= Maple syrup =

Maple syrup is a syrup usually made from the xylem sap of sugar maple , red maple , or black maple trees , although it can also be made from other maple species . In cold climates , these trees store starch in their trunks and roots before the winter ; the starch is then converted to sugar that rises in the sap in late winter and early spring . Maple trees can be tapped by drilling holes into their trunks and collecting the exuded sap , which is processed by heating to evaporate much of the water , leaving the concentrated syrup .

Maple syrup was first collected and used by the indigenous peoples of North America , and the practice was adopted by European settlers , who gradually refined production methods . Technological improvements in the 1970s further refined syrup processing . The Canadian province of Quebec is by far the largest producer , responsible for 75 % of the world 's output ; Canadian exports of maple syrup in 2014 were C $ 380 million ( approximately US $ 300 million ) , with Quebec accounting for 85 % of this total . Vermont is the largest producer in the United States , generating about 6 % of the global supply .

Maple syrup is graded according to the Canada , United States , or Vermont scales based on its density and translucency . Sucrose is the most prevalent sugar in maple syrup . In Canada , syrups must be made exclusively from maple sap to qualify as maple syrup and must also be at least 66 percent sugar . In the United States , a syrup must be made almost entirely from maple sap to be labelled as " maple " , though states such as Vermont and New York have more restrictive definitions ( see below ) .

Maple syrup is often eaten with pancakes , waffles , French toast , oatmeal or porridge . It is also used as an ingredient in baking , and as a sweetener or flavouring agent . Culinary experts have praised its unique flavour , although the chemistry responsible is not fully understood .

= = History = =

= = = Indigenous peoples = = =

Indigenous peoples living in northeastern North America were the first groups known to have produced maple syrup and maple sugar . According to aboriginal oral traditions , as well as archaeological evidence , maple tree sap was being processed into syrup long before Europeans arrived in the region . There are no authenticated accounts of how maple syrup production and consumption began , but various legends exist ; one of the most popular involves maple sap being used in place of water to cook venison served to a chief . Other stories credit the development of maple syrup production to Nanabozho , Glooskap , or the squirrel . Aboriginal tribes developed rituals around sugar @-@ making , celebrating the Sugar Moon ( the first full moon of spring ) with a Maple Dance . Many aboriginal dishes replaced the salt traditional in European cuisine with maple sugar or syrup .

The Algonquians recognized maple sap as a source of energy and nutrition . At the beginning of the spring thaw , they used stone tools to make V @-@ shaped incisions in tree trunks ; they then inserted reeds or concave pieces of bark to run the sap into buckets , which were often made from birch bark . The maple sap was concentrated either by dropping hot cooking stones into the buckets or by leaving them exposed to the cold temperatures overnight and disposing of the layer of ice that formed on top . While there was widespread agriculture in Mesoamerica and the Southeast and Southwest regions of the United States , the production of maple syrup is one of only a few agricultural processes in the Northeast that is not a European colonial import .

= = = Europeans = = =

In the early stages of European colonization in northeastern North America , local Indigenous peoples showed the arriving colonists how to tap the trunks of certain types of maples during the

spring thaw to harvest the sap . André Thevet , the " Royal Cosmographer of France " , wrote about Jacques Cartier drinking maple sap during his Canadian voyages . By 1680 , European settlers and fur traders were involved in harvesting maple products . However , rather than making incisions in the bark , the Europeans used the method of drilling tapholes in the trunks with augers . During the 17th and 18th centuries , processed maple sap was used primarily as a source of concentrated sugar , in both liquid and crystallized @-@ solid form , as cane sugar had to be imported from the West Indies .

Maple sugaring parties typically began to operate at the start of the spring thaw in regions of woodland with sufficiently large numbers of maples . Syrup makers first bored holes in the trunks , usually more than one hole per large tree ; they then inserted wooden spouts into the holes and hung a wooden bucket from the protruding end of each spout to collect the sap . The buckets were commonly made by cutting cylindrical segments from a large tree trunk and then hollowing out each segment 's core from one end of the cylinder , creating a seamless , watertight container . Sap filled the buckets , and was then either transferred to larger holding vessels ( barrels , large pots , or hollowed @-@ out wooden logs ) , often mounted on sledges or wagons pulled by draft animals , or carried in buckets or other convenient containers . The sap @-@ collection buckets were returned to the spouts mounted on the trees , and the process was repeated for as long as the flow of sap remained " sweet " . The specific weather conditions of the thaw period were , and still are , critical in determining the length of the sugaring season . As the weather continues to warm , a maple tree 's normal early spring biological process eventually alters the taste of the sap , making it unpalatable , perhaps due to an increase in amino acids .

