

Maple Sap Concentration

Initially discovered by Native Americans and then further explored by European settlers, maple sap has served as an integral part of spring in northeastern North America and as such, maple syrup remains a popular natural sweetener featuring over 65 antioxidants. The northeastern section of North America is the only region in the world where the environmental conditions are optimal to produce maple sap to yield maple syrup.

MAPLE SYRUP MANUFACTURING PROCESS

During winter, sugar made by the maple tree's leaves during summer is stored as starch in the root tissues. When temperatures slowly rise in early spring, the trees turn the stored starch back into sugar. At this time, farmers, or sugar makers, tap the trees by drilling a hole (called a tap hole) into the trunk and attaching either a bucket or tubing.

Sap is made as the tree mixes ground water with the sugar. Maple sap is primarily made up of water and about 2-3% sugar (mostly sucrose), as well as calcium, potassium, phosphorus, iron and trace amounts of B vitamins. In order to make syrup from maple sap, most of this water must be removed. In fact, it takes approximately 151.4 L (40 gal) of maple sap to make 3.8 L (1 gal) of syrup with a sugar content of 66.9%.

A typical sugaring season lasts 4 to 6 weeks, usually somewhere between the months of February through April. By late spring when the trees begin to produce leaves and flowers, a chemical change occurs in the sap giving it an unpleasant "buddy" taste. A pattern of freezing and thawing temperatures (below freezing at night and 4.4-7.2°C or 40-45°F during the day), builds up enough pressure within the maple trees, causing the sap to flow through from the tap holes. The sap collected in buckets must be gathered by hand, while sap from pipelines is drawn back to storage tanks at the sugarhouse using a vacuum pump. From the storage tanks, the sap is sent through a reverse osmosis system to remove a large percent of water from the sap before boiling.

REVERSE OSMOSIS FOR CONCENTRATING MAPLE SAP

Maple sap is pumped through a series of reverse osmosis (RO) elements to remove water and to produce a more concentrated maple sap product. Concentrating maple sap with RO significantly increases the efficiency and profitability of processing sap into syrup by reducing the amount of both fuel and time required to concentrate the material to syrup density in the evaporator.

Spiral-wound RO elements are used to remove 75% or more of the water from maple sap before it reaches the evaporator. Standard maple sap RO elements may increase the sugar concentration to as high as 22% while high brix maple sap RO elements may be used to concentrate the sugars up to as high as 25-40%. MANN+HUMMEL Water & Fluid Solutions offers both standard maple sap RO elements as well as high brix maple sap RO elements. [TRISEP® Maple XP-8040](#) elements may be used to concentrate the sugars up to 22%, while [TRISEP® Maple HB-8040](#) elements may be used to concentrate sugars up to 25-40%. For more information, please contact MANN+HUMMEL Water & Fluid Solutions.

After being concentrated by reverse osmosis, the sap is sent to the evaporation process. As the sap boils, water evaporates, and the sap becomes denser and sweeter. The evaporation process concentrates the sugar to approximately 66.9-68.9%, producing the final product known as maple syrup. The syrup is then filtered and bottled.

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