

## SCIENTIFIC CORRESPONDENCE

### Status of sugarcane cultivation in Kerala *vis-a-vis* product diversification options

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#### Abstract

Sugarcane cultivation in Kerala had a glorious past. Till 1920's sugarcane cultivation was in limited areas bordering Coimbatore district of Tamil Nadu and later it spread to other parts of the state with the establishment of sugar factories during 1930's and 1960's. Unfortunately, the success of the sugar industry was short-lived and all three sugar mills closed due to huge losses incurred. Nowadays sugarcane is majorly cultivated in Idukki District (78%) followed by Palakkad District. In other districts like Alappuzha, Pathanamthitta, Kottayam, and Kannur, cultivation is to a limited extent. The main reason for dwindling cultivation includes lack of processing mills, unavailability of skilled labourers, lack of government assistance and lack of suitable processing technologies. According to the information gathered from the survey, sugarcane cultivation is the backbone of small-scale jaggery production units existing in specific areas of the state, thus focus may be given to sustain the cultivation. Though some farmers are interested to cultivate, the marketing of the produce and lack of proper technologies for product diversification is hindering their interest. Various technologies developed at ICAR-Sugarcane Breeding Institute Research Centre Kannur for the product diversification will help sugarcane growers to increase their income and to retain their interest in cultivation.

**Keywords:** Sugarcane; Kerala; Liquid jaggery; Powder jaggery

#### Introduction

Sugarcane cultivation in India dates back to the prehistoric times. It was relished as chewing cane till the discovery of concentrating extracted juice in India more than 2000 years back. Products obtained by concentrating the sugarcane juice viz; sugar, jaggery, and khandsari are universal sweetening agents for mankind. Other than the sweetening agents, the crop is a potential source of by-products like bagasse, molasses, press mud etc. Of late, the crop has been globally recognized as a source of bio-ethanol and bio-energy. Sugarcane is cultivated throughout India except in cold hilly areas and the sugarcane-based industry is one of the largest industries supporting the livelihood of our population (Ahmed and Rahman, 2014).

Sugarcane cultivation in Kerala had a glorious past. Till 1920's sugarcane cultivation was limited to specific areas, bordering the district of Coimbatore where Tamil culture had a significant

influence and later it spread to other parts of the state mainly for the production of jaggery. The establishment of Travancore sugars in 1937 changed the cultivation scenario, leading to mass cultivation for sugar production (Nair 2019). This further led to the establishment of two more sugar factories in the cooperative sector, Mannam sugar mill in 1964 and Chittoor Sugar in 1965. Sugarcane became a major commercial crop of the state significantly contributing to the agricultural income. During the period from 1960-1980 the area under sugarcane cultivation and sugar production increased tremendously, the sugar mills generated direct employment for thousands of people, and the jaggery making units started flourishing providing employment opportunities and hence this period was regarded as the Golden age of sugar industry in Kerala. The employment opportunities increased the per capita income and standard of living of the people (Nair, 2012).

During this period the state was self-sufficient in sugar to a great extent.

Unfortunately, the success of the sugar industry was short-lived due to various reasons and all three sugar mills closed due to huge losses incurred. Presently sugarcane cultivation in the state is primarily for jaggery making and to a limited extent for juice consumption, chewing cane during festival seasons, and religious offerings. The number of Jaggery production units reduced from 591 in 1980 to 41 in 2010 (Nair 2012). But the state's consumption of sugar and jaggery is increasing every year, far ahead of the other Indian states. The per capita consumption of sugar in Kerala is 47.1kg per annum and that of jaggery is 23.1kg per annum (Nair 2012).

As per the Economics and Statistics Department of Kerala, the area under sugarcane cultivation is decreasing year after year and in the 2020-21 statistics about 920.73ha was under sugarcane crop mainly in Idukki District and Palakkad District. In other districts like Alappuzha, Pathanamthitta, Kottayam and Kannur, cultivation is in a limited extent.