The boiling process was very time @-@ consuming . The harvested sap was transported back to the party 's base camp , where it was then poured into large vessels ( usually made from metal ) and boiled to achieve the desired consistency . The sap was usually transported using large barrels pulled by horses or oxen to a central collection point , where it was processed either over a fire built out in the open or inside a shelter built for that purpose ( the " sugar shack " ) .

= = = Since 1850 = = =

Around the time of the American Civil War , syrup makers started using large , flat sheet metal pans as they were more efficient for boiling than heavy , rounded iron kettles , because of a greater surface area for evaporation . Around this time , cane sugar replaced maple sugar as the dominant sweetener in the US ; as a result , producers focused marketing efforts on maple syrup . The first evaporator , used to heat and concentrate sap , was patented in 1858 . In 1872 , an evaporator was developed that featured two pans and a metal arch or firebox , which greatly decreased boiling time . Around 1900 , producers bent the tin that formed the bottom of a pan into a series of flues , which increased the heated surface area of the pan and again decreased boiling time . Some producers also added a finishing pan , a separate batch evaporator , as a final stage in the evaporation process .

Buckets began to be replaced with plastic bags , which allowed people to see at a distance how much sap had been collected . Syrup producers also began using tractors to haul vats of sap from the trees being tapped ( the sugarbush ) to the evaporator . Some producers adopted motor @-@ powered tappers and metal tubing systems to convey sap from the tree to a central collection container , but these techniques were not widely used . Heating methods also diversified : modern producers use wood , oil , natural gas , propane , or steam to evaporate sap . Modern filtration methods were perfected to prevent contamination of the syrup .

A large number of technological changes took place during the 1970s . Plastic tubing systems that had been experimental since the early part of the century were perfected , and the sap came directly from the tree to the evaporator house . Vacuum pumps were added to the tubing systems , and preheaters were developed to recycle heat lost in the steam . Producers developed reverse @-@ osmosis machines to take a portion of water out of the sap before it was boiled , increasing processing efficiency .

Improvements in tubing and vacuum pumps , new filtering techniques , " supercharged " preheaters

, and better storage containers have since been developed . Research continues on pest control and improved woodlot management . In 2009 , researchers at the University of Vermont unveiled a new type of tap that prevents backflow of sap into the tree , reducing bacterial contamination and preventing the tree from attempting to heal the bore hole . Experiments show that it may be possible to use saplings in a plantation instead of mature trees dramatically boosting productivity per acre .

= = Processing = =

Production methods have been streamlined since colonial days , yet remain basically unchanged . Sap must first be collected and boiled down to obtain pure syrup without chemical agents or preservatives . Maple syrup is made by boiling between 20 and 50 volumes of sap ( depending on its concentration ) over an open fire until 1 volume of syrup is obtained , usually at a temperature 4 @.@ 1 ° C ( 7 @.@ 4 ° F ) over the boiling point of water . As the boiling point of water varies with changes in air pressure the correct value for pure water is determined at the place where the syrup is being produced , each time evaporation is begun and periodically throughout the day . Syrup can be boiled entirely over one heat source or can be drawn off into smaller batches and boiled at a more controlled temperature .

Boiling the syrup is a tightly controlled process , which ensures appropriate sugar content . Syrup boiled too long will eventually crystallize , whereas under @-@ boiled syrup will be watery , and will quickly spoil . The finished syrup has a density of 66 ° on the Brix scale ( a hydrometric scale used to measure sugar solutions ) . The syrup is then filtered to remove sugar sand , crystals made up largely of sugar and calcium malate . These crystals are not toxic , but create a " gritty " texture in the syrup if not filtered out . The filtered syrup is graded and packaged while still hot , usually at a temperature of 82 ° C ( 180 ° F ) or greater . The containers are turned over after being sealed to sterilize the cap with the hot syrup . Packages can be made of metal , glass , or coated plastic , depending on volume and target market . The syrup can also be heated longer and further processed to create a variety of other maple products , including maple sugar , maple butter or cream , and maple candy or taffy .

