A Closer Look, by Richard M. Klein

# Maple Syrup: Confection from the Forest

**The sap that comes from the tree is rainwater-clear and with comparable taste, but boiling turns it into the only topping fit for pancakes**

Just about everyone has seen nostalgic Currier and Ives prints of 19th-century maple sugaring, an operation that made Vermont's most renowned product—next to Calvin Coolidge, of course. Modern producers in the syrup states of Vermont, New York, Ohio and in *La Belle Province,* Quebec, plug their trees into plastic tube systems and vacuum pumps, feed the sap directly into oil-fired stainless steel evaporators and package the syrup in plastic bottles. The bottles bear lithographs of the 19th-century sugaring operation, complete with horse-drawn sledges, wooden buckets and stacked cords of rock maple fuel.

Although the hand-crafted wooden buckets have all been sold at fabulous prices to big-city collectors of Americana, the trees remain, reliable moneymakers, feeding their sap into tubing systems, or steel vessels or cut-off bleach bottles.

However taken from the tree, maple sap is clear as rainwater and has a comparable taste. The sugar concentration averages less than 3 percent sucrose, almost below the amount capable of stimulating taste buds. But averages can be misleading. Syrup producers have known for over a century that the magnificent, stately trees that line country roads in New England or the umbrella-shaped giants growing in solitary grandeur in pastures tend to produce sweeter saps than do the average run of trees in a sugarbush (a stand of maple). Some of these trees contain sap with up to 8 percent sugar and this high sugar concentration usually goes along with a high rate of sap flow.

*With the first signs of thaw, the sap begins to run. This Vermonter will have to pour 28 gallons of sap into the vat for every gallon of syrup he produces. Photo by Hans Wendler.*

Maple syrup and sugar are among the very few farm products still obtained from wild plants, with genetic constitution—and sap sweetness—as variable as the winds that disseminate their pollen. Nevertheless, even before the trees are big enough to be tapped, it is possible to determine which of them are likely to be superior producers. Sweet trees outperform their neighbors year after year, and it is to the advantage of the farmer to upgrade the sugarbush by removing those trees that are less exuberant producers.

Even with a population of superior trees, the volume and sugar in the sap will vary a good deal due to differences in the previous year's growing conditions, the amount of water held in the soil over the winter and other, virtually unknown, factors that seem to be under the control of maple nymphs and sugarbush sprites.

Fortunately, sugaring in upper New England and adjacent Canada is a part-time job during the farm's slack season and is rarely seen as much more than icing on a family's economic cake. Even in romantic, nostalgia-filled, picture-postcard-scenic Vermont, maple sugar amounts to a very small fraction of the economy of the state—dairying and those lovely tourists and skiers are what keep the state semi-solvent.

### Native American enterprise

The early settlers of the North American colonies probably were unfamiliar with maple sugar; the coniferous forests of Massachusetts and the Canadian Maritimes contained few maple trees. Much of our knowledge of maple sugar dates from 1784 when John Carver noted that the Nandowessie Indians "consume the sugar which they extracted from maple trees." Legend has it that an Indian woman decided to cook with the water dripping from an injured maple tree instead of taking the long trip to a spring—and thus were born sweet stews.

Certainly as early as 1650 the Chippewa and Winnebago tribes were making sugar, for the traders of the Northwest Fur Company were exchanging hatchets and kettles for the Indians' coarse brown sugar with the unusual flavor. Before the introduction of metal kettles, the Indians brought the sap to boil with hot stones dropped into birchbark vessels, the

sap having been collected from trees whacked with a stone ax. The whacking procedure usually killed the tree in a few years.

Europeans introduced the brace and bit, the spile and the collecting bucket, all of which increased efficiency and allowed a tree to continue to produce without apparent injury. Since even the most efficient modern vacuum pumping systems extract no more than a small percentage of the sap, a sweet roadside tree can deliver for a century.

The running of sap is still poorly understood. During the previous growing season, sugars formed in the leaves by photosynthesis move down to the trunk and the roots where they are converted into starch and stored in living ray cells of the wood. When February and March nights are below freezing and the following days are warm and sunny (glorious skiing weather!), the trunk warms up just enough for the starch to be converted first into glucose sugar, then into invert sugar—a mixture of glucose and fructose—and finally into sucrose. We are almost completely ignorant of the mechanisms that cause the sugar solution—the sap—to flow, although we do know that both positive and negative pressures develop in the tree, with sap moving both up and down.

The making of maple syrup is essentially the process of getting rid of excess water by rapid evaporation. If maple sap consisted only of water and sucrose, boiling it down would merely result in a caramelized syrup tasting much like Karo syrup or caramel candy. Sap, however, contains small amounts of calcium, potassium, phosphate and sodium ions which, although nutritionally insignificant, may contribute to the taste of the syrup. There are also a variety of organic compounds including sucrose, invert sugars, amino acids and small amounts of citric, malic and other acids that make the sap slightly acidic.

