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Sugar and Related Products

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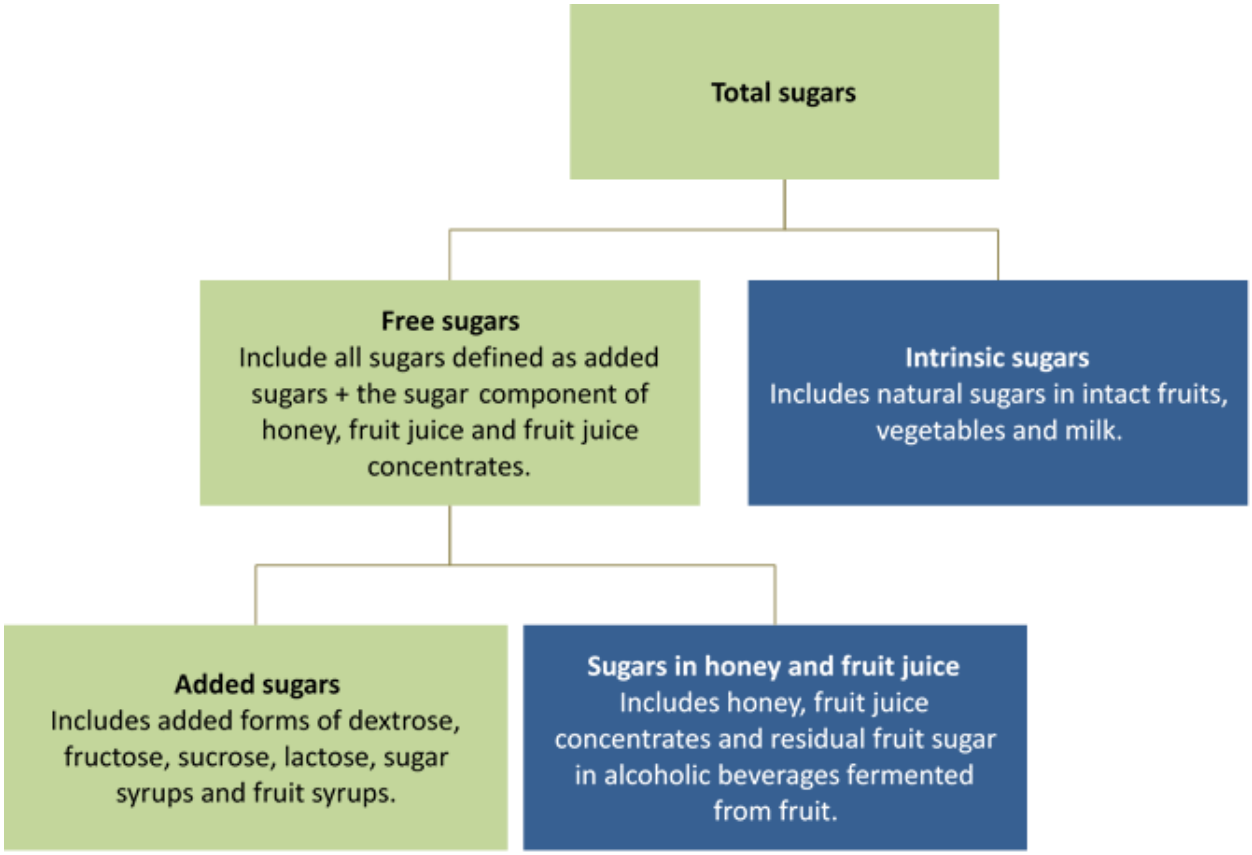
ABSTRACT

Sweeteners have been utilized in cuisine from prehistoric times, most likely when honey was discovered. Every person has a natural desire for sweet flavors. To improve the palatability of drinks and other meals, sugar and jaggery are utilized.