= = = Off @-@ flavours = = =

Off @-@ flavours can sometimes develop during the production of maple syrup ; causes include contaminants in the boiling apparatus , such as paint or cleanser ; changes in the sap , such as fermentation when it has been left sitting too long ; and changes in the tree , such as " buddy sap " late in the season when budding has begun . In some circumstances it is possible to remove off @-@ flavours through processing .

= = Production = =

Maple syrup production is centred in northeastern North America ; however , given the correct weather conditions , it can be made wherever suitable species of maple trees grow .

A maple syrup production farm is called a " sugarbush " or " sugarwood " . Sap is often boiled in a " sugar house " ( also known as a " sugar shack , " " sugar shanty , " or cabane à sucre ) , a building louvered at the top to vent the steam from the boiling sap .

Maples are usually tapped beginning at 30 to 40 years of age . Each tree can support between one and three taps , depending on its trunk diameter . The average maple tree will produce 35 to 50 litres ( 9 @.@ 2 to 13 @.@ 2 US gal ) of sap per season , up to 12 litres ( 3 @.@ 2 US gal ) per day . This is roughly equal to 7 % of its total sap . Seasons last for four to eight weeks , depending on the weather . During the day , starch stored in the roots for the winter rises through the trunk as sugary sap , allowing it to be tapped . Sap is not tapped at night because the temperature drop inhibits sap flow , although taps are typically left in place overnight . Some producers also tap in autumn , though this practice is less common than spring tapping . Maples can continue to be tapped for sap until they are over 100 years old .

= = Commerce = =

Until the 1930s , the United States produced most of the world 's maple syrup . Today , after rapid growth in the 1990s , Canada produces more than 80 percent of the world 's maple syrup , producing about 26 @,@ 500 @,@ 000 litres ( 7 @,@ 000 @,@ 000 US gal ) in 2004 . The vast majority of this comes from the province of Quebec , which is the world 's largest producer , with about 75 percent of global production totalling 24 @,@ 660 @,@ 000 litres ( 6 @,@ 510 @,@ 000 US gal ) in 2005 . As of 2003 , Quebec had more than 7 @,@ 000 producers , collectively making over 24 @,@ 000 @,@ 000 litres ( 6 @,@ 300 @,@ 000 US gal ) of syrup . Production in Quebec is controlled through a supply management system , with producers receiving quota allotments from the Federation of Quebec Maple Syrup Producers ( Fédération des producteurs acéricoles du Québec ) , which also maintains reserves of syrup although there is a black @-@ market trade in Quebec product . Canada exports more than 9 @,@ 400 @,@ 000 litres ( 2 @,@ 500 @,@ 000 US gal ) of maple syrup per year , valued at more than C $ 145 million . The provinces of Ontario , Nova Scotia , New Brunswick , and Prince Edward Island produce smaller amounts of syrup .

The Canadian provinces of Manitoba and Saskatchewan produce maple syrup using the sap of the box elder or Manitoba maple ( Acer negundo ) . A Manitoba maple tree 's yield is usually less than half that of a similar sugar maple tree . Manitoba maple syrup has a slightly different flavour from sugar @-@ maple syrup , because it contains less sugar and the tree 's sap flows more slowly .

Vermont is the biggest US producer , with over 1 @,@ 320 @,@ 000 US gallons ( 5 @,@ 000 @,@ 000 L ) during the 2013 season , followed by New York with 574 @,@ 000 US gallons ( 2 @,@ 170 @,@ 000 L ) and Maine with 450 @,@ 000 US gallons ( 1 @,@ 700 @,@ 000 L ) . Wisconsin , Ohio , New Hampshire , Michigan , Pennsylvania , Massachusetts , and Connecticut all produced marketable quantities of maple syrup of less than 265 @,@ 000 US gallons ( 1 @,@ 000 @,@ 000 L ) each in 2013 . As of 2003 , Vermont produced about 5 @.@ 5 percent of the global syrup supply .

Maple syrup has been produced on a small scale in some other countries , notably Japan and South Korea . However , in South Korea in particular , it is traditional to consume maple sap , called gorosoe , instead of processing it into syrup .

In 2013 , 65 % of Canadian maple syrup exports went to the United States ( a value of C $ 178 million ) , 9 % to Japan ( C $ 25 million ) , 8 % to Germany ( C $ 22 million ) and 4 @.@ 3 % to the United Kingdom ( C $ 12 million ) .

