

INTERFERING WITH CRYSTAL FORMATION: FUDGE



Lab Group Partners: _____

Kit # _____ Food Science, Hr _____

Safety

- * Use food preparation sanitation procedures
- * Use hot pads for handling hot equipment
- * Use long handled wooden spoon to keep hands well away from boiling syrup

Purpose

In this experiment, you will examine the effect the fat content of a liquid ingredient in fudge has on the speed of sugar crystal growth. Quality candy is determined largely by the size of the sugar crystals. Good rock candy has large crystals. Quality fudge has a smooth, creamy texture, which is a result of very small sugar crystals. Sugar crystals form as the candy cools. Ingredients can interfere with or encourage the growth of sugar crystals.

Equipment

8 x 8" baking pan
Non-stick cooking spray
Dry measuring cups
Liquid measuring cup
Heavy saucepan
Wooden spoon
Candy thermometer
Microscope
Microscope slide

Supplies

2 3/4 cups sugar
4 ounces unsweetened chocolate
3 tablespoons butter
1 cup of **assigned variation of liquid** (see below)
1 tablespoon corn syrup
1 tablespoon vanilla extract
1 drop glycerin

Directions

DAY 1

1. Grease an 8 by 8-inch pan with non-stick cooking spray.
2. In a heavy-bottomed saucepan, combine the sugar, chocolate, 1 ½ tablespoons of the butter, ASSIGNED VARIATION OF LIQUID, and corn syrup. Over medium heat, stir with a wooden spoon until sugar is dissolved and chocolate is melted.
 - **VARIATION 1:** WATER
 - **VARIATION 2:** FAT FREE MILK
 - **VARIATION 3:** LOW FAT MILK
 - **VARIATION 4:** WHOLE MILK
 - **VARIATION 5:** HALF AND HALF
 - **VARIATION 6:** HEAVY WHIPPING CREAM
3. Increase heat and bring to a boil. Reduce heat to medium-low, cover, and boil for 3 minutes.
4. Remove the cover and attach a candy thermometer to the pot. Cook until the thermometer reads 234 degrees F. Remove from the heat and add the remaining butter. Do not stir. Let the mixture cool for 10 minutes or until it drops to 130 degrees F.
5. Add vanilla and mix until well-blended and the shiny texture becomes matte. Pour into the prepared pan. Let sit in cool dry area until firm.

DAY 2

1. Cut into 1-inch pieces. Using 1 piece, place a pinch of fudge on a microscope slide and add a drop of glycerin. Examine the sugar crystals under a microscope.
2. Note the differences in crystal size and shape.
3. Note any other substances that are visible under the microscope.
4. Note the differences in crystal size and shape.
5. Note any other substances that are visible under the microscope.
6. Taste a piece of each fudge variation and note the flavor, color, and texture.
7. Document in the chart below for each variation. Repeat for all samples.

Pre-Lab:

Purpose: _____

Procedure Summary:

Lab:

Data

	Variation 1	Variation 2	Variation 3	Variation 4	Variation 5	Variation 6
<i>Crystal size & shape</i>						
<i>Other substances visible under microscope</i>						
<i>Flavor</i>						
<i>Color</i>						
<i>Texture</i>						

Post-Lab

Questions:

1. What relationship did you observe, if any, between the flavor of the fudge and the liquid used?
2. Was there a relationship between the color of the fudge and the liquid used?
3. Which, if any, variations have a texture other than the creamy texture typical of good fudge?
4. Which fudge had the largest sugar crystals?
5. Which fudge had the smallest sugar crystals?
6. Which variation made the best quality fudge?

Recipe/Experiment adapted from:

http://www.foodnetwork.com/food/cda/recipe_print/0,1946,FOOD_9936_26073_RECIPE-PRINT-FULL-PAGE-FORMATTER,00.html?oc=linkback