

Sugarcane Jaggery:

An alternative of sugar for healthy living

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India is the world's largest sugar and sugarcane producer. More than 70% of global production is done in India, with 53% being processed into white sugar, 36% into jaggery and khandsari, 3% for chewing as cane juice, and 8% as seed cane. India is world's leading jaggery producer and user. Sugarcane jaggery, often called "gur" is a natural, traditional, and nutritious sweetener made by concentrating sugarcane juice. It is a non-centrifugal, unprocessed sugar that contains all of the minerals and vitamins found in sugarcane juice. Jaggery is made by condensing sugarcane juice and it comes in solid blocks and granulated form. Granulated jaggery is becoming popular due to its ease of handling, packaging and storage. Although the methods for converting sugarcane and producing sugar, gur and khandsari varies, the creation of these consumable end products adds a significant amount of value. Millions of individuals will be able to find work as a result of this. Jaggery and khandsari have resisted competition while also addressing ethnic desires and maintaining farmers' interests. Jaggery is traditionally made on the farm by cane producers. With the arrival of new entrepreneurs that embarked into jaggery manufacturing as a pure business by purchasing cane from cane growers, this tendency has shifted. Some hurdles such as significantly higher price, prompt disbursements for the sale of cane, failure to register with the factory on time, delays in cutting orders, untimely payments are responsible for the farmers to prepare the jaggery from canes and sell it directly to the users.

Keywords: Farmers, Gur, Jaggery, Sugarcane

GUL, gud, gur, vellum, and bella are all names for jaggery, which is made in various parts of our country. Jaggery is actually more complex than sugar, since it is made up of longer chains of sucrose. As a result, it is digested more slowly than white sugar, which quickly releases energy. Slower release of energy is beneficial for the human body. Unfortunately, since it is a source of sugar, it has not been proven to work for diabetic patients. Because jaggery is made in iron vessels, it collects a significant amount of ferrous salts, which is beneficial to anaemic people. Jaggery is healthy for the human body because it contains mineral salts that come from sugarcane. Jaggery cleanses the lungs, stomach, intestines, oesophagus and respiratory systems since it is a

cleansing agent. Furthermore, those exposed to high levels of dust in their daily activities, it is recommended that they drink it, which protects them from ailments such as asthma, cough and cold, chest congestion and so on. Gur is used for a variety of things, including serving as a welcome drink to visitors, preparing reori, gazak, chikki, patti and other dishes, as cattle fodder and in distilleries and pharmaceutical production facilities. Gur is now used in a variety of confectionery products. Gur can also be found in the leather and tobacco industries. In addition, Gur is provided to workers in cement plants and coal mines to prevent dust allergies.

Nutritional value and uses of jaggery

Gur is a high-calorie sweetener

that is known to be healthier than white sugar since it contains minerals, proteins, glucose and fructose. A high quality gur has more than 70% sucrose, less than 10% glucose and fructose, less than 5% minerals and less than 3% moisture. It is rich in minerals such as Calcium (40-100 mg), Magnesium (70-90 mg), Potassium (10-56 mg), Phosphorus (20-90 mg), Sodium (19-30 mg), Iron (10-13 mg), Manganese (0.2-0.5 mg), Zinc (0.2-0.4 mg), Copper (0.1-0.9 mg), Chloride (5.3 mg), Vitamin A (3.8 mg), Vitamin B1 (0.01 mg), Vitamin B2 (0.06 mg), Vitamin B5 (0.01 mg), Vitamin B6 (0.01 mg), Vitamin C (7.00 mg), Vitamin D2 (6.50 mg), Vitamin E (111.30 mg), Vitamin PP (7.00 mg), and Protein (280 mg per

100 g of jaggery). Hence, it could serve as a source of nutrition for people suffering from mal-nutrition and undernutrition.

Preparation of jaggery (Gur)

After considering nutritional value of jaggery along with regular income, it is essential to train the cane farmers with scientific, tested and recommended techniques. Further, for earning higher profits, value addition can be done by adding dry fruits such as groundnut, sesame (til) and packaging training is also a must. Punjab Agricultural University, Ludhiana and Regional Research Station, Kapurthala, Punjab frequently provides training on these aspects to the farmers. Different steps involved in jaggery preparation are given here.

- **Juice Extraction from the harvested canes:** This is the first important step towards better jaggery. For extracting the maximum juice from the canes, a three mill roller sugarcane crusher should be preferred. Afterwards, the crushed



Jaggery varieties obtained from different cane cultivars

juice is filtered with muslin cloth to remove bagasse and other suspended solids.

- **Juice clarification:** After extraction, sugarcane juice is to be clarified, which further helps in the proper crystallization and solidification of sugar, to have a better product. Under this step of juice clarification, emulsion is prepared from the bark of the Sukhlai after soaking it in water for 24 hours. Afterwards, bark is rubbed to obtain a thick mucilaginous fluid, which is then added in the boiling juice when the scum begins to rise. As per one estimate, around one litre emulsion is sufficient to clarify 100 litres of sugarcane juice. Beside the use of Sukhlai emulsion, extract of various plants (Okra, Masak dana, Phalsa etc.) or certain chemicals (lime water, sodium carbonate, sodium bicarbonate, gum, citric acid, potassium metabisulphite) are added when juice starts boiling. Juice is boiled extensively to concentrate it to 60° brix.

