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Evaluation of Sugarcane Clones for Quality Cane Juice used for Beverage

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ABSTRACT: The Consumer purchasing sugarcane juice as beverage for drinking in local markets prefer light green coloured juice rather than dark green or brown coloured juice. In general *Sacharum officinarum* clones are known for the low fibre content with high juice quality which is being highly used for chewing purpose. The juice vendors also prefer sugarcane clones with higher juice quantity with less baggase which results in more juice extraction per cent. The light green coloured juice producing canes were identified in the study during 2020-21 for consumer preference due to its attraction. The sugarcane juice vendors always prefer light coloured juice of consumer preference. Hence, there is a dire need of identifying Sugarcane clones with light coloured juice along with rich in sucrose (sweetness) content. Keeping this as an objective, this study was conducted to identify sugarcane clones with light coloured juice and rich in sucrose. Among 15 sugarcane clones tested, sugarcane clones 2015A 222 (1.8), 2015A 199 (1.9), 2015A 152 (1.9), 2015A 137 (1.9), 2015A 59 (1.9), 2015A 230 (1.9) and 2015A 93 (1.9) recorded less colour intensity values denotes light coloured juice after cane extraction. The standard 87A 298 significantly recorded a high color intensity value of 2.2. Among the clones tested, sugarcane clone 2015A 222 recorded a colour intensity value of 1.8 correspondingly recorded higher sucrose per cent (19.45) with purity of 95%, low reducing sugars per cent (0.21) and low dextran per cent (4.25) which is an indication for less deteriorated cane after juice extraction over other clones tested which attracts consumers preference.

Keywords: Light colored juice, sucrose (%), reducing sugars (%), dextran (%), fibre and baggase.

INTRODUCTION

India is the second largest producer of sugarcane next to Brazil. Out of 359 million tonnes of sugarcane produced in India, about 67.64% is utilized by sugar mills for the production of white sugar and the rest for the preparation of different forms of jaggery, seed, feed and chewing. On industrial scale over 103 countries are producing white sugar using sugarcane and sugar beet as raw material (FAOSTAT 2018, Mukunda Rao *et al*. 2021). Sugarcane is the country's chief sugar source and also a major commercial cash crop (Mukunda Rao *et al*. 2021). In Andhra Pradesh, it is cultivated in 1.26 lakh hectares with a production of 95.93 lakh tonnes and productivity of 76.14 t/ha (Anonymous, 2020). Sugarcane varieties cultivated in India contain 20% of total soluble solids in the juice at the age of about 12 months, of which a major part of it is sugar and the rest are minerals and health-promoting substances. Fresh sugarcane juice is a refreshing, natural and popular thirst-quenching drink in many countries due to its typical cane flavor and sweetness coupled with healthy nutrients and minerals. Now-a-days under value addition of sugarcane juice entrepreneurship is gaining popularity among small and marginal entrepreneurs light coloured juice is preferred by consumers due to attraction of juice colour. Cane juice is typically an opaque liquid with a brown to dark green color. Sugarcane composition affects color due to the presence of anthocyanins, carotenoids, flavonoids, melanoidins, melanins and products from the alkaline degradation of fructose in different amounts, while color influences consumer acceptance (Laurade *et al*. 2018). After extraction of juice from cane, several mechanisms can cause juice browning like oxidation of chlorophyll and poly phenols (Prati *et al*. 2005) and enzymatic browning of poly phenol oxidase (PPO) and peroxidase (POD) (Buchali and Robinson 1994). Besides, bio chemical browning mechanisms and growth of micro organisms can also affect juice color (Oliveira *et al*., 2007).

The quality of sugarcane and sugarcane juice is evaluated in terms of percentage of brix (Total soluble solids), popularisable sugar (sucrose content and purity per cent) ability to measure sugar content in the field is very important especially for assessing the crop growth and development, harvesting management, adoption of precision agriculture techniques and payment purpose to growers. The consumer purchasing sugarcane juice as beverage for drinking in local markets prefer light green coloured juice rather than dark green or brown coloured juice. In general *Sacharum officinarum* clones are known for the low fibre content with high juice quality which is being highly used for chewing purpose. The juice vendors also prefer sugarcane clones with higher juice quantity with less baggase which results in more juice extraction per cent.

Nowadays under value addition of sugarcane juice entrepreneurship is gaining popularity among small and marginal entrepreneurs light coloured juice is preferred by consumers due to attraction of juice colour. Especially in cities and towns sugarcane juice hubs are opening their market in large scale as consumers are preferring sugarcane juice as healthy drink/ beverage due to its healthy consciousness and nutritive value. Based on this history with an objective to identify clones with light coloured juice with high sucrose of consumer preference, this experiment was conducted at RARS, Anakapalle.

