

SUGAR BEETS



Sugar beets are the principal source of sugar outside of the tropical areas of the world, where sugarcane is used. Although beets were used for many centuries as food and animal feed, beets for sugar are a relatively recent development. In 1747, Robert Marggraf, a chemist in Berlin, discovered a small amount of sugar in the juice of beets, but thought that there wasn't enough sugar to warrant developing the techniques needed to extract it. Fifty years later, a student of Marggraf's, Mr. Archard, re-kindled the search for extraction techniques, and the development of beets with higher sugar content. His efforts were effective and he founded the first beet sugar factory, in 1802 in Kunern, Germany.

In the early 1970's, California and the desert Southwest accounted for about 30 percent of national sugar beet production. The closing of the processing plants in Arizona and California in the 1980's coupled with the transition to more profitable alternative crops have contributed to the subsequent drop in acreage in the region.

In the Yuma area sugar beets are a winter crop, planted in the fall and harvested in the spring and early summer. When fully grown, a sugar beet is about a foot long, weighing two-to-five pounds, and is about 18% sucrose. Beet sugar represents about 54% of domestically-produced sugar. There is no difference between beet and cane sugar.

In the United States, genetically modified Sugar Beets resistant to the herbicide, glyphosate, (marketed by Monsanto as Roundup) are slated to be planted for the first time in the Spring of 2008. Sugar from the biotechnology-enhanced sugar beet has been approved for human and animal consumption in the European Union. This action by the EU executive body allows unrestricted imports of food and feed products made from glyphosate-tolerant (Roundup Ready) sugar beets.

The sugar beet is a hardy biennial plant that can be grown commercially in a wide variety of temperate climates. If not harvested, during its second growing season, the nutrients in this root are consumed to produce the plant's flowers and seeds. In commercial beet production, the root is harvested after the first growing season, when the root is at its maximum size.

Recently, Syngenta AG has developed a "tropical sugar beet. It allows the plant to grow in tropical and subtropical regions. Beets are planted from a small seed; about 2 pounds of beet seed comprises 100,000 seeds and will plant over 2 acres of ground.

Up until the latter half of the 20th century, sugar beet production was highly labor-intensive, as weed control was managed by densely planting the crop, which then had to be manually thinned and weeded as many as three times during the growing season.

Processing sugar beets separates sucrose from insoluble pulp, soluble non-sugars, and water.

The roots are washed, cut into strips and conveyed slowly toward the top of a diffusion tower where hot water is added which extracts the sugar from the beet pulp. The sugar is dried and crystallized within granulators, cooled and sold as granulated sugar, blended with flour to make powdered sugar or mixed with molasses to make brown sugar.

Sugar is an important source of carbohydrate, the body's primary energy source. Sugar can contribute to the flavor, aroma, texture, color, and body of healthy, but not-very-tasty, foods. It helps bread rise by acting as a food for the yeast. In baked products, it contributes to flavor and crust color as well as prolonged shelf life. Sugar preserves jams, jellies and canned goods against the growth of yeast and molds.

The sucrose molecule is composed of twelve atoms of carbon, twenty-two atoms of hydrogen, and eleven atoms of oxygen ($C_{12}H_{22}O_{11}$). Sugar beet processing produces refined sugar and 2 main byproducts: pulp and molasses. Pulp, the vegetable matter remains after the beet pulp is pressed and dried is formed into pellets and used as a nutritious feed for cattle. Molasses, an unrefined sugary syrup is produced by cooking shredded sugar beet for several hours, then pressing the resulting sugar beet mash and concentrating the juice produced until it has the consistency similar to that of honey.

In a number of countries, sugar beets are used to make a type of "rum," known as *tuzemak*. In some European countries, especially in the Czech Republic and Germany, sugar beets are also used to make a form of vodka.

The first U.S. sugar beet mill opened in 1838, but the first commercially successful mill was established by E. H. Dyer in 1879. Historically, sugar was only produced from sugar cane and then only in relatively small quantities. This resulted in sugar being considered a great luxury, particularly in Europe where cane could not be grown.

The history of man and sugar is a subject in its own right but suffice to say that, even today, it isn't easy to ship food quality sugar across the world, so a high proportion of sugar is made in two stages. Raw sugar is made where the sugar grows and white sugar is made from the raw sugar in the country where it is needed. Beet sugar is easier to purify and most is grown where it is needed so white sugar is made in only one stage.

Sugar is made by some plants to store energy that they don't need straight away, similar to animals storing fat.

U.S. Sugar beet seed production started in 1936, and today, most seed is produced in Oregon.

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