

Sap tapping

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*Harvesting
maple syrup the
old fashioned
way*

As an exchange student in Wisconsin, USA I was surprised to find many farm kids missing from school in late winter and no one raised any concern – sugaring was the activity, one of the few excusable reasons to be absent from school. The idea of hauling heavy buckets through knee deep snow and slush didn't appeal to me but the taste of real maple syrup sure did.

What's in the sap?

Maple – 98% water/2% sugar/minerals, nutrients, enzymes, antioxidants, phenolic compounds. Sugar is mostly sucrose, and doesn't caramelise easily until above 138°C.

Birch – 99% water/1% sugar. Sugar is mostly fructose (caramelises at 71°C) and glucose (caramelises at 60°C), has a lower viscosity (runnier) in comparison to maple.

Walnut – 98% water/2% sugar but a

lower flow rate than sugar maple.

Why maple sap flows

During late winter, freezing nights mean ice crystals form in tree fibres, drawing water out of the cambium and compressing air bubbles, which drags water up the trunk till the trunk is full. During the warmer days the ice crystals melt and the air bubbles expand, pushing liquid back into the cambium vessels, which creates sap flow.

Tapping trees

Maples are tapable when they reach a size greater than 25 cm DBH (diameter at breast height), with a second tap going in when trees reach a DBH of 45 cm. While old illustrations show metal spouts being driven into tree trunks with buckets hanging off that needed to be emptied every day, modern North American sugar tapping consists of

a drilled eight millimetre hole with a plastic tap that has a flange at the end to allow plastic piping to be attached. It all looks like irrigation in reverse, with lines from trees connecting to a larger hose that allows sap to flow down to a collection tank. Large scale operations of 500+ taps even have vacuum pumps at the collection point to speed up the sap movement through the lines, although lines and vacuum pumps are only economic at 220 taps per hectare.

In New Zealand, sealed lines to a lidded bucket would also be more hygienic as insects are active in our milder weather.

Tapping of sugar maples used to start late February a century ago, but now a January start is common. The taps are pulled out before the buds open – usually in April. The North American birch season follows behind maple.

Uses for Sap

Reducing tree sap down to syrup or sugar is a modern usage. People across Europe, Asia and tropical areas have long harvested tree sap. In temperate areas the sap was an important spring tonic, the consumption of which was believed to maintain good health.

In Korea, the Namakje Festival celebrates the tapping of *Acer mono*, known as Goroese or 'the tree that is good for the bones', due to the high calcium, potassium & magnesium content of its sap.

Across Europe and Asia it is birch sap that is harvested.

Traditional curative properties of birch sap

Birch sap has been used in beer brewing in Europe for centuries and *Betula lenta* (black birch) sap can be carbonated to produce a drink similar to root beer.

Maple sap is now being sold as a natural 'tonic' water and maple sap concentrated to 10% sugar makes an excellent creaming soda.

	Korea	China	Finland	Russia
Hypertension	X		X	
Urinary problems	X	X	X	
Gout		X	X	X
Decreased work capacity	X	X	X	X
Gastritis	X	X	X	X
Kidney Problems	X	X	X	
Scurvy		X	X	X

Making syrup

Most maple syrups contain 68% sugar. It takes 40 litres of sap to make one litre of maple syrup. So, the harvested sap has had a lot of water driven off to get it to this concentration. Traditionally maple sap was boiled in shallow pans for many days, requiring large amounts of energy and time. Unfortunately, prolonged boiling creates a stronger flavour and colour as the sugars caramelise. This is exacerbated in birch syrups, which take longer to produce due to less sugar in the sap and the fructose and glucose it contains burns far more readily than the sucrose in maple sap.

Modern syrup makers use reverse

osmosis filters to remove 80 – 90% of the water, thereby drastically reducing the boil times and energy required and producing consistently lighter syrups.

What you can tap

Maples Though the sugar maple (*Acer saccharum*) is the most famous of the maple family and has been successfully tapped in New Zealand it is the big leaf maple (*Acer macrophyllum*) that has great potential in New Zealand. The big leaf maple distribution ranges from northern California to British Columbia and compares similarly to New Zealand's climatic conditions. A third selection is the red maple, *Acer rubrum*. Current breeding programs in North America have selected from high performing wild specimens to breed trees regularly producing 8% sugar (a fourfold increase in sugar content). Most of the maple species grow in Asia, indicating that there is much more to investigate.

