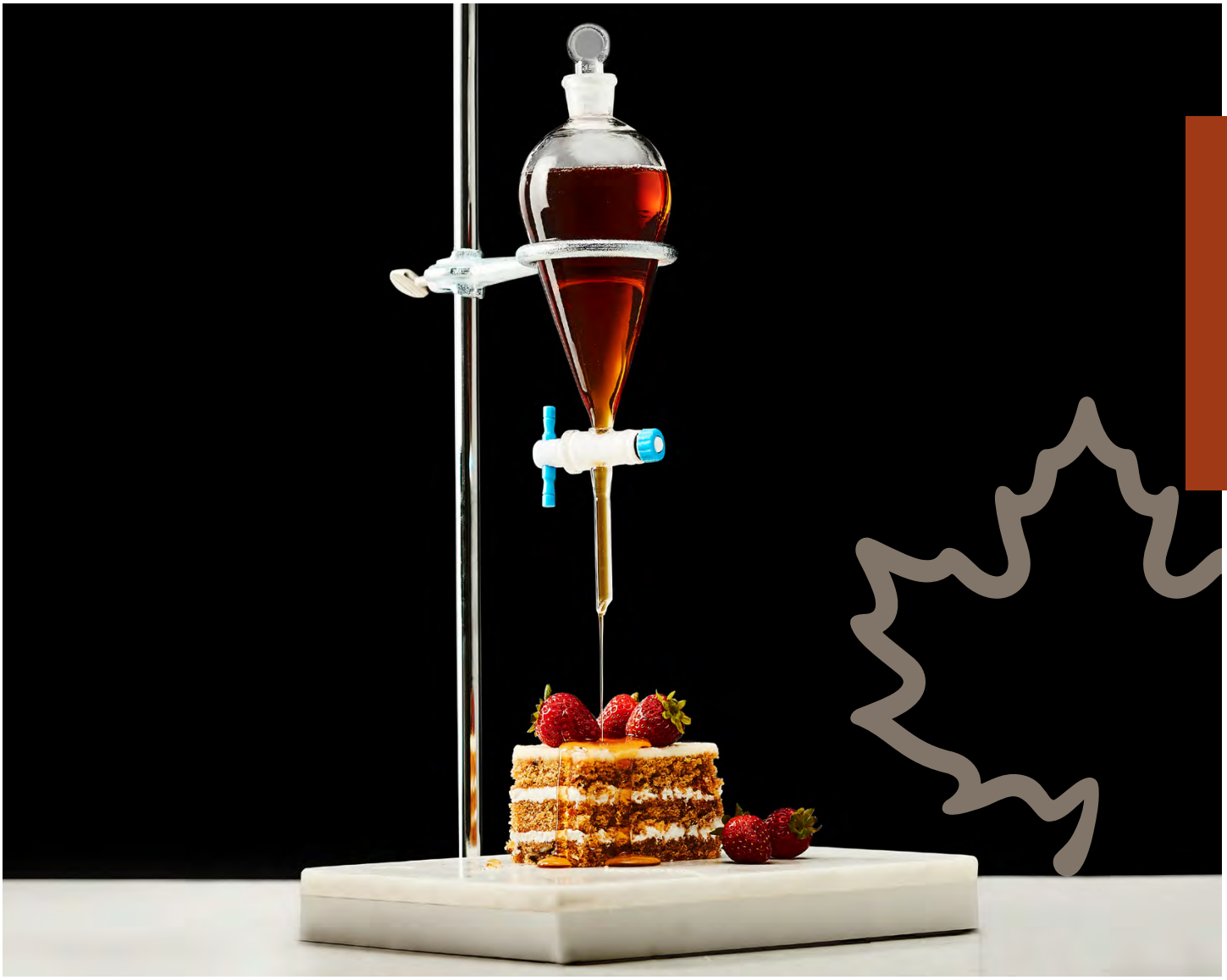
MAPLE 301

Culinary Innovation with Maple



Québec
Maple Syrup
Producers

This textbook has been prepared for the use of students and instructors in hospitality courses,
chefs, and those involved in the hotel,restaurant and institutional (HRI) sector.

Table of Contents

The Science of Maple

Chapter 01

INTRODUCTION

You are at the beginning of an advanced learning module about maple syrup. Why? Perhaps it's because you have a fond attachment to an iconic Canadian symbol. Perhaps you love its taste. Or maybe you're simply an inquisitive student. This much is certain: by the end of this volume, you will possess expert knowledge of a sweetener that is unique to the world.

Due to the efforts of Québec maple producers, scientists, health and nutrition specialists, chefs and food-lovers, every day opens a new door for this remarkable natural product. Little by little, people around the planet are discovering maple syrup.

Maple and its wide range of products are finding their ways into diverse cuisines, indeed into the future of gastronomy, thanks to innovation.

In this third module, we will be exploring many subjects, including lactofermentation, the savoury taste known as umami, and maple's flavours that marry well with spices and mushrooms.

You will discover many of the secrets that emanate from Canada's sugar maple tree. Such secrets, by the way, continue to come to light, to our delight and amazement. By learning and sharing them, you join us in perpetuating the ancestral knowledge of our maple producers.

MAPLE: SOME BASIC CONCEPTS

Understanding Maple Sap and Maple Syrup

Maple sap and maple syrup contain a rich, complex variety of compounds, some of which are yet to be identified.

Maple sap and maple water (as it is known as a consumer product) have a subtle, fresh, and delicately sweet taste. They hold 46 nutritional compounds, including vitamins, minerals, polyphenols, and antioxidants. Maple water is used as both a beverage and an ingredient in culinary applications for savoury, sweet, and sweet-and-sour recipes.

Maple syrup ranges in flavour and colour, from delicate and golden to strong and very dark. This makes its a highly versatile culinary ingredient. However, one must understand its subtle differences to maximize its utility.

(For complete information about maple water and maple syrup, see the fact sheets in our Maple 101 module.)

GREEN AND LOCAL
Eco-Friendly
A Renewable Resource

100

RICH IN NUTRIENTS
100 Nutritional Compounds

100% PURE AND NATURAL,
Non-GMO No Preservatives

Before It's Syrup, It's Sap

It's generally known that maple syrup is made of sap extracted from the maple tree in spring. Only two species, the sugar maple (Acer Saccharum) and the red maple (Acer Rubrum), produce sap appropriate for syrup. And they actually do that in summer. This is the tree's lifeblood, containing numerous nutrient compounds necessary for its metabolism. The sap's composition will depend on which species as well as the environmental conditions to which the individual tree has been exposed.

Component	Value per 100 g
Water	98 g
Sugar	2.34 g
Sucrose	2.23 g
Glucose	6 mg
Fructose	6 mg
Complex Sugars	4.9 mg
Organic Acids	29.35 mg
Minerals	11.28 mg
Potassium	5.59 mg
Calcium	4.19 mg
Magnesium	0.74 mg
Iron	0.32 mg
Zinc	0.13 mg
Copper	0.09 mg
Manganese	0.22 mg
Amino Acids	2.05 mg
Polyphenols	0.96 mg
Phytohormones	5.25 µg
Aromatic Molecules	Traces

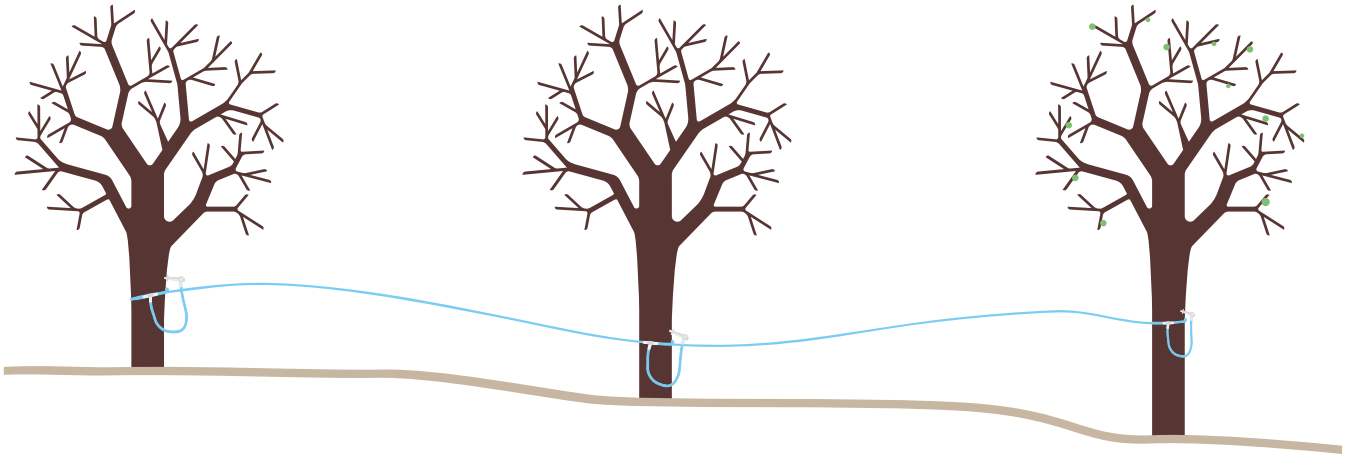
Research conducted by CENTRE ACER has identified at least 30 different amino acids and derivatives in maple sap. Their proportions vary as the season progresses, but also from one collection area to another.

How Maple Sap Changes in Spring and the Resulting Effects on Maple Syrup

Start of Season
- Cold Temperatures
- Tree Thaws

As Season Progresses
- Temperatures Moderate
- Activation of Tree Metabolism

End of Season
- Warm Temperatures
- Buds appear on Tree



- Simple composition
- Almost all sucrose
- Few microorganisms

- Composition more complex (amino acids develop)
- Increased endogenous microbial flora activity
- Sucrose converting to glucose and fructose (reducing sugars)

- Composition even more complex
- Even greater endogenous microbial flora (mainly yeast) activity
- Higher concentration of reducing sugars

Organoleptic properties produced when the sap is heated, mainly by caramelization and to a lesser extent by the Maillard reaction

Organoleptic properties produced when the sap is heated, by both caramelization and the Maillard reaction

Organoleptic properties produced when the sap is heated, by caramelization and the Maillard reaction, and facilitated by the elements present

All the many steps carried out by a maple producer, from the care and cultivation of the forest to the bottling process, have an influence on the properties of the syrup that is produced. In addition to the specific characteristics of the sugar bush and its geographical location (terroir), one must account for weather conditions and how the sap was collected, stored, pre-concentrated, and treated in the evaporator. After this comes filtration, conditioning, and packaging. These skills in the hands of knowledgeable maple producers have a significant impact on the quality and properties of maple syrup.

INTERESTING FACTS

The Maillard reaction is a form of nonenzymatic browning in which the highly reactive compounds glucose and fructose react with the amino acids present in maple sap. It is mainly responsible for the characteristic colour and flavour of maple syrup that develop when sap is heated in the evaporator. As the harvest season goes forward, the syrup becomes progressively darker and its flavour richer and more robust.

The evaporator can therefore be seen as a kind of reactor. It uses heat to concentrate sap, modifying its properties and changing it into syrup.

Microorganisms can exert a significant impact on the physicochemical and sensory properties of maple syrup. Their increasing degradation of the sap as the season progresses can sometimes result in an overly dark or stringy syrup (due to the presence of polysaccharides) and even cause defects such as "burnt" or "overcaramelized" flavours.

This type of syrup goes to the food processing and ingredients markets, as it still has interesting organoleptic values.

Sensory Science

Chapter 02

02

APPLYING SENSORY SCIENCE TO CULINARY PRACTICE

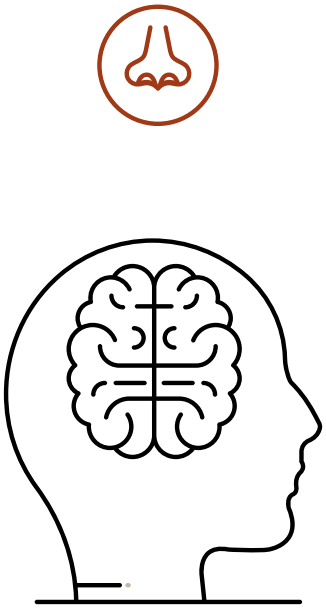
Knowledge of sensory perception and food aesthetics can help chefs innovate and give them a greater chance of creating dishes that will appeal to their clientele. (Schifferstein et al., 2020)

> ***"Gastronomy makes our nostrils quiver with intelligence."***
>
> *Charles Monselet, novelist, poet and culinary journalist (1825-1888)*

TASTING: BASIC CONCEPTS

Tasting is more than putting food in your mouth and swallowing. (That's eating). The conscious act of tasting engages all the human senses: sight, smell, hearing, touching, and tasting. This interplay occurs when the body's various sensory receptors respond to the stimuli provided by the food.

Sense of Smell: The olfactory system, with its several million receptors, perceives odour molecules entering through the nose (before the food is put in the mouth) and those that are released during chewing (by the retronasal pathway as the food is heated and mixed with saliva). Humans are able to perceive thousands of different aromas.



Sense of Sight: Our eyes permit an appreciation of the food's appearance (colour, size, shape, quantity, and surface texture).

Sense of Hearing: The taster pays attention to the sounds produced by palpation in the hand or mouth, such as crunching or chewing, or by the fizz of a sparkling beverage.

Sense of Taste: There are as many as 10,000 taste buds (located mainly on the tongue) that detect the basic taste elements which are sweet, salty, sour, bitter, and umami. The trigeminal nerve is also stimulated, creating pungent, astringent, numbing, burning, and cooling sensations.

Sense of Touch: Receptors in the skin, lips, and mouth give information about, for example, the temperature, texture, and movement of the food being tasted.

It has been shown that the consumer's most important criterion in the appreciation of a food is its taste, followed by smell, visual appearance, tactile properties, and sound impressions. Although the sensory systems that perceive taste and aroma operate on separate physiological pathways, they work in unison when appreciating food. **It has been estimated that 10-20% of the taste experience comes through the tongue, while 80-90% of it is caused by smells and aromas.** (Anh et al., 2011). How a food tastes to an individual results from a complex combination of all the sensations perceived during the tasting process, from the moment the food is seen to its being placed in the mouth and chewed, until it is ultimately swallowed.

We must also be mindful that the whole environment can have a significant effect on perceptions and appreciation during the gastronomic experience. It begins well before taking the first bite (Spence et al., 2012). The combination and presentation of the food on the plate, the beverages served, the tableware, and the surrounding ambiance should all be thoughtfully considered. **Researchers have shown, for example, that a strawberry mousse was more appreciated and perceived as sweeter and more intense when served on a white plate than on a black plate** (Piqueras-Fiszman et al., 2012).

Sensory deprivation can alter the perception of food. It is well known that certain foods taste different under the effects of congestion or anosmia (loss of smell).

Did you know that, if deprived of sight and smell, you could easily mistake an onion for an apple? That's because you would only be able to detect their basic flavours. Apples and onions have more or less the same degree of crunch, sweetness, and tartness. Without seeing or smelling, it's almost impossible to tell them apart!

(Soo-Yeun Lee, University of Illinois at Urbana-Champaign)

INTERESTING FACTS

Anosmia is a disorder that results in the partial or complete loss of the sense of smell. It affects, to varying degrees, about 12% of the population.

Astringency results from the contraction, stretching, or wrinkling of the skin or mucous membranes in the mouth. It's the dry or puckering feeling you get from the tannins in red wine and other beverages and foods.

Flavour is a complex combination of olfactory, gustatory, and trigeminal sensations perceived during tasting, which may be influenced by tactile, thermal, algic, and/or kinaesthetic impressions (International Organization for Standardization, 2008).

The sensations of hot and cold can be chemically produced, as with the capsaicin of peppers (hot) and the menthol in chewing gum (cold).

MAPLE AND UMAMI

Umami is one of the five basic tastes. It is produced when dilute aqueous solutions of compounds from the glutamate family interact with specific sensory receptors in the mouth.

