

12 20 32 40 60

Figure 2.—Sample of a color test. The dilution in test tube 12 shows a positive reaction. Test tube 20 shows a doubtful reaction. The other three dilutions show negative reactions.

KEY TABLE

For Interpreting Results of Color Test of Five Dilutions
 [— indicates negative reaction; + indicates positive reaction; ± indicates doubtful reaction]

Reactions for 5 Dilutions					Invert-Sugar Content of Sirup (Percent)	Suitability of Sirup for Making into Cream
12	20	32	40	60		
—	—	—	—	—	Less than 2	Suitable.
+	—	—	—	—	More than 2, less than 3.	Suitable, if sirup is heated 2 to 4 degrees higher than usual in cream making.
+	±	—	—	—	More than 2, less than 4.	Not suitable.
+	+	—	—	—	More than 3, less than 4.	Not suitable.
+	+	±	—	—	More than 3, less than 5.	Not suitable.
+	+	+	—	—	More than 4, less than 5.	Not suitable.
+	+	+	±	—	More than 4, less than 6.	Not suitable.
+	+	+	+	—	More than 5, less than 6.	Not suitable.
+	+	+	+	±	More than 5, less than 7.	Not suitable.
+	+	+	+	+	Above 6, may be 7 or more.	Not suitable.

Procedure

The test for invert sugar is made in two main steps.

- Step 1. Preparing a 1-to-20 sirup-and-water mixture.
- Step 2. Color-testing the 1-to-20 sirup-and-water mixture for invert sugar. This will show whether the sirup contains too much invert sugar to permit its being creamed.

Preparing sirup-and-water mixture

Fill pint bottle with water. Fill measuring cup to the ½-cup mark with water. Fill medicine glass to the 1-ounce mark with sirup.

Pour both the measured pint of water and the 1 ounce of sirup into the quart bottle.

Rinse remnants of the sirup from the medicine glass by successively filling it with water from the measuring cup. Repeat the rinsing of the medicine glass at least four times; transfer each of the rinses to the quart jar.

Transfer any water remaining in the measuring cup to the quart jar. One ounce of sirup and 1 pint plus ½ cup of water (20 ounces) yield a 1-to-20 dilution.

Stir the 1-to-20 sirup-water mixture vigorously with the table-spoon for ½ minute to insure complete and uniform mixing.

Color-testing the dilution

1. Place test tube in the holder.
2. Fill a clean, dry medicine dropper with the 1-to-20 dilution.
3. Hold the filled medicine dropper vertically (bulb up) over the test tube; be careful not to touch the test tube with the tip of the medicine dropper.
4. Squeeze the bulb of the medicine dropper slowly; allow exactly 5 drops of the diluted sirup to fall into the test tube. Lay the dropper aside.
5. Fill another clean, dry medicine dropper with water. Add exactly 10 drops of water to the test tube.
6. Place a Clinistest tablet in the test tube. The tablet, as it dissolves, causes the contents of the test tube to boil. Do not move the test tube while solution is boiling.
7. Fifteen seconds to 1 minute after the boiling stops, add water until test tube is two-thirds full.
8. Hold the test tube by the top rim between the thumb and index finger and shake gently to mix contents.
9. Compare the color of the solution with the colors of the test tubes in figure 2, page 4. The illustration depicts colors with more clarity than is possible with words. Make the color comparison in a room lighted with an incandescent bulb. You cannot easily judge the colors by fluorescent or direct sunlight.

Interpreting the color.—If the color is blue, like tubes 32, 40, or 60 (fig. 2), the test reaction is negative and indicates that the sirup contains less than 2 percent invert sugar. It is satisfactory for making maple cream.

If the color is yellow-green, similar to the color of tube 20 (fig. 2), the reaction is doubtful and indicates that the sirup contains more than 2 percent, but less than 3 percent, invert sugar. The sirup can be used for creaming, but it must be boiled to a temperature 2° to 4° F. higher than if the sirup contained 2 percent or less invert sugar.

If the color is yellow, like tube 12 (fig. 2), or yellow-brown, the reaction is positive and indicates that the sirup contains more than 3 percent invert sugar. It is not suitable for making maple cream.

If doubtful about the color you developed in the test tube, compare it with a solution that is a definite color.

