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Introduction

Maple Cream Production

Maple cream is a value-added product that is made from pure maple syrup. The name maple cream, also referred to as maple butter or maple spread, would imply that dairy products are involved, but they are not. Maple cream is made by additional concentration by evaporation, quick cooling, stirring and then packaging at room temperature. Maple spread is an alternative name that does not confuse customers about the inclusion of dairy products. But maple cream is the traditional name and will be used here.

The finished maple cream should be light colored with a smooth, creamy texture that is used on toast, bagels, muffins, pancakes, doughnuts and combined with other bakery or confection products. From a marketing point of view, it is an all-natural product comprised mainly of sugars, but it also has other important nutrients such as amino acids, proteins, organic acids, minerals (calcium and potassium being the most prevalent) and trace levels of some vitamins.

Production Options

In recent years the procedure for making maple cream has been changing with research on shelf-stable maple cream and the introduction of the gear pump maple cream machine. Now a maple producer needs to choose between making traditional maple cream or the higher invert sugar shelf-stable maple cream. A producer can also choose to use the common turn table and paddle cream machine, the spiral drive candy machine, the new gear pump maple cream machine, or the no machine manual stirring method to perform the required agitation to crystallize the maple cream. Each method offers its own advantages and disadvantages.

Traditional Cream

Traditional Maple Cream

Generally maple cream is made from light or medium amber maple syrup, however guessing which syrups to use can result in poor quality maple cream or batch failures. For details on measuring and adjusting invert sugars in maple syrup see the Cornell Maple Bulletin titled “Measuring and Adjusting Invert Sugar in Maple Syrup.” The levels of invert sugar recommended in syrup for making traditional maple cream is between 0.5 and 3% with 1.5% a suggested ideal. When the invert sugar level is between 3 and 4%, use the higher boiling temperatures to finish. See the following chart on the next page for the ideal reading on a glucose meter when using a 1 in 10 syrup dilution.

Boiling

To prepare traditional maple cream, heat syrup to a temperature of 22° to 24° F (12° to 13° C) above the boiling point of water. Boil to the higher temperature on rainy or humid days or when your invert sugar level is between 3 and 4 %. Remember to establish the exact temperature at which water boils at the time the maple spread is prepared since the exact temperature at which water boils depends on weather (atmospheric pressure) conditions. Watch the boiling syrup carefully as the temperature climbs. It can get too hot very quickly near the end. A good digital thermometer, especially one that shows temperatures to one tenth of a degree can be very helpful in more precisely determining the temperature to finish. Many modern digital thermometers also have alarm functions that can help alert you when



the finishing temperature is getting close. See the bulletin on thermometers and temperature measurement. As soon as the syrup reaches the desired temperature it should be removed from the heat and rapidly cooled.

» Glucose Meter Reading

(US)	1 - 10 invert
mg/dL	invert %
20	0.4
30	0.6
40	0.8
50	1
60	1.2
70	1.4
80	1.6
90	1.8
100	2
110	2.2
120	2.4
130	2.6
140	2.8
150	3
160	3.2
170	3.4
180	3.6
190	3.8
200	4
210	4.2
220	4.4
230	4.6
240	4.8
250	5

The light gray indicates values usable in syrup for traditional maple cream

The darker gray indicates values in ideal syrup for traditional maple cream

Cooling

If you are using a paddle and turn table machine for stirring and you are only making a single batch, cool the syrup in the pan that will be used for stirring. If you plan to stir the cream by hand, the syrup can be chilled and stirred in the boiling pan. Rapid cooling reduces premature crystallization. Cooling the cooked syrup in large shallow pans will facilitate quick cooling. Place the pans in a refrigerator or in troughs with circulating cold water and elevate the pans off the bottom so cool water surrounds all sides. Small batches can be efficiently cooled in a sink of cold water. Ice can be added to the water to speed the process. Heat is removed faster by cool water than by cool air. *Be sure that the cooling syrup solution is kept absolutely still.* Do not move or stir it, because crystals will begin to