### Survey and data collection

A Survey was conducted to assess the post-flood scenario of sugarcane cultivation in Kerala. The preliminary data on sugarcane cultivated area was collected from the Economics and Statistics Department of Kerala. The officials of the Agriculture Department of the concerned districts were contacted to confirm the present crop situation. In recent years, in Ernakulam, and Kozhikkode districts sugarcane was not cultivated. Hence, the remaining districts were selected for the survey. The districts surveyed include Idukki, Palakkad, Alappuzha, Pathanamthitta, Kottayam and Kannur (Fig. 1). The preliminary data was collected from each district visiting the farmers cultivating sugarcane.



**Figure 1.** Map of Kerala showing the districts surveyed (Indicated with star sign)

### Assessment of crop loss -district wise

As per primary data from the survey, about 1026.8ha area is under sugarcane cultivation in the state extending over six districts. About 4.6% of the area (mainly in Alappuzha and Pathanamthitta Districts) under the crop is severely affected by flood.

### Palakkad

In Palakkad district, sugarcane is cultivated in Chittur, Agali and Malampuzha areas. The cultivated area was 171.45 ha in 2016-17 but it drastically reduced to 41.5 ha in 2018. This reduction was because at end of 2016-17 season drought occurred and many farmers could not cultivate sugarcane. The cultivation is exclusively for jaggery production. The variety cultivated was Co 86032 in most of the places. Though there was flooding in Chittur and Malampuzha blocks with varying extents of flooding from 2 to 15 days, there was no complete crop loss due to flooding probably because the crop was at 6 months of age and sugarcane in general being tolerant to

short-term waterlogging. But the crop health deteriorated due to lodging and minor incidence of pests and diseases like pokkah boeng, wilt, borer, and whitefly (Fig. 2). Flood may result in lower recovery of jaggery mainly on account of lodging and side shoot germination which reduces the sucrose accumulation and thereby affect the jaggery recovery.



**Figure 2.** Flood affected sugarcane field at Chittor, Palakkad district

### **Idukki**

Idukki District had the maximum cultivation of sugarcane (925ha) extending over Kandloor and Marayoor Panchayats. Marayoor jaggery is known for its quality and obtained GI registration to its credit. So sugarcane is an important crop in this area and all produce go for jaggery preparation. Only a very negligible area (0.6ha) was affected by flood. To extend the crushing period, staggered planting was made in this area

and hence crop at three months, six months, and at the harvesting stage was observed. Only the three-month-old crop was affected by flood. Pink borer infestation (around 10%) was also observed in the flood affected fields.

### **Alappuzha**

In Alappuzha district, 40 ha of land is under sugarcane cultivation and about 90% of the area is affected by flood. The sugarcane crop was mainly affected in Pandanad and Thirvanvandoor panchayats. Complete drying of the crop is reported due to lack of aeration and waterlogging. Most of the production goes for jaggery in this area and the central Travancore jaggery also has got popularity for its sweetness and taste. The flood during the months of July and August damaged the crop and also many jaggery production units.

### **Pathanamthitta**

In Pathanamthitta, 10 hectare area was under sugarcane cultivation, 50% of the area was severely affected and the flooding was extended for one week. Crops in Thiruvalla, Kuttor and Pandalam Panchyats were affected due to flood.

### **Kottayam**

In Kottayam district, only 8ha was under sugarcane cultivation and 40% of the area mainly in Uzhavoor and Pampady Panchayat was affected.

### **Kannur**

In Kannur district, the cultivation was only about 2ha in Kurumathur, Mayyil and Kayaralam Panchayat. The crop is sold in the festival season as a chewing cane. Flooding affected the entire area under sugarcane cultivation. During flooding, water reached even up to the crown of the plant and on intermittent days resulting in extensive rooting at the nodal region. Crop became lean and the rind covered with mud making it unsuitable for chewing purposes and hence the farmers were not able to market the produce (Fig. 3).



