

Manufacturing Jaggery, a Product of Sugarcane, As Health Food

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Abstract

Predominantly, the Indian population is rural, as above 65% people lives in rural villages. The majority of the population suffers due to under nutrition and or malnutrition, as the common Indian diet is deficient in nutrition. The health food is considered to be the food which is beneficial to health, beyond a normal healthy diet required for human nutrition. It is also referred to as functional food, i.e. food for which a specific claim of health benefits is made, such as that consumption of the food may prevent diseases. Jaggery, a product of sugarcane, is such a product which is rich in important minerals (viz Calcium-40-100 mg, Magnesium-70-90 mg, Potassium-1056 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, and Chloride-5.3 mg per 100 g of jaggery), and vitamins (viz 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). The magnesium strengthens our nervous system, helps to relax our muscles, gives relief from fatigue and takes care of our blood vessels. It also, along with selenium, acts as an antioxidant and has property to scavenge free radicals from our body. The potassium and low amount of sodium present in jaggery maintain the acid balance in the body cells, and also combat acids and acetone, and control our blood pressure. Iron helps to prevent anaemia. It also helps to relieve tension and takes care of asthma, as it has anti allergy properties. Ayurveda also prescribes jaggery for migraine, and at the time of post pregnancy, for removing all clotted blood from the body, within 40 days after the birth of a baby. The preventive ability of jaggery on smoker's smoke-induced lung lesions suggest the potential of jaggery as a protective food for workers in dusty and smoky atmosphere; even for those who are engaged in woollen industries, the wool dust clogged in the food pipe could be cleared with jaggery. Thus, jaggery helps to breathe easier and counters the pollution problems naturally. The moderate amount of calcium, phosphorous and zinc helps to maintain optimum health. It also purifies the blood, prevents rheumatic afflictions and bile disorders, and thus helps to cure jaundice. The current article briefly describes about the manufacturing process of different forms of jaggery and jaggery based products, which are most appropriate natural health food, for major portion of Indian population living in the rural areas.

Keywords: Jaggery; Ayurveda; Vitamins; Cane juice

Introduction

The majority Indian population, being rural, suffers due to under nutrition, and or malnutrition, as the common Indian diet is deficient in nutrition. Jaggery, a product of sugarcane, is such a product which is rich in important minerals (viz Calcium-40-100 mg, Magnesium-70-90 mg, Potassium-1056 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, and Chloride-5.3 mg per 100 g of jaggery), vitamins (viz 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, which can be made available to the masses to mitigate the problems of mal nutrition and under nutrition. The current article briefly describes about the manufacturing process of different forms of jaggery and jaggery based products which are most appropriate natural health food. Jaggery is a natural traditional sweetener made by concentrating the extracted sugarcane juice. It is a traditional unrefined non-centrifugal sugar consumed in Asia, Africa, Latin America and the Caribbean. Containing all the minerals and vitamins present in sugarcane juice, it is known as healthiest sugar in the world. India is the largest producer and consumer of jaggery. Out of total world production, more than 70% is produced in India [1]. It is consumed in almost all sections of the society as a sweetener, and as a source of energy. It is also used in animal feed mixtures. In Ayurvedic way of medicine, it is used as medicine, blood purifier and base material for syrups. Jaggery is among major agro processing industries in India. Nearly 20-30% of total sugarcane produced in the country is used for manufacture of about 7 million tonnes jaggery, which is known as

most nutritious agent among all sweeteners [2]. This sector provides employment to about 2.5 million people (cooperative sugar [3]). It is therefore, imperative to expand the sector, as it provides higher food value jaggery at lower cost and boosts-up the rural economic system, involves low transportation cost of raw material, and non requirement of highly technical machinery and labour [4]. Jaggery still dominates in preparation of various products like- reori, gazak, chikki, patti and ramdana, etc. of ancient origin. Kakavi (liquid jaggery) is part of daily diet in most parts of Maharashtra, and has been gaining commercial importance in India [5]. Jaggery is rich in important minerals like salts: 2.8 g/100 grams, whereas only 300 mg/kg is obtained in refined sugar.

