

Sap Flow

Maple trees are unique in that they build up a sap pressure (as much as 40 pounds per square inch) during the dormant season. Fluctuations in air temperatures above and below freezing are needed to create this pressure. Basically, when the sap freezes, the gases in the sap contract creating a negative pressure that draws water from the roots, thereby increasing the volume of sap. That is why moisture in the soil is important for sap flow. When the sap thaws and the gases expand, the increased volume of sap creates a positive pressure, which finds an exit through the tap hole. Lack of freezing at night prevents pressure from building up, resulting in diminished sap flow.

Like other modern sugar operations, Farmpark has adopted new technology to overcome part of the problem of fluctuating pressures. We use a vacuum pump on the lines to reinforce the pressure differential needed to make the sap flow. We are also able to use smaller tap holes (thereby causing less damage to the tree) but still get more sap. While the pump does increase sap yield, it doesn't eliminate the tree's need for the freezing and thawing cycle to insure a longer flow of high quality sap.

This year Farmpark will be maple sugaring again as usual – but when the sap actually flows is anybody's guess. The length of the sugaring season varies from year to year; it may last only two weeks or as long as almost two months. Typically our season runs from mid-February to mid-March. However, on a day-to-day basis the unusual properties of the maple tree leave the sugaring operation highly dependent on very specific and localized variations in the weather.

Consequently, anyone who wants to see the maple process should call Farmpark at (440) 256-2122 before visiting just to make sure the sap is flowing and the syrup is boiling.



Maple Sugaring



By Andy Baker, Farmpark Administrator

Maple trees, family *Aceraceae*, are one of the few trees whose sap is easily processed to produce sugar. And the sugar maple *Acer saccharum*, which exists only in North America, has the sweetest sap with a sugar content averaging 2.2%.

Although no written documentation exists for the origins of maple sugaring, native linguistic references and mythologies suggest a long association between sugaring and a number of Native North American tribes. Several tribes refer to the first full moon in March as the Maple or Sugar Moon and have stories that relate the origins of maple sugaring. The Iroquois attribute the discovery to a particular squaw who used the sap for boiling food and found that the liquid became sweeter as it boiled.

Initially, making maple sugar had nothing to do with the maple flavor. The goal of the Native Americans and colonists was to obtain sugar, a rarity before 1800, because cane sugar, produced in very warm climates, had to be transported a great distance.

The first methods of sugaring were quite primitive. Initially, tapping followed the native method of gashing trees. Gradually the process evolved into cutting holes with an axe, chisel or auger (twist drill). By 1800, the more destructive methods of tapping were refined as farmers found that 1/2 inch holes still produced an adequate sap flow.

Colonists carved spouts from sumac, elder, pine or maple. Hollowed out wooden troughs of poplar or maple were set at the base of the trees to catch the sap. Boiling was done over an open fire in large kettles and as the sap boiled down it was transferred to smaller kettles to make into sugar. The final product was a coarse brown, heavily flavored sugar, which sold for two-thirds the cost of refined white cane sugar.

As farmers were drawn into the national and international markets in the early 1800s, technological changes, consumer tastes, and new markets affected the traditional maple sugaring methods. Improvements in transportation and the processing of sugar cane helped cane sugar become more available and affordable. In the 1840s the price of sugar dropped dramatically and the consumption of sugar began to rise, reaching 50 pounds per capita by the mid 1870s.

Farmers, seeking to keep maple sugar competitive, began to improve the product and the efficiency of the process. Over the first half of the 19th century farmers switched to using wooden and tin buckets, metal spouts, and boiling sap in sheet metal pans set on a brick arch enclosed in a "sugar" or "sap house." These improvements resulted in higher quality maple products that compared favorably to cane sugar and molasses.

A local farmer, W. T. Chamberlain, described his Hudson, Ohio maple sugaring operation in the 1870 issue of *American Agriculturalist*. He used the latest equipment and methods, with tin buckets, metal spouts, a sugarhouse fitted up with sheet-iron pans and automatic sap feeder to control the level of the sap in the pans. He made most of the sap into syrup, because prime syrup could yield \$1.50 to \$2.00 per gallon while the best maple sugar could not compete with "C" coffee sugar. Top quality maple syrup, he claimed, was the best for buckwheat cakes and better than honey for tea biscuits.

The evolution of the industry from sugar to syrup is statistically documented as well. In 1850, only 25% of Ohio's sap was converted to maple syrup while



Early 1800s sugaring

by 1908 fully 98% went to syrup. Additionally, sugar operations were getting larger as fewer farmers produced more syrup and production increasingly concentrated in six counties of the Western Reserve (Ashtabula, Geauga, Lorain, Medina, Portage, Summit and Trumbull).

Over the 20th century additional improvements have been made to continually improve the quality of the product and efficiency of the process. Today, buckets have been replaced with plastic tubing and vacuum pumps. Reverse osmosis machines, improved sap pans, automatic draw-offs, and filter presses are all designed to maximize the efficiency and quality of the process. Efforts have even been made to breed more productive maple trees. Increasing the sugar content even a half a percent on average would save boiling five gallons of water for each gallon of syrup produced.

Today the productivity of a maple sugar producer is many times greater than that of the first settlers. Despite that, maple products seem expensive, because the prices of other types of sugars have continued to decline.

Ironically, maple syrup today is no more expensive than an equivalent amount of maple sugar in 1800. However, even though maple products seem so expensive we are willing to pay a lot extra for that unique maple flavor.

Maple Tidbits

- Ohio is the fifth ranked maple producing state. Vermont is first.
- The province of Quebec produces more maple syrup than the rest of North American producers combined.
- Sugar content of sap = 2.2% (average)
- Sugar content of syrup = 66.5%
- Thirty-two to forty gallons of sap yields one gallon of syrup
- One gallon of syrup weighs 11 pounds
- One gallon of syrup yields 7 to 8 pounds of maple sugar
- Sinzibuckwud is Algonquin for maple sugar, and means "drawn from wood"
- Sopomkin is Iriquois for the Sugar Moon (the first full moon in March or April)
- Sheesheegummawiss is Objjway for rock maple, and means "sap flows fast"



Maple Sugaring Resources

Randall B. Heiligmann, Mervin R. Koelling, Timothy D. Perkins, North American Maple Syrup Producers Manual, Second Edition, The Ohio State University, 2006.

James M. Lawrence & Rux Martin, Sweet Maple, Chapters Publishing Ltd., Shelburne, Vermont, 1993.

Helen & Scott Nearing, The Maple Sugar Book, Schocken Books, New York, 1950.

Chamberlain's operation, 1870 - Hudson, Ohio

Maple Sugaring Weekend

March 10 & 11
Farmpark

Turn to page 17 for more information!