Testing MAPLE SIRUP for Creaming

Producers of maple sirup can increase their income by making some of the sirup crop into maple cream, or "butter"—a spread that is good on pancakes, waffles, toast, and bread. The cream made from the sirup will sell for at least half again as much as the sirup.

Some sirups cannot be made into maple cream because they contain too much invert sugar, which retards crystallization. This leaflet explains two methods for testing maple sirup for invert sugar content, a short method and a long one. It also includes a simple recipe for making maple cream.

COMPOSITION OF SIRUP

Maple sirup contains both sucrose and invert sugars. Most of the sugar is sucrose; a little is invert. Because of the difference in chemical structure, the sucrose sugar crystallizes to make the cream, and the invert sugar influences the way the sucrose crystallizes. The degree to which invert sugar slows or prevents the crystallization depends on the amount present in the sirup.

Few sirups contain too little invert sugar—the main problem is to avoid using those that contain too much. The following table shows how much invert sugar can be tolerated in sugar for making a good cream. It also shows what can be expected if sirups too high in invert sugar content are used.

INVERT-SUGAR CONTENT OF SIRUP (Percent)	SUITABILITY FOR CREAM
0.5 to 2.....	The right amount of invert sugar for making a fine-textured cream—one that feels smooth to the tongue. Sirup is cooked 22° to 24° F. hotter than boiling water.
2 to 3.....	Can be made into cream if sirup is cooked until it is 2° to 4° F. hotter than temperature called for in standard recipes for cream.
3 or more.....	Not suitable for cream. Sirup will crystallize only if it is heated to a much higher than standard temperature. Resulting cream will separate a few days after it is made.



Figure 1.—Materials for making the short test.

MAKING THE SHORT TEST

The short, or qualitative, method will show whether a sirup is suitable for making cream. This simple test of one dilution is most often used by sirup makers.

Materials

Here are the materials you will need for the test. Except for three items, all can be found or made at home.

Clinitest¹ tablets. Drugstores stock these inexpensive tablets. They are sold by the bottle, or as a part of a kit.

1 test tube, about ½ inch in diameter and 3 to 4 inches long.

2 medicine droppers.

Sample of sirup to be tested.

1 transparent measuring cup.

1 quart bottle with wide mouth (fruit jar).

1 one-ounce medicine glass.

1 one-pint bottle.

1 tablespoon.

1 test-tube holder; make this from a block of wood 2 inches square and 1 inch thick. Drill a hole in the center about ⅝ inch in diameter and ⅛ inch deep.

2 four-ounce drinking glasses.

Water.

¹ Trademark. This product is one of several that may be used by diabetics in testing for sugar in urine.

Trade names are used in this publication solely for the purpose of providing specific information. Mention of a trade name does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture.

Write down in order the values you have given the five dilutions, starting with the 1-to-12 dilution at the left.

Special Note: If the first sirup test proves positive in the 1-to-20 dilution and negative in the 1-to-60 dilution, you will readily see the difference between a positive and a negative color reaction.

It is possible, however, that the sirup you test will give either a positive or a negative test in all dilutions. If this happens, and you are doubtful about your interpretation of the results, it will be helpful to have a solution that you know will give a positive test.

To make such a solution, add 3 drops of corn sirup to the 4-ounce glass containing the sample of the 1-to-60 dilution. Stir the corn sirup into the diluted sirup.

In the remaining clean test tube, place 5 drops of this solution. Add 10 drops of water, then one Clinitest tablet. After boiling has stopped, add water until the test tube is two-thirds full.

The color that develops will be the color that indicates a positive reaction.

Determining invert-sugar content of sirup.—To find the invert-sugar content of the sirup you are testing, find the line in the Key Table (p. 4) that contains the same combination of values for the five dilutions that you have obtained in the color test.

As the table shows, the sirups that are most suitable for making into cream are those that are negative in all dilutions or positive in the 1-to-12 dilution and negative in all the others.