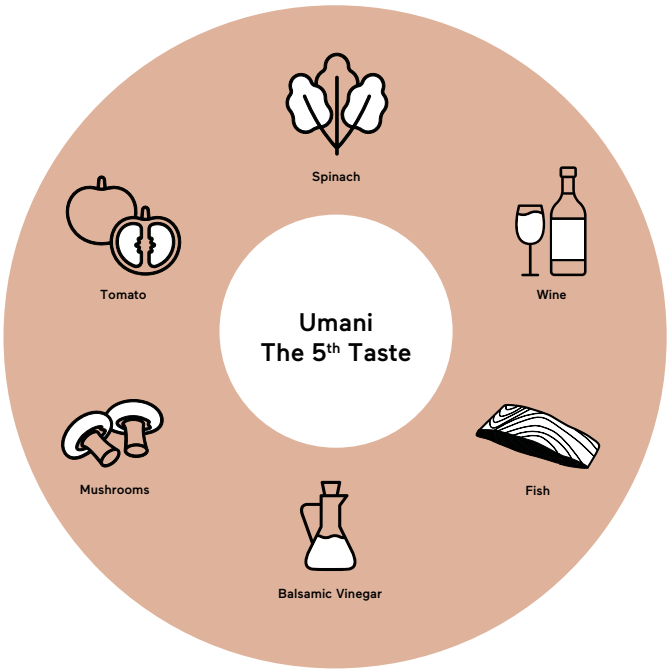
In 1908, University of Tokyo scientist and professor Kikunae Ikeda identified umami as a taste attributed to glutamic acid. In 1985, it was officially recognized as a scientific term, describing the taste of glutamate, at the first Umami International Symposium in Hawaii. Pronounced ooMAHmee, the word means "savoury taste" in Japanese. Yet the sensation remains difficult to pin down. French chef Alexandre Bourdas says it comes from "the middle of the tongue, above the palate, something quite appetizing, round and delicious, slightly salty, and it makes you want to come back for more." Umami flavour emanates strongly from mouth-watering meats and salty, rich chicken stock. It feels as if it coats the mouth. It lasts longer than the other basic tastes. It's tantalizing.

The compounds that produce umami occur naturally in different forms and concentrations, and most foods have them. But some foods have more, such as tomato sauce, Parmesan cheese, shiitake mushrooms, prosciutto, and kombu seaweed. Monosodium glutamate (MSG) is a well-known umami ingredient. It is naturally present in foods but is produced synthetically (through fermentation) and widely used to accentuate the flavour of prepared dishes.

旨味

UMA MI

Umami in Japanese



Maple syrup has earned a reputation as an ingredient that enhances the flavour of foods with which it is combined in cooking. Interestingly, glutamine and glutamic acid are among the amino acids identified in maple syrup. They often appear in greater concentration toward the end of the production season (when the syrup is darker). Used in savoury to sweet applications from appetizers through main dishes to desserts, it helps balance, blend, and round the overall perception of other flavours. Maple syrup stimulates umami.

INTERESTING FACTS

Why do we love umami so much? Perhaps it's because humans subconsciously recognize it as an indicator of protein accessibility. Glutamic acid is the most abundant amino acid in breast milk, suggesting that newborns are being prepped to detect umami from the very start of life!

Maple water, like maple syrup, contains flavour-enhancing compounds such as glutamic acid. Chefs and home cooks use it for many applications like braising poultry, blanching vegetables, and deglazing pans for stock. Maple water adds umami to food.

Maple performs very well in savoury dishes. By applying the chemistry of cooking to soften its sweetness with umami, interesting flavour profiles emerge. Umami alone does not explain the distinctive taste of maple. It is our hypothesis that aromatic compounds in umami food enhance maple flavour.

The concept of umami actually predates Kikunae Ikeda by almost a century. French gastronome and writer Jean Anthelme Brillat-Savarin refers to the peculiar essence of meat flavour in his "Physiologie du goût" in 1825. Back then, it was known as "osmazone."

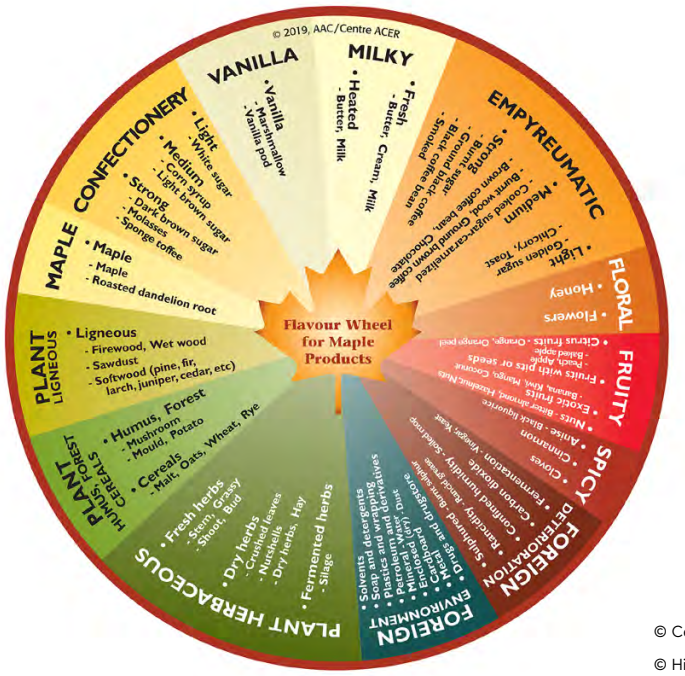
The umami effect is also associated with the nucleotides guanosine monophosphate (GMP) and inosine monophosphate (IMP). Research has shown that they cannot produce the umami effect on their own but, in synergy, intensify the taste of glutamate. Interestingly, the researchers have confirmed the presence of IMP in maple syrup, contributing to the richness and depth of its flavour. That may explain why maple syrup enhances the flavours of other foods so well, and why it's so addictive on its own!

THE MAPLE FLAVOUR WHEEL

There can be no vocabulary more expansive yet finely tuned than one which describes the subtleties of our senses. One of the difficulties is finding the right terms for perceptions. A common language is needed but words too often fall short in the attempt to translate the thousands of sensations recorded by one's brain. This is certainly true of trying to express the nuances inherent in the flavours and aromas of food. The solution lies in using references and analogies on a flavour wheel. Like wine, olive oil, and coffee, maple syrup has its own flavour wheel that serves as a comprehensive glossary of the range and diversity of sensations produced in the tasting of a sample of maple syrup.

The Maple Flavour Wheel was developed by Centre Acer and Agriculture and Agri-Food Canada to identify the elements across the broad spectrum of flavours present in Québec maple products. There are 91 attributes that (as mentioned above) use references to other products such as brown sugar, banana, sawdust, and hay, grouped into 13 flavour families and 39 subfamilies. While complex in its entirety, the analysis found that the flavours of maple syrup can be grouped into 4 main category types according to the most frequently encountered olfactory top notes (Sabik et al., 2009).

Descriptive lexicon specific to maple, articulating and documenting sensory perceptions.



TYPE 1 Characterized by notes of cooked to burnt sugar, caramel, brown sugar, or smoke

TYPE 2 Characterized by balanced notes of caramel, maple, and sponge taffy

TYPE 3 Characterized by notes of plant ligneous such as sawdust

TYPE 4 Characterized by notes of sugar, vanilla, hazelnuts, and spices

The Maple Flavour Wheel is a step-by-step guide to the flavours of maple products, for the use of professionals, amateurs, food-lovers, and those wishing to explore the world of maple.

THE THREE STEPS TO TAKE ON YOUR SENSORY EXPERIENCE

Step 1: Look

Observe the maple syrup's colouring ("coat"). It should be bright and free of crystallization. It can come in a wide range of tones but in any case should be appealing to the eye.

Step 2: Smell

Use your nose to take in the syrup's odour molecules. Do not be influenced by its colour in this step. Take three quick sniffs and make a mental note of your impressions.

Step 3: Taste

The time has come to taste the maple syrup. You are seeking to assess its body (mouthfeel), the variety and intensity of its flavours (bitterness, acidity, etc.) Your taste buds and nose will work together. **Here's how you do it:**

Tasting is the careful appreciation of a substance's quality.

When flavours deviate from the usual characteristics of a food (often due to spoilage or processing), they are referred to as "atypical flavours."

- Take a small sip of the syrup and swirl it around to coat your mouth. For about a minute, as it warms, use your senses to assess its range of flavours. Breathe. Air will propel the volatile aromas toward your olfactory receptors.
- Think. Can you associate the flavour with your own experiences? You may refer to the Maple Flavour Wheel to, for instance, realize that it reminds you of the smell of a bag of marshmallows.
- If you can, assess the degree of the syrup's flavour intensity (light, medium, or strong). And, if possible, share your feelings with others. This often helps trigger memory associations. Once a characteristic has been clearly identified, memorize it.

THE FLAVOURS OF MAPLE WATER AND MAPLE SYRUP

Maple Water

Maple water has a delicate, subtly fragrant, and lightly sweet taste that makes it not only pleasant to drink but also a premium ingredient for a wide range of culinary applications. The only thing it has in common with water is the name. Maple water is rich with nutritional and flavour compounds. To date, its aromatic composition has not been studied extensively, but a recent analysis determined that sweet, maple, woody, and plant were among the most frequently observed sensory descriptors. It was also noted that maple water, with its low sugar content, generally presents blander notes with a hint of bitterness.

Harvested in spring, maple sap is sterilized and boxed in Tetra Pak® containers as maple water. It requires no refrigeration before opening and keeps for over 18 months at room temperature. Maple water is found in better grocery stores all year round.

Maple Syrup

The very complex composition of maple syrup is yet to be fully articulated. The relationship between its volatile compounds and sensory qualities continues to attract a great deal of research interest. The most recent studies have identified over 200 volatile compounds (Sabik et al., 2009 and 2010), although not all necessarily contribute to maple syrup's characteristic flavours. To date, about 60 of them are known to have odour potential (Sabik et al., 2010). They belong to various chemical compound families such as acids, alcohols, aldehydes, furans, and pyrazines.

SOTOLON

Sotolon is an extremely powerful aromatic compound of the lactone family, found in a number of foods and wines. Formed mainly by the degradation of sugars, it confers pleasant notes ranging from maple, hazelnut, and caramel at low concentrations to a curry-like aroma in higher concentrations. Although sometimes associated with a rancid taste in some prematurely aged white wines, sotolon is generally considered a key element of fortified wines such as sherry, port, and Madeira. It contributes to the aromatic signature of soy sauce, fenugreek, certain types of mushroom, and MAPLE SYRUP. Researchers have measured the presence of sotolon in maple syrup at concentrations ranging from 0.03 to 0.56 mg/L, correlating to colour intensity (Belford et al., 1991). Working in synergy with maple syrup's other volatile compounds, sotolon is described as bearing notes of candy floss and burnt sugar but, above all, maple. This is why it is used, through the addition of fenugreek, to give artificial maple syrup its flavour.

More information about sotolon and maple syrup can be found in the Sotolon chapters of Taste Buds and Molecules (McClelland & Stewart) by François Chartier.

Some sherry, port, and Madeira wines contain sotolon at concentrations as high as 0.5, 0.9, and 2 mg/L, respectively. Its perception threshold is extremely low, at 0.0003 mg/L in a water solution and 0.00001 mg/kg in raw cane sugar. That means you'd be able to taste just 3 mg of sotolon in 1,000 litres of water or even 1 mg in a 1,000 kilos of raw cane sugar!

Toasted fenugreek seed, a relatively common cooking ingredient, has a sweet and sour aspect with notes of caramel and maple syrup. The food processing industry uses fenugreek to make artificial maple syrup flavouring.

Fenugreek is used in soups, stews, and Indian food as a meat seasoning as well as in some teas. It mimics maple syrup so closely that it is used as a substitute. There are, however, differences in sweetness and response to heating. Results will vary!

THE AROMATIC SCIENCE OF MAPLE

- François Chartier

François Chartier is the only Canadian ever to win the Grand Prix Sopexa International as the world's best sommelier in French wines and spirits. A co-founder of Chartier World LAB, a multidisciplinary scientific and gastronomic laboratory in Barcelona, Chartier's theory of Molecular Harmonies asserts that certain foods and wines achieve aromatic synergy at the molecular level.

"The list of compounds that make the bouquet and flavours of maple syrup so complex is very long. The list of ingredients that complement maple and contain the same aromatic molecules is even longer. The result is a multiplication of harmonic paths, both between foods in recipes and between plate and glass" (Chartier, 2013).

The aromatic profile of maple syrup can be described as consisting of a "dominant aroma of toasted fenugreek and vanilla, as well as caramelized and empyreumatic notes (burnt, roasted, toasted)..." In Chartier's theory, maple has the same aromatic compounds as seared and grilled meats as well as cacao beans when they're roasted to make chocolate. This would explain why maple pairs well with those foods. Apples have a delicate flavour and contain malic acid, as does maple syrup, making them a good match, especially with caramelization.

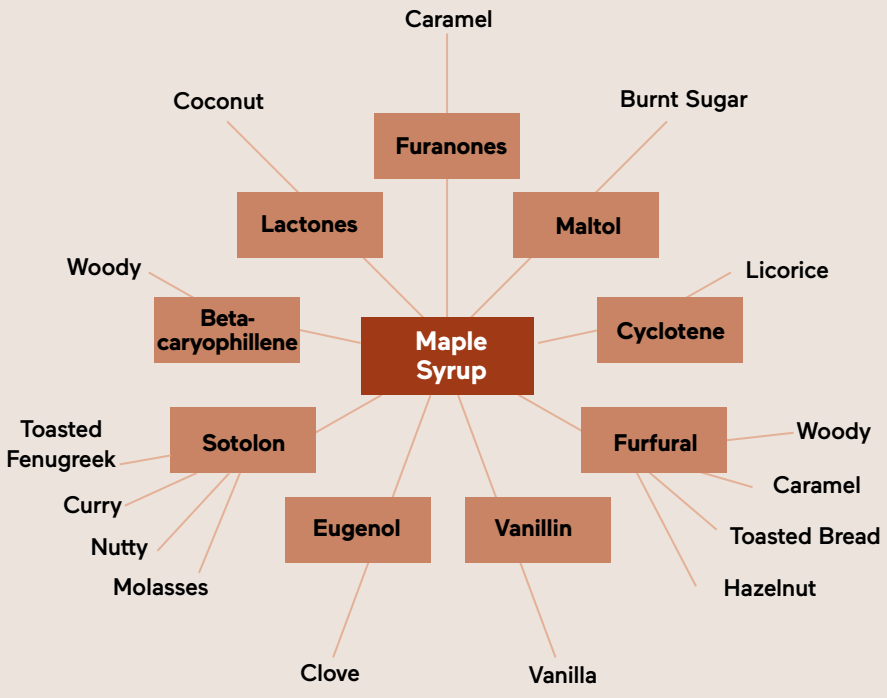
FLAVOURS IN HARMONY

Many of the ingredient combinations put forth by chefs in their recipes for this volume are based on the theory of Molecular Harmonies described by François Chartier in his book Taste Buds and Molecules. The pairings he suggests for maple products are based on dominant aromatic compounds such as lactones and furanones, maltol, cyclothene, furfural, and many others. A number of foods share common molecules (above the perception threshold), according to the theory.

Generally speaking, maple goes well with grilled, roasted, and smoked foods, due to the caramelization and Maillard reaction they undergo. This led Chartier to compile a list of foods that are most compatible with maple.

The table below, taken from Taste Buds and Molecules (McClelland & Stewart), shows foods and ingredients Chartier has identified as sharing aromatic molecules with maple syrup.

The Maple Flavour Map



Complementary Foods

Almonds, toasted
Apricot
Balsamic Vinegar
Cacao/Dark Chocolate
Candy Floss
Celery, cooked and celery salt
Cherry
Chicory, roasted
Cinnamon
Clove
Coconut
Coffee
Curry
Fenugreek seed, toasted
Fish, smoked
Grape
Hazelnuts, toasted
Licorice
Malt Powder
Marshmallow
Meat, grilled, smoked, or roasted
Milk, cooked
Mushrooms
Peach
Peanuts, roasted
Pineapple
Plum
Popcorn
Raspberry
Shellfish
Soy Sauce
Strawberry
Swiss Cheese
Taco, cooked
Toasted Bread
Tonka Beans
Vanilla

(Figure borrowed from the book Apprecécier les qualités organoleptiques des aliments by Suzanne Léger, published by CCDMD, 2014)

Exploratory Approaches with Maple

Chapter 03

03

MAPLE IS A NATURAL ALLY

As in botany with plants, foods have beneficial relationships in cuisine. We've already demonstrated about grilled or roasted mushrooms and spices such as nutmeg, cloves, saffron, and peppercorns that, when roasted, accentuate the flavours of maple.