= = Grades = =

Following an effort from the International Maple Syrup Institute ( IMSI ) and many maple syrup producer associations , both Canada and the United States have altered their laws regarding the classification of maple syrup to be uniform . Whereas in the past each state or province had their own laws on the classification of maple syrup , now those laws define a unified grading system . This had been a work in progress for several years , and most of the finalization of the new grading system was made in 2014 . The Canadian Food Inspection Agency announced in the Canada Gazette on 28 June 2014 that rules for the sale of maple syrup would be amended to include new descriptors , at the request of the IMSI .

As of December 31 , 2014 , the Canadian Food Inspection Agency ( CFIA ) and as of March 2 , 2015 , the United States Department of Agriculture ( USDA ) Agricultural Marketing Service ( AMS ) issued revised standards on the classification of maple syrup as follows :

Grade A
Golden Colour and Delicate Taste
Amber Colour and Rich Taste
Dark Colour and Robust Taste
Very Dark Colour and Strong Taste
Processing Grade

Substandard

As long as maple syrup does not have an off @-@ flavour and is of a uniform colour and clean and free from cloudiness , turbidity , sediment , it can be identified as one of the A grades . If it exhibits any of these problems , it does not meet Grade A requirements and must be labeled as Processing Grade maple syrup and may not be sold to the consumer . If maple syrup does not meet the requirements of Processing Grade maple syrup ( including a fairly characteristic maple taste ) , it is classified as Substandard .

As of February 2015 , this grading system has been accepted and made law by most maple @-@ producing states and provinces , other than Ontario , Quebec , and Ohio . Vermont , in an effort to " jump @-@ start " the new grading regulations , adopted the new grading system as of January 1 , 2014 , after the grade changes passed the Senate and House in 2013 . Maine passed a bill to take effect as soon as both Canada and the United States adopted the new grades . They are allowing a one @-@ year grace period . In New York , the new grade changes became law on January 1 , 2015 , with a one @-@ year grace period . New Hampshire did not require legislative approval and so the new grade laws became effective as of December 16 , 2014 , and producer compliance is required as of January 1 , 2016 .

Golden and Amber grades typically have a milder flavour than Dark and Very dark , which are both dark and have an intense maple flavour . The darker grades of syrup are used primarily for cooking and baking , although some specialty dark syrups are produced for table use . Syrup harvested earlier in the season tends to yield a lighter colour . With the new grading system , the classification of maple syrup depends ultimately on its translucence . Golden has to be more than 75 percent translucent , Amber has to be 50 @.@ 0 to 74 @.@ 9 percent translucent , Dark has to be 25 @.@ 0 to 49 @.@ 9 percent translucent , and Very Dark is any product less than 25 @.@ 0 percent translucent .

= = = Old grading system = = =

In Canada , maple syrup was classified prior to December 31 , 2014 , by the Canadian Food Inspection Agency ( CFIA ) as one of three grades , each with several colour classes : Canada No. 1 , including Extra Light , Light , and Medium ; No. 2 Amber ; and No. 3 Dark or any other ungraded category . Producers in Ontario or Québec may have followed either federal or provincial grading guidelines . Québec 's and Ontario 's guidelines differed slightly from the federal : there were two " number " categories in Québec ( Number 1 , with four colour classes , and 2 , with five colour classes ) . As in Québec , Ontario 's producers had two " number " grades : 1 , with three colour classes ; and 2 , with one colour class , which was typically referred to as " Ontario Amber " when produced and sold in that province only . A typical year 's yield for a maple syrup producer will be about 25 to 30 percent of each of the # 1 colours , 10 percent # 2 Amber , and 2 percent # 3 Dark .

The United States used ( some states still do , as they await state regulation ) different grading standards . Maple syrup was divided into two major grades : Grade A and Grade B. Grade A was further divided into three subgrades : Light Amber ( sometimes known as Fancy ) , Medium Amber , and Dark Amber . The Vermont Agency of Agriculture Food and Markets used a similar grading system of colour , and is roughly equivalent , especially for lighter syrups , but using letters : " AA " , " A " , etc . The Vermont grading system differed from the US system in maintaining a slightly higher standard of product density ( measured on the Baumé scale ) . New Hampshire maintained a similar standard , but not a separate state grading scale . The Vermont @-@ graded product had 0 @.@ 9 percent more sugar and less water in its composition than US @-@ graded . One grade of syrup not for table use , called commercial or Grade C , was also produced under the Vermont system .