Equally important, there are minute amounts of phenolic compounds, particularly those involved in the formation of wood lignins. Concentrations of all of these chemicals vary from year to year and from one part of the sap-flow season to another, usually increasing in concentration as spring draws closer. All are, somehow, involved in the development, during boiling, of that very special maple flavor and odor.

**The fine art of boiling**

Like other arts, the conversion of sap into syrup or sugar requires skills that can't be learned from books, although it can be described well enough.

The sap flows from holding tanks into evaporator pans, which are fired, still, by wood (ten hours of boiling uses up to three cords of wood) and nowadays ofttimes by oil.

High-quality syrup requires quick evaporation, yet the evaporator must be heated just enough. Too cool a fire will leave the syrup languishing too long in the evaporator pans. Too hot, and some will scorch or boil over. The evaporator is watched carefully and only small batches are processed at a time.

Hot syrup burns so fast it will nearly explode, taking the sugarhouse with it. A film of fat rubbed onto the top edge of the evaporator before boiling, or a draft of cold air blowing over the fire, or a tiny drop of fat flung into the roiling liquid, will all prevent the sap from climbing the walls of the pan and catching fire and setting everything ablaze. The syrup maker is alert to every sound the evaporator makes.

If the operation is going successfully, geysers of steam shoot up from the evaporator pans and the

*Maples bordering old fields have more space than forest maples, grow more luxuriantly and have higher sugar concentration — up to 8 percent.*

F. B. Grunzweig

sugarhouse is shrouded in a steamy fog. Eventually the liquid approaches the "finishing point"—an ephemeral state the experienced sap maker can discern by the look of the boiling liquid, the color, and the pattern of bubbling. A thermometer also helps: The liquid is taken off when its boiling point is reached. A hydrometer, registering the liquid's density, is also used. The finished syrup is drawn off and strained before bottling. If, instead, it is boiled further, the syrup reaches a higher temperature, becomes more concentrated and becomes, finally—maple sugar candy.

Since the composition of each batch of sap differs, so must its processing. In general, the early runs of sap produce the light-colored, aromatic "Fancy" grade of syrup. As the season advances, the syrups become darker, progressing through grades A and B to the late-season C and D grades, which are very dark with strong, almost unpleasant maple tastes, and which are used to flavor breakfast cereals and junk foods. In all of the grades, however, the sugar concentration is the same.

When spring finally arrives and the leaves begin to appear, the sap becomes "buddy" and develops off-flavors and odors. The producer knows that this is the time to clean up and begin to think of plowing, or, if so inclined, of tennis.

There is, however, still one ritual that must be conducted before the season can be said to have been completed: A sugar-on-snow party must be given. Some of the syrup is boiled to contain a bit more than the standard sugar level so that it becomes very thick. Fresh, clean snow is collected from a shaded part of the sugarbush or from the north side of a barn and the hot syrup is ladled onto the snow where it immediately hardens into a taffy-like mass. You dip an unglazed, raised doughnut into the taffy or lift a bit with a wooden spoon and gnaw it until your jaws ache, alternating with bits of dill pickle to cut the cloying taste of the syrup. Kids and avaricious dentists love it.

*Maple syrup, or the more highly concentrated maple sugar candy, is a late-winter cash crop for Vermont farm families. Photos by Hans Wendler.*

Although the sugar, or rock, maple, *Acer saccharum,* is the only species of any importance in the maple industry, the black, or hard, maple, *Acer nigrum*, the red maple, *Acer rubrum,* and even the silver maple, *Acer saccharinum,* have spring sap flows, but these species are rarely tapped because their sugar concentrations are usually less than 1 percent. The rule of thumb for determining the final amount of syrup is to divide the number 86 by the sugar concentration of the sap. With a sugar concentration of 1 percent, a gallon of syrup would require boiling down 86 gallons of sap. With the more usual 3 percent sugar, one can get a gallon of syrup from about 28 gallons of sap, and with the sap of superior, sweet trees, only 15 to 18 gallons of sap will provide a gallon of syrup. The sweeter the sap the less water has to be boiled away. With fuel oil prices on an endless upward spiral, the need for selecting, breeding or propagating sweet trees is obvious.

Current economic reports show that the greatest amount of maple syrup is made in Quebec, with upstate New York and Vermont arguing each year as to which state has outproduced the other. Ohio and Pennsylvania boil down enough sap to satisfy the families that have a few good trees in their woodlots. For some reason, which really does not seem to have been a deliberate public relations ruse, at least not initially, the cachet of maple syrup superiority was awarded to Vermont. Although they will deny it vigorously, both Quebec and New York send bulk syrup to Vermont to be packaged by the Vermont syrup associations. *Caveat emptor!*

In our southern states, molasses is used on johnnycake, and in the Midwest dark corn syrups are the adjunct to morning pancakes. Neither of these has any maple flavor unless adulterated with an extract of fenugreek seeds, an act of desecration comparable to denigrating motherhood or trampling on the flag. □