Trials are ongoing with the unique Moroccan treasure argan oil but we already know that olive oil, truffles, walnuts, and almonds can be used in perfect symbiosis with maple sugar and maple syrup.

And herbs such as lemon balm, verbena, mint, and lemongrass come to brilliant life when infused in maple syrup.

Berries develop unique flavours when combined with maple in making compotes and jams.

As mentioned previously, the delicate sweetness of maple ably counterbalances the bitterness of vegetables like endive, rapini, turnip, and sorrel. The inclusion of maple in a gastrique (a sweet and sour flavouring for sauces) unequivocally asserts its culinary utility.

Maple is a natural way to enhance the flavours of other foods.

CONCENTRATING FLAVOURS

As explained in our previous volumes, **concentrating flavours leads to the development of taste**. One must, however, take precautions when cooking with maple products to prevent caramelization and bitterness.

When making a sauce, flavour concentration is achieved by gradually reducing original volume to 1/4. Then add 1/2 volume of liquid and repeat the procedure three times to obtain, for example, 250 ml from one litre of liquid. **This is the culinary technique of demi-glace.**

The concentration of flavours and blend of ingredients create the savoury umami taste. This atypical taste also results when maple is paired with roasted mushrooms, berries, or fermented ingredients.

Maple Glaze

Flavours are concentrated in the reduction of a sweet or savoury blend of ingredients.

Glazes are prepared for specific applications such as grilling or finishing in the oven. A glaze adheres to the food element, most frequently meat, poultry, or fish.

This is not necessarily a sweet maple sugar or syrup glaze or the gelling agent of preparations such as aspics.

In any case, gelling can be achieved with various additives such as gelatin, agar, or vegetable gums like cocoa butter.

A glaze coats the food while allowing it to retain its original flavour. Most commercial glazes are corn-syrup-based and overly sweet. You can make a maple glaze in your kitchen with your chosen level of spiciness or lack thereof.

Spicy Maple Glaze

Yield: 250 ml (1 cup) of glaze

2 sheets gelatin or 7 g (1 tbsp) agar-agar

80 ml (⅓ cup) maple syrup (preferably dark syrup for its robust flavour)

250 ml (1 cup) thick veal stock or demi-glace

5 ml (1 tsp) wine vinegar

15 ml (1 tbsp) light soy sauce

2 ml (½ tsp) hot sauce, your choice

1. Soften the gelatin by soaking in cold water or dilute the agar-agar in a little water.
2. In a saucepan, reduce the maple syrup, veal stock, vinegar, and soy sauce to about 250 ml (1 cup) of liquid.
3. Add the softened gelatin or dissolved agar-agar. Return to the boil for 2 minutes. At the very end, add the hot sauce.
4. Do not add salt.

This glaze can be used cold on meat, poultry, or vegetables.

Infusions

An infusion is the process of placing an aromatic plant (or a vegetable such as dried mushroom) into a liquid for an amount of time to infuse it with its flavour.

Plants such as verbena, lime, elderberry, mint, and sage all do very well with maple syrup. We suggest using a less pronounced type such as golden maple syrup with its delicate flavour for a balanced pairing.

It is worthwhile to consider adding a spice element, as this produces an innovative infusion of great utility in cuisine. Furthermore, it can counteract bitterness and astringency. In fact, peppers and false peppers contribute to this effect, as do berries such as sea buckthorn, cloudberries, redcurrants, blueberries, and cranberries. The plants, berries, and spices are removed and set aside, and the infusion is ready to use.

Europeans tend to use cranberries, redcurrants, elderberries, and bilberries. Goji berries impart a unique flavour to infusions, reductions, and flavour concentrations, as do sesame seeds and pumpkin seeds, especially if they are roasted.

Let's Infuse Some Maple Syrup!

- Bring the maple syrup to a boil and remove from heat
- Add the infusion material to the hot syrup. Let stand for a few minutes
- Remove the material. You may use a filter. Or you may leave it longer to macerate.

What Shall We Use?

Plants	Spices	Seeds and Berries
Verbena Lime Elderberry Mint Sage	Pepper False Pepper	Berries (blueberries, sea buckthorn, redcurrants, cloudberries, elderberries, etc.) Sesame Seeds Pumpkin Seeds

Oak barrels that have been used to age spirits may now take their turn at storing maple syrup, thereby infusing it with the previous contents (e.g. whiskey, Cognac, etc.)

The term "**infusion**" refers to the technique as well as the solution it produces.

A cold infusion is analagous to **maceration**. It takes longer but maximizes aromatic absorption.

A **decoction** is made in a boiling liquid, which allows non-soluble active ingredients to be extracted at a lower temperature.

Fermentation

There are thought to be more than 4,000 fermented foods among the cultures of the world. Most of them have a potential probiotic effect due to live microorganisms that help restore the balance of bacteria in the gut and promote digestive health. The foods themselves have increased nutritional quality and shelf life.

Such benefits have earned the praise of nutritionists and the attention of chefs and home cooks. Maple works wonderfully in various fermentations. Maple sugar is an excellent substitute for processed sugar or cornstarch.

Maple syrup, maple water, and maple concentrate also appear in modern iterations of probiotic foods such as kimchi, the traditional Korean dish.

The main ingredients of kimchi are vegetables such as cabbage, daikon radish, green onions, and others. Soaking in brine begins the fermentation process, producing lactic acid and destroying harmful bacteria. Aromatics traditionally include seafood, garlic, ginger, and Korean chili. Maple brings contemporary innovation to an age- old staple.

Kimchi with Maple and Shrimp

Serves 4

1 head napa cabbage

140 g (½ cup) coarse sea salt

40 g (¼ cup + 2 tbsp) Korean chili powder (gochugaru)

50 ml (¼ cup) shrimp paste (found in Asian markets)

75 g (½ cup) daikon radish, julienned

3 cloves garlic, chopped

3 green onions, chopped

2 g (2 tbsp) fresh coriander, chopped

½ Asian pear, julienned

50 g (⅓ cup + 1 tbsp) maple sugar

15 g (2 tbsp) fresh ginger, grated

1. Slice cabbage thinly and submerge in cold water with half the sea salt. Soak for 12 hours, then drain and dry.
2. Place into a large container with the remaining salt and all other ingredients. Mix thoroughly. Divide into glass jars, leaving their lids loose to allow gas to escape during fermentation.
3. Let sit on the counter for 24 hours, then refrigerate at least 6 days before serving.

A delicious side dish. Recipe can be varied with the addition of julienned sweet peppers, apples, etc.

TESTING WITH SMOKE

Smoking with Maple

This technique involves exposing food to the smoke produced by burning organic material (e.g. wood chips). **Smoking serves several functions: colouring and flavouring, preservation (anti-microbial effect), and hardening of texture (modification of protein constituents).**

Three categories of maple syrup were tested to determine which responded best to the two smoking methods.

Maple Syrup Imparts Incomparable Flavour!

Parameters	Cold	Hot
Pre-treatment with maple	Salting	Brining Marination
Finished State	Raw	Cooked
Internal Temperature	Between 15-20° C (Max 30° C)	Dependent on Food
External Temperature	Below 25° C Meats, fish, vegetables, cheeses, salts, nuts, chocolate, etc.	Between 40-130° C Meats, fish, vegetables

Cold Smoking: For this method, the interior temperature of the smoker did not exceed 25° C. Crushed ice was placed in hollow steel plates and changed every two hours. Racks were positioned 1.3 metres above the burning wood chips.

The three maple syrups in the cold smoking test were:

Maple wood chips were used in a smoker suitable for charcuterie.

After two hours of cold smoking, taste intensity was found to be negligible with all three syrups. After four hours, a light smoky flavour was detected but deemed of little value.

Hot Smoking: Same three types of maple syrup with no heat restriction.

After two hours, the interior temperature of the smoker was 40° C. **All three syrups produced a light smoky flavour. After four hours, the delicately flavoured golden maple syrup produced a distinct smoky taste. But the best results came after six hours of hot smoking.** This extended smoking time translates to higher input costs for processors and therefore a higher price point for consumers. Interest in producing smoked maple syrup is consequently limited.

We also tested maple water (sap) in this experiment. The results of smoking were unimpressive and, in fact, manifested as more of a defect.

Recipe: Cold-smoking yellow beets for two hours, then cooking in lightly salted maple water proved greatly successful. Cooking beets in maple syrup required the addition of water and contributed abundant sweetness, making it appropriate for a sweet course or dessert.

Testers also cooked the beets before smoking but the experiment was declared a failure: the beets shrivelled.

Roasting

This technique enhances flavour by employing the Maillard effect. Foods are roasted with maple syrup or maple sugar at low heat.

Flavour is achieved by slowly grilling or roasting a food. As when coffee beans are roasted, the process effects changes in colour and taste. The results are particularly interesting when fresh mushrooms and spices are roasted with maple sugar and/or maple syrup.

Amber maple syrup, with its rich taste, produces the best results. It facilitates a more concentrated flavour, while avoiding caramel or jammy effects.

Which foods roast well when maple is first added to them? Berries and some vegetables such as mushrooms benefit from, for example, a sprinkling of maple sugar before roasting and drying with low, sustained heat.

Oven-Dried Maple Mushrooms

Yield: two 125 g containers

2 containers (450 g) shiitake or maitake mushrooms, cut into chunks or thin strips
30 ml (2 tbsp) canola oil
40 g (⅓ cup) maple sugar
125 ml (½ cup) maple syrup (preferably amber syrup for its rich taste)
1 stem of rosemary, chopped

1. Preheat oven to its lowest setting.
2. Soak mushrooms in the canola oil.
3. Sauté the mushrooms in a non-stick pan for 1 - 2 minutes.
4. Sprinkle with the maple sugar and sauté for another minute, then remove from heat.
5. Pour the maple syrup into a baking sheet, add the mushrooms, and toss with the rosemary.
6. Place in oven to dry for 3 hours.
7. Pulverize into powder or use as is.

MAPLE-SPICE/HERB COMBINATIONS

The following ingredients do wonderfully well with the flavours of maple: star anise, turmeric, most peppercorns (but not pink), nutmeg, cloves, ginger, cinnamon, saffron, coriander seeds, sesame seeds, sesame paste, peanut paste, fermented black garlic, and camelina, hazelnut, and argan oils.

In Harmony with its Natural Environment: Maple and Boreal Plants and Spices

Everywhere on our planet, few ingredients can be dissociated from their natural environments. This may be due to an element as basic as the water that nourishes the ecosystem and its forests, fields, and marshes.

Just as fish feed on algae and tomatoes ripen in the shade of olive trees, the sap of the maple takes sustenance from the same source as the wild garlic growing at its foot.

The flavours of maple are intimately connected to its native land and the countless edibles found there.

This specific natural setting is the boreal forest of eastern Canada, where sugar maple trees evolved and continue to thrive, along with a host of other indigenous (or well- acclimated) plant species.

Maple blends beautifully with dune pepper, wild mushrooms, northern berries, yellow nutsedge, as well as other trees such as spruce, poplar, and walnut. And these represent a mere fraction of the possibilities.

While all Canadians identify with the maple leaf and maple syrup as national symbols, maple holds a special reverence in the hearts of Québecers.

Maple is woven into Québec's ancestral culture and, over the course of four centuries, has been a cornerstone ingredient of Québec cuisine. Due to its unique qualities and versatility, this remains the case today.

Table: Flavour Profiles and Usages: *Some spices/herbs are not universally available, being specific to a region.*

	COMMON NAME(S)	LATIN NAME	HARVEST PERIOD	FLAVOUR PROFILE	NOTES
	**DUNE PEPPER (ALDER CRISP, GREEN ALDER PEPPER)**	Alnus viridis	October to April	Resinous Camphorous Sprucey Floral	Botanically not a pepper. Dune pepper's mildly bitter flavour profile is complementary to that of maple. A remarkable combination. Use in equivalence to black pepper.
	**SWEET CLOVER (MELILOT)**	Melilotus alba	July to September	Tonka Bean Fresh Hay Cherry Stone Fresh Almond Vanilla Cinnamon Nutmeg Cardamom	Regional nickname "boreal vanilla." Use wherever vanilla is called for.
	**SWEETFERN (TRAVELLING COMPTONIA)**	Comptonia peregrina	November to mid-April	Cinnamon Nutmeg Cardamom	Used wherever "hot"spices are called for.
	**SWEET GALE (BOG MYRTLE)**	Myrica gale	July to September	Resinous Floral (fresh) Peppery (scent) Sprucey	Regional nickname "boreal nutmeg." Quite bitter, when dried. Very flavourful. Use sparingly.

	COMMON NAME(S)	LATIN NAME	HARVEST PERIOD	FLAVOUR PROFILE	NOTES
	**STAGHORN SUMAC**	Rhus typhina	August	Acidic Pungent Cashew Mango Skin	Sometimes sweetened and made into a pink "lemonade."
	**CARAWAY (MEADOW CUMIN)**	Carum carvi	July	Complex Flavour Slight acidity Minty finish	Sometimes called meadow cumin because of where it is found.
	**BALSAM FIR**	Abies balsamea	Late May, early June (shoots)	**Fresh Shoots:** Sweet Arboreal Blue Raspberry Slightly bitter **Dried Shoots:** Cooked sugar flavour, almost candy-like	The Balsam Fir's gum, needles, shoots, cones, and cambium are all edible. Also used for pharmaceutical purposes.
	**LABRADOR TEA (BOG LABRADOR TEA)**	Rhododendron groenlandicum	All year, best in late June	Jasmine Tea flavour Autumn leaf Dried citrus peel Tannic	Though devoid of theine, this is the quintessential nordic tea.

	COMMON NAME(S)	LATIN NAME	HARVEST PERIOD	FLAVOUR PROFILE	NOTES
	**NORTHERN WHITE CEDAR (ARBORVITAE)**	Thuja occidentalis	All year	Resinous taste Tart Citrus Notes Strong aroma	Arborvitae is Latin for "tree of life". This evergreen native to eastern Canada can reach the age of 400 years or older.
	**TAMARACK (EASTERN LARCH)**	Larix laricina	Late spring	Resinous taste but milder than that of related conifers Slight bitterness Tart flavour Citrus Zest	A rare "deciduous" conifer, as its needles turn yellow in autumn and drop in winter.
	**COMMON PRICKLY ASH**	Zanthoxylum americanum	Autumn	Pleasant flavour: Mandarin/Orange Essential Oil Citrus Complex, salty, floral acidity Slightly minty Causes momentary numbness of the tongue in some.	Northernmost New World species of citrus family, in same genus as the sichuan pepper.
	**BALSAM POPLAR (BAM)**	Populus balsamifera	Buds in spring Leaves in August	Resinous Potent Floral Bitterness	Proper handling and fermentation lends notes of blackberry, field berries, and ripe pear skin. Use with finesse, as it is quite flavoursome. Goes very well with wild game.

	COMMON NAME(S)	LATIN NAME	HARVEST PERIOD	FLAVOUR PROFILE	NOTES
	**WILD CELERY ROOT (LOVAGE ROOT)**	Levisticum officinale	Early autumn	**Raw:** Strong notes of celery Almost peppery bitterness Earthy **Dried:** Light celery taste Maple sap flavour	Goes well in sweet preparations, especially with chocolate.
	**COMMON MUGWORT (WILD WORMWOOD)**	Artemisia vulgaris	September	Similar to herbes de Provence, oregano, marjoram	Used as a finishing herb.
	**WHITE SPRUCE**	Picea glauca	Late May	Resinous A candy-like aspect Marked acidity	Spruce beer is reputed to have saved many lives in long, harsh Northern winters. Also tasty.