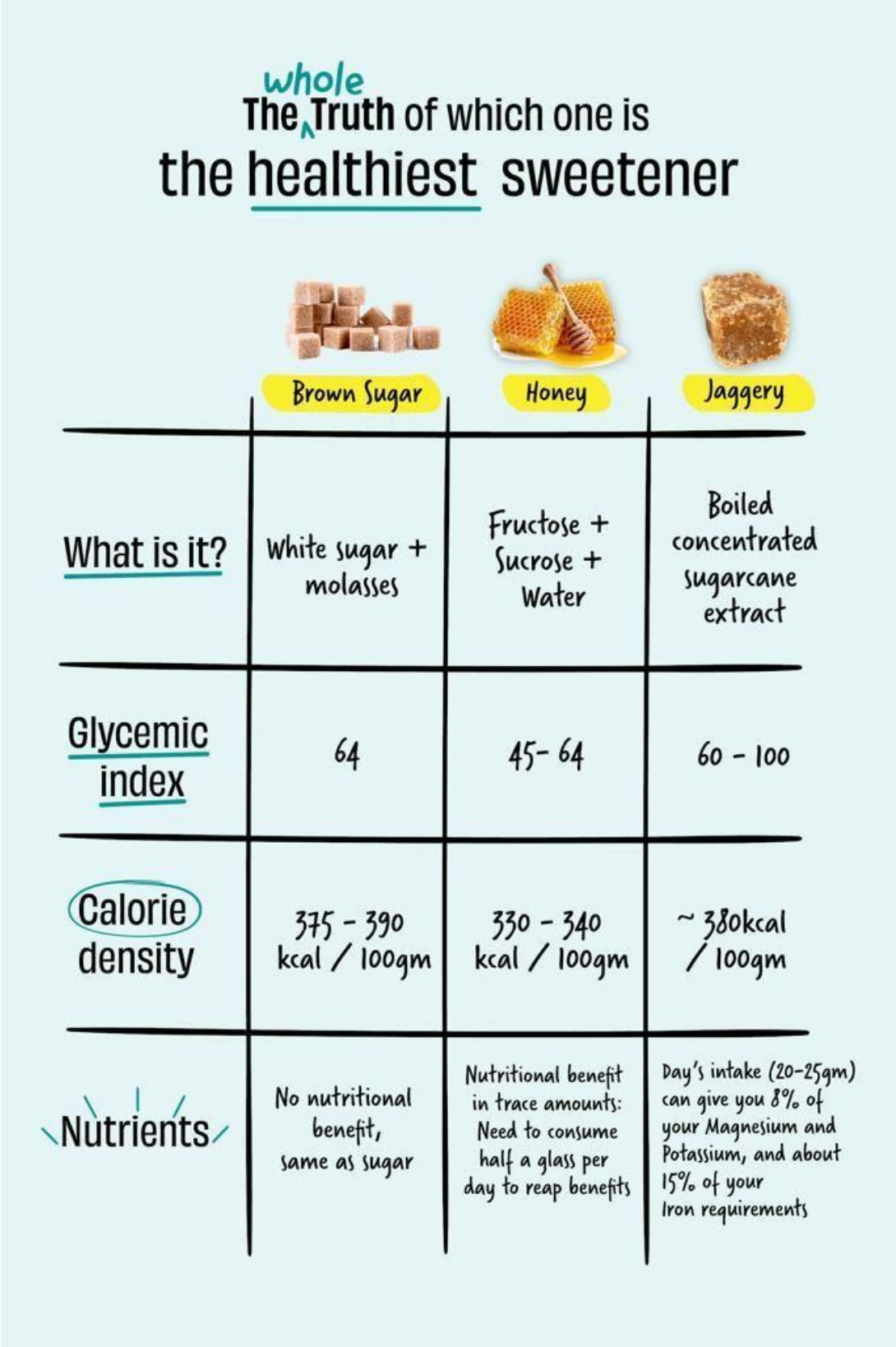
Keywords : Sweeteners, Fermentation, Caramelisation, Crystallization, Candies, Artificial Sweeteners.



Nutritional value

Sugar is merely a source of energy for the body. As a result, meals with high sugar content have a poor nutritional density, including proportionally less protein, minerals, and vitamins.

Molasses includes certain nutrients other than carbs, such as a tiny quantity of Calcium and Iron, because it is created from the natural ash of the plant juices from which it is made.



