Factors in the Preparation of Maple Cream

F. W. Hayward
ABSTRACT

MAPLE cream is a soft fondant prepared from pure maple sirup. Difficulty is often encountered in preparing a product of uniform quality.

A good quality sirup is necessary to prepare a good cream. Use of moldy, fermented, or high invert sugar sirup should be avoided. It is often advisable to check each batch of sirup on an experimental scale.

In preparing cream, the sirup should be boiled rapidly to 20° F above the boiling point of water. Temperatures should be checked carefully.

Fine crystal formation is essential to a smooth, fine-textured cream. This will depend upon conditions during crystallization.

The boiled sirup should be cooled quickly to room temperature, seeded with a few crystals of dry maple sugar, and stirred until crystallization is complete.
FACTORs IN THE PREPARATION OF MAPLE CREAM

F. W. HAYWARD

INTRODUCTION

Many producers of maple products who sell directly to the consumer have found maple cream a very profitable item. Considerable difficulty has been reported in making a cream of uniform quality when using late-season sirup, which often has a high invert sugar content, altho this sirup may be perfectly satisfactory in color and flavor.

The investigation reported here was undertaken particularly to determine the influence of invert sugar on the crystallization of sugar during maple cream preparation; and on the basis of the results, to suggest procedures to insure manufacture of a uniformly high quality product.

MAPLE CREAM

Maple cream is a soft fondant which is prepared from pure maple sirup by boiling until a temperature of about 232°F is reached, cooling to room temperature, and then stirring or beating the cooled mass until crystallization is complete. It is used principally as a spread for waffles, pancakes, cakes, and sandwiches.

A maple cream of good quality is light brown in color, has true maple flavor, has a consistency about that of peanut butter, is so smooth it does not grit between the teeth, and shows no separation of sirup after long standing.

INVERT SUGAR

Invert sugar is a mixture of dextrose and levulose formed by the splitting of sucrose, the chief sugar of maple sirup. It is produced by the action of bacteria on maple sap, by the yeasts and acids of fermented sirup, and by the molds which sometimes grow on maple sirup. All maple sirups contain small amounts of invert sugar, averaging about 1.5 per cent, but in normal sirups there is rarely over 5 per cent.\(^1\) Excessive amounts are usually accompanied by off-flavors,

which are produced by the bacteria, yeasts, or molds, and such sirups would therefore not be used in the manufacture of maple cream.

CONTROL OF QUALITY IN MANUFACTURE OF MAPLE CREAM

COLOR

The color of maple cream is largely determined by that of the sirup used in its manufacture. It is influenced somewhat by the number and size of crystals, many small crystals making the cream appear lighter in color. Slow boiling of the sirup causes greater caramelization and a darker product. Since invert sugar is more easily caramelized, a sirup of high invert content tends to produce a darker maple cream.

FLAVOR

The true maple flavor of the cream also depends upon the quality of the sirup used in its manufacture. Prolonged boiling of a high invert sirup causes a strong caramel flavor which masks the more delicate maple flavor.

CONSISTENCY

The consistency of maple cream is largely determined by the sugar concentration of the boiled sirup as indicated by the boiling temperatures. Accurate control of this final temperature is of vital importance in quality control. For a normal sirup a temperature elevation of 20°F above the boiling point of water is satisfactory. A lower temperature causes a thin fluid cream, and a higher temperature yields one that is too stiff to spread. Large amounts of invert sugar lower the viscosity of the sirup\(^2\) and makes the cream too thin. Under such conditions it is necessary to boil the sirup to a higher temperature to obtain the desired consistency.

TEXTURE

The texture of maple cream is determined by the size of the sugar crystals and this depends on the conditions during crystallization. The formation of a great many very fine crystals is necessary for a smooth maple cream. This is best accomplished by cooling the boiled sirup to room temperature so that it is very viscous before stirring is

\(^2\)Lang, L. Some properties of maple sugar that affect candy. The Manufacturing Confectioner, June, 1931.
started. The sugar (sucrose) is held in supersaturated solution until the shock of stirring starts crystallization. Each crystal grows rapidly until the surrounding solution is exhausted of excess sugar. The high viscosity of the cooled sirup prevents contact of the crystal with more supersaturated solution. In this way, as stirring is continued, the formation of many small crystals is favored and none of them grows large enough to make the cream undesirably granular. If the boiled sirup is stirred while still hot, the mass is more fluid and the crystals formed come easily in contact with supersaturated solution, causing more rapid growth and fewer but larger crystals. Such a cream has a coarse granular texture.

**SEPARATION OF SIRUP**

After standing for some time, a layer of sirup often forms on top of the maple cream which makes the appearance unattractive. This separation is more often noticed when the sirup is not boiled to a high enough concentration. As invert sugar lowers the viscosity of the sirup, the crystals in such creams settle much faster. Invert sugar is also more soluble than sucrose and this increases the ratio of liquid to solids in maple cream. By boiling high invert sirups to a slightly higher temperature, these difficulties may be overcome and a better quality product made.

**DELAYED CRYSTALLIZATION**

One of the most troublesome properties of invert sugar in maple cream preparation is its tendency to remain in supersaturated solution. This delays the formation of crystals so that a much longer period of stirring is necessary when making maple cream from high invert sirup. It seemed probable that this difficulty could be overcome by seeding the cooled sirup.

A series of sirups was made containing various amounts of invert sugar from 0 to 20 per cent. Sucrose (cane sugar) and water were used to bring the total sugar concentration of the sirup to 65 per cent, which is about that of standard maple sirup. Each sirup was then boiled in a Pyrex beaker to a temperature elevation of 20°F over that of boiling water. After cooling to 80°F, the viscous sirup was stirred with a glass rod until crystallization was complete. The time of stirring required to start crystallization was carefully noted.