Photo Sources:
Racines boréales (racinesboreales.ca)
Épices de cru (epicesdecru.com)
Agroboréal (agroboreal.com)

Applications

Maple takes on the aromatic properties of boreal spices and herbs in virtually countless ways. It is wise to favour infusion over roasting, as the latter method tends to cause bitterness and degradation of spice flavour.

Mushrooms, fresh or dried, are once again worthy of mention in this context. They also deserve consideration in dessert courses.

The maple-boreal aromatic combination is furthermore propitious with berries such as blackcurrants, cherries, cranberries, sea buckthorn, and Saskatoons. They present a degree of bitterness or natural acidity that finds balance with the sweetness of maple.

Cuisine

Maple paired with boreal spices and herbs create kitchen magic, particularly with game, both red and white meat.

- Rabbit Stew: maple and dune pepper
- Venison Tataki: maple/balsam poplar glaze
- Breast of Guinea Fowl: a jus of maple vinegar and Labrador Tea
- Bison Cheek: braised with maple, blackcurrant, and balsam poplar
- Pork Osso Bucco: braised with maple and pine nard
- Veal Blanquette: maple water and sweet gale

Explore the combinations possible with fish and seafood, particularly salmon and shellfish such as scallops.

- Salmon smoked with maple and dune pepper
- Seared scallops with a maple vinegar/caraway sauce
- Arctic Char Rillettes with maple and dune pepper
- Seared trout glazed with maple, soy sauce, and balsam fir.

In the preparation of vegetables, a maple-boreal spice/herb combination can balance the sometimes more bitter flavours of endive and turnip or enhance caramelization of sweet carrots, squash, and beets.

- Carrots glazed with maple syrup and caraway
- Sous vide endive with maple syrup and balsam fir
- Squash roasted with maple and sweet clover
- Beetroot fondant with maple, blackcurrants, and balsam poplar

Baking

The numerous applications include basic doughs and cream infusions.

- Crème anglaise with maple and dune pepper
- Maple cream with caraway
- Entremet of maple, cranberry, and tamarack
- Apple pie with maple and balsam fir
- Maple/sweet clover brioche
- Maple/pine nard croissants

CUISINES OF THE WORLD

All nations have food customs that are unique. In addition to being a source of pride and sustenance, some culinary traditions have been recognized by UNESCO as symbols of intangible cultural heritage.

While maple syrup remains under-used in Canadian and international cuisine, interest is growing in its applications to food other than pancakes.

Notably, maple is gaining traction in North America as an ingredient in marinades and glazes. In Europe, top chefs are employing maple more often, but still primarily in desserts.

The sweet-savoury combination (into which maple fits perfectly) is most prevalent in Asian nations.

In Africa, more specifically the Maghreb (e.g. Morocco), maple finds a perfect pairing with argan for use in tagine and tangia. Chefs in the western part of the continent have begun to use maple syrup.

In Japan, Korea, and perhaps even China, people are known to love sweets. We would like them to know that maple is a fine alternative to health-harming processed sweeteners!

A Maple Recipe Tour

This section of our Maple 301 exploration of culinary innovation takes us globe-trotting, to see how maple products adapt to the traditions, identities, and flavours of other nations.

Come along with us by trying the following recipes.

Europe (Belgium) - *Mussels with Maple, Herbs, and Caramelized Onions*

Serves 4

4 kg (9 lbs) mussels (1 kg or 2.2 lbs as a main course per person)

60 g (4 tbsp) butter

30 ml (2 tbsp) vegetable oil

2 white onions, finely chopped

2 cloves garlic, crushed

Freshly ground pepper

Salt, to taste

15 ml (tbsp) Dijon mustard

125 ml (½ cup) dry white wine

125 ml (½ cup) maple syrup (preferably golden syrup for its delicate flavour)

45 ml (3 tbsp) lemon juice

2 g (1 tbsp) coriander leaves, chopped

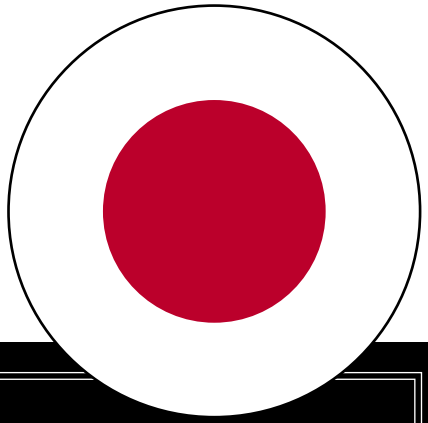
2 g (1 tbsp) fresh parsley, chopped

2 g (1 tbsp) chives, chopped

1. Wash mussels throughly. Change water repeatedly in the process.
2. Heat the oil and 30 g (2 tbsp) butter in a non-stick skillet. Once it foams, add the onion.
3. Cook over low heat to achieve caramelization, about 25 -30 minutes. Set aside.
4. Put the remaining 30 g (2 tbsp) butter into a large stockpot. Add all the mussels, then the garlic, pepper, and salt. Mix well. Now stir in the mustard, wine, maple syrup, onions, and lemon juice.
5. Put the herbs in last and cover the pot.
6. Give the mussels 5 - 8 minutes to open.
7. Serve the mussels with their cooking juices. This can also be thickened, if desired, with cornstarch, a white roux, or beurre manié.

In Japan, vegetables are always used in various combinations. This eggplant, tofu, and maple dessert has a fluffy, airy texture somewhere between a cheesecake and a sponge cake. Delicious!

The tofu and maple syrup jell perfectly in a way that the Japanese love.



Asie (Japan) - *Eggplant Cake with Maple and Tofu*

Serves 4

2 large eggplants

7 sheets of gelatin

Cold water

150 g (¾ cup) soft or silken tofu, plain

1 pinch ground cinnamon

15 ml (1 tbsp) orange blossom water

15 ml (1 tbsp) lemon juice

80 ml (⅓ cup) maple syrup of your choice

12 g (2 tbsp) maple flakes

45 ml (3 tbsp) blueberry jam or a few fresh berries, to garnish

1. Preheat oven to 190° C (375° F).
2. Prick eggplants with the tip of a knife.
3. Place in an ovenproof dish and bake for 30 minutes.
4. Soften the gelatin in cold water.
5. Remove baked eggplant flesh from the skins, add to a food processor along with the tofu, and blend.
6. Warm the maple syrup in a small saucepan. Add the gelatin and allow to dissolve. Pour over the eggplants in the food processor and blend again.
7. Pour this mixture into 1 or 2 bowls, ideally silicone (or non-stick). Refrigerate 4 hours, then turn out onto a plate.
8. Sprinkle with maple flakes and garnish with blueberry jam or fresh berries.

This recipe was inspired by Japan's highly popular sweet bean cakes.

A big platter of spare ribs is an all-American feast. Marinating and baking pork in maple, spices, and soy sauce produces a lip-smacking glaze for these ribs.

North America (USA) - *Spare Ribs with a Maple-Mushroom Caramel*

Serves 4

1 kg (2 ¼ lbs) pork spare ribs, cut up
1 onion, quartered
3 bay leaves
2 stems of thyme
8 peppercorns
1 handful coarse salt
170 ml (⅔ cup) maple syrup (preferably dark syrup for its robust flavour)
30 ml (2 tbsp) Dijon mustard
30 ml (2 tbsp) tomato paste
30 ml (2 tbsp) lemon juice
1 clove garlic, crushed
30 ml (2 tbsp) light soy sauce
10 drops Worcestershire sauce
10 drops Tabasco sauce
30 ml (2 tbsp) mushroom powder

1. Put spare ribs, onion, bay leaves, thyme, peppercorns, and coarse salt into a large stockpot. Cover with water, bring to the boil, then reduce heat to medium and cook for 45 minutes.
2. Make the marinade by combining the maple syrup, mustard, and tomato paste in a large container. Stir in the lemon juice, garlic, soy sauce, Worcestershire sauce, Tabasco sauce, and mushroom powder.
3. Drain the ribs and place into the marinade. Reserve the pork cooking liquid to use for rice or other purposes.
4. Preheat oven to 200° C (400° F).
5. Arrange the ribs on a baking sheet and caramelize in oven for 10-15 minutes. If desired, coat ribs with a maple glaze*.
6. Finish by adding the remaining marinade to the ribs or to the reserved broth.

*Maple Glaze recipe on Page 25.

Couscous is a traditional Moroccan dish that is prepared and eaten around the world. While often bolstered by proteins such as chicken, merguez sausage, lamb, and fish, the secrets of its richness lie in the semolina, chickpeas, and vegetables. Our recipe guides you to cook chicken in a maple-tinged broth, while a touch of argan oil allows the semolina to reveal its full flavour.

Africa (Morocco) - *Maple Couscous*

Serves 4

1 chicken, cut into 8 pieces
45 ml (3 tbsp) canola oil
Salt and pepper, to taste
4 carrots, sliced into rounds
2 zucchini, cut into chunks
1 onion, thinly sliced
2 leeks, cleaned and chopped
2 bay leaves
1 stem of thyme
2 stalks of celery, chopped
1 litre (4 cups) chicken broth or water
170 ml (⅔ cup) maple syrup (preferably dark syrup for its robust taste)
210 g (1 ¼ cup) semolina couscous
45 g (3 tbsp) butter
30 ml (2 tbsp) argan oil
1 cup chickpeas, cooked
1 g (1 ½ tsp) saffron

1. Add the oil to a large skillet and brown the chicken pieces for 2 minutes. Season with salt and pepper.
2. Put the chicken into a large stockpot along with the vegetables, bay leaves, thyme, celery, broth or water, and maple syrup. Cover and cook over medium heat for 45 minutes.
3. Drain the chicken and vegetables, reserving the liquid.
4. Fill the bottom half of your coucous pot with water and salt it.
5. Put the semolina into a dish and moisten with a little chicken broth.
6. Place a clean cloth into the top part of the couscous pot and put in the semolina. When the water starts to boil, cover and cook for 6 minutes.
7. Move the semolina back to the dish. Pour in 60 ml of the chicken broth, add a little butter, and stir. Repeat this process, called "rolling the couscous", 3 or 4 times.
8. When completed, add the argan oil, season with salt and pepper, and keep warm.
9. Reheat the chicken and vegetables in the remaining broth, then add the chickpeas and saffron.
10. Arrange the semolina in the centre of your serving dish, then the chicken, vegetables, and chickpeas around it. Drizzle with a little chicken broth and serve the rest of it separately so that diners may add it to taste.

The Land Down Under is a land of seafood, barbecues, and ceviche (raw fish marinated in citrus).

In our recipe, maple offers a sweet, mellow counterpoint to tangy lime juice and tart cilantro.

Oceania (Australia) - *Maple Prawn Ceviche*

Serves 4

400 g (1 lb) tiger prawns
5 limes
1 onion, thinly sliced
2 cloves garlic, chopped
1 yellow bell pepper, finely diced
1 tomato, finely diced
0.5 g (¼ tsp) chili sauce (e.g. sambal oelek)
60 ml (¼ cup) maple syrup (preferably golden syrup for its delicate taste)
30 ml (2 tbsp) olive oil
2 g (1 tbsp) cilantro, chopped
2 g (1 tbsp) parsley, chopped
Salt and pepper, to taste

1. Peel and de-vein prawns.
2. Cut them in half lengthwise and put into a bowl.
3. Squeeze the limes and pour the juice over the prawns. Let marinate for 5 minutes.
4. Add all other ingredients and mix gently.
5. Refrigerate for 1 hour and serve.

INNOVATION AND DEVELOPMENT

Research and development is advancing at such a rapid pace in food science and technologies that it seems we learn the latest breakthrough one day, only to discover there is something new the next.

This is certainly true in the maple industry, where age-old traditional methods have modernized in the space of a few short years. Producers who remember sap collection with buckets and barrels on horse-drawn sleds now employ highly efficient tubing systems, while reverse osmosis systems save energy and produce better quality maple syrup.

The food processing industry, however, still has work to do in the development of maple products, particularly meals and beverages ready to consume from the shelf. There are practical explanations for why maple is not a sweetener of choice for mass-produced frozen or vacuum-packed offerings. It's fragile compared to other commercial sugars like corn syrup, and more costly.

Maple syrup's path to progress in processed foods (pastries, confectionery, etc.) may lie in more innovative techniques such as freeze-drying, cryogenics, and smoke treatment as well as more imaginative products.

For example, beets that are smoked, then cooked in maple water have a unique taste and texture that should appeal to an increasingly health-conscious public. Could smoked maple syrup move beyond culinary innovation to mainstream commercial interest?

Science and cuisine work wonders in partnership. But great ideas do not always result in lasting commercial success. Molecular gastronomy comes to mind...

Maple and Innovative Culinary Technology

Sous vide

Sous vide makes it possible to cook food to the correct temperature while enhancing its flavour and that of its seasoning.

When maple is used as the seasoning in sous vide cooking, flavours are sometimes transformed, the flavours of other ingredients are sometimes intensified, and textures sometimes change.

Cooking a vegetable sous vide with lightly salted maple water doesn't make a noticeable difference with the vegetable, but the cooking liquid is much tastier than if boiled. This means vegetable peels, an equivalent ratio of maple water, and 1 g of salt per litre will produce a delicious broth when cooked sous vide at a temperature of 83° C for 12-16 hours.

Fish seasoned with a little dark or very dark maple syrup and a bit of salt will develop a umami flavour similar to soy sauce.

Red meat seasoned with a little maple syrup imparts a delicate maple flavour. Marination under sous vide changes the meat's texture so it should be cooked promptly after vacuum packing. And post-cooking application of a maple lacquer is recommended for deeper flavouring.

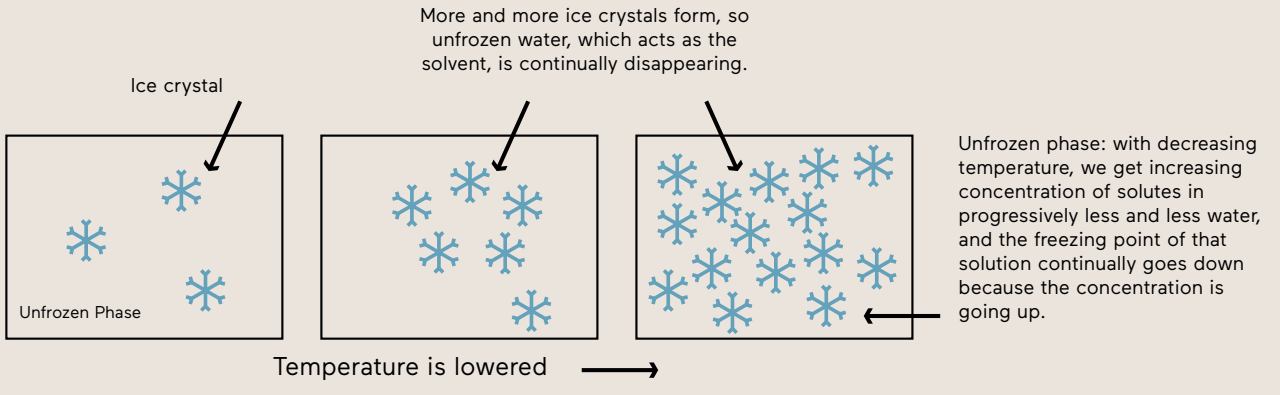
Cryoconcentration/Freeze-Drying

Cryoconcentration and freeze-drying remove the water from a food by freezing it. The processes are different but they achieve the same results: preserving the food's original flavour and concentrating it.

This does not work with maple water because its flavour remains undeveloped until it is cooked and undergoes the Maillard effect. However, if the maple water is first cooked sous vide (as explained in the previous section), its flavour will be concentrated by these methods. The more concentrated the broth, the sweeter it becomes.

Maple syrup does not freeze, so water must be added to it before it can be freeze-dried. (This does not apply to cryoconcentration, as it will merely remove the water that was added.) Freeze-drying, however, produces a powder which must be vacuum-packed and stored in the freezer. If left at room temperature, freeze-dried syrup liquefies to the consistency of taffy.

Cryoconcentration



Source: University of Guelph (Ice Cream Technology E-Book/Structure from the Ice crystals)

As ice crystallization begins and water freezes out in its pure form, the concentration of the remaining solution of sugar is increased due to water removal and hence the freezing point is further lowered.