Birch Tapped throughout Europe, Asia and areas in North America that contain few maples. The most tapped species in North America is the paper birch, *Betula papyrifera*. Other selections include black birch (*B. lenta*) and yellow birch (*B. alleghaniensis*). As these trees do not need the freeze/thaw conditions to move sap they may be a better option in New Zealand. Eurasian selections need further research.

Walnuts All members of the walnut family can be tapped for sap. The sugar content is often similar to sugar maples but the flow rate is less. Members of the walnut family generally grow faster than maples so could be tapped at a younger age.

Palms In the tropics, several palms are

tapped or have the flower spike cut to release sweet sap. Coconut sugar is the reduced sap collected from cut coconut palm flower spikes. In New Zealand the two well-known harvestable palms are:

The Chilean wine palm, *Jubaea chilensis*, where traditionally the entire trunk was cut down and the sap collected as it drained out. This obviously could only be done once so attempting to tap it may offer the palm greater longevity.

The Phoenix palm, *Phoenix canariensis*, where traditionally the crown would be cut and the sap collected at night. This weedy and very spiky palm may not be suitable to propagate, but tapping till the palm collapses may be an interesting pest control method.

Several of the decorative palms currently growing in New Zealand produce edible fruit, suggesting the sap could be worth harvesting.

Eucalyptus The cider gum, *Eucalyptus gunnii* produces not only a tapable sap but foliage suitable for the floristry market.

Matai *Prumnopitys taxifolia*, matai or black pine is our own entry into this international list. The sap was collected and drunk fresh, this was referred to as "Matai beer".

Commercial opportunities under your maple forest

In North American sugar bush areas, secondary crops are also proving valuable under the main tree canopy.

Herbs such as ginseng and goldenseal need the dappled light that filters through the canopy. Mushrooms –

chanterelles, morels, shitake and oyster types grow on the moist forest floor. Beechnuts can be collected from the American beech, *Fagus grandifolia*. Birch oil can be taken from the inner bark and twigs of black and yellow birches to extract methyl salicylate, from which salicylic acid, the active ingredient in aspirin can be derived.

*Articles in Tree Cropper: Cider Gum (Issue 10 1996), Sugar Maple (Issue 9 1996, Issue 20 1998) .Further Reading: The Sugar Makers Companion. Michael Farrel, 2013
<http://www.sugarbush.info/forums/>*

A selection of sugar sap tree species in New Zealand

Maples (Acer spp.)

<i>Acer glabrum</i>	Rocky Mt maple
<i>Acer macrophyllum</i>	Bigleaf maple
<i>Acer mono</i>	Gorosoe (Korea)
<i>Acer negundo</i>	Box elder
<i>Acer platanoides</i>	Norway maple
<i>Acer rubrum</i>	Red maple
<i>Acer saccharinum</i>	Silver maple
<i>Acer saccharum</i>	Sugar maple

Walnuts (Juglans spp.)

<i>Juglans ailantifolia</i>	Heartnut/Japanese walnut
<i>Juglans cinerea</i>	Butternut
<i>Juglans nigra</i>	Black walnut
<i>Juglans regia</i>	European walnut

Birch(Betula spp.)

<i>Betula alleghaniensis</i>	Yellow birch
<i>Betula lenta</i>	Black birch
<i>Betula nigra</i>	River birch
<i>Betula papyrifera</i>	Paper birch
<i>Betula pendula</i>	European white birch
<i>Betula populifolia</i>	Grey birch

Sycamore (Platanus spp.)

<i>Platanus occidentalis</i>	Sycamore
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Hophornbeam Ostrya

<i>Ostrya virginiana</i>	Hophornbeam (US) or hop-hornbeam (UK)
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Palms

<i>Jubaea chilensis</i>	Chilean wine palm
<i>Phoenix canariensis</i>	Phoenix palm

Cider gum

<i>Eucalyptus gunnii</i>

Matai

<i>Prumnopitys taxifolia</i>