Properties of sugar

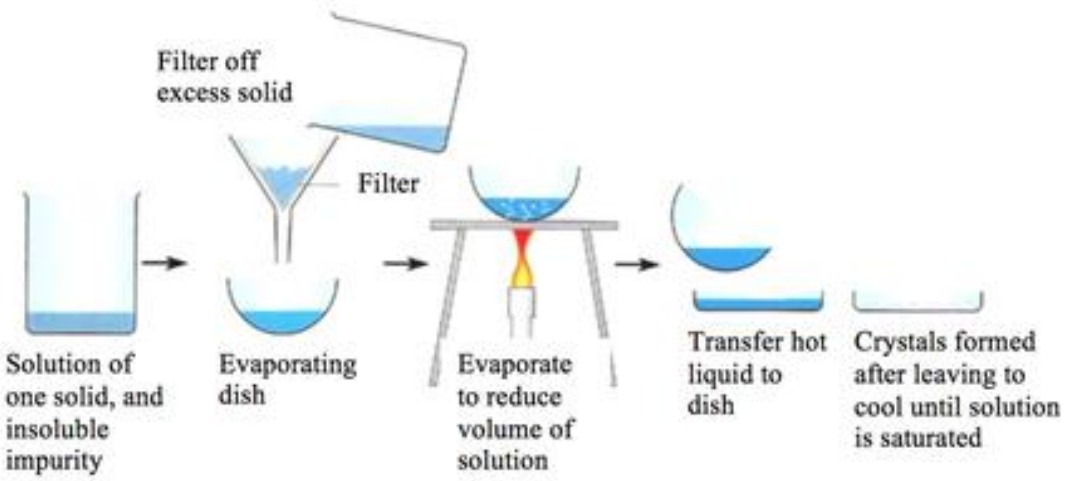
1) Solubility: Sugars are in solution in their natural condition. Fructose is the most soluble sugar, followed by sucrose and lactose. The most soluble sugars, such as fructose, are more difficult to crystallize than the least soluble sugar, lactose.
2) Moisture absorption: Sugar is hygroscopic. The hydroscopicity of fructose is higher than that of the other sugars. Honey molasses cake keeps the best for the longest period.
3) Fermentation: Yeast can ferment most sugars, save lactose, to create carbon dioxide gas and alcohol. This is a crucial reaction in the production of bread and other baked goods. During baking, carbon dioxide leavens the product and alcohol volatilizes.
4) Acid hydrolysis: Acid hydrolyzes sucrose quickly, whereas maltose and lactose take longer. The final result of sucrose hydrolysis is a combination of glucose and fructose, which is referred to as invert sugar.
5) Enzyme hydrolysis: In the candy industry, the enzyme sucrose, commonly known as invertase, is employed to hydrolyze some of the sucrose in cream fondant into fructose and glucose. This is done to make chocolates with a soft semi-fluid middle.
6) Melting point and heat decomposition: [Caramelisation] It happens when sugar melts or changes from a solid to a liquid form at around 17 degrees Celsius, resulting in the production of a distinctive caramel flavor and a brown color. When sucrose melts at 160 degrees Celsius, a transparent liquid develops, which progressively becomes brown as the temperature rises.
Cramel has a strong flavor, is frequently harsh, is significantly less sweet than the sugar from which it is made, and is non-crystalline. It is water soluble.
7) Alkali decomposition: Alkalis degrade monosaccharide's, causing the flavor to become intense and harsh. Alkalis have the least effect on sucrose.
8) Sweetness of the sugars: Lactose is the least sweet sugar, followed by maltose, galactose, glucose, and sucrose, with fructose being the sweetest. The best way to get the most sweetness out of fructose is to combine it with acid, cold meals, and beverages.

Sugar Related Products

1) Corn syrup: Has a carbohydrate content of 75% and a water content of 25%. It increases the citrus flavor of fruit items used in Cola drinks and is beneficial in baked goods. Dried corn syrup is used in dry beverage mixes, instant breakfast mixes, cereal bars, and sauce mixes.
2) Molasses: Molasses is the residue left after sucrose crystals have been extracted from sugarcane or beet concentrated juices. It has a maximum water content of 25% and a maximum mineral ash content of 5%.
Molasses is rich in sugar and light in color after the initial crystallization of sucrose. Black strap molasses, a dark and bitter substance with a high mineral concentration, remains after the final process.
3) Maple syrup: Is the most expensive of all the syrups for culinary and table use. It's manufactured by evaporating the sap of the sugar cane Mable to a concentration of no more than 35% water.
4) Honey: Honey is mostly composed of water and glucose, with little amounts of minerals, vitamins, and enzymes. Fructose accounts for 38% of honey's carbohydrate content, followed by glucose (31%), maltose (7%), and sucrose (2%). Honey's hue ranges from white to dark amber. Fresh Honey's hue is determined by its mineral composition and is unique to the flower source.
5) Jaggery: The most common source of jaggery is sugarcane, although it may also be made from palm, date palm, and coconut. The juice is heated after the cane is crushed and coarse suspended contaminants from the juice are removed by steering. To inoculate colloids contained in the juice, chemical clarifying is performed. Following clearing, the cane juice is aggressively boiled at 115-177 degrees Celsius with continual guiding.
6) Caramel sugar: Is made from sugars that have been dried or cooked with specified additions or concentrated solutions. Caramel is polymeric in nature, including around 143 volatile and non-volatile chemicals. As breakdown products, it contains caramelan, caramelen, Caramelin, glucose, alcohols, acids, aldehydes, esters, carbon dioxide, and sulfur dioxide. Brewing, vinegar production, whiskey, rum, and wine production, as well as soft beverages, all employ it. Biscuits, pickles, sauces, and pastries all include them. Soybean, tapioca, and sago may all be used to make caramel sugar.