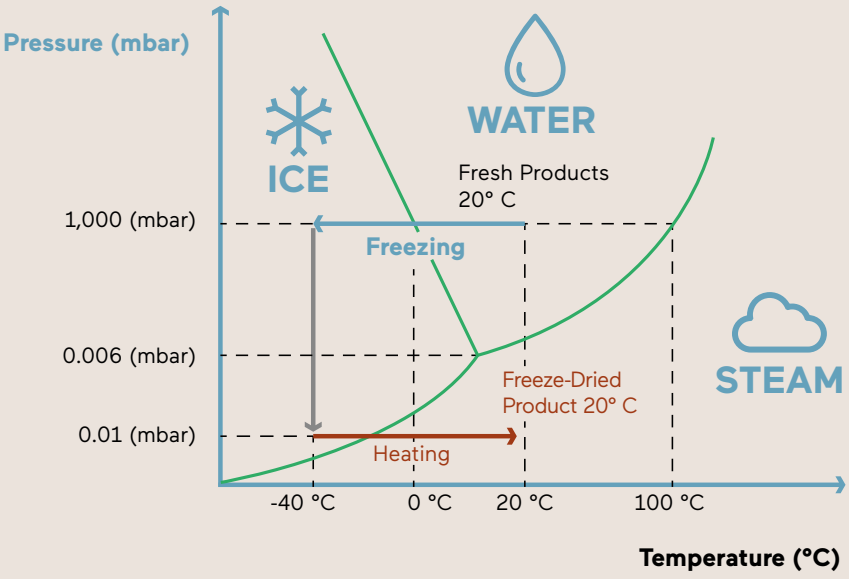
The same principle occurs naturally in the process of making ice wine. As temperatures drop, a portion of the water in grapes freezes, concentrating their sugars.

The ice crystals in the pulp go through the press, producing grape juice with an elevated sugar content.

Cryoconcentration may change a food's flavour profile. For example, the saltiness and umami of a mushroom broth may intensify, while the bitterness of an artichoke broth will diminish.

The technique concentrates natural sugars, producing a syrup without having to add sugar.

Freeze-Drying



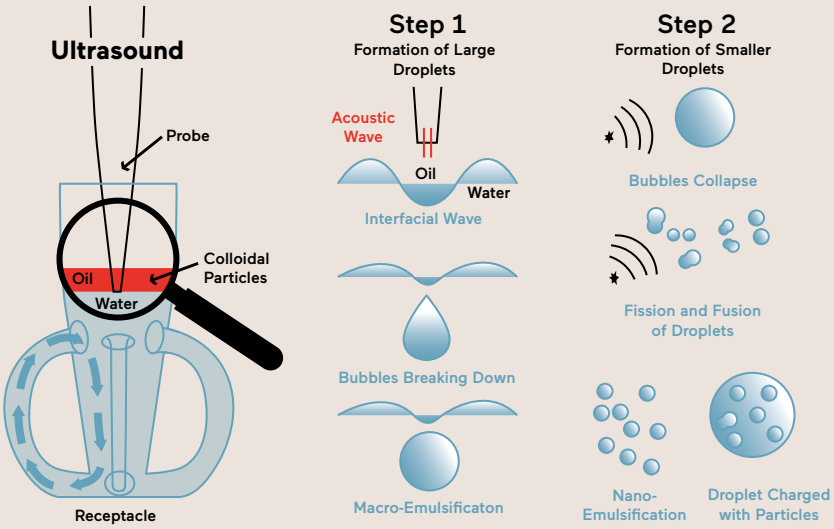
Freeze-dried foods retain their flavour and nutritional properties. What's more, this technique does not denature the product by hardening or darkening it. It saves considerable space and lengthens shelf life significantly.

Emulsifying by Ultrasonic Cavitation

This process enables the kitchen creation of extremely stable emulsions, with much more flexible fat-to-liquid ratios, less fat, and better flavour distribution.

Emulsifying through the use of ultrasonic probes creates acoustic cavitation, generating high shear forces that produce very fine droplets.

This process is therefore useful in making vinaigrettes, mayonnaise, and any emulsion with a maple base. In this case, the maple flavour is heightened.



The action of specific operations, such as the force of agitation and the addition of surfactants (emulsifiers), as well as the formation of the finest-possible droplets help stabilize the emulsion.

Source: Plüisch, Claudia & Wittemann, Alexander. (2016). Assembly of Nanoparticles into "Colloidal Molecules": Toward Complex and yet Defined Colloids with Exiting Perspectives. 10.5772/65343.

Extraction by Ultrasonic Cavitation

This process is not an infusion, but an extraction.

It extracts the main active ingredients and flavours of various foods (herbs, spices, teas, mushrooms, etc.) into a cold liquid.

Sound waves produce a cavitation effect that increases contact with the food's surfaces, thereby improving the migration of its substances into the liquid.

Extraction by ultrasonic cavitation is quite similar to simple infusion except without the need for boiling the medium, thereby hastening the process.

Maple water, in this extraction method as with cold or hot infusion, always delivers better results than plain water, meaning the flavours are much more present.

The Range of Maple Products

Chapter 04

MAPLE SYRUP AND OTHER MAPLE PRODUCTS

Maple confections can be soft or hard, crunchy or smooth. But they all begin as maple syrup.

Soft ⟷ **Hard**

The degree to which a confection is soft or hard depends on its water content.

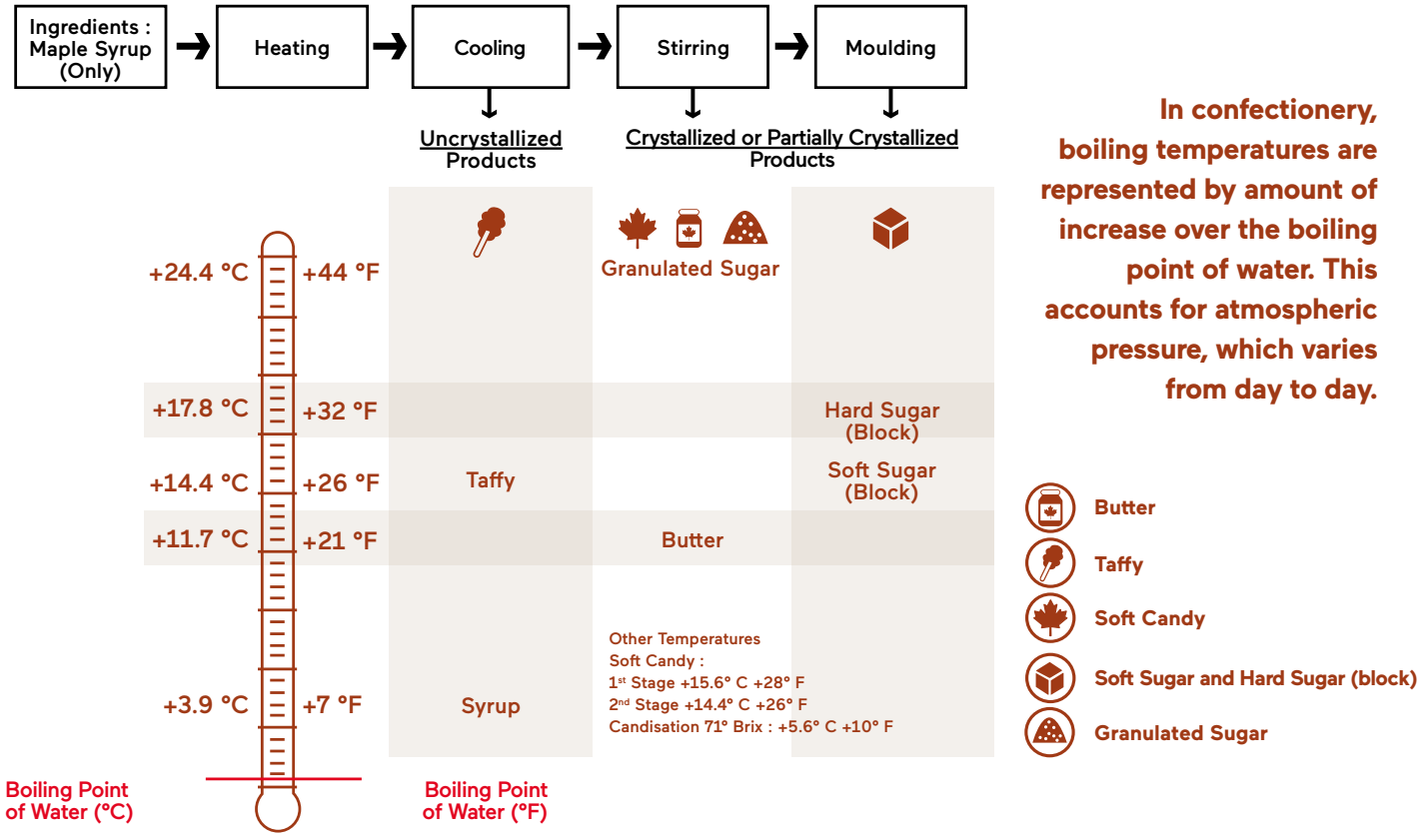
Smooth ⟷ **Granulated**

Uncrystallized Products

Partially Crystallized and Crystallized Products

The degree to which a confection is smooth or granulated depends on the size and number of the sucrose crystals it contains.

The water content and granularity of any maple product is determined by how it is made. The process is as follows.



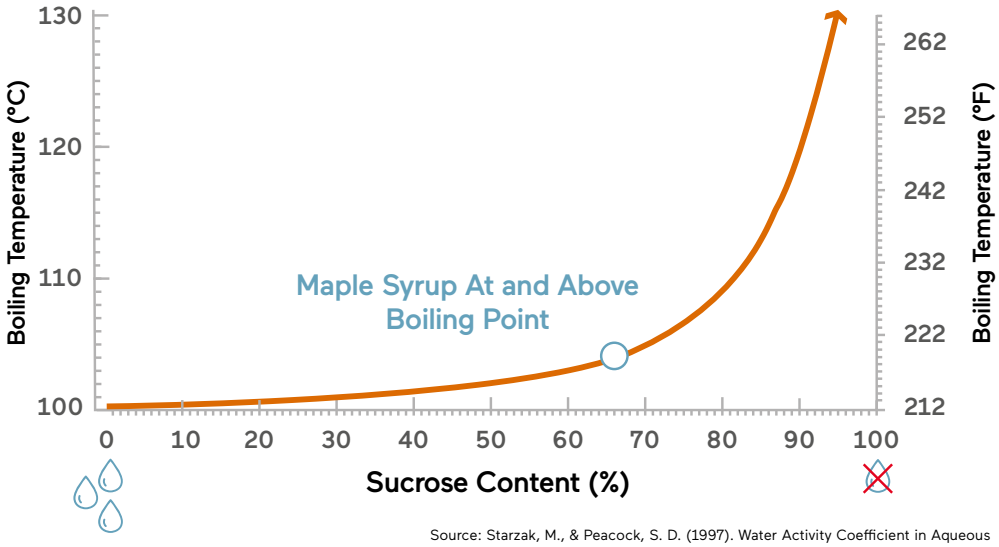
In confectionery, boiling temperatures are represented by amount of increase over the boiling point of water. This accounts for atmospheric pressure, which varies from day to day.

**All recipes are in Fahrenheit plus simple conversions to Celsius.*

BOILING TEMPERATURE IS AN INDICATOR OF SUGAR CONTENT

The temperature at which maple syrup is boiled results in its sugar content and degree of firmness. Sugar content increases in relation to the rising temperature level of the sucrose/water mixture, as illustrated in the graph below.

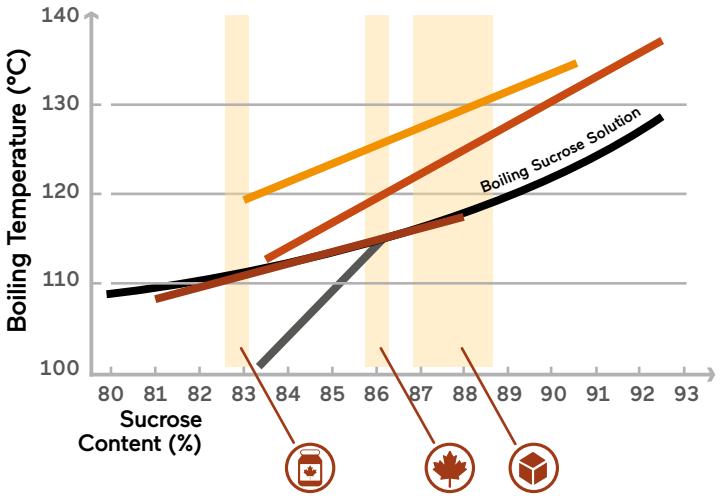
Temperature to Sucrose Content at Normal Pressure



Source: Starzak, M., & Peacock, S. D. (1997). Water Activity Coefficient in Aqueous Solutions of Sucrose—A Comprehensive Data Analysis. Zuckerindustrie, 122(5), 380-387.

Maple syrup is mostly a combination of sucrose and water. However, other molecules are present so the temperature-to-sugar content equation can be altered. How these molecules influence the equation is not known, but the following lab study measured the effects of boiling on the different grades of maple syrup.

Temperature to Sucrose Content of Maple Syrup by Grade



Source : GastronomiQc Lab

Syrup grade is a determinant of boiling point.

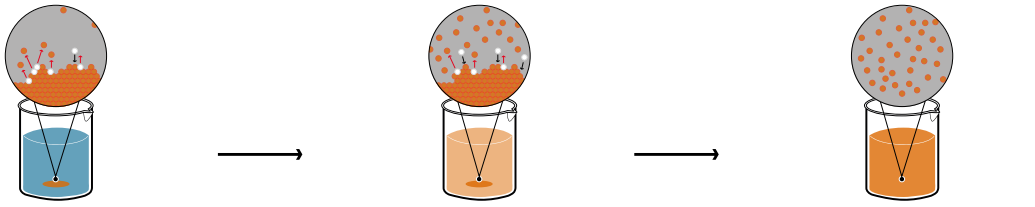
Very dark maple syrup reacts differently than amber and dark syrups.

Even though its sucrose content is the same, very dark maple syrup has a lower boiling point.

These results suggest that much higher temperatures are needed for amber syrup to achieve the desired texture than are required for very dark syrup.

BUT NO. When tested in the kitchen, product texture did not seem to be affected by grade. The composition of a syrup has some influence on how it reacts to temperature level but, in the absence of a better testing model, the best policy remains to abide by the temperature-to-sucrose curve as-is.

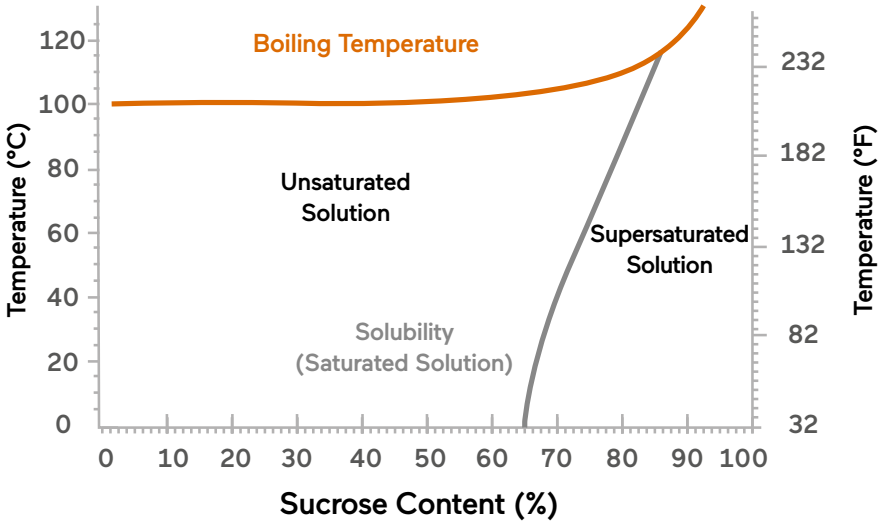
Supersaturation By Cooling



	Unsaturated Solution	Saturated Solution	Supersaturated Solution
Definition	Can dissolve added sugar.	Cannot dissolve added sugar. Will not crystallize over a long period of time.	Dissolves more sugar than it can normally contain. A solution becomes supersaturated when boiled to lose enough water. It is then cooled and allowed to crystallize over time.
Example	Maple Water	Maple Syrup	Maple Taffy

The amount that a saturated solution is able to dissolve correlates to its temperature. The higher the temperature, the more it can dissolve.