**Figure 3.** Sugarcane field affected by flood at Mayyil, Kannur

According to the information gathered from the survey, sugarcane cultivation is the backbone of small-scale jaggery production units existing in specific areas of the state, thus focus may be given to sustaining the cultivation. Declining interest among the farmers in continuing sugarcane cultivation is mainly due to lack of government assistance for sugarcane cultivation as it is not considered a major crop of the state. Though some farmers were interested to cultivate, the marketing of the produce and lack of proper technologies for product diversification was hindering their interest. In the districts like Kannur where crop is exclusively cultivated for chewing purpose during festival season, water logging affected the marketability of the crop and farmers had to discard the entire crop as they don't have any other option to market the crop. Farmers of Kannur district are unaware of any processing technologies so as to utilise the affected crop. Keeping the above aspects in view, detailed product diversification methods developed at ICAR-Sugarcane Breeding institute research centre Kannur is detailed.

## **Product diversification options for the sugarcane growers of Kerala**

### **1. Freeze preservation of sugarcane juice with natural additives**

Sugarcane juice is one of the healthiest fresh juices widely consumed in our country. Sugarcane is generally crushed afresh to obtain juice and served as a drink to quench thirst during the summer months. Besides, being a nutritious drink containing natural sugars, minerals, and organic acids, the sugarcane juice is a good energizing drink with good medicinal properties. Sugarcane juice strengthens the digestive and excretory systems and stimulates the brain and reproductive systems. It is also used for gaining weight and is a rich source of iron. The sugarcane juice changes its colour and taste soon after extraction and the shelf life is a concern. Within a short period, it completely gets spoiled due to polyphenol oxidation and microbial activity. The Sugarcane Breeding Institute Research Centre, Kannur has developed freeze preservation technique for sugarcane juice with natural additives. The present method was standardized by quick freezing of the juice and adding the organic products which prevent polyphenol oxidation and avoid spoilage under storage. The addition of herbs of medicinal value can be a choice across age groups. The calorific value was also maintained low by choosing the varieties with low sugar/the traditional varieties of chewing canes. A certain amount of inversion happens in the presence of citric acid available in the lemon and it adds a quick refreshing ability. The addition of fresh spices and herbal extracts help to build up immunity and also adds several potential health benefits. The juice can be consumed not only as an energizer but at the same time as a healthier drink. This technology is a method for preserving sugarcane juice without any preservatives or chemical additives by maintaining colour,



**Figure 4.** Sugarcane juice block, Sip up and popsicles

quality, and freshness with a shelf life of over three months under frozen conditions. The juice can be frozen as juice blocks, sip-up or popsicles (Fig. 4).

## 2. Powder jaggery production

Jaggery is a traditional sweetener prepared by concentrating sugarcane juice. This natural unrefined non-centrifugal sugar is consumed in Asia, Africa Latin America and Caribbean Islands (Pawar and Dongare 2001). India is the largest producer and consumer of jaggery, contributing to more than 70% of the World's jaggery production (Rao et al., 2007). It is consumed by all sections of society as a sweetener cum source of energy as it is the healthiest form of sugar, containing minerals and vitamins (Madan et al., 2004).

Production of jaggery from sugarcane juice was known in India since time immemorial and cottage industries based on jaggery have played a commendable role in the socio-economic development of rural India. Jaggery production requires low investment and the process is simple in comparison to sugar. Sugar production is highly centralized, expensive, and complicated involving sugar mills with sophisticated machinery. Jaggery can be produced at the farm level on a small scale without the use of complicated machinery and less capital requirement. Hence, the production of jaggery is within the reach of common sugarcane farmers.

Jaggery making involves juice extraction, boiling, clarification, concentration, cooling of syrup, and moulding. Farmers still practice the age-old

traditional, inefficient and unhygienic method of jaggery making. They indiscriminately use sodium hydrosulphite (bleaching agent) besides, other chemical clarificants to get golden yellow colour jaggery which has more consumer preference (Ravindra, 2003).