RECIPE FOR MAPLE CREAM

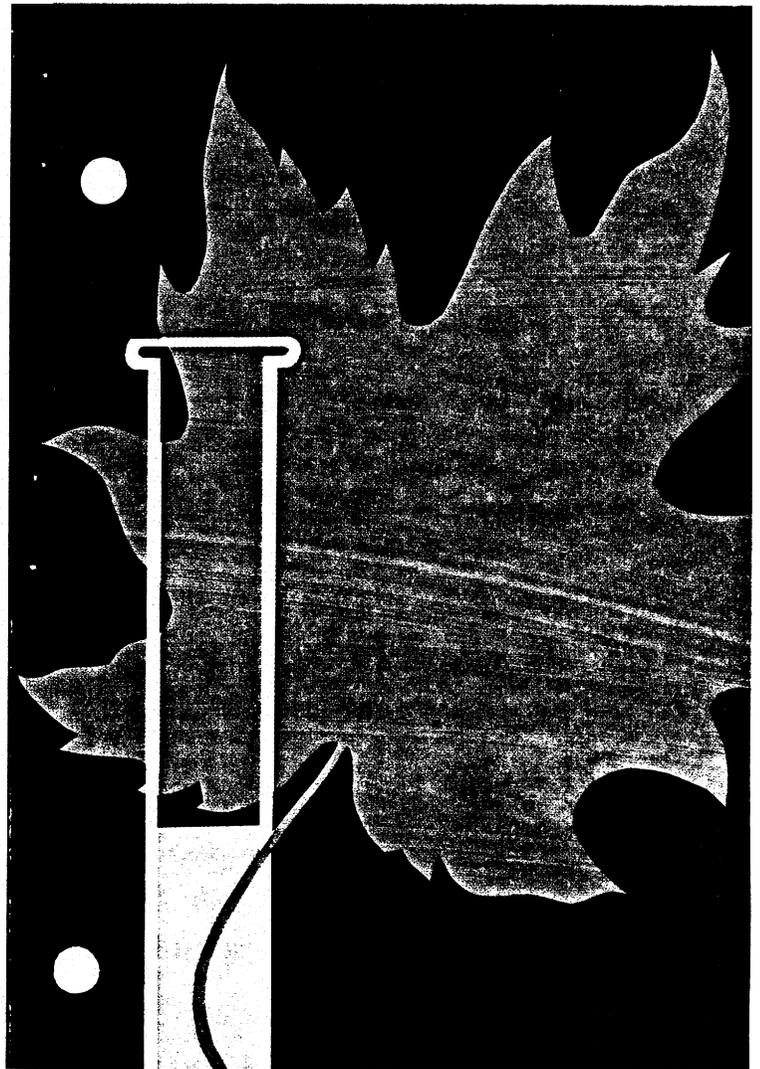
Maple cream making is a fairly simple process, similar to making fudge or fondant.

Directions are as follows:

1. Boil sirup to a temperature of 22° to 24° F. above the boiling point of water.

2. Remove from heat and cool rapidly to at least 70° F., preferably to 50° or below. Rapid cooling is necessary to prevent crystallization. To provide a large cooling surface, the hot sirup is poured into large, flat-bottomed pans. The layer of sirup should be not more than 1 to 3 inches deep. The pans are set in a trough through which cold water (35° to 45°) is flowing.

3. Stir the chilled sirup continuously until it "creams."



Testing MAPLE SIRUP for Creaming

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To develop the yellow or yellow-brown color showing positive reaction, first prepare a 1-to-20 dilution, as described earlier, substituting corn sirup for the maple sirup. Then using this 1-to-20 corn sirup dilution to replace the maple sirup dilution, follow the directions for color-testing on page 5.

To develop a negative blue color for comparison, substitute 5 drops of water for the 5 drops of 1-to-20 dilution called for in color-testing.

MAKING THE LONG TEST

The long, or quantitative, method involves testing five dilutions of sirup to find out the invert-sugar content. It provides information useful in selecting the procedure for creaming that will give the best results.

Materials

Following is a list of the materials you will need for the testing.

Clinitest tablets. As mentioned previously, drugstores stock these inexpensive tablets—by the bottle, or as part of a kit. A color scale on a small card comes with the tablets; this scale will be used in the test. You will need five tablets each time you make the test.