Boiling Temperature to Sucrose Content at Normal Pressure



Cooling furthers the supersaturation process. It is essential for proper crystallization.

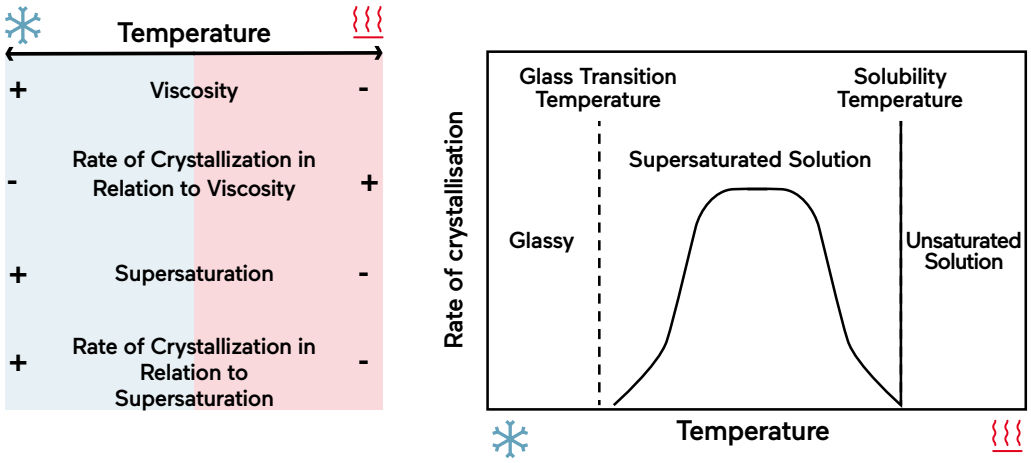
Source: Hartel, R. W., Ergun, R., & Vogel, S. (2011). Phase/State Transitions of Confectionery Sweeteners: Thermodynamic and Kinetic Aspects. Comprehensive Reviews in Food Science and Food Safety, 10(1), 17-32.

Thickening By Cooling

The more supersaturated maple syrup cools, the more viscous it becomes. Thicker syrup tends to crystallize less quickly because its molecules find it difficult to move around.

Supersaturation and viscosity both depend on the syrup's temperature but their effect on crystallization is different. In fact, the closer crystallization occurs to the temperature of glass transition or solubility, the slower it occurs.

Rate of Crystallization as Maple Syrup Cools

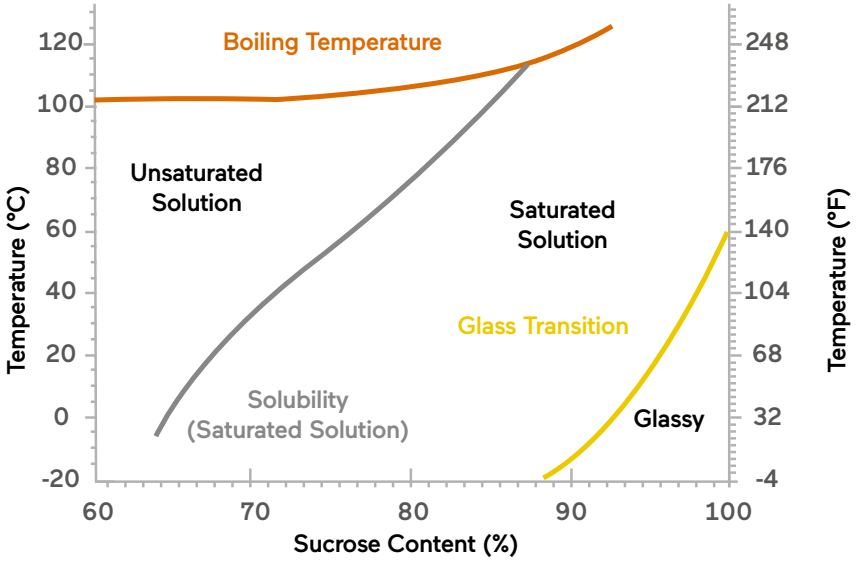


Source: Hartel, R. W., Ergun, R., & Vogel, S. (2011). Phase/State Transitions of Confectionery Sweeteners : Thermodynamic and Kinetic Aspects. Comprehensive Reviews in Food Science and Food Safety, 10(1), 17-32.

When Does Maple Syrup Become "Like Glass"?

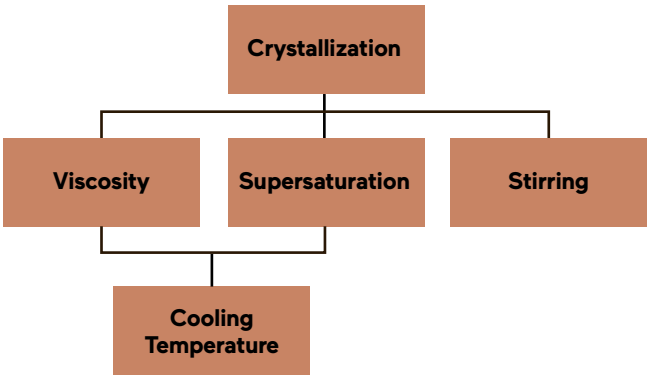
At a very low temperature, maple syrup is so thick that is said to have become a solid, even though it has not frozen or crystallized. This is known as its glass transition temperature at which (or below it), the maple syrup is said to have become "glassy." The temperature rises in correlation with sugar concentration. Wheat and barley kernels are said to be in a glassy state before they are saturated.

Phase Diagram of Sucrose in Solution



Crystallization by Agitation and Moulding

Crystallization may or may not be desirable for a given product but it should be a controlled process. There are three factors involved in crystallization, seen opposite.



These products are made in processes that involve stirring and temperature control:

Maple Butter

Steady mixing of maple syrup that has been heated, then quickly cooled, produces the small, fine crystals present in maple butter. The low temperature slows crystallization while churning causes formation of the tiny crystals.

Hard (or Block) Maple Sugar

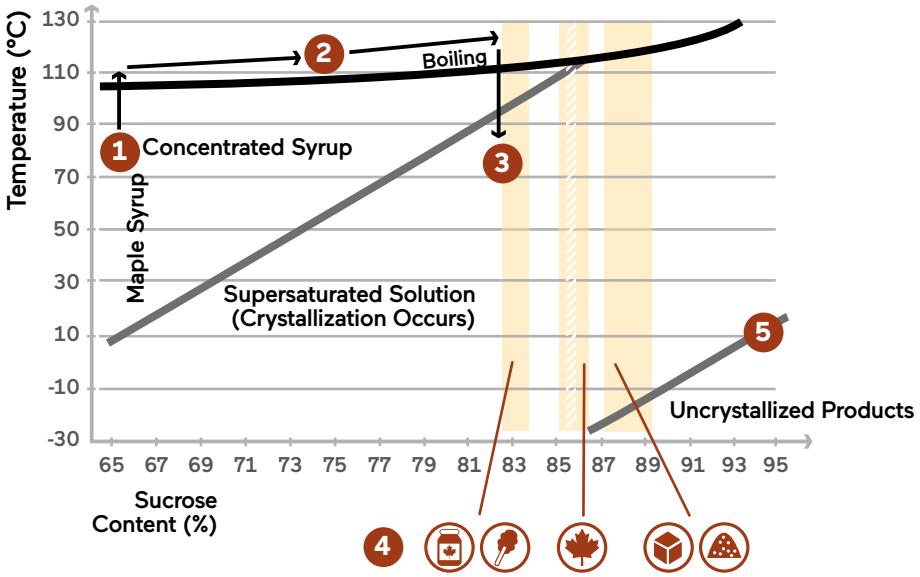
Maple syrup is slowly stirred, causing the formation of large crystals, and then poured into moulds at a moderate temperature. No longer being stirred, the sugar hardens into a block in the mould.

Maple Taffy

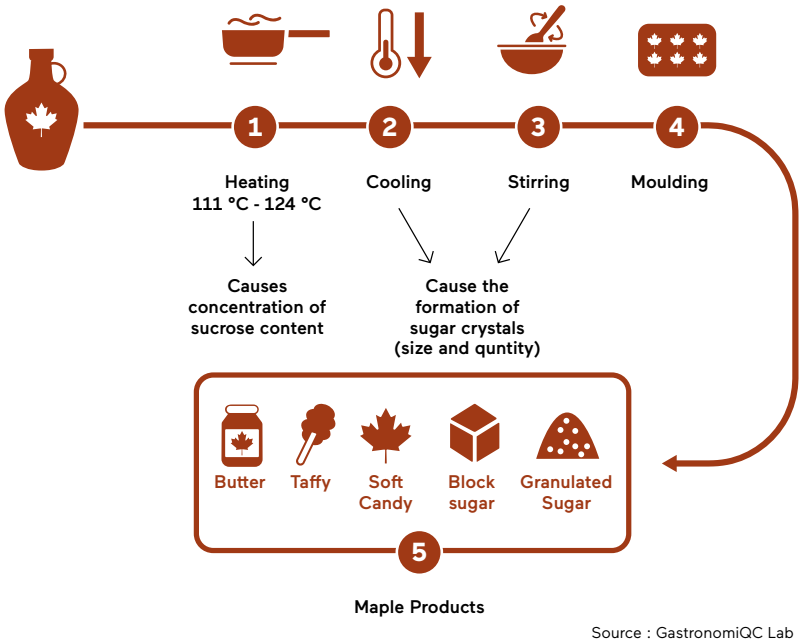
Crystallization does not occur because the maple syrup is brought to a high temperature and agitated only by the action of pouring it into its packaging. The smooth taffy is then frozen, preventing crystal formation.

HOW TO MAKE MAPLE PRODUCTS

These diagrams illustrate the effects heating and cooling exert on the making of maple products



How to Make Maple Products, Step-by-Step



Source : GastronomiQC Lab

WHAT YOU NEED TO TURN MAPLE SYRUP INTO OTHER MAPLE PRODUCTS

Heating

Stove with round burners.

Maple products are typically processed on gas stoves but conventional and induction stoves also work.

A pot three times the height of the amount of syrup to be processed. A pouring spout is helpful.

Syrup will rise above its resting level during boiling. A pot with good height will help prevent spillage.

A vegetable-based anti-foaming agent to coat the upper inside of the pot before boiling.

Butter, lard, cream or other animal fats are not used, as maple products are considered vegetarian.

A candy thermometer.

A standard thermometer can be used but a digital device may have the added advantage of being able to preset the target temperature with an alert for when it is reached.

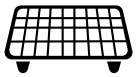
Important Criteria for Choosing a Thermometer:

Reading range of at least 20 - 130° C (68 - 266° F). A rod thermometer must be long enough to hang over the pot into the syrup.

The graduated cylinder or probe must not touch the bottom of the pot.

Fahrenheit measurements were the previous norm for reasons of precision. But digital devices now display temperatures to the decimal, making °C more accurate than °F.

Cooling



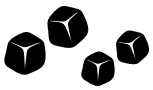
Cooling Grate.

Use grates with smaller openings for small pots. If cooling is to be done with water, be sure the grate fits into your cooling tub.

Cooling Tub.

Must be large enough to accommodate the grate on which the pot sits, allowing the water to circulate under it to optimize cooling.

A plastic tub is acceptable.



Crushed ice, a water tap, or other cooling system.

Usually the process involves putting the tub into a sink and letting the tap run a slow stream of cold water around the pot. The water must not be allowed to warm and its level must reach the level of syrup in the pot.

Adequate circulation of cold water all around the pot aids rapid cooling.

A small container of hot water for the thermometer.

Clean cloths to clean the pot.

Infrared Thermometer.

Cooling is typically judged by touch. More accurate results, of course (especially for multiple production runs), are achieved with an infrared device that reads the product's surface temperature.

You will be need a temperature range of at least between 10° C and 95° C.

Agitation

Hand Mixing Tool.

Mixing by hand has traditionally been done with maple wood instruments to maintain aromatic integrity. For sanitary reasons, however, the use of silicone, plastic, or stainless steel hand tools is now recommended. If you choose a silicone paddle, ensure the blade has sufficient rigidity to work through thick products.

Mixer.

Pictured are examples of appliances commonly used by maple producers. In home kitchens, a stand mixer or hand mixer will do.

Mixing speed is important. If too high, it heats the syrup and produces an undesirable degree of crystallization.

Moulding

Food Grade Moulds.

Wood moulds (like hand mixers) are commonly used at the sugar bush. Again, for sanitary reasons, silicone, plastic, or stainless steel is recommended.

Glycerin and/or Non-Stick Spray.

Careful brushing and/ or spraying will prevent sticking in the mould.

Kitchen Brush.

Cake Spatula.

To level and shape surface of what you've put in the mould.

Other

Packaging/Storing

- Glass Jars
- Plastic Wrap (cellophane)
- Parchment Paper
- Plastic Containers (polypropylene)
- Food-Safe Metal Cans
- Grease-resistant paper liners and candy boxes (e.g. for chocolates)

Candisation

- Candisation Tub and Tray
- Grate

Other ingredients

- Glucose Syrup
- Condensed Milk
- Carrageenan

Granulation

- Potato Masher
- Cellophane Bags
- Sieve: 6-mesh per cm (1.67 mm openings) is what people are accustomed to, but other sizes can be used.

Maple Butter

- Piping Bag

GENERAL INFORMATION ON THE STEPS OF PROCESSING MAPLE SYRUP

Preparation

1. Calculate the Correct Boiling Temperature

- Boil a pot of water and use a candy thermometer to determine the boiling point. Do this first on each day you intend to work.
- Calculate the correct boiling temperature, as follows:

	Boiling point of water
+	Temperature increase for the chosen product
=	Boiling temperature for the maple product to be made

The boiling temperature is also influenced by atmospheric pressure, which in turn is influenced by altitude and weather conditions.

For this reason, the boiling point is determined regularly.

The same thermometer must be used to measure the boiling temperatures of both the water and syrup.

The syrup will foam up, sometimes a lot, once it starts to boil. This is why defoamer is essential.

2. Prepare to Cook

- Coat the upper inside surfaces of the pot with antifoaming agent, using a maximum of 1 g per litre of syrup.
- Position the candy thermometer inside the pot so its rod will extend halfway into the syrup.
- Add syrup to pot in small quantities (e.g. a litre at a time) to guard against excessive foaming.

Heating

1. Turn on the stove and place pot on element.

Medium-high heat works well on most conventional stoves. High heat risks burning the syrup, while too low extends heating time and will produce fine crystals in the syrup or on the sides of the pot.

2. Bring syrup to the boil and heat until it reaches the correct temperature, as calculated above.

Avoid touching the thermometer during and after boiling.

3. As soon as the correct temperature has been reached, immediately remove the thermometer from the pot, and the pot from the burner.

Boiling (even hot) syrup must be handled with great care. It is also quite sticky. Contact with skin will cause burns.

If the pot foams excessively during boiling (even with defoamer), reduce the heat until it subsides.

When you take the thermometer out, put it in the container of hot water immediately. This makes it easier to clean. A clean thermometer is needed for accurate readings.

Cooling

1. As soon as the syrup begins cooling, it becomes a supersaturated solution and crystallization starts to occur. It must not be agitated at all until the recommended cooling temperature is reached, in order to obtain the crystal size that's correct for the intended product.
2. The pot should now be on a grate in the cooling tub with circulating or ice-cold water around it up to the level of the syrup. If the water is too high, the pot will float; if too low, the syrup will not cool properly.
3. Overheated syrup or dried foam may stick to the pot's inner walls during boiling. This could affect the crystallization process so it should be carefully removed with a clean, damp cloth.
4. Allow syrup to cool to the product's prescribed temperature. This should be measured with the infrared thermometer to avoid agitation.

Notes :

The time it takes to cool to the target temperature may vary according to the product.

Cooling directly in a sink is sometimes done but is not recommended due to the risk of microbial contamination.

Important: Cooling, stirring, and moulding control crystallization by preventing, initiating, or allowing it.