Magnesium present in jaggery strengthens our nervous system, helps to relax our muscles, gives relief from fatigue and takes care of our blood vessels. It also along with selenium acts as an antioxidant property scavenge free radicals from our body. The potassium and low amount of sodium present in it maintain the acid balance in the body cells and also combat acids and acetone and control our blood pressure. It is rich in iron, and helps to prevent anaemia. It also helps to relief

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tension and takes care of asthma as it has anti allergy properties. It is good for migraine and at the time of post pregnancy it has great benefits to perform to remove all clotted blood from the body of women within post 40 days after the birth of a baby [6]. A typical composition of 100 g of jaggery is given in table 1. The preventive ability of jaggery on smoker's smoke-induced lung lesions suggest the potential of jaggery as a protective food for workers in dusty and smoky atmosphere even for those who are engaged in woollen industries, the wool dust clogged in the food pipe could be cleared with jaggery. Thus, jaggery helps to breathe easier and counter pollution problems. It has moderate amount of calcium, phosphorous and zinc so it helps to optimum health of a person along with all its benefits, purifies the blood and prevents rheumatic afflictions and bile disorders and thus helps to cure jaundice. Major states producing jaggery are Uttar Pradesh, Tamil Nadu, Maharashtra, Andhra Pradesh, and Karnataka. The increasing production trend and market value of jaggery has much significance to learn about peoples liking towards jaggery. As the urban people become more health conscious, demand for jaggery will be more not as a sweetener, but as health supplement. Other uses include jaggery toffees and jaggery cake made with pumpkin preserve, cashew nuts, pea nuts and spices. Jaggery may also be used in the creation of alcoholic beverages like palm wine.

Methods of Manufacturing

Jaggery is produced in three forms viz solid, liquid and powder or granular form, which is briefly dealt in as under.

Solid jaggery (Cube shape)

The filtered cane juice was pumped into open pans kept on triple pan furnace (Figure 1), and heated with the begasse as fuel. The juice was clarified with herbal clarificant (deola extract @ 45 g/100 kg juice), to make light coloured jaggery by eliminating impurities in suspension, colloidal and colouring compounds by accumulation. The juice was then boiled and concentrated to make jaggery in desired shape and size (Figures 2 and 3) [7].

Liquid jaggery

It is an intermediate product obtained during concentration of purified sugarcane juice during jaggery making, and is semi liquid syrup like product. The quality of liquid jaggery largely depends upon quality and composition of cane juice, type of clarificants used, and striking temperature at which concentrating juice is collected. For quality liquid jaggery, the juice concentrate is removed from boiling pan, when it reaches striking point temperature of 103-106°C, depending upon the



Figure 1: Triple pan furnace in operation.

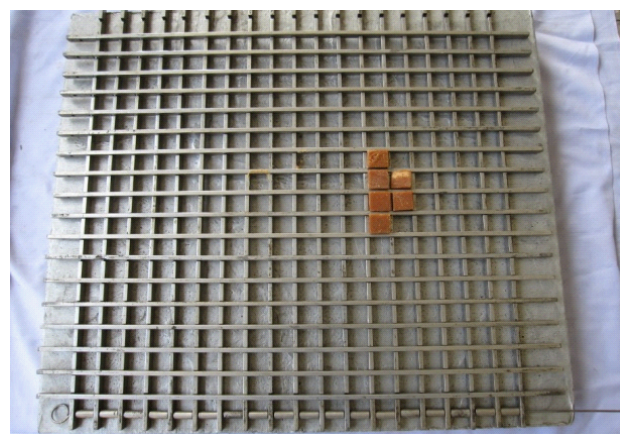


Figure 2: Moulding frame.



Figure 3: Cubical jaggery.

