

## SCIENTIFIC CORRESPONDENCE

### Value added products from clarified sugarcane juice

Irudayaraj Rajendran\*, A. Vennila and C. Palaniswami

*Division of Crop Production, ICAR - Sugarcane Breeding Institute, Coimbatore - 641 007, India*

\*Corresponding author: Email: [sbi56rajendran@gmail.com](mailto:sbi56rajendran@gmail.com)

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#### Abstract

Sugarcane juice (SCJ) is a valuable base product obtained from sugarcane to prepare wide range of products of interest with increased nutritional quality. SCJ contains variety of non sugar impurities which are to be removed prior to preparation of the products including the SCJ beverage. These non sugar components interfere in the stability, colour and texture of the products. They mainly constitute fibre, wax, fat, dirt, soil, albuminoids, gums, starch, organic acids, etc. As long as they are present, they change the constituents of SCJ, chemically alter the original components and pH, which adversely affect the quality and shelf life of the final products. Hence the importance of the components present in sugarcane juice and their removal has been discussed in this paper. From the clarified SCJ, four products viz. SCJ beverage, badam jaggery (BJ), grape juice jaggery (GJ) and SCJ rich drink have been prepared to show the potential and versatility of SCJ to prepare such products. Nutritional quality of these products is due to the minerals, vitamins originally present in SCJ and they are having various health benefits. Shelf life of badam and grape juice jaggery was found to be six months. SCJ beverage and SCJ rich drink were found stable for three months without mold formation under ambient conditions.

**Keywords:** Non centrifugal cane sugar; Jaggery; Sugarcane juice; Clarification; Value added products

#### Introduction

Sugarcane juice (SCJ) is a valuable starting material for the preparation of variety of products which include mainly non centrifugal cane sugar (NCS) like jaggery, liquid jaggery and sugar. Various products are also prepared from SCJ depending on the locality and traditional demand. Incorporation of nutritive ingredients which is a source of both nutrition and medicinal property in sugarcane products makes the product of more demand with good palatability brought by the ingredients of SCJ. SCJ ingredients have the health benefits of immunological effects, anti-toxicity and cytoprotective effects, anticariogenic effects and regulating diabetes and hypertension (Jaffé 2012). Thus a product of target should contain the nutritive quality and pharmaceutical properties as well. Since the food product formulations derived

from SCJ will find a special place among the market products, they are expected to contain such nutritive ingredients with nutraceutical properties. Reports on the formulation of new SCJ based products are scanty in the literature and it is felt that such nutritive products can be prepared by taking the SCJ as base material.

SCJ is a versatile base material to prepare a range of products of choice and target. To achieve these food formulations, the SCJ is to be clarified so that interference of the juice impurities is avoided while making such products. The fresh SCJ is initially filtered to remove suspended particles of fibre, wax, fat, dirt, soil, etc., though it appears as a homogenous mixture, on heating the whole physical state is changed with the formation of lighter scum on the surface and heavier flocculant

precipitate settling at the bottom. Apart from the main constituent of sucrose, SCJ contains organic acids i.e. trans-aconitic, citric, malic and oxalic acid, proteins, polysaccharides, starch, wax, fat, albuminoids, gums, etc. in homogenous state (Singh et al. 2015). Peeling of sugarcane rind removes wax and colouring matter, as the rind portion houses these impurities (Inarkar and Lele 2012). Colouring matter consists of a variety of organic compounds including chlorophylls, carotene, flavonoids and polyphenols (Walford 1996). The organic acids are responsible for the net pH, and proteins, polysaccharides and starch increase the viscosity of the SCJ. On heating, these emulsified non sugar ingredients become partially heat - coagulated cane protein due to complex chemical reactions. However, reducing sugars and amides are also present. Lime Slaked lime ( $\text{Ca}(\text{OH})_2$ ) is used for neutralization of the SCJ and the excess lime reacts with reducing sugars to form lime glucinate which is responsible for the dark colouration of the juice (Browne 1907; Thai and Doherty 2011).

The clarified SCJ concentrate is having the essential health ingredients which complement the final products prepared. In the present work, few new products have been prepared including a beverage involving the food thickeners like isabgol (IG, Psyllium husk) and algin which are good dietary fibres (Brownlee et al. 2005).

## Materials and Methods

### Raw material

Sugarcane variety, Co 86032 was used to prepare sugarcane clarified juice. Leaves and green tops were removed and the canes were crushed in the horizontal three roller crusher to obtain the juice. The SCJ yield was 53% in volume with density of 1.089 g/ml. The SCJ was filtered to remove suspended impurities, boiled to remove scum and the heated juice was allowed to settle the impurities. The juice was decanted and filtered

through fibre filter bag ( $1\mu$ ) to remove the heat suspended impurities. The total impurities constitute about 5.3% on the volume of juice. This filtered clear final SCJ was taken for the preparation of value added products. Analysis of minerals and water soluble vitamins of LJ was done by ICP-MS and HPLC-DAD methods in Indian Institute of Food Processing Technology, Thanjavur, Tamilnadu. Algin was extracted from brown seaweed, *Sargassum* sp. as sodium alginate (Rajendran et al. 2016). Isabgol (IG) was procured from the market.