Agitation must be avoided at the cooling stage.

Here are some examples of how it may ocur:

- ***By leaving the thermometer in the syrup or during its removal***
- ***Jostling the pot, disturbing the contents***
- ***Transferring the contents into another container***

If the syrup, for one reason or another, MUST be agitated, this should be done immediately at the end of the heating stage, i.e. before cooling.

Agitation

1. **As you stir, you may observe the following:**

- The maple syrup and bubbles in it are translucent. It looks glossy, like maple taffy.
- Small white streaks of uneven crystals are forming around the edges and on the bottom of the pot. When you scrape the syrup at the bottom of the pot, it seems rougher and more granular.
- The bubbles become cloudier, as does the syrup, which you can see when you let it drip from your hand tool. The colour is becoming paler.
- The colour fades progressively.
- Where you stir, the surface of the syrup looks dull, compared to elsewhere which is still shiny. It's starting to feel like dough.
- The syrup all turns dull in colour and the texture is a bit like cookie dough.

2. **At this point, the agitation stage is complete and the product will quickly harden. It's very important to move immediately to the next stage.**

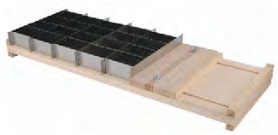
When the agitation stage ends depends on which product you are making. One rule of thumb to remember is that the sooner you stop stirring, the larger the crystals will be.

The changes you see occurring as you stir are, in fact, the process of crystallization.

Stir a little = large crystals.
Stir a lot = small crystals.

Moulding

1. Your moulds should be ready, prepared in advance (during heating or cooling) by coating them with glycerin or kitchen spray, finishing carefully with a brush.
   Surfaces should have no visible droplets.
2. The cooled maple is hardening so waste no time in putting it into the moulds.
3. But also be careful and deliberate. Once placed into the mould (and leveled and shaped, if desired), it should not be disturbed, as it will not regain its firm texture.
4. Cleaning silicone moulds: Soak them in a mixture of boiling water and 1 tbsp baking soda.



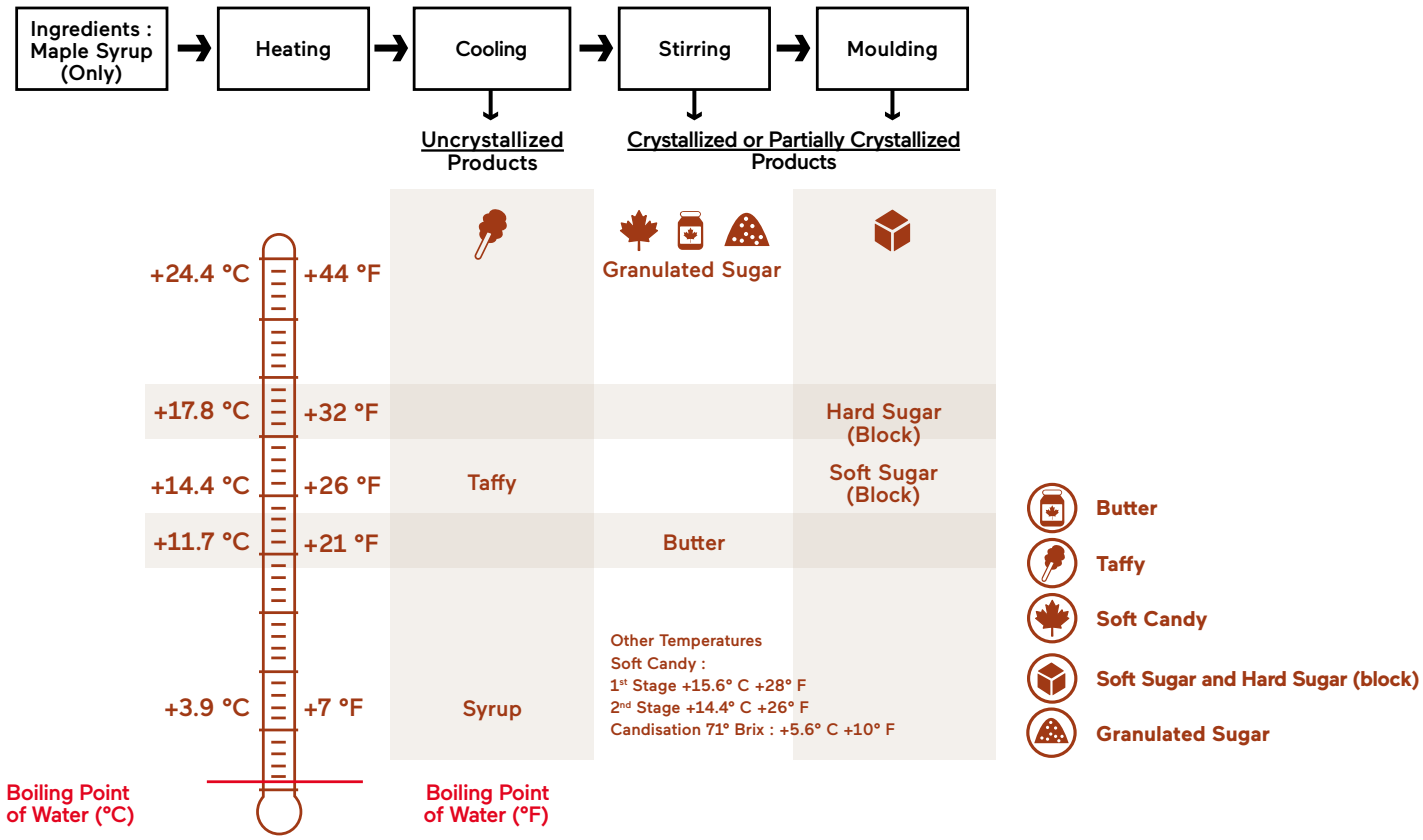
Large silicone moulds (e.g. muffin trays) can be used instead of the traditional block sugar moulds.

100% PURE MAPLE PRODUCTS TECHNICAL SHEETS

Determining Boiling Temperatures

Before the preparation of any maple product, one must first determine the boiling point of water (demineralized or distilled water, or osmosis filtrate). This will vary at any given time due to the atmospheric pressure and altitude at which it takes place.

The boiling point of water is the reference to which degrees are added to determine the correct boiling temperature of the product being made, as shown in this chart.



***All recipes are in Fahrenheit plus simple conversion to Celsius.*

Maple Taffy

Maple taffy is crystal-free, smooth, and translucent with a sticky mouthfeel. It retains its appearance from container to usage (e.g., spread on snow or crushed ice).

Equipment/Ingredients

- Candy Thermometer
- Pot
- Defoamer
- Cooling Tub
- Maple Syrup

Packaging

- Glass
- Polypropylene
- Food-Safe Metal

Storage

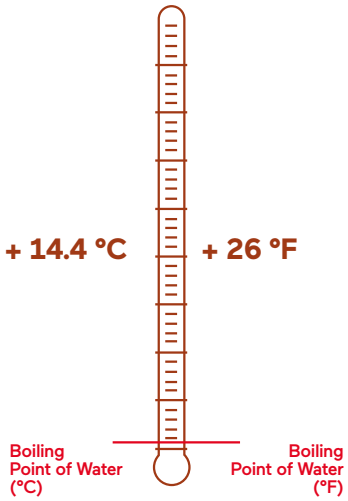
Source: CTTA, 2004

Room Temperature	Not recommended
Fridge	1 month
Freezer	6 months

The syrup used to make maple taffy is a supersaturated, uncrystallized solution so there is a high risk it will crystallize if stored at too high a temperature. Freezing delays crystallization.

Method

1. **Preparation:** Consult "General information on the steps of processing maple syrup" on Page 58.
2. Boil the water used to measure boiling point for 10 minutes. Remove from heat and save for Step 7.
3. **Heat** the syrup until it measures **+14.4° C (+26° F)** above that of the boiling water.
4. **Cool** at room temperature just until the expansion of the syrup subsides and move on to putting it into containers. Do not allow it to cool too much because undesirable crystals will begin to form.
5. **Pour** into clean containers. Try to do so in single streams without tipping the pot back and forth.
6. Place containers into iced water to finish cooling. The tops of the taffy in its containers should match the height of the water and the water must remain cold throughout the process.
7. After 15 minutes, add a little of the reserved water to the tops of the taffy containers. Add cold sterilized water to level the surface and dissolve sugars that could crystallize.
8. Wait another 15 minutes. Then remove the containers from the ice water and cover with their lids.



Maple Butter

A spreadable, semi-firm fondant. Less sticky than taffy.

Equipment/Ingredients

- Candy Thermometer
- Pot
- Defoamer
- Glass Containers
- Hand Mixing Tool
- Cooling Tub
- Grate
- Stand Mixer (optional)
- Piping Bag
- Maple Syrup

Packaging

- Glass
- Plastic
- Food-safe Metal

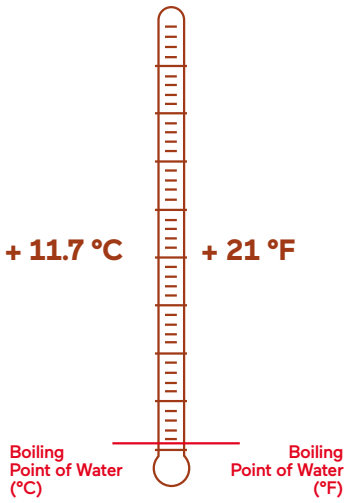
Storage

Source: CTTA, 2004

Room Temperature	Not recommended
Fridge	2-4 months
Freezer	36 months

Method

1. **Preparation:** Consult "General information on the steps of processing maple syrup" on Page 58.
2. **Heat** the syrup until it measures +11.7° C (+ 21° F) above that of the boiling water.
3. **Cool** in an ice water bath until a reading of 28° C (82° F) is reached on an infrared thermometer pointed at the centre of the syrup's surface. The cooler the syrup while stirring, the creamier and smoother will be your butter.
4. **Stir** continuously at a rate of one fold/second. It will start losing its lustre at the stir points, then take on a homogenous, dull texture. This will take between 15 and 60 minutes. **Maple butter hardens rapidly. Do not waste any time getting it into containers.**
5. **Transfer** it into your containers with a piping bag.



Notes: Stirring by hand can take longer than by machine, but manual agitation makes it easier to tell when it's time to stop. Stirred too much, maple butter gets too firm to properly fill the containers.

Slow, steady stirring should produce a nicely textured maple butter and save energy if stirring by hand.

Soft (Block) Maple Sugar

Creamy and melt-in-your-mouth, this type of block maple sugar is firmer than maple butter and less firm than soft maple candies.

Equipment/Ingredients

- Candy Thermometer
- Pot
- Defoamer
- Hand Mixing Tool
- Silicone Moulds
- Glycerin Coating for Moulds
- Cake Spatula
- Cooling Tub
- Grates
- Maple Syrup

Packaging

- Parchment Paper
- Candy Box (such as the type for chocolates) lined with grease resistant paper
- Plastic film (cellophane)

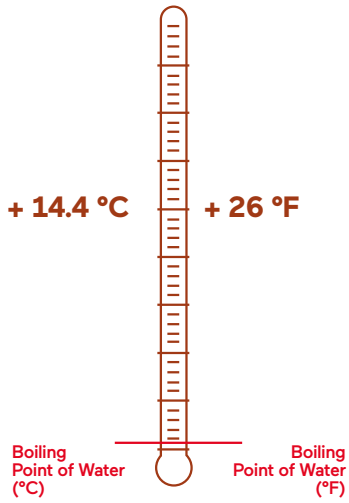
Storage

Source: CTTA, 2004

Room Temperature	Not recommended
Fridge	1 month
Freezer	6 months

Method

1. **Preparation:** Consult "General information on the steps of processing maple syrup" on Page 58.
2. **Heat** the syrup until it measures **+14.4° C (+26° F)** above that of the boiling water.
3. **Cool** in an ice-water bath until a reading of 44° C (111° F) is reached on an infrared thermometer pointed at the surface. The faster the mixture cools, the less crystallization occurs, and the creamier the sugar will be.
4. **Stir** with your hand tool, folding the solution toward the centre of the pot at a rate of one fold per five seconds. You will see the cooling mixture losing its lustre where you stir it. It is turning opaque but not solid.
5. **Pour** into moulds that have been pre-coated with glycerin. Level the tops with your cake spatula. Cover to keep out dust as it hardens, about 10-15 minutes..
6. **Unmould** by first manipulating the moulds to ensure the blocks have hardened sufficiently. If so, tap the moulds on your work surface, unmould the blocks and leave them to harden on wire grates for 3-6 hours.
7. **Transfer** blocks to their packaging.



Note: The agitation stage for soft maple sugar is quite similar to that for maple butter. The difference of significance is the higher boiling temperature that lends it a firmer texture.

Hard (Block) Maple Sugar

Formerly known as "country sugar," this was the homemade sweetener of choice for les habitants du Québec for over two centuries. It is still used today, usually grated. Hard maple sugar has a rough surface and grainy mouthfeel.

Equipment/Ingredients

- Candy Thermometer
- Pot (with or without pouring spout)
- Defoamer
- Hand Mixing Tool
- Moulds
- Non-Stick Spray
- Cake Spatula
- Cooling Tub
- Grate
- Maple Syrup

Packaging

- Parchment Paper
- Plastic film (cellophane)

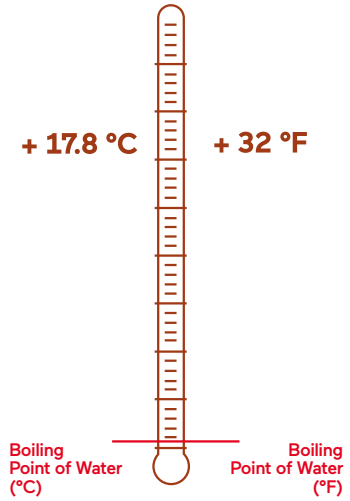
Storage

Source: CTTA, 2004

Room Temperature	9-12 months, after candisation (Page 68) and kept cool and dry
Fridge	Not Recommended
Freezer	Not Recommended

Method

1. **Preparation:** Consult "General information on the steps of processing maple syrup" on Page 58.
2. **Heat** the syrup until it measures +17.8° C (+32° F) above that of the boiling water.
3. **Cool** rapidly by placing the pot on the wire grate until the syrup temperature reads 88° C (190° F)
4. **Stir** with your hand tool for 20-30 seconds, carefully scraping the crystals off the bottom and sides toward the middle of the pot. Transfer to another container and resume stirring at a rate of about 1 full turn per 5 seconds. Continue until the mixture is thick but still pliable and looks dull where you move it with your tool. The trick is to find the correct pace of stirring: if too fast, the mixture will be too hot to put into the moulds; too slow, and it will solidify in the pot. The maple syrup is boiled at a higher temperature than for other products, so it's more supersaturated. Stirring it slowly while it's hot causes crystals to form more quickly but in smaller numbers. You will see them appear as you stir.
5. **Pour** into moulds that have been pre-coated with the non-stick spray, then smooth the surfaces with the cake spatula. Cover with a warm, damp cloth to keep out dust during the hardening process, about 30 minutes.
6. **Unmould** by first manipulating the moulds to ensure the blocks have hardened sufficiently. If so, tap the moulds on your work surface and release the blocks.
7. **Transfer** blocks to the wire grate to cool completely.
8. **Finish** with a coating of maple syrup. See the instructions for candisation on Page 68.
9. **Wrap** the blocks of hard maple sugar in your packaging.



Granulated Maple Sugar

An excellent natural substitute for processed sugar.
The maple syrup is stirred very hot to evaporate most of its water content.