Do Not Disturb



form and result in a grainy maple spread. Leaving the digital thermometer in the pan as it is cooling is the best way to keep track of the temperature, continually testing the syrup by sticking a thermometer in and out of the syrup may cause it to begin to crystallize. The cooler the syrup becomes before stirring the more, smaller sugar crystals will form and the longer the crystals will stay small while the maple cream is stored. Cooling to between 45°F and 55°F will tend to make the finest cream that will maintain that finer quality longer in terms of weeks and months. The problem with these cooler temperatures is that the syrup can be difficult to remove from the pan used for chilling into the equipment used for stirring and so thick that stirring by hand is very difficult. This thicker, cooler syrup has also been known to stall the various machines used to stir it. For good results, the syrup should be cooled to at least 75°F (24° C) or below before stirring with any method. Stirring the chilled syrup at warmer temperatures tends to make a cream that will separate sooner. In the case where the cream will be consumed immediately, this temperature is not as critical. If crystals begin to form on the surface of the cooling solution, mist the surface lightly with clean water. This creates a very thin layer of low-density syrup on the surface and tends to dissolve the surface crystals and disperse any bubbles or foam.

When you begin stirring the chilled syrup, expect to see the syrup warm up and become more fluid. This warming always happens when crystallization occurs. It is called the heat of crystallization and is not due to the room being too warm or the stirring being too vigorous. Crystallization, similar to ice formation, involves sugar molecules moving from a higher energy state to a lower energy structure releasing energy as heat in the process.

Turn Table Machine

Turn Table Cream Machine

If using a paddle and turn table type stirring machine, adjust the paddles so that one gently scrapes the side of the revolving pan while the other is positioned about a third of the way from the edge of the pan. When the cream reaches the proper consistency, it can be scooped out as the pan turns by using a thumb-operated, 2-ounce portion control scoop. When using a mechanical cream machine and the syrup solution starts to get too stiff, it is possible to soften it by applying a gentle heat source to the outside of the revolving pan. An electric heat gun works well for this purpose. Never heat maple cream above 120°F and recognize that this type of reheating can cause the finished product to be grainy and to separate more quickly.

Hand Stirring

Hand Stirring

Stirring by hand must be done slowly - don't beat or whip the syrup. The objective is to slowly stir the solution until crystals start to form. This will require some time and strength, especially if the syrup is cooled below room temperature. This is usually a two-person operation - one to hold the bowl and one to stir. While being stirred, the cooled syrup first tends to become more fluid (less stiff). Later it will gradually become thicker, lighter in color, and most importantly will lose its glossy appearance and become opaque. Eventually it will become a smooth paste-like consistency. When this occurs, the crystallization process is complete and the spread can be transferred to appropriate containers. If stirring is stopped too soon, the final product may become somewhat grainy due to the formation of larger crystals. Likewise, if the cooking process did not reach the correct temperature, some separation (presence of liquid syrup on top of the crystallized cream) may occur while in storage. If the cream separates, stirring will bring it back together.



Candy Machine

Stirring the mixture too long may cause it to start to harden in the pan. If this occurs, add a small amount of hot water as a mist and stir it in to soften it a bit. If the syrup solution does harden in the pan, it can be immersed into a pan of hot water, heat from a heat gun applied or placed into a warm oven until it can be easily stirred again.

Candy Machine Method

An advantage of making cream with a candy machine is that you can conveniently fill the finished jars directly from the machine; hand scooping will not be necessary. This machine also will allow you to run multiple batches without stopping by simply continuing to add syrup to the trough. Further, you can produce two products with one machine.

When making maple cream with the candy machine you would start the worm drive and then slowly fill the trough about half full with the chilled syrup and allow it to stir until the syrup in the trough forms crystals and loses that glossy appearance. This may take anywhere from just a few minutes to 20 to 40 minutes depending on many factors. There will be a few minutes before the syrup warms from the heat of crystallization when it will tend to bunch up at the far end of the trough. If you have filled the trough with too much syrup it can easily overflow the sides near the far end. When the cream loses that glossy appearance and looks finished, begin gradually adding more syrup to the trough from the pan or pig and gradually fill jars or containers with finished cream by opening the end of the trough.

Gear Cream Machine

Gear Pump Cream Machine

This is the fastest and easiest way to make large amounts of cream. Machines from equipment manufacturers are expensive, but it is the way to go for larger producers.

