

INTRODUCTION

Sugar industry is one of the most important agro-based industries in India and is highly responsible for creating significant impact on rural economy in particular and country's economy in general. Sugar industry ranks second amongst major agro-based industries in India. As per the Government of India's recent liberalised policy announced on 12th December, 1986 for licensing of additional capacity for sugar industries during 7th five-year plan, there will be only one sugar mill in a circular area of 40 sq km. Also the new sugar mill is allowed with an installation capacity of 2500 TCD (Tonne Sugar Cane crushed per day) as against the earlier capacity norms of 1250 TCD. Similarly, the existing sugar mills with sugar cane capacity of about 3500 TCD can crush sugar cane to the tune of 5000 TCD with a condition imposed that additional requirement of sugar cane be acquired through increased productivity and not by expansion of area for growing sugar cane.

Cane sugar is the name given to sucrose, a disaccharide produced from the sugarcane plant and from the sugar beet. The refined sugars from the two sources are practically indistinguishable and command the same price in competitive markets. However, since they come from different plants, the trace constituents are different and can be used to distinguish the two sugars. One effect of the difference is the odor in the package head space, from which experienced sugar workers can identify the source.

In the production scheme for cane sugar, the cane cannot be stored for more than a few hours after it is cut because microbiological action immediately begins to degrade the sucrose. This means that the sugar mills must be located in the cane fields. The raw sugar produced in the mills is item of international commerce. Able to be stored for years, it is handled as raw material – shipped at the lowest rates directly in the holds of ships or in dump trucks or railroad cars and pushed around by bulldozers. Because it is not intended to be eaten directly, it is not handled as food. The raw sugar is shipped to the sugar refineries, which are located in population centers. There it is refined to a food product, packaged, and shipped a short distance to the market. In a few places, there is a refinery near or even within a raw-sugar mill. However, the sugar still goes through raw stage.

The principle by-product of cane sugar production is molasses. About 10 – 15% of the sugar in the cane ends up in molasses. Molasses is produced both in the raw-sugar manufacture and also in refining. The blackstrap or final molasses is about 35 – 40% sucrose and slightly more than 50% total sugars. In the United States, blackstrap is used almost entirely for cattle feed. In some areas, it is fermented and distilled to rum or industrial alcohol. The molasses used for human consumption is of a much higher grade, and contains much more sucrose.

Sugarcane characteristics:

Sugarcane contains not only sucrose but also numerous other dissolved substances, as well as cellulose or woody fibre. The percentage of sugar in the cane varies from 8 to 16% and depends to a great extent on the variety of the cane, its maturity, condition of the soil, climate and agricultural practices followed.

The constituents of ripe cane vary widely in different countries and regions but fall generally within the following limits:

Constituent	Percentage range
Water	69.0 – 75.0
Sucrose	8.0 – 16.0
Reducing sugars	0.5 – 2.0
Organic matter other than sugar	0.5 – 1.0
Inorganic compounds	0.2 – 0.6
Nitrogenous bodies	0.5 – 1.0
Ash	0.3 – 0.8
Fibre	10.0 – 16.0

Organic matters other than sugar include proteins, organic acids, pentosan, colouring matter and wax. Organic acids present in cane are glycolic acid, malic acid, succinic acid and small quantity of tannic acid, butyric acid and aconitic acid. These vary from 0.5 to 1.0% of the cane by weight. The organic compounds are made up of phosphates, chlorides, sulphates, nitrates and silicates of sodium, potassium, calcium, magnesium and iron chiefly. These are present from 0.2 to 0.6%.

The nitrogenous bodies are albuminoid, amides, amino acids, ammonia, xanthine bases, etc. These are present to the extent of 0.5 to 1.0%.

Fibre is the insoluble substance in the cane. Dry fibre contains about 18.0% lignin, 15% water-soluble substances, 45% cellulose and the rest hemicellulose.

The juice expressed from the cane is an opaque liquid covered with froth due to air bubbles entangled in it. The colour of the juice varies from light grey to dark green.

Colouring matter is so complex that very little is known about them and there is a great need for research in this direction. 'Colouring matters' consist of chlorophyll, anthocyanin, saccharatin and tannins.

Canes which have been injured or which are over-ripe contain ordinarily invert sugar as well. When severe frost damages sugarcane, all buds are killed and the stalk split. Then the juice produced has low purity, less sucrose, high titrable acidity, and abnormal amounts of gum, which make processing difficult and at times impossible. Frost is generally not a very common phenomenon in Indian crops. Insects and pests cause a greater damage.

Cane juice has an acidic reaction. It has a pH of about 5.0. The cane juice is viscous owing to the presence of colloids. The colloids are particles existing in a permanent state of fine dispersion and they impart turbidity to the juice. These colloids do not settle ordinarily unless conditions are altered. The application of heat or addition of chemicals brings about flocculation or coagulation. They may be coagulated by the action of electric current and adsorption by sucrose attractions using porous or flocculent material. Some colloids are flocculated easily while others do so with great difficulty. Each colloid has a characteristic 'pH' at which flocculation occurs most easily. It is known as the isoelectric point of the colloid.

The cane juice is turbid owing to the presence of such colloidal substances as waxes, proteins, pentosans, gums, starch and silica.