Equipment/Ingredients

- Candy Thermometer
- Pot
- Defoamer
- Stand Mixer (or Hand Tool)
- Infrared Thermometer
- Cooling Tub
- Potato Masher
- Sieve
- Maple Syrup

Packaging

- Airtight Containers (e.g., glass jars)
- Cellophane Bags

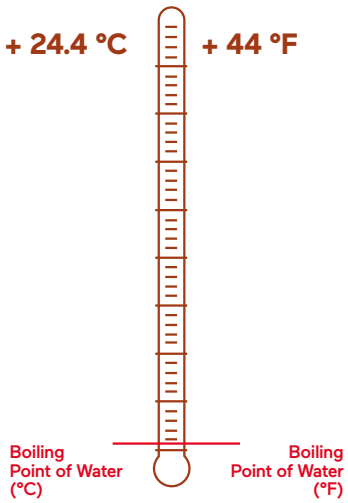
Storage

Source: CTTA, 2004

Room Temperature	36 months, if kept cool and dry
Fridge	Not Recommended
Freezer	Not Recommended

Method

1. **Preparation:** Consult "General information on the steps of processing maple syrup" on Page 58.
2. **Heat** maple syrup until it reaches **+24.4° C (+44° F)** above that of the boiling water.
3. **Cool** on a tempered surface or grate for one minute per litre of syrup.
4. **Stir** as hot as possible to promote water evaporation. Start stirring gently while scraping the bottom. If no large bubbles appear, continue to stir.
   - Pour into the stand mixer.
   - Mix at the second speed setting until it begins to flake and crumble.
   - Transfer to the tray.
   - Break up larger chunks with the potato masher.
   - Mixing may be done by hand but it will be time-consuming.
5. **Sift** through a sieve onto trays to promote cooling and drying. The mesh size of the sieve will determine granule size.
6. **Transfer** to packaging once sugar has come down fully to room temperature.



Soft Maple Candies

These special treats call for two different syrup preparations that are then blended into a hybrid of hard and soft maple sugar.

The result is a fudge-like experience that melts in your mouth, with a granular finish.

Equipment/Ingredients

- Candy Thermometer
- Pots (2)
- Defoamer
- Hand Mixing Tool
- Moulds
- Glycerin
- Cake Spatula
- Cooling Tub
- Grates
- Maple Syrup

Packaging

- Parchment Paper
- Candy Box (such as the type for chocolates) lined with grease resistant paper

Storage

Source: CTTA, 2004

Room Temperature	For a few weeks after candisation (Page 68) kept cool and dry.
Fridge	Recommended
Freezer	Recommended

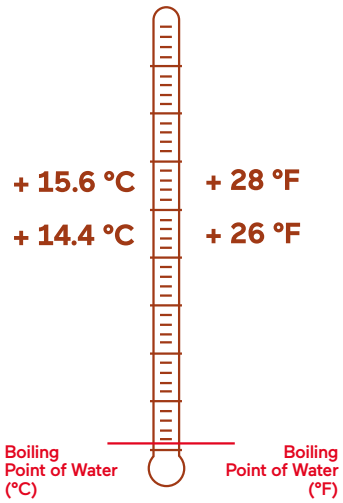
Method

First Preparation

1. **Preparation:** Consult "General information on the steps of processing maple syrup" on Page 58.
2. **Heat** maple syrup until it reaches **+15.6° C (+28° F)** above that of the boiling water. Do not stir while heating.
3. **Cool** rapidly by placing pot in the sink and running cold water around it until the thermometer reads 43°C (109.4° F).
4. **Stir** to obtain a pale colour (as for soft maple sugar) and leave to set in the pot.

Second Preparation

5. **Preparation:** Pour the same amount as for the first preparation + 10% into the second pot.
6. **Heat** maple syrup until it reaches **+ 14.4° C (+26° F)** above that of the boiling water, Do not stir while heating. As it heats, place the pot with the first preparation into a bain-marie of boiling water. This will return it to a liquid state.
7. **Pour** the second preparation into the first and mix until smooth and uniform.
8. **Transfer** to moulds that have been coated with glycerin and level with the cake spatula. Cover with a damp, warm cloth to keep out dust during the hardening process, about 20 minutes.
9. **Unmould** by first manipulating the moulds to ensure the contents have hardened sufficiently. If so, tap the moulds on your work surface and release the candies.
10. **Cool** on grates at room temperature for 2 hours.
11. **Coat** by following the instructions for candisation on Page 68.
12. **Transfer** to packaging.



Candisation

There is no English-language equivalent of this term, which is specific to the Québec maple industry. It is the name of the process whereby the shelf life of soft maple candies and hard maple sugar is extended.

Candisation is done with maple syrup at 66° Brix. A higher Brix value (71 or 74° Brix) results in an even longer shelf life (source: CTTA, 2004).

Equipment/Ingredients

- Candy Thermometer
- Pot
- Defoamer
- Infrared Thermometer
- Cooling Tub with Grate
- Candisation Tub with Grate
- Cheesecloth (cotton or plastic)
- Maple Syrup (use syrup with high light transmission, 70% or higher).

Packaging

- Airtight container such as that used for maple syrup.

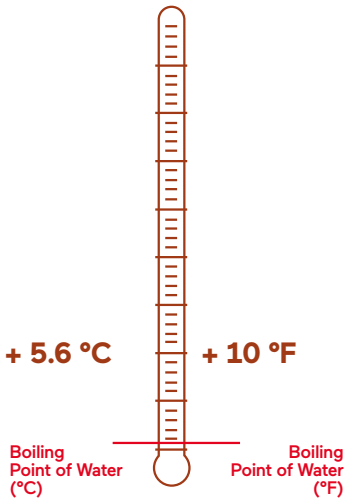
Storage

Source: CTTA, 2004

- Leftover syrup can be stored in the freezer and reused up to three times.

Method

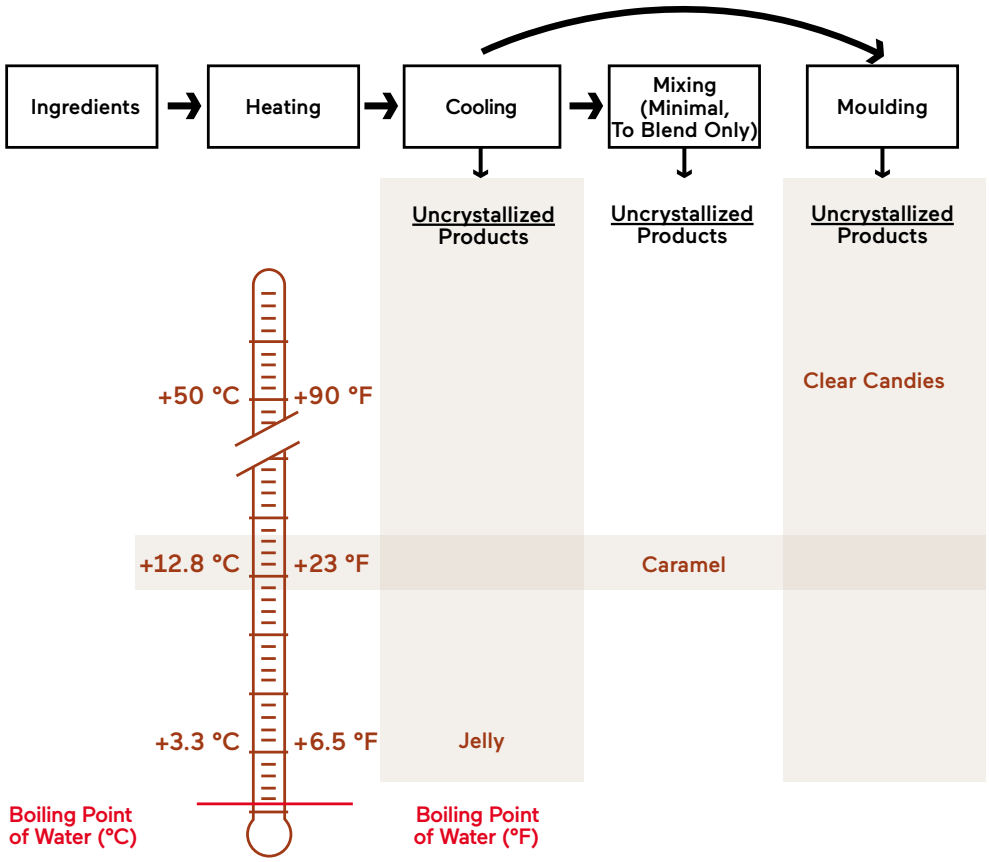
1. Estimate the amount of syrup it will take to fill the candisation tub.
2. **Preparation:** Consult "General information on the steps of processing maple syrup" on Page 58.
3. **Heat** maple syrup until it reaches **+5.6° C (+10° F)** above that of the boiling water (to reach 71° Brix).
4. **Cool**
   - Turn off heat and cool rapidly on the grate in the cooling tub until the thermometer reads 82° C (180° F).
   - Transfer to grate in the candisation tub, which is itself in a sink of cold water.
   - When the thermometer reads 22° C (71.6° F), put in the maple products on their grates so they're submerged.
5. **Candisation**
   - Leave submerged at room temperature for one hour.
   - Lift grates out of candisation tub and place on a tray. Cover to protect from dust and allow to dry for 6 hours or overnight.



Does it look to you like candisation uses a HUGE amount of syrup?
Don't worry: it goes a long way. The syrup can be used twice more for the same purpose and what's left can be granulated!

OTHER MAPLE PRODUCTS TECHNICAL SHEETS

There are maple products that contain ingredients other than maple syrup, making it possible to obtain textures that would not be attainable with syrup only. We will introduce three and how to make them.



***All recipes were made in Fahrenheit degrees and converted to Celsius values.*

Preparation of maple jelly and clear maple candies require no stirring so the process goes from cooling directly to moulding.

Maple Jelly

A texture similar to that of apple jelly, but flavour that is all deliciously maple.

Equipment/Ingredients

- Candy Thermometer
- Pot (with or without a spout)
- Defoamer
- Grate
- Carrageenan
- Maple Syrup

Packaging

- Glass Containers

Storage

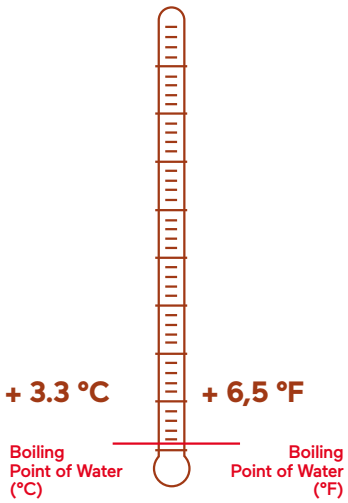
Source: CTTA, 2004

Room Temperature	6 months unopened. Refrigerate after opening
Fridge	1 year, unopened
Freezer	1 year, unopened

Method

1. **Preparation:** Consult "General information on the steps of processing maple syrup" on Page 58.
2. **Keep** to a boil the water (1.5 L) used to measure the boiling point.
3. **Heat** the maple syrup (4 L) on high until its temperature reads between **79 - 88° C (175 - 190° F)**.
   - As it heats, dissolve 25 ml carrageenan powder in the 1.5 L of boiling water, mixing with a high-speed hand blender for about 2 minutes, being careful as the water is very hot.
   - Once the syrup has attained a temperature between **79 - 88° C (175 - 190° F)**, stir in the gelatin solution, then reduce the heat.
   - Continue to heat the maple/gelatin mixture until its temperature reads **+3.3° C (+6.5° F)** above the boiling point of the water.
4. **Transfer** the jelly to containers as soon as the target temperature is reached.
   - Close containers tightly. Turn upside down for 30 seconds, then right side up. (Use gloves.)

   Note: *To maintain the ideal temperature for putting the jelly into containers, put the rest of the solution in the upper part of a double boiler, with boiling water in the lower part. (If you are using 1 L of maple syrup, this step is not required.)*
5. **Cool** on a grate at room temperature.



Note: Not all gelling agents can be used with maple. For example, pectin gels at an acidic pH. Carrageenan does not, which is why it is specifically used for maple jelly.

Maple Caramel

Soft, spreadable maple caramel is uncrystallized.

While stirring is intended to form crystals in maple products, in this case a light stirring serves the purpose of making the mixture smooth and consistent. Glucose syrup is used to increase the solubility of the sucrose and delay crystallization. If crystals form while the caramel is stored, it is likely due to improper texture.

Equipment/Ingredients

- Candy Thermometer
- Pot (with or without spout)
- Defoamer
- Cooling Tub
- Hand Mixer
- Grate
- Maple Syrup
- Sweetened Condensed Milk
- Glucose Syrup

Packaging

- Glass Containers

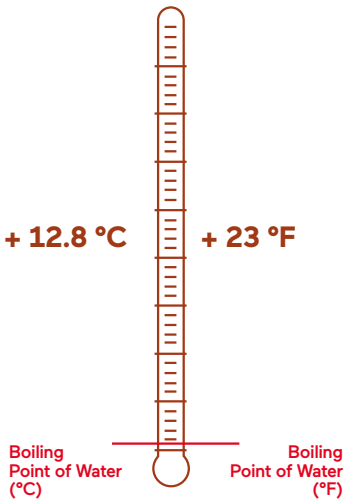
Storage

Source: CTTA, 2004

Room Temperature	Not Recommended
Fridge	Preferable
Freezer	Preferable

Method

1. **Prepare** containers for filling and consult "General information on the steps of processing maple syrup" on Page 58.
2. **Pour** 980 ml of maple syrup into the pot, followed by 200 ml of glucose syrup. Do not stir.
3. **Heat** until the thermometer measures **+12.8° C (+23° F)** above the boiling point of water. At this temperature, the caramel's texture is firmer. It can be made creamier at **+11.1° C (+23° F)**.
4. **Cool** to a temperature of **80° C (176° F)** and add 200 ml sweetened condensed milk to the pot. Use the hand mixer on low speed to blend until smooth.
5. **Transfer** to a vessel with a pouring spout.
   - Fill containers immediately.
   - Close containers.
   - Place containers on a rack with spaces between them and allow to fully cool.



Clear Maple Candies

Smooth texture. Not sticky.

Glucose syrup increases sucrose solubility and reduces crystallization, giving these hard candies their smooth, translucent appearance.

The process requires longer boiling time, risking the development of bitter or burnt (empyreumatic) flavours. This is why golden maple syrup is recommended: for balance.

Equipment/Ingredients

- Candy Thermometer
- Pot with pouring spout
- Defoamer
- Plastic Moulds
- Lollipop Sticks
- Grate
- Glucose Syrup
- Maple Syrup

Packaging

- Cellophane Bags with closures

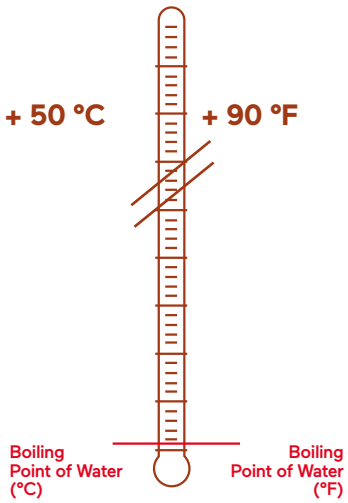
Storage

Source: CTTA, 2004

Room Temperature	1 month
Fridge	Not Recommended
Freezer	Not Recommended

Method

1. **Preparation:** Consult "General information on the steps of processing maple syrup" on Page 58.
2. **Pour** 500 ml maple syrup (preferably golden syrup for its delicate flavour) into the pot, followed by 60 ml glucose syrup. Do not stir. If the glucose syrup appears too solid, soften it in the microwave for 30 seconds.
3. **Heat** the syrups until the thermometer reads **+50° C (+90° F)** above the boiling point of the water. HOWEVER, shut off the burner when the temperature reaches **+46.6° C (+86° F)**.
4. **Cool** on a wire rack until the syrup stops bubbling.
5. **Pour** into the clean moulds in a single stream, without tipping the pot back and forth. If you see the syrup bubbling in the moulds, it's too hot.
6. If you're making lollipops, put the sticks into the moulds first. Pour syrup over the stick, then the rest of the mould as needed.
7. **Unmould** as soon as the candy is cool enough to handle and place on a tray.
8. **Transfer** to plastic bags after 1 hour.



Here's to those who explore new flavour horizons,
Who constantly seek to surprise and delight with
brilliant blends and magnificent meals.

Here's to those who experiment,
innovate, and create.
Who bring renewal to the culinary world
and all of us who take such pleasure in it.

This book is for you.
May it guide you and nurture your instincts!

Luc Goulet
President, Québec Maple Syrup Producers

maplefromcanada.ca
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