



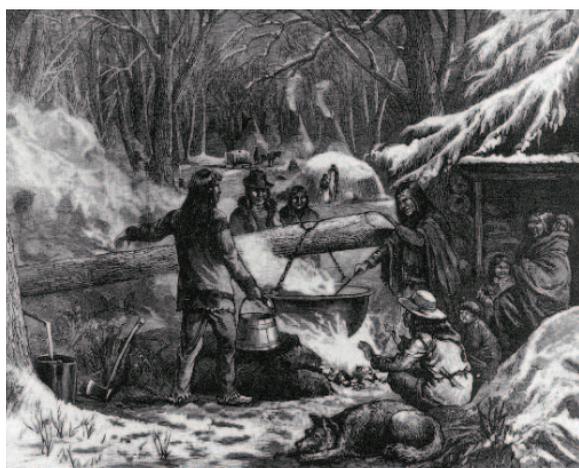
Maple Syrup MAGIC – COLOUR AND FLAVOUR

The Cold Creek Stewardship Report, by Gordon Craig

Spring brings new life: plants emerge, trees leaf out and flower, and the flowing of sap marks the first of our spring cultural events, the production of maple syrup. Everyone knows that when 40 volumes of sap are boiled down to one volume, maple syrup results. Jacques Cartier reported North American Indians making syrup as early as 1540 and they were undoubtedly making it long before then.

Interestingly, if the water is removed

from the sap by freeze concentration or by vacuum rather than by boiling, the maple flavour is absent and the colour of the syrup is rather gray. But once the syrup is heated a golden brown colour and maple flavour develops. Heat is therefore one of the critical ingredients of maple syrup. Related truths to maple syrup production include: syrup colour and flavour are lighter at the beginning of the season than the end; the longer sap is boiled the darker the colour and the stronger the flavour.



Early season maple sap has a slightly higher sucrose concentration than later in the season but a maple related bacteria is higher later in the season. The bacteria cleave the larger 12 carbon sucrose molecule ($C_{12}H_{22}O_{11}$) into each of a 6 carbon fructose and glucose molecule (both $C_6H_{12}O_6$) known as invert sugars. The rate of sucrose cleavage increases as the bacteria and ambient temperature increase, that results in higher concentrations of fructose and glucose in the sap as the season progresses. Amino acids present in the maple sap combine with both fructose and glucose when heated, called the Maillard reaction, producing the golden brown colour and the unique maple flavour. In short, the increase in syrup colour and flavour as the season progresses is dependent on the presence of amino acids, greater bacterial activity and higher concentrations of the invert sugars later in the season.

This non-enzymatic development of colour and flavour from the complexation of amino acids with invert sugars in the presence of heat was described in 1912 by Louis-Camille Maillard of France. It begins at temperatures of $80^{\circ}C$ and below being much different than caramelization which occurs at $110^{\circ}C$ for fructose and $160^{\circ}C$ for glucose and sucrose.

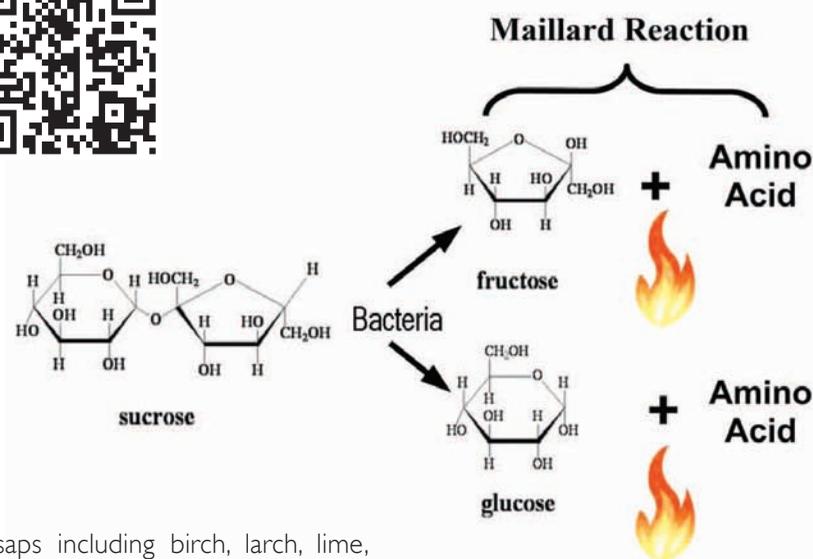
Producers strive to produce higher-priced lighter-coloured syrups and focus on collecting sap earlier in the season, reducing the time between collection and boiling and reducing the total boiling time once in the evaporator to reduce, but not eliminate, the extent of the Maillard reaction. Nonetheless, darker syrups are rich in flavour and preferred for adding maple flavour to foods.

Many trees produce sugar-containing saps including birch, larch, lime, sycamore and walnut but alternative amino acids will produce flavours different than “maple”. Maples as a group, contain the highest sugar concentrations in their sap and *Acer saccharum*, the Sugar Maple, has the highest of them all. Economies of energy and time to boil off the water make the Sugar Maple the preferred species for syrup production. Current maple syrup research is focusing on fall tapping, climate change effects on production and sugar bush health but that is for another article.

Indian legends of how the sugar maple produces its sweet sap and why it is available for only a few weeks a year make for fascinating reading and instill the values of hard work and care for nature. Read these wonderful stories and other reports on maple syrup production at ColdCreek.ca/cool-stuff/.



Painting Phil Chadwick. Photo Tom Wray



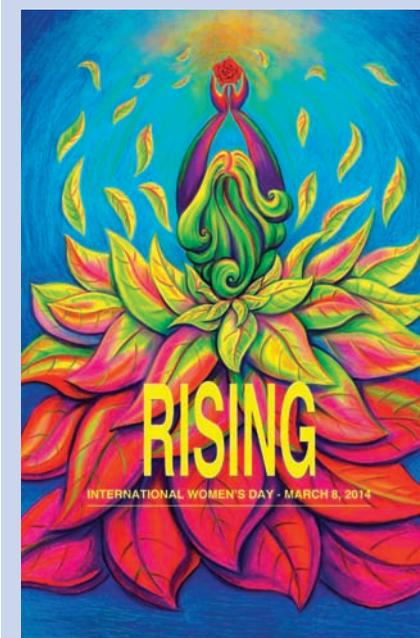
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Giovannina Colalillo of Schomberg has once again been asked by the Ontario Federation of Labour to create the illustration for International Women's Day, March 8, 2014!