= = Nutrition and food characteristics = =

The basic ingredient in maple syrup is the sap from the xylem of sugar maple or various other species of maple trees . It consists primarily of sucrose and water , with small amounts of the monosaccharides glucose and fructose from the invert sugar created in the boiling process .

In a 100g amount , maple syrup provides 260 calories and is composed of 32 % water by weight , 67 % carbohydrates ( 90 % of which are sugars ) , and no appreciable protein or fat ( table ) . Maple syrup is generally low in overall micronutrient content , although manganese and riboflavin are at high levels along with moderate amounts of zinc and calcium ( right table ) . It also contains trace amounts of amino acids which increase in content as sap flow occurs .

Maple syrup contains a wide variety of volatile organic compounds , including vanillin , hydroxybutanone , and propionaldehyde . It is not yet known exactly what compounds are responsible for maple syrup 's distinctive flavour , however its primary flavour contributing compounds are maple furanone , strawberry furanone , and maltol .

New compounds have been identified in maple syrup , one of which is quebecol , a natural phenolic compound created when the maple sap is boiled to create syrup .

One author described maple syrup as " a unique ingredient , smooth- and silky @-@ textured , with a sweet , distinctive flavour ? hints of caramel with overtones of toffee will not do ? and a rare colour , amber set alight . Maple flavour is , well , maple flavour , uniquely different from any other . " Agriculture Canada has developed a " flavour wheel " that details 91 unique flavours that can be present in maple syrup . These flavours are divided into 13 families : vanilla , empyreumatic ( burnt ) , milky , fruity , floral , spicy , foreign deterioration or environment , maple , confectionery , plants forest @-@ humus @-@ cereals , herbaceous , or ligneous . These flavours are evaluated using a procedure similar to wine tasting . Other culinary experts praise its unique flavour .

Maple syrup and its various artificial imitations are widely used as toppings for pancakes , waffles , and French toast in North America . They can also be used to flavour a variety of foods , including fritters , ice cream , hot cereal , fresh fruit , and sausages . It is also used as sweetener for granola , applesauce , baked beans , candied sweet potatoes , winter squash , cakes , pies , breads , tea , coffee , and hot toddies . Maple syrup can also be used as a replacement for honey in wine ( mead ) .

= = Imitations and substitutions = =

In Canada , maple syrup must be made entirely from maple sap , and syrup must have a density of 66 ° on the Brix scale to be marketed as maple syrup . In the United States , maple syrup must be made almost entirely from maple sap , although small amounts of substances such as salt may be added . Labelling laws prohibit imitation syrups from having " maple " in their names . " Maple @-@ flavoured " syrups include maple syrup but may contain additional ingredients . " Pancake syrup " , " waffle syrup " , " table syrup " , and similarly named syrups are substitutes which are less expensive than maple syrup . In these syrups , the primary ingredient is most often high fructose corn syrup flavoured with sotolon ; they have no genuine maple content , and are usually thickened far beyond the viscosity of maple syrup .

Imitation syrups are generally cheaper than maple syrup , but tend to taste artificial . A 2009 Cook 's Illustrated comparison between top @-@ selling maple and imitation syrups consistently rated the real maple brands ( Maple Grove Farms , Highland Sugarworks , Camp Maple , Spring Tree , and Maple Gold ) above the imitation brands tested ( Eggo , Aunt Jemima , Mrs. Butterworth 's , Log Cabin , and Hungry Jack ) . In the United States , consumers generally prefer imitation syrups , likely because of the significantly lower cost . The fenugreek seed , a spice with high amounts of sotolon , can be prepared to have a maple @-@ like flavour , and is used to make a very strong commercial flavouring that is similar to maple syrup , but much less expensive ; one such syrup , Mapleine , was popular during the Great Depression .

= = Cultural significance = =

Maple syrup and maple sugar were used during the American Civil War and by abolitionists in the years prior to the war because most cane sugar and molasses were produced by Southern slaves . Because of food rationing during the Second World War , people in the northeastern United States were encouraged to stretch their sugar rations by sweetening foods with maple syrup and maple

sugar , and recipe books were printed to help housewives employ this alternative source .

Maple products are considered emblematic of Canada , in particular Quebec , and are frequently sold in tourist shops and airports as souvenirs from Canada . The sugar maple 's leaf has come to symbolize Canada , and is depicted on the country 's flag . Several US states , including New York , Vermont and Wisconsin , have the sugar maple as their state tree . A scene of sap collection is depicted on the Vermont state quarter , issued in 2001 .

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