The present method of powder jaggery preparation was standardized to get good uniform powder, better clarity, colour, taste, and enhanced storability. The sugarcane juice obtained from mature canes of 11 - 12 months with Brix of >19% could be conveniently used for the preparation of jaggery. The good quality powder jaggery thus prepared is yellow in colour, less salty, and is uniform granular powder (Fig. 5). A good colour can be obtained by adding clarificants of plant origin. Bhindi extract and Shoe flower extract are the best clarificants. The filtered juice is boiled and extract made by crushing the chopped petals of the Shoe flower is added to it. After boiling, the scum is removed. Another constituent virgin coconut oil is used as an emulsifier which has added nutritional benefits. The pH of the juice is adjusted with calcium carbonate. The striking temperature depends on the Brix content of the juice. The higher the brix content lower is the set temperature and vice versa. The set point ranges from 116° to 130°C. It is also found that a single variety at a time gives better crystallization resulting in uniform powder and a mixture of canes of different Brix and quality fails to form granular powder. The optimized organic process ensures that the product is of good quality with enhanced shelf life.



Figure 5. Powder jaggery prepared using organic clarificants

### 3. Liquid jaggery /semi liquid syrup

The liquid jaggery or semi liquid syrup is obtained as an intermediate product during the evaporation of filtered and clarified sugarcane juice during the process of solid jaggery making. The traditional liquid jaggery preparation contains 30-36% water, 40-60% sucrose, 15-25% invert sugar, calcium 0.3%, iron 8.5-10mg/100mg, phosphorous 0.5/100mg, protein 0.1/100mg and vitamin B 14/100mg.

The present method of preparation was a standardized procedure to get liquid jaggery of good gloss and shelf life. The sugarcane juice obtained from both matured and immature canes of 7 to 12 months age could be conveniently used for the preparation of liquid jaggery. Good sugarcane juice has a density of 1.07 – 1.10 g/ml. Good clarity was achieved by the removal of impurities by initial filtration of sugarcane juice, the removal of heat-coagulated suspension and floating impurities. Heating facilitates the separation of dissolved colloidal albumins, wax and gum in the form of dark-coloured waxy coagulated matter floating on the surface. The product pH range was 5.0 to 6.8 and the moisture content was less than 12%. Sugarcane juice obtained from 7½ month-old cane yielded only 14.6% liquid jaggery as against 24% from 11-12 month-old cane. The liquid jaggery can be prepared with a

hassle-free process without the use of chemical additives like clarificants, colouring agents and preservatives thereby ensuring the production of a healthy sweetener (Fig. 6). Further extension of shelf life if required can be met with the addition of permissible levels of preservatives. This can also form an adulterant-free healthy raw material for various confectionery items and in Ayurvedic Medicines.

### Conclusion

Sugarcane cultivation has immense potential as climate and soil condition of Kerala is suitable for it. Areas like river banks, waste lands etc. where other crops cannot be cultivated can be profitably utilized through sugarcane cultivation. Moreover sugarcane can tolerate heavy rainfall and short-duration waterlogging. Major factor hindering the expansion of the area under cultivation is lack of suitable processing avenues for utilizing the crop as there are no sugar mills in the State. Therefore the various technologies discussed will be a new avenue for sugarcane growers to double their income from farm produce.

In a state like Kerala, where people are more health conscious and longing for Agri-business as a stable income generator, there exists ample opportunity for the establishment of sugarcane juice-based processing units in the current scenario. The process of liquid jaggery making, powder jaggery



**Figure 6.** Liquid jaggery produced from ICAR-SBIRC Kannur

making and freeze preservation of sugarcane juice is easy and doesn't require much skill. The preparation can be done more hygienically and products can be packed hygienically in sealed containers that improve the quality of the product. The advantage of these technologies are that, they can be taken up as a cottage industry for rural women, which in turn can improve the per capita income of rural household thus a better standard of living in the rural area. Sugarcane cultivation and utilisation of the same for making value-added products can reduce the cost of production. For raw material, apart from the local availability of sugarcane, the neighbouring states can also be explored. For most sugarcane juice vendors, the sugarcane is coming from the neighbouring states. The industries based on sugarcane have a bright future due to the high consumption of sweeteners including jaggery for domestic use and confectionaries. Thus, organically prepared jaggery can emerge as a nutritional sweetener available locally and can achieve self-reliance in healthy jaggery production and once again recapture the glorious past of sugarcane agriculture in the state.

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