When making maple cream with the gear pump maple cream machine, start the pump before you fill the top cone with syrup. Also, lightly mist the cone and pump with warm water and gradually add the chilled syrup to the cone until the syrup begins to circulate. Too much chilled syrup at once has been known to stall the pump or increase current draw causing circuit breakers to open. This method of stirring causes the syrup to crystallize rapidly so that the loss of the glossy appearance takes just a few minutes and canning can begin soon after starting the process. So have your containers ready before you begin. Continually scrape the interior of the cone while you are filling containers so it will completely empty. The gear pump cream machine allows for continuous operation with multiple batches. When switching to an additional batch, be sure that all the syrup gets into circulation as it is possible for some to stick in the cone and get pumped directly into a jar without proper stirring. Also do not try to rinse the cone between batches as water will be trapped and upset the density of the next batch.

With this machine containers can be quickly and easily filled without any scooping or extra handling. Be sure that all of the syrup has moved through the pump and crystallized before you begin filling jars. It is easy for pockets of syrup to be in the cone that have not yet been stirred. The ability to control the speed of the gear pump can give better control to the stirring and filling processes and significantly reduce introducing air into the cream in the last few containers filled. Controlling gear pump speed can be accomplished by using



Seeding

three phase electric, single phase electronic controls or a transmission between the motor and gear pump.

Seeding Crystals

With any of the methods of stirring, to hasten crystallization, add a small amount of “seed” crystal (previously made maple cream) to the chilled syrup just before or as it is stirring. The addition of one teaspoonful of “seed” for each gallon of cooked syrup provides small particles to serve as nuclei so crystals will form more rapidly. For best results use “seed” from the best and smoothest maple cream available

Packaging

Packaging

Maple cream can be packaged in food grade glass or plastic. Containers with wide mouths are best for easy filling. Care must be taken to prevent air bubbles from forming during stirring or filling, especially when the maple spread is packaged in glass. Air bubbles are not only unpleasing in appearance but also create the impression that the package is short in weight. Furthermore, separated syrup can collect in air pockets, further adding to a poor appearance.

Refrigerate

During cream production, the maple syrup is heated to high temperatures, which eliminates all pathogenic microorganisms, but the subsequent steps of rapid cooling and filling at room temperature occur in an open environment where the maple cream is re-contaminated. At the high levels of sugar concentration of the cream, pathogens cannot grow, but the spoilage microorganisms, reportedly molds and yeast, can slowly grow and spoil the product. That is why the traditional cream is sold under refrigeration. If the spread is packaged in glass or other moisture-proof containers, it can be stored in the refrigerator for a month or two with little likelihood of the saturated syrup in the spread separating. Because traditional maple cream, like maple syrup, contains no preservatives, it is susceptible to mold forming on the surface. For long-term storage (up to a year) it should be stored in a freezer where it will not mold and will show little or no separation.

Shelf Life

Pure traditional maple cream has a shelf life of less than one month if stored at room temperature. The maple cream may mold and physically separate into its maple syrup component during this period. This product requires refrigeration to achieve an acceptable shelf life of 6 months. This requirement significantly reduces marketability, distribution and availability of the product to the consumer. The storage and handling requirements also increase the final cost to the consumer. As a result, production, consumption and producer profit is limited.

Sanitizing

All cooking utensils, thermometers and especially the stirring equipment should be thoroughly washed in hot water and be completely cleaned after each use to avoid contamination of future batches with bacteria and molds that can destroy the product quality. It is best to make cream in a clean environment with easily sanitized surfaces.

Shelf-Stable Cream

Shelf-Stable Maple Cream

Over time at room temperature separation in traditional maple cream is likely to occur and mold growth on the surface is probable. Research at the Cornell Food Venture Center found a way to make maple cream stable for a longer time when stored at room temperature. The



Invert Syrup

Food Venture Center staff discovered that having a higher amount of invert sugar in the syrup used to make the cream could prevent separation during storage. For a complete review of the research conducted see the section titled “Shelf Life Extension of Maple Cream”

Making shelf-stable maple cream requires using a mix of regular maple syrup and syrup that has been treated with the enzyme invertase to break all of it’s sucrose into invert sugars. We will call this enzyme-treated syrup “invert syrup”. The invert syrup will have an invert sugar level of 50 to 67% depending on the extent to which invertase has completed converting the sucrose. The level of invert sugar in the final combined syrup mix should be between 7 and 9%. Be careful not to confuse the level of invert sugar in the final mix with the percent of invert syrup we are adding to the regular syrup. Totally converted invert syrup will contain about 67% invert sugar and the invert syrup is added to the regular syrup at a rate of about 10% by weight or volume. This means that totally converted invert syrup will add about 6.7% invert sugar to the final mix and the regular maple syrup will usually add between .5% to 2% invert sugar to the final mix. Measuring the invert sugar in the invert syrup with your glucose meter is not possible unless the invert syrup is diluted enough to be