Manufacturing of Sugar

1. Sugar cane extraction
2. Cane sugar purification
(lime juice is used as a purifying agent).
3. The process of evaporation
(clarifying juice contain 85 percent water after evaporation it contains 75 percent water)
4. Crystallization:- A crystal is made up of tightly packed molecules that are organized in a certain pattern. Only when the solution is hyper saturated can crystallization occur. The size of the crystals generated is determined by the pace at which nuclei are formed around which the crystals develop, as well as the rate at which crystals grow around the nuclei. The size of the crystals generated will be huge if just one or two nuclei are created, but if the rate of nuclei creation is very fast, numerous little crystals will develop.



5. Centrifuging:- The rest of the crystals are created in a machine to divert attention away from the queries.
6. Liquid re-boiling:- During this procedure, the remaining water is absorbed.

Crystallization-related factors

1. The nature of crystalline substances: Some sugars, such as glucose, are unable to form big crystals, preferring instead to form nuclei. The production of numerous little crystals occurs as a result of the shattering of many nuclei from previously formed crystals.
2. Temperature: The smaller the crystal, the lower the temperature.
3. Agitation: The more steering, the more small crystals will develop.
4. Acid addition: Adding acid to the solution can inhibit the crystallization process, and acid ingredients such as cream of tartar, lemon juice, or vinegar can be used to speed up the conversion of sucrose to glucose and fructose. Citric acid, for example, prevents crystallization in jams and jellies. When mango is used in sweet pickles, crystallization is avoided. Sugar solutions that have been boiled can be handled to make crystalline or non-crystalline sweets. Crystalline candies get softer with time. They are silky smooth and creamy when properly prepared. Fondant, mysore pak, and coconut burfi are the three main crystalline candies.
Amorphous refers to non-crystalline candies and means "without shape." Sugar crystallization is avoided in their preparation by the employment of numerous ways. Candy that isn't crystalline can be chewy, like caramels, or firm, like butterscotch, toffees, and brittle.

5. Crystalline Candies: a) Fondant
b) Fudge

a) Fondant: Fondant is a soft, smooth candy made by heating a sucrose solution to a certain temperature, then cooling and beating the solution until crystallization occurs. The use of acid speeds up the inversion process, while using milk or cream as the liquid enhances the fondant's creamy texture.

b) Fudge: Fudge-making concepts are similar to fondant-making fundamentals. Generally, the components that prevent crystallization include butter or margarine, chocolate fat, and milk.

6. Non-Crystalline Candies: In non-crystalline sweets, sugar does not crystallize. Cooking at very high temperatures prevents crystallization because the completed product hardens fast before the crystals have a chance to form. Adding a big enough amount of interfering compounds to prevent the formation of crystals, or combining these strategies. For instance, gajak and coffee.

Sugar's Function in Cooking

1. Used in ice cream and beverages such as coffee, tea, coca, milkshakes, and desserts as a sweetening ingredient.
2. Used as syrup in desserts such as Gulab Jamun and Rasgulla.
3. It inhibits the development of microorganisms at high concentrations; this concept is applied in the preparation of jams and jellies.
4. To increase the color and flavor of the pudding, caramel sugar is utilized.
5. Used to boost yeast fermentation while baking bread.
6. Icing sugar is used as a decorative agent.
7. It offers items like jam, pudding, fondant, and ice cream not just sweetness but also substance.
8. It aids in the improvement of cake and confectionery texture.

9. Sugar's crystallization property is employed in dishes such as Balu shahi, laddu, fondant, and fudge.

Artificial sweeteners:

Artificial sweeteners are utilized in the food sector since just little amounts of these compounds are necessary to sweeten the product. Colorless, odorless, readily soluble, stable, functional, and economically possible, an ideal sweetener is as sweet as or sweeter than sucrose, has a pleasant flavor with no aftertaste, is colorless, odorless, readily soluble, stable, functional, and economically practicable. They are also non-toxic and contain fewer calories. Stevia, Sucralose, Saccharin, Aspartame, Acesulfame K, and cyclamate are among examples.

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