NATIONAL SUGAR MARKETING

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Beet and Cane Sugar Similarities

National Sugar Marketing services the food industry and retail markets by supplying sugar products derived from sugar beets and sugar cane. Modern diet trends and varying public opinions have prompted widespread debates on the perceived similarities and differences between beet and cane sugar. The purpose of this document is to examine both products and address potential questions relating to differences on a nutritional, chemical, and functional level.

Origins: Sucrose, more commonly known as sugar, is a carbohydrate naturally found in all plants. Plants manufacture it through photosynthesis by converting carbon dioxide and water into storable energy for later use. Two plants produce more sugar than any other and have proven to be excellent sources for processing and purification: sugar beets (Beta vulgaris) and sugar cane (Saccharum officinarum). These crops produce chemically identical sugars although they grow in different environments e.g., root and grass. Once purified, beet and cane sugar are ≥ 99.85% pure sucrose and is a widespread additive for numerous nutritional foods and can provide technical functions for many applications. Both products meet the World Codex Standards for white refined sugar.

Processing and Purification into Granulated Sugar: Sugar beet and cane processing facilities have identical objectives: to extract and purify sugar. A simplified explanation of this process begins with the removal of the sugar from the beets or sugar cane. Beets are washed, sliced, and immersed in hot water to allow the sugar to flow into the water. Cane is crushed, and the squeezed juice is collected. In both cases, the resultant juice contains impurities that must be removed to crystallize. Both operations employ slaked lime to capture and settle out non-sucrose impurities and sulfur dioxide to inhibit the Maillard reaction. The juice is dewatered, concentrating the sugar content and later crystallized. The crystallization process is molecularly exclusionary, only allowing sucrose molecules to adhere to the crystal lattice. Post crystallization, slurries of crystals are then separated through centrifuges and briefly washed with hot water to remove remaining molasses. The crystals are then dried, stored, and packaged for consumer use.

Raw sugar, a cane-only product, is simply partially purified sucrose with a thin film of cane molasses to be further purified or used directly. There are minor differences in processing both products, but the key processes are very similar.

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Chemical Properties: Both beet and cane sugars consist of pure sucrose. Sucrose is a disaccharide, meaning that is consists of two monosaccharides: fructose and glucose. Chemically, sucrose is indistinguishable, and regulatory authorities and technical advisory committees such as the FDA and the United States Pharmacopeia's Food Chemical Codex monograph view it as identical.

As mentioned earlier, the result of this process is a product that is ≥ 99.85% pure sucrose regardless of the organism from which it was derived. A large contributor to the debate in differences between the two products stems from the remaining 0.15%, most of which consists of moisture and a component technically known as ash. Ash is measured by conductance and consists of insoluble and soluble salts of organic and inorganic acids and bases, primarily consisting of sodium and potassium. Most ash is from water that adheres to the surface of the crystal or minute amounts trapped in the crystal layers during crystallization. Regarding ash, there may be differences between sucrose derived from sugar beets and sugar cane due to the makeup of the organism, e.g. grasses vs. roots. While slightly different, this has no distinguishing effect on the product's physical properties, nutrients, and functionality.

Nutritional Properties: The nutritional properties of beet and cane sugar are identical and may be used interchangeably. The nutritional facts panels are indistinguishable.

Functionality: In addition to adding sweetness, sugar has numerous technical functions in food products. Some of these include enhancement to aroma, volume, texture, freezing point reduction, shelf life extension, caramelization, moisture retention, and fermentation process; most of which are vital to many food products. To discern the difference between the two products and their effect on sensory analysis and food preparation, a study was commissioned by the United States Beet Sugar Association with the Culinary Institute of America (CIA). The CIA's final statement included:

> "In an independent study conducted by The Culinary Institute of America's Industry Solutions Group, sugar from sugar beets was shown to perform as functionally equivalent to cane sugar, with no discernable taste difference found in products evaluated in sensory testing."

Consumers may have preferences, but according to the CIA, there are no noticeable differences between beet and cane sugar.

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Biotechnology: Cane sugar is derived from sugar cane that has not been genetically modified and may be considered non-GMO. Beet sugar, on the other hand, is derived from sugar beets that have been genetically modified. Sugar beets are grown from seed utilizing Monsanto Event H7-1. While beet sugar is not considered non-GMO, the product is a pure carbohydrate, and does not contain proteins derived from genetically modified DNA. Beet sugar is analyzed annually and found to be polymerase chain reaction (PCR) negative. The GMO debate is complex and controversial, with numerous assertations and claims that currently lack unified support from the scientific community. The breadth of the GMO discussion is beyond the scope of this letter.

Conclusion: National Sugar Marketing services our customers with supplies of both beet and cane sugar to meet their unique needs and enhance their foods. The critical properties of the two products are identical and they can be interchanged without usage modification by the customer.

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Supporting documentation available upon request.