- **Cane juice boiling and concentrating:** The extracted and clear juice is now transferred to a boiling pan up to 1/3rd of its volume. Firstly, juice is boiled slowly up to its boiling temperature at 85°C, the dirt along with nitrogenous compounds coagulates and floats on the surface

Table 1. Relative performance of varieties for good quality jaggery preparation

Characteristic/ Variety	CoPb 92	Co 118	CoJ 85	CoJ 88
Maturity group	Early	Early	Early	Mid-late
Cane colour	Purple green	Purple green	Green	Greyish green
Cane thickness	Medium thick	Thick	Thick	Medium thick
Sucrose per cent in December	18.0	17	18.0-18.5	17.0-18.0
Colour	Yellow	Dark Brown	Light brown	Golden yellow
Taste	Sweet	Sweet	Sweet	Sweet
Hardness	Hard	Hard	Hard	Hard
Storage life	Longer storage life	Longer storage life	Average storage life	Longer storage life
Ratoonability	Good	Average	Average	Excellent
Cane yield	335 qtl/acre	320 qtl/acre	305 qtl/acre	335 qtl/acre

Table 2. Comparative evaluation of jaggery and sugar

Jaggery	Sugar
It is far complex and is made up of longer chains of sucrose	It is simplest available form of sugar
It is digested slower than sugar and releases energy slowly	It is instantly absorbed in blood and releases a burst of energy
It is rather a tastemaker and colour maker	It is just a sweetener
It contains iron, calcium, potassium, phosphorus	It is a source of empty calories
Jaggery helps in calcium absorption	Sugar interferes with absorption of calcium and magnesium
Jaggery is eco-friendly	Sugar industry pollutes air, water and soil
Jaggery aids digestion, on its consumption becomes alkaline in the digestive system	Sugar becomes acidic

as scum, which must be removed before juice starts boiling. Afterwards, juice is boiled vigorously for 2.5 to 3.0 hours to evaporate the water for concentrating the syrup. After attaining temperature of 100°C, flame should be reduced till the concentrated juice reaches the striking point (114-116°C) for gur and (120-122°C) for Shakkar making.

- **Moulding and packaging:** After attaining the striking point, material is transferred to wooden or aluminum moulds where after cooling, it solidifies. Afterwards, it could be moulded into different shapes using specially designed moulds or khurpa.

Suitable time for jaggery preparation

Jaggery preparation is not carried out throughout the year as it requires mature canes. Generally, this operation starts from November and continues up to April. However, for best quality jaggery, selection of cane cultivars and time of jaggery

preparation matters a lot. From early and mid-late sugarcane cultivars, the best time for jaggery preparation starts from November and December, and January to April, respectively.

Value addition and storage of jaggery

For value addition, jaggery is blended with different natural flavours and taste additives like ginger, black pepper, cardamom, till and peanuts. Jaggery should be air dried before storing. From storage aspects, at household levels it is traditionally stored in earthen pots, wooden boxes, metal drums, polythene bags, etc. To avoid microbial infestation during the rainy season, jaggery should be stored at low temperature (4°C-9°C). Under any condition, for maintaining good jaggery quality, while storing the moisture content should not exceed 6% and be kept at a relative humidity of 43-61%.

Sugarcane cultivars and jaggery quality

Selection of a good cane cultivar is a must for having the quality jaggery.

In Punjab's climatic conditions for eating and keeping the quality of Gur, best cane cultivars recognized are CoPb 92, Co 118, CoJ 85 and CoJ 88.

SUMMARY

Jaggery is better than sugar as far as nutritional values are concerned. Jaggery preparation not only provides additional nutrients in our diet but also adds to the overall income of the farmers which further improves their livelihood. Majority of the farmers produce jaggery with minimal capital input without caring about the scientific technique of jaggery preparation with value addition and also ignore the selection of sugarcane cultivars. Further, it is also critical to protect farmers' profits by increasing both quantity and the quality of their jaggery units with value addition and current technology for packaging and jaggery-based products.

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Impoved varieties of Sugarcane (*Saccharum* sp. Hybrid)

CoC 13339	Tamil Nadu, Andhra Pradesh and Odisha (Coastal areas)	Suitable for irrigated areas, average cane yield: 117.97 t/ha, moderately resistant to red rot and YLD, moderately resistant to smut.
Karan 14 (Co 13035)	Haryana, Rajasthan, Punjab, Uttarakhand and Central and Western Uttar Pradesh	Suitable for mid-late group for North-West zone, average cane yield 86.76 t/ha, Reaction to red rot is resistant to moderately resistant, least susceptible to shoot borer, top borer and stalk borer.
Sahaj-3 (CoS 12232)	Punjab, Haryana, Uttarakhand, Rajasthan and Central and Western Uttar Pradesh	Suitable for medium and high fertility soil under irrigated areas, average cane yield: 88.86 t/ha moderately resistant reaction to red rot and smut.
Sankalp (Co 12009)	Tamil Nadu, Kerala, Interior Andhra Pradesh, Telangana, Karnataka, Gujarat, Maharashtra, Madhya Pradesh and Chhattisgarh	Suitable for irrigated conditions, average cane yield: 119.65 t/ha, moderately resistant reaction to red rot, smut and YLD, less moderately susceptible to shoot fly and highly susceptible to internode borer.

Source: ICAR Annual Report (2020)