A similar series of sirups was treated in the same manner, except that after cooling and before stirring a few crystals of sucrose were
crushed and dropped into the sirup. The results of these experiments are shown in Table 1.

**Table 1.—The Effect of Seeding with Sucrose Upon the Time Necessary to Start Crystallization of Maple Cream.**

<table>
<thead>
<tr>
<th>Composition of sirup</th>
<th>Time of stirring before crystallization starts, in minutes</th>
<th>Consistency of creamed sirup</th>
<th>Millimeters of sirup on surface after 30 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milliliters of water</td>
<td>Grams of invert sugar</td>
<td>Grams of sucrose</td>
<td>Not seeded</td>
</tr>
<tr>
<td>35</td>
<td>0</td>
<td>65</td>
<td>1</td>
</tr>
<tr>
<td>35</td>
<td>3</td>
<td>62</td>
<td>8</td>
</tr>
<tr>
<td>35</td>
<td>6</td>
<td>59</td>
<td>13</td>
</tr>
<tr>
<td>35</td>
<td>9</td>
<td>56</td>
<td>20</td>
</tr>
<tr>
<td>35</td>
<td>12</td>
<td>53</td>
<td>40</td>
</tr>
<tr>
<td>35</td>
<td>15</td>
<td>50</td>
<td>26</td>
</tr>
<tr>
<td>35</td>
<td>20</td>
<td>45</td>
<td>--*</td>
</tr>
</tbody>
</table>

*Not started after 150 minutes.

It is evident from these results that much time can be saved by seeding the cooled sirup before stirring. Crushed dry maple sugar was also tried in place of cane sugar for seeding and gave similar results. The use of maple sugar is to be recommended in maple cream preparation as it cannot be considered an adulterant. It is also shown that the amount of sirup separating from the cream increased as the amount of invert sugar increased. The cream made from sirup of high invert content was also more fluid in consistency. That made from pure sucrose was a fairly stiff spread, while that with large amounts of invert sugar could be easily poured.

**EFFECTS OF DIFFERENT BOILING TEMPERATURES ON PROPERTIES OF MAPLE CREAM**

A further series of experiments was made to determine the effects of sugar concentration, as indicated by boiling temperature, on the properties of maple cream. A pure maple sirup was selected which had a considerable mold growth in order to insure a fairly high invert sugar content. It was found to contain 4.65 per cent of invert sugar, which would be quite high for a normal sirup. Samples of this sirup were boiled to different temperatures from 16 to 24°F above the boil-
ing point of water. They were then cooled to 80°F, seeded with su-
crose, and stirred until crystallization was complete.

The results (Table 2) show that the undesirable qualities of maple
cream due to high invert sugar content (excessive sirup separation
and softness) can be prevented by boiling such sirups to a higher tem-
perature before crystallizing.

**Table 2.—Effects of Boiling Temperature on the Properties
of Maple Cream.**

<table>
<thead>
<tr>
<th>Elevation of boiling point over that of water, °F</th>
<th>Time of stirring before start of crystallization, minutes</th>
<th>Thickness of sirup layer at end of 30 days, mm</th>
<th>Consistency of cream</th>
</tr>
</thead>
<tbody>
<tr>
<td>16°</td>
<td>10</td>
<td>18</td>
<td>Very fluid</td>
</tr>
<tr>
<td>18°</td>
<td>10</td>
<td>12</td>
<td>Quite fluid</td>
</tr>
<tr>
<td>20°</td>
<td>6</td>
<td>5</td>
<td>Tends to flow</td>
</tr>
<tr>
<td>22°</td>
<td>5</td>
<td>2</td>
<td>Soft spread</td>
</tr>
<tr>
<td>24°</td>
<td>5</td>
<td>0.5</td>
<td>Firm spread</td>
</tr>
</tbody>
</table>

In using a new lot of sirup for the manufacture of maple cream, it is
recommended that several small-scale experiments be made to find
the boiling temperature which gives the desired consistency. This
knowledge can then be used in the production of large batches and a
product of high quality obtained.

**RECOMMENDED PRECAUTIONS IN MAKING
MAPLE CREAM**

1. Select only sirup of good maple flavor. Avoid sirups which taste
"buddy", moldy, or fermented.
2. Experiment on a small scale to find the boiling temperature
which gives the desired consistency of cream.
3. Boil the sirup rapidly to avoid excessive caramelization.
4. Accuracy of temperature control is of vital importance. Check
the thermometer daily in boiling water as temperature varies with
atmospheric pressure. Avoid reading the thermometer from an angle,
as this gives inaccurate reading. Remove the sirup from the heat as
soon as the required temperature is reached.
5. Cool the boiled sirup to room temperature before starting to stir.
6. Seed with a little crushed dry maple sugar and start stirring at
once.
7. Continue stirring or beating until crystallization is complete to
prevent a granular cream.
8. Package in clean, tight containers.
SUMMARY

The factors which influence the quality of maple cream are entirely in the hands of the operator at all times.

A sirup with high invert sugar content is more difficult to crystallize in maple cream production, and causes a soft cream which tends to separate. If the high invert sirup is boiled to a slightly higher temperature, a firmer cream results which is less likely to separate. By "seeding" the cooled boiled sirup with crushed dry maple sugar before stirring, crystallization starts sooner and much time and labor may be saved.

Recommendations are given for making a maple cream of uniformly high quality.