Carbohydrates g		Vitamins mg	
Sucrose	72-78	Provitamin	2.D
Fructose	1.5-7	Vitamin A	3.8
Glucose	1.5-7	Vitamin B1	0.01
Minerals mg		Vitamin B2	0.06
Calcium	40-100	Vitamin B5	0.01
Magnesium	70-90	Vitamin B6	0.01
Phosphorus	20-90	Vitamin C	7.00
Sodium	19-30	Vitamin D2	6.50
Iron	10-13	Vitamin E	111.30
Manganese	0.2-0.5	Vitamin PP	7.00
Znic	0.2-0.4	Protein	280 mg
Chloride	5.3-0	Water	1.5-7g
Copper	0.1-0.9	Calories	312

Table 1: Composition of 100 g of jaggery.

variety and agro-climatic zone. To avoid crystallization and to make liquid jaggery attractive in colour, citric acid is added @ 0.04% (400 mg/kg of liquid jaggery), whereas to improve shelf life of liquid jaggery without deterioration in quality, potassium metabisulphite @ 0.1% (1 g/kg of liquid jaggery), or Benzoic acid @ 0.5% (5 g/kg of liquid jaggery), is added. Liquid jaggery is then allowed to settle for period of 8-10 days

at ambient conditions. Later after filtration, it is properly packaged in sterilized bottles. Chemical composition of typical liquid jaggery could be: water 30-36%, sucrose 40-60%, invert sugar 15-25%, calcium 0.30%, iron 8.5-10 mg/100 mg, phosphorus 05/100 mg, protein 0.10/100 mg, and vitamin B 14/100 mg.

Granular jaggery

The process of making granular jaggery is similar up to concentration. The concentrating slurry is rubbed with wooden scrapper, for formation of grains. The granular jaggery is then cooled and sieved. Less than 3 mm sized crystals are found to be better for quality granular jaggery. Raising of pH of cane juice with lime, up to 6.0-6.2, and striking point temperature of 120°C was found to yield quality granular jaggery with high sucrose content of 88.6%, low moisture of 1.65%, with good colour, friability and crystallinity. Jaggery in the form of granules (sieved to about 3 mm), sun dried and moisture content reduced to less than 2%, and packed in polyethylene polyester bags or polyethylene bottles, can be stored for longer time (more than two years), even during monsoon period with little changes in quality.

Value addition in jaggery

Jaggery with natural source of vitamin C: Vitamin C is an important constituent of our daily diet. It is important in forming collagen, a protein that gives structure to bones, cartilage, muscle and blood vessels. Vitamin C also plays an important role in the synthesis of the neurotransmitters, which are critical to brain function, and are known to affect mood. It is also a highly effective antioxidant. It helps in fighting colds and cancer, as well as enforcing teeth, healthy gums, and prevention of heart disease and cataract. Vitamin C is an important anti-oxidant, helps protect against cancers, heart disease and stress. Vitamin C helps in maintaining a healthy immune system, it aids in neutralizing pollutants, is needed for antibody production, acts to increase the absorption of nutrients (including iron) in the gut, and thins the blood. Vitamin C when added to jaggery in proper proportion, through a natural source, can become a part of mid-day meal given to rural school going children, and will help in fighting malnutrition. An Amla fruit were cut into small pieces and slices and grated/shredded, dried up to 10% moisture content, powder and grated forms were found to be acceptable [8]. Mixing was better in fine powder form, but the colour of jaggery is affected, and the taste also becomes uniformly sour. Jaggery samples in which dried Amla was mixed in coarse powder

form was found to be the best, followed by samples with grated and fine powder form of Amla, as indicated through sensory evaluation.

Conclusion

As human, we have distinctive nutritional requirements to survive and perform. We need food for our body and mind. At the same time, we want to delight our senses with good food. Our lifestyle has become fast. While meeting the demands of our fast-paced professional life, we have made serious compromises with our food, and in the process, with our health. As professionals also, we find it more difficult to eat fresh and nutritious food at the work place. Our search for healthy, fresh and tasty food is endless. Since jaggery in different forms, as manufactured and explained above, comprises of many useful minerals, vitamins and antioxidants stated earlier in this manuscript, can be taken as health supplement, which would help improving the majority population suffering due to under nutrition, and/or malnutrition, because of deficient common diet and probably, may replace sugar in making of health foods, and hence, appears to have bright future among masses and could be promoted.

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