens and protects teeth and treats ocular disorders. It is recommended to consume sugarcane juice on a daily basis due to its numerous health benefits and nutritional value.

Conclusion: The higher the maturity the greater was the physical parameters. Hence the three sugarcane varieties with 12th month maturity stage was selected and sensory evaluation was performed. Compared to other sugarcane juices the SCR2-83R23 sugarcane variety was more sensorial accepted than SCR1-85R186 sugarcane variety and control SCO-Co86032 sugarcane variety. The reasons for the higher sensory acceptance of SCR2-83R23 include its sweetness, juiciness and favorable aroma which likely contributed to a more enjoyable consumption experience. Additionally, the physical robustness of this variety may have resulted in better juice extraction which enhanced its overall flavor profile. The combination of these factors led to a higher preference for SCR2-83R23 sample in sensory evaluations.

Challenges of the study: There is abundant availability during season but if once the crop is harvested the sugarcane is not available till the next crop. The difficulty was faced while getting the raw material, sugarcane cultivators from Rudrur to Rajendrangar due to long distance.

Future scope of study: In order to determine the possible advantages of consuming sugarcane juice, it is necessary to conduct additional research on its nutritional and anti-nutritional components.

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Conflict of Interest: The authors did not report any potential conflict of interest.

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