- 7 medicine droppers.
- 6 test tubes, about ½ inch in diameter and 3 to 4 inches long.
- 1 package small gummed labels.
- 1 two-ounce medicine glass.
- Sample of sirup to be tested.
- Water, about 4 quarts.
- 1 transparent measuring cup.
- 1 pail or other large container that holds at least 4 quarts.
- 1 long-handled spoon or paddle.
- 5 four-ounce juice glasses.
- 1 test-tube holder. Make this from a block of wood that is at least 8 inches long, 3 inches wide, and 1 inch thick. Drill five holes in the wood; make each hole ⅜ inch in diameter and ½ inch deep. Label the holes from left to right: 12, 20, 32, 40, and 60.
- Pencil and paper.

Procedure

Preparing sirup-and-water mixtures

For this step you will need the water, medicine glass, measuring cup, large container, spoon or paddle, pencil, juice glasses, and labels. All glassware must be thoroughly dry at start.

Thoroughly stir the sirup to be tested before taking the sample. If the sirup is in a tank, drum, or 5-gallon can, take about a cup of the sirup and then measure exactly a 2-ounce sample from this by carefully pouring the test sirup from the cup to exactly the 2-ounce mark of the medicine glass. Return unused sirup to container. Wash and dry measuring cup for later use.

Dilute the 2-ounce sample by adding successive amounts of water as follows:

1-to-12 dilution (2 ounces sirup and 24 ounces water).—Pour

3 measured cups of water into the pail or container. Add 2 ounces of sirup. Remove any sirup remaining in the medicine glass by dipping it into the container and shaking the glass vigorously in the water.

Fill one of the 4-ounce glasses half full from the 1-to-12 diluted sirup in the container. Label the glass "12" and set aside.

1-to-20 dilution.—To the diluted sirup in the container, add 2 cups (16 ounces) water. Stir the contents until well mixed. Remove half a glassful (2 ounces) and label it "20."

1-to-32 dilution.—Add 3 cups (24 ounces) water to the contents in the container. Stir well. Remove half a glassful (2 ounces) and label "32."

1-to-40 dilution.—Add 2 cups (16 ounces) water to the contents in the container. Stir well. Remove half a glassful (2 ounces) and label it "40."

1-to-60 dilution.—Add 5 cups (40 ounces) water to the contents in the container. Stir well. Remove half a glassful (2 ounces) and label it "60."

Color-testing the dilutions

For this step you will need the labeled samples of the five dilutions, test-tube holder, test tubes, medicine droppers, Clinitest tablets and color scale, a small amount of water, pencil, and paper.

Make the color test as follows:

1. Place five test tubes in the test-tube holder.
2. Fill a clean, dry medicine dropper with the diluted sirup from the glass labeled "60." Hold this dropper above the test tube that is in the hole marked "60" and let exactly 5 drops of the diluted sirup fall into the test tube.

Similarly, place exactly 5 drops of the "40" dilution, 5 drops of the "32" dilution, 5 drops of the "20" dilution, and 5 drops of the "12" dilution in the tubes numbered for these dilutions. Use a separate clean, dry medicine dropper for each dilution.

3. Fill another clean medicine dropper with water and add 10 drops of water to each of the five test tubes; refill the medicine dropper as necessary.

4. Remove five Clinitest tablets from bottle or wrapper. Place on a clean piece of paper.

5. Place one tablet in each test tube, in order, starting with the tube marked "60."

The tablets, as they dissolve, cause the contents of the tubes to boil. Do not move the test tubes while the solutions are boiling.

6. Fifteen seconds after boiling stops, add water to the test tube marked "60" until the tube is two-thirds full. Add the same amount of water to the other four test tubes, in order, from right to left.

7. Compare the colors in the test tubes with the two colors of the color scale marked "trace" and "+." Disregard everything else on the scale; the other colors and the labels on all the colors have no relationship to this test.

Make this comparison in a room lighted with an incandescent bulb. You cannot judge the colors of the solutions for this test with fluorescent light or with light from the sun only.

Assign to the mixture in each tube one of three values: positive (+), negative (−), and doubtful (±), according to the following standard.

<i>Color of solution</i>	<i>Value</i>
Same as or more blue than color on scale labeled "trace."	Negative (−)
Same as or more yellow than color on scale labeled "+."	Positive (+)
Between "trace" and "+" colors on scale.	Doubtful (±)