MATERIALS AND METHOD

Fifteen pre release sugarcane clones (2015A 228; 2015A 199; 2015A 222; 2015A 152; 2015A 183; 2007A 81; 2015A 187; 2015A 137; 2015A 233; 2015A 59; 2015A 51; 2015A 230; 2015A 93; 83V 15; 87A 298 (c)) were studied with randomized block design with two replications at RARS, Anakapalle during 2020-21. The soils are of medium black soils with pH of 6.5 to 7.0 and nutritive value of low in nitrogen and medium in P and K. A healthy crop was raised duly following all recommended package of practices of the zone and timely plant protection measures were taken. Juice analysis was taken at cane harvest at maturity stage duly following standard juice analysis procedures (Meade and Chen, 1971). Per cent sucrose was measured with the instrument sucrolyser. The parameters mentioned are estimated by measurement with refractometer and polarimeter respectively, as standard methodologies that are regulated by norms of evaluation of the quality of sugarcane (Tripathi *et al*., 2017). Data was statistically analyzed with the procedures given by Panse and Sukhatme (1978).

RESULT AND DISCUSSION

The results recorded in the study are given in Table 1, Fig. 1 and 2. The data on each parameter presented in given paragraphs.

Brix per cent: Among 15 sugarcane clones tested percent brix was ranged from 15.50 (2015A 233) to 21.23 (2015A 93). Higher brix was recorded in sugarcane clone 2015A 93(21.23) followed by 2015A 222 (20.66%), 2007A 81 (20.46%) and 2015A 187 (20.42%), over other clones tested. The standard 87A 298 recorded a brix per cent of 18.88 which is significantly superior over other clones tested.

Sucrose per cent: The sucrose percent was ranged from 12.45% (2015A 233) to 19.45 (2015A 187). Higher sucrose percent was recorded in 2015A 187 (19.45%) 2015A 222(19.45%) followed by 2015A 93 (19.35%). The standard 87A 298 recorded a per cent sucrose of 16.95.

Purity per cent: Among 15 sugarcane clones tested the percent purity was high in 2015A 222 (95%) followed by 2015A 187, 2015A 137 and 2015A 230 with 94%. The standard 87A 298 recorded a per cent purity of 89.

Reducing sugars: Among 15 sugarcane clones tested the percent reducing sugars ranged from 0.21% (2015A 93, 2015A 51, 2015A 137, 2015A 222) to 0.29% (2015A 199). Higher percent reducing sugars was recorded 2015A 199 (0.29%), 2015A 152 (0.29%) followed by 2015A 233 (0.27%), 2015A 230 (0.25%) and 2015A 228 (0.25%). The standard 87A 298 recorded a per cent reducing sugars of 0.25.

Dextran per cent: The dextran per cent which is a polymer of glucose representing cane quality deterioration in cane juice was high in 2015A 187 (6.05%) followed by 2015A 137 (6.0%) and 2015A 228 (5.80%). The standard 87A 298 recorded a dextran percentage of 5.80.

Colour intensity: The colour intensity of juice after cane extraction is prime most parameter for this study is ranged from 1.8 (2015A 222) to 2.4 (2015A 183). Among 15 sugarcane clones tested low colour intensity was recorded in 2015A 222 (1.8) followed by sugarcane clones 2015A 199, 2015A 152, 2015A 137, 2015A 59, 2015A 230 and 2015A 93 with colour intensity value of 1.9.

Among 15 sugarcane clones tested less colour intensity values represented light coloured juice and correspondingly recorded high sucrose per cent, lesser dextran per cent and reducing sugars content. Sugarcane clones 2015A 222 (1.8) recorded lesser juice colour intensity value of 1.8, correspondingly recorded higher sucrose percent (19.45) with purity of 95%, low reducing sugars per cent (0.21) and low dextran percent (4.25) which is an indication for less deteriorated cane after juice extraction over other clones tested which attracts consumers preference. Similar type of research results was also published in sugarcane by Laurade *et al*. (2018). According to Prati *et al.* (2005), addition of 60ppm of APC (Aluminium Poly Chloride), pH 8 and 0 ppm Poly electrolyte represented a low Polysaccharide content, 90% turbidity and high scores for colour appearance and turbidity. The beverage sensorially well accepted by the customers.

This study is a new line of work in recent past based on local demand of sugarcane vendors, some of the research work was taken up and very meagre literature was published so far. The quality of sugarcane and sugarcane juice is evaluated in terms of brix (total soluble solid), polarizable sugar (sucrose content) and purity per cent.