» Invert Sugar Reading

(US)	1 - 10 dilute
mg/dL	invert %
250	5
260	5.2
270	5.4
280	5.6
290	5.8
300	6
310	6.2
320	6.4
330	6.6
340	6.8
350	7
360	7.2
370	7.4
380	7.6
390	7.8
400	8
410	8.2
420	8.4
430	8.6
440	8.8
460	9.2
480	9.6
500	10

within the measurement range of the meter. The high sugar level in the invert syrup and the normal variation of meter readings being about 20%, combine to make readings at the higher sugar level undependable. The final mix or a sample of the mix can be read on the glucose meter with reasonable accuracy and provide helpful information for making up batches with consistent invert sugar levels. The chart for suggested invert sugar levels for making shelf stable maple cream, featured on the left, shows the ideal range of 7 to 8% and usable range from 6 to 9%.

The light gray indicates values usable in syrup mix for shelf stable maple cream

The darker gray indicates values in ideal syrup mix for shelf stable maple cream



Using Invertase

The “invert syrup” is made by adding 0.1% to 0.25% by volume of the enzyme invertase to pure maple syrup. For a gallon (4.4 liters) of syrup to be converted to invert syrup add 1.5 teaspoons (8 ml) of Invertase. Invertase performs optimally at a temperature 120°F, and is rapidly deactivated at temperatures greater than 170°F. The syrup plus invertase is heated to 120°F for 24 to 48 hours and then stored under refrigeration, or held at lower temperatures for a longer period of time. Over-heating the treated syrup will stop the conversion process. The use of an oven or crock-pot is ideal for this purpose. When you are ready to make shelf stable maple cream begin by boiling to near finish temperature the regular maple syrup and then adding the 10% of the invert syrup when the cooking is nearly finished. The invert syrup should represent 10% of the final quantity of syrup to be boiled to 25°F to 27°F above the current boiling point of water. 10% is just less than one pint of invert syrup for each gallon of regular syrup.

Invertase is available from confectionary and baking supply sources. In New York invertase is considered a processing aid and does not need to be declared on the maple cream label. This is not the case in Vermont. Adjusting the invert sugar levels allows the maple cream to stay on the shelf much longer at room temperature with out separating. Producers can choose to make maple cream this way to solve separation problems without making the next step of mold prevention, but you need to realize that mold can become a problem when cream is at room temperature for significant time.

Any of the stirring methods and equipment listed under the traditional maple cream section above can be used to manufacture shelf-stable maple cream.

Inhibiting Molds

Inhibiting Mold Growth

To prevent mold growth on the surface of traditional or shelf-stable maple cream, powdered potassium sorbate can be added after the boiling stage. Potassium sorbate is a commonly used food preservative available at most stores that supply materials for wine making. Add potassium sorbate at the rate of 500 parts per million based on volume to the concentrated cooled product prior to stirring. If the cooled product is a result of one gallon of syrup prior to cooking add 0.3 teaspoons of potassium sorbate to the surface of the concentrated syrup. For a four-liter quantity (prior to cooking), add 1.4 ml of potassium sorbate. A producer in New York will need to have 20-C food processor certification with the Department of Agriculture and Markets to legally add potassium sorbate to maple cream, or the products will need to be made in a certified facility.

» Shelf Stable Maple Cream

~ 1 pint of maple syrup + .4 teaspoon invertase and 48 hours at 120°F
+
One gallon of maple syrup with .5 to 2% invert sugar
+
Boil to 25°F to 27°F above boiling point of water
add 0.3 teaspoons of potassium sorbate
+
Chill to 45°F to 75°F, (the lower the better) then stir



Shelf Life

Shelf Life

Shelf-stable maple cream with higher sugar levels and potassium sorbate will not mold or separate for six months when held at room temperature. However, for the benefit of consumers it is recommended that containers in which maple spread is placed be labeled “Best if used by _____” (dated six months after production) and “Refrigerate after opening”.