### Moisture content

Moisture content was determined by heating the sample taken in a silica crucible in electric oven at  $100^\circ\text{C}$  for 4 hours daily until attaining a constant dry weight during six days. From the differences in the wet and dry weights, the percentage of heat volatiles was obtained. Liquid jaggery (LJ) was prepared from the clarified SCJ by standard method at the striking point of  $106^\circ\text{C}$ .

## Value added products from sugarcane juice

### i. Preparation of SCJ beverage

Fresh sugarcane juice (dark green) was heated to  $85^\circ\text{C}$  and kept for 10 min. The floating scum was removed and the hot juice set aside for settlement of brown precipitate (ppt). On cooling, the clear upper juice was decanted and the bottom precipitate-juice slurry was filtered through fibre cloth bag ( $1\mu$ ) by gravitation. The filtered clear juice (light brownish yellow) was mixed with the decanted main clear juice. Potassium meta bisulphite (KMS, 0.5%, 500ppm) was added and mixed well. The juice was bottled and sealed air tight. The SCJ was stable for 90 days.

### ii. Preparation of Badam jaggery (BJ)

Liquid jaggery (LJ) was prepared by the standard procedure from SCJ (3 L). Isabgol

paste was prepared from IG (1gm) in boiling distilled water and was added to the LJ. Badam milk prepared from soaked and peeled badam (300 g), was added and heated. Ghee (100g) was added along with 75g of roasted cashew nuts. The contents were mixed well and concentrated under controlled heat to remove most of the water till it reached jelly-like consistency.

**iii. Preparation of Grape juice jaggery (GJ)**

LJ was prepared from SCJ (3L). Grape juice (600ml) was added and the contents were boiled further to remove the scum. Isabgol paste prepared from isabgol (1 g) was added and heated further to get thick mass. Ghee (100g) and roasted cashew nuts (75g) were added. The contents were mixed well till the temperature reached 115°C. The product was then cooled and packed in a clean container.

**iv. Preparation of SCJ rich drink**

Fresh SCJ was treated with slaked lime (0.04%) to get the final pH of 6.4. The SCJ was then processed to get the clarified sugarcane juice. To the clarified juice, algin (0.5%) was added and the contents were concentrated by heating till the juice turned to a required consistency. Ghee (3%) was added for good palatability. The mild hot product was packed in containers with sealed cap. SCJ rich drink was stable for 90 days.

**Results and Discussion**

Liquid jaggery is having essential nutrients and vitamins (Table 1.) required for good health. These minerals are essential for overall health and immunity in particular. Vitamin B, elements like zinc and selenium boost the immune system of our body preventing from viral infections (Steinbrenner et al. 2015). Other nutrients of LJ are having wide spectrum of health benefits (Nath et al. 2015). These nutrients of LJ increase

the overall nutritional quality and value of the products prepared.

**Table 1.** Minerals and vitamins in liquid jaggery

S. No	Mineral	Concentration (mg/100g)
1.	Calcium	66.75
2.	Phosphorous	40.93
3.	Sodium	20.46
4.	Selenium	0.39
5.	Iron	2.39
6.	Potassium	653.57
7.	Magnesium	116.84
8.	Manganese	0.27
9.	Zinc	9.00
Vitamin		
1.	Thiamine hydrochloride (B <sub>1</sub> )	10.47
2.	Cyanocobalamine (B <sub>12</sub> )	1.35

Elimination of impurities by heating and filtration steps decreased the viscosity and colloidal nature of the original SCJ. Thickening agent, isabgol was used in the present formulations for better consistency of the products of badam and grape juice jaggery. IG helps to check obesity and removes the toxins of digestive tract (Verma and Mogra 2015). Algin is a good food product with its rheological properties and it is used for thickening of foods. In the present work, use of algin for SCJ was attempted to give rich drink with good consistency for consumption as a beverage. Both IG and algin are the source of good dietary fibre and algin is generally regarded as safe for consumption. SCJ beverage, SCJ rich drink, badam jaggery and grape juice jaggery were found stable at room temperature without any mold formation. Badam jaggery and grape juice

jaggery were having the shelf life of six months. SCJ beverage and SCJ rich drink were found stable for three months without mold formation in the closed packs under ambient conditions. Thickening agent, isabgol enables the loss of moisture in liquid jaggery during the preparation of products to get viscous products. The moisture content of LJ, BJ and GJ was found to be 32, 28 and 22% respectively (Table 2).

**Table 2.** Moisture content of sugarcane liquid jaggery products

Product	Moisture (%)
Liquid jaggery	32
Badam jaggery	28
Grape jaggery	22

So loss of moisture favoured the increase in shelf life of the products BJ and GJ, as moisture attracts microbes to formation of mold/fungus (Thompson 2009). The products were stable at room temperature. IG and algin also stabilized the excess moisture which was not available for deterioration by microbes. Other SCJ beverages can also be prepared from the clarified sugarcane juice without addition of preservative by incorporating ginger, mint, lemon etc. at a concentration of 0.1% as per the desired flavour. Addition of algin (0.5-1.0%) gave good consistency for the juice. The present work is an endeavour to show the compatibility of SCJ and the scope of SCJ for various products.

### Conclusion

The versatility of SCJ to prepare various types of products as reported in this paper gives further scope for sugarcane based products which are nutraceuticals when they are considered in the context of the nutrients present apart from the major sugar components. As the preparations did not involve any harmful chemicals as preservatives or stabilizer, the scope of using SCJ/LJ for the

preparation of diversified food products is high in the future with the use of natural nutritive ingredients.

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