Table 1: Evaluation of sugarcane clones for quality cane juice used for beverage.

Sr. No.	Sugarcane Clones	Brix (%)	Sucrose (%)	Purity (%)	Dextran (%)	Reducing sugars (%)	Colour intensity (540 nm)
1.	87A298(C)	18.88	16.95	89	5.80	0.25	2.2
2.	83V 15(C)	19.83	18.60	94	5.80	0.26	2.1
3.	2015A 228	19.05	15.65	77	5.80	0.25	2.1
4.	2015A 199	19.39	16.45	80	5.40	0.29	1.9
5.	2015A 222	20.66	19.45	95	4.25	0.21	1.8
6.	2015A 152	18.40	16.50	90	4.85	0.29	1.9
7.	2015A 183	19.01	15.95	86	5.25	0.24	2.4
8.	2007A 81	20.46	18.15	86	5.95	0.20	2.0
9.	2015A 187	20.42	19.45	94	6.05	0.23	2.1
10.	2015A 137	18.82	17.40	94	6.00	0.21	1.9
11.	2015A 233	15.50	12.45	80	4.65	0.27	2.3
12.	2015A 59	16.14	13.20	82	5.00	0.22	1.9
13.	2015A 51	17.12	15.30	89	5.35	0.21	2.1
14.	2015A 230	19.34	18.50	94	5.10	0.25	1.9
15.	2015A 93	21.23	19.35	92	5.10	0.21	1.9
S.Em ±		0.29	0.83	2.14	0.13	0.02	0.05
C D (0.05)		0.87	2.53	6.55	0.41	0.03	0.14

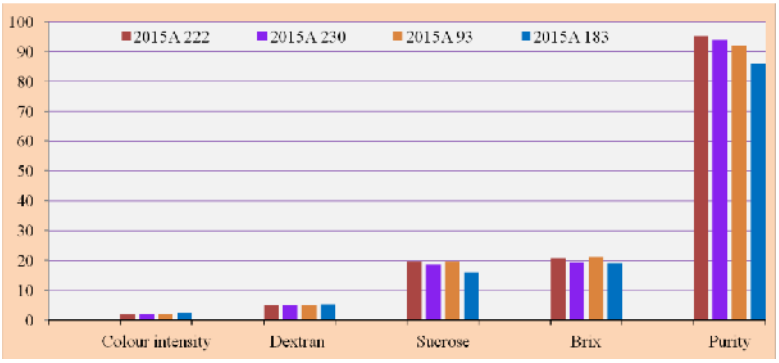

Fig. 1. Evaluation of sugarcane clones for quality cane juice used for beverage.

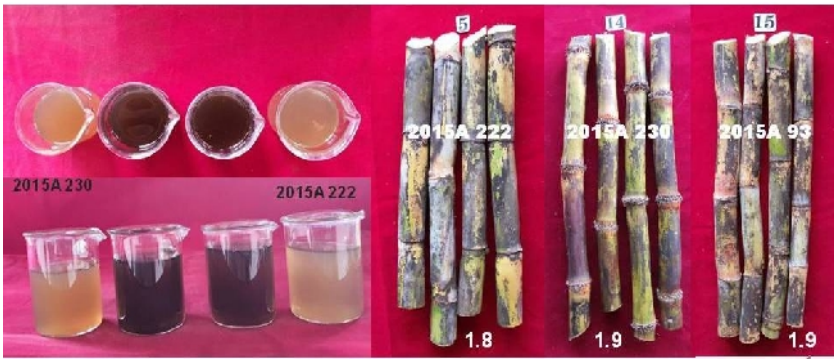

Fig. 2. Evaluation of sugarcane clones based on Colour intensity.

CONCLUSION

Sugarcane juice colour was primarily influenced by juice quality regarding its physico- chemical properties, enzymatic activity and browning reaction rates. Juice colour may also influenced by viable microorganism counts for fresh sucrose juice. Browning of juice may be due to enzymatic reaction and microorganism counts which causes consumer rejection. The light colour juice with colour intensity of 1.8 (sugarcane clone 2005A 222) is a greater potential for consumer acceptance. This type of results was also published in sugarcane by Laurade *et al*. (2018).

FUTURE SCOPE

In general, after extraction of juice, coloring of cane juice influenced by oxidation of polyphenols, enzymatic activities of peroxidases and polyphenol oxidases etc. which are to be studied in future scope of research, keeping in view of identification of sugarcane clones with light colored juice along with high sucrose content of consumer preference.

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Conflict of Interest. None.

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