

Make Your Own Gumdrops

*The story of sugar



Introduction:

The average American today consumes approximately 130 pounds of sugar each year. Sugar can also be used by nonfood industries: mixing cement, tanning leather, making plastics, medicines (to disguise or enhance taste). Sugar comes from sugar cane or sugar beets.

Sugar Cane

Sugar cane is a tall grass plant that grows in tropical and semi-tropical climates. The top producers are Brazil, India, China, Thailand, and Pakistan. In Europe, during the Middle Ages, the high cost of sugar made sugar candy a delicacy available only to the wealthy. Sugar cane is harvested by chopping down the stems and leaving the roots so that it re-grows for the next harvest. Cane juice must be extracted from the cane. The cane is crushed in a series of large rollers and the juice comes out. Since the juice still has soil, small fibers, and green extracts in it, it must be cleaned with slaked lime. The juice is thickened into syrup by boiling off the water using steam and evaporation. The syrup is put into large pans for boiling. Most water is boiled off until the sugar crystals can grow. This is spun in a centrifuge to separate the crystals and mother liquor. The crystals are dried with hot air before storage. The final raw sugar looks like a sticky brown mountain, so it is usually refined when it gets to the country where it will be used.

Sugar Beets

Sugar beets originated in Ancient India. In 1747, a German chemist named Andreas Marggraf proved there was sugar in sugar beets and it could be extracted. Sugar beets grow in temperate climates. The top producers are France, the Russian Federation, United States, Germany and Turkey.

Sucrose is stored in the sugar beet's fleshy root. The tops of sugar beets are fed to livestock or used as fertilizer. Beets are harvested in autumn and early winter by digging them out of the ground. They are taken to the factory, washed, and separated from any beet leaves, stones, or trash materials that were collected with them during harvest. To extract the sucrose, the beets are sliced into thin chips. The chips are called cossettes. This increases the surface area so the sugar is easier to extract. The extraction takes place in a diffuser for about an hour with hot water. (Similar to the color and flavor of tea coming out of tea leaves in a teapot.) Next, the sugar beet slices are pressed to squeeze as much juice from them as possible. The pulp leftover from the pressing is sent to a drying plant where it is turned into pellets which are used for some animal feeds. The juice is cleaned before it is used for sugar production. This is done by growing small clumps of chalk in the juice. As the chalk forms, it collects the non-sugars and both are filtered out. The juice is then put in a multi-stage evaporator. As the water is boiled, sugar crystals grow. This mixture is spun in a centrifuge to separate the crystals and mother liquor. The crystals are dried with hot air before being packed or stored. The final sugar is white. Beet molasses is the syrupy left-over liquid from the sugar extraction process. The molasses is used as an additive in livestock feed, during the fermentation of ethanol, and is also mixed with salt or brine and used as a de-icer for roads during the winter months.

Sugar can be found in candies such as Hershey[®] bars, Snickers[®], Reese's[®] Peanut Butter Cup, Almond Joy[®], Spree[®], Starburst[®], M&M's[®], 100 Grand[®], Mars[®], Junior[®] Mints, Dots[®], York[®] Peppermint Patties, Pinwheel Mints, Licorice, Werthers[®] Originals, Candy Corn, Brachs[®] Maple Nut Goodies, Whoppers[®], Butterfinger[®], Chocolate Covered Cherries, Peanut Brittle, Gumdrops, Tolberone[®], Chocolate Orange[®], and Peeps[®].

Common Core:

CCSS.ELA-Literacy.RI.5.7; RI.5.9; W.5.2; W.5.4; W.5.7

Next Generation Science Standards:

Earth's Systems-5-ESS2-1

Engineering Design-3-5-ETS1-2; 3-5-ETS1-3

Suggested Reading:

Charlie and the Chocolate Factory by Roald Dahl ISBN-13: 9780142410318

Materials Needed:

- Jello® powder (one teaspoon per child)
- Water
- Paper Plates
- Sugar
- Eyedropper

Directions:

Make Your Own Gumdrops

1. Pour a teaspoon of Jello® powder on a paper plate.
2. Add drops of water to the powder while you mix it with your finger.
2. Roll the mixture into a ball.
4. Next roll the gumdrop in some sugar.
5. Pick it up with your fingers and enjoy!

Discussion Questions:

1. Where does sugar come from?
2. What are some non-food uses of sugar?

Lesson Extenders:

1. Ask your students to research the top five countries that eat the most sugar confectionary per capita and create a graph to represent the data found.
2. Ask the students to research the life of Andreas Marggraf and write a short biography.
3. Ask your students to research the process of making sugar in a factory and draw a flow chart on a piece of poster board showing the process.
4. Ask your students to research where sugar beets grow in the U.S. and mark the locations on a map.