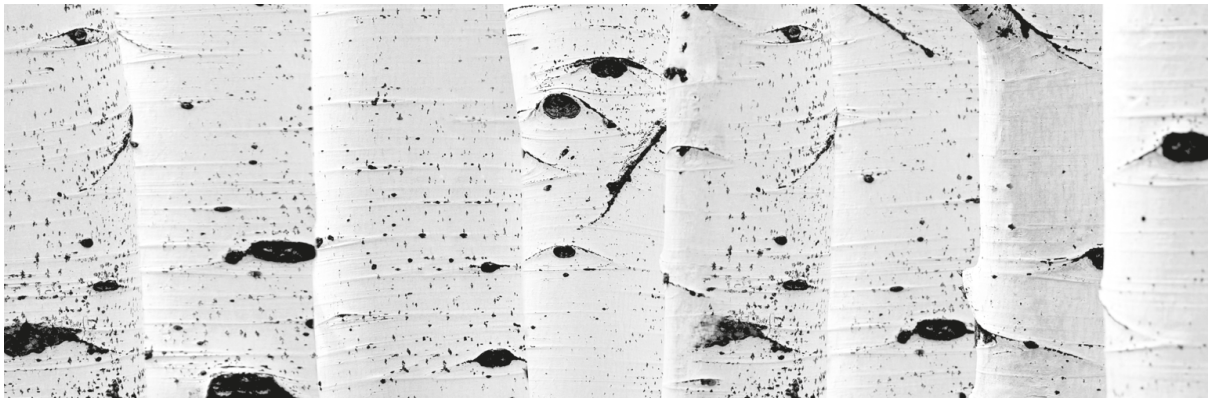
All about Birch Water

By Lotte Tisenkopfa-Iltnere, founder of MADARA

With the outbreak of spring, birch trees across the Northern hemisphere prepare themselves for blossoming by running an energising liquid - known as birch water, sap or juice - throughout the tree from the roots to the buds.



Why does birch water flow at all?

Birch water is a nutritious liquid that birch roots vigorously push into the trunk, moving it upwards to the branches where it finally reaches its destination – the buds. The juicing process is necessary for the tree to ensure intensive growth and regeneration after the freezing winter standstill. It rapidly spreads nutrients across the body of the tree, boosting cell division, leaf unfurling, blossoming, and most of all - growth.

What's in birch water?

Birch water is generated by the roots. Roots take water and minerals from the soil, while carbohydrates (sugars) formed in the previous summer by photosynthesis are accumulated and stored in the roots. Besides minerals like potassium, magnesium and calcium, the sap contains a unique blend of amino acids (citrulline, glutamine, glutamic acid, asparagine, isoleucine, phenylalanine), enzymes and natural fruit acids (malic acid, succinic acid, citric acid and fumaric acid).

When does it flow?

The flow of sap is triggered by rapid temperature changes. Night temperatures should fall below zero but the day should be warm and sunny. The birch tree senses the freezing and thawing of the soil and launches a cascade of natural processes that result in the flowing of sap.

The flow continues for just one to two weeks and the fresh green hue of unfurling buds marks the end of birch water harvest and the onset of spring. The time of the year when birch trees generously share their nutritional sap with us humans is different across the Northern hemisphere. It might be the beginning of April in Latvia or Southern Finland and it can be as late as May in territories closer to the Arctic Circle.

Traditional use of birch water

Harvesting of birch water is a tradition of nations living in the Nordic region. It is used primarily as a health drink to detoxify the body, improve health, clarify skin and strengthen hair. Fresh water is used for cooking. Birch water starts fermenting after a day or two, so it is used to make sparkling soft drinks or even birch wine.

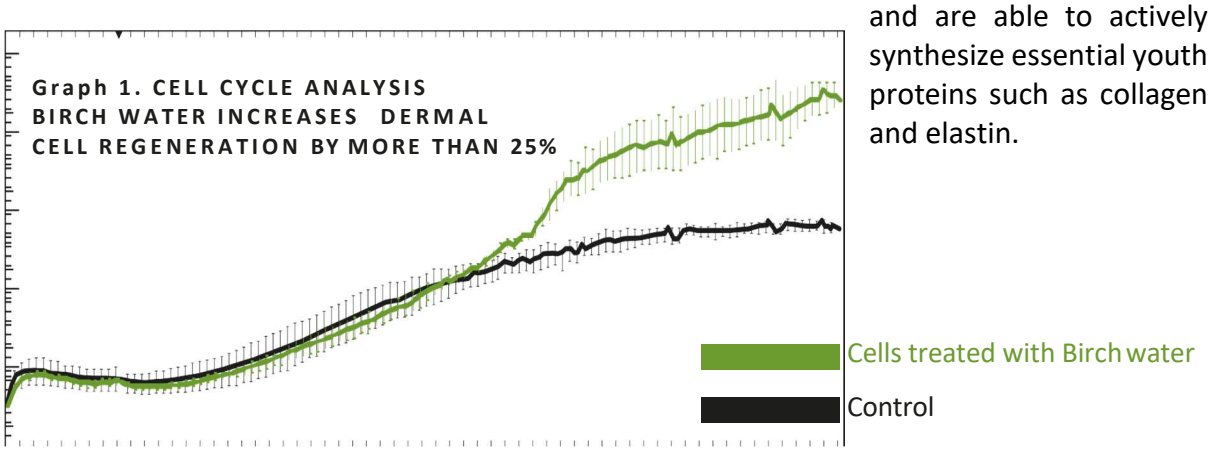
Birch water INNOVATION – the new anti-ageing ingredient

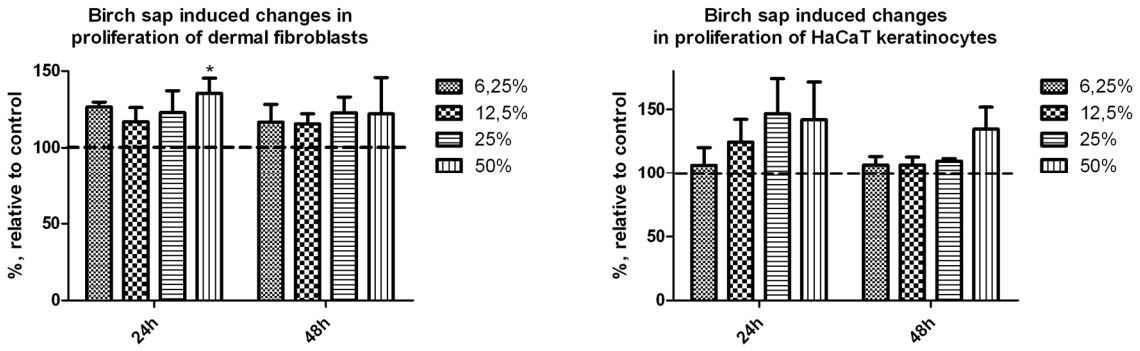
Cosmetic manufacturers are continuously searching for new active ingredients for product development to satisfy consumer needs. Among anti-ageing ingredients there is demand of natural substances with well characterized chemical composition and proven efficacy.

The first of its kind scientific study on birch water was launched by the University of Latvia and organic skincare producer MADARA to investigate effects of birch water on skin. Historical medical records highlight positive effects of birch water both nutritional and topical use; however no proven mechanisms of action on skin have been characterized before.

This study focused on elucidation of birch water's effects on skin cells *in vitro*. Birch water's potency to stimulate dermal and epidermal cell proliferation, delay of cell senescence, *in vitro* protection against reactive oxygen species, and promotion of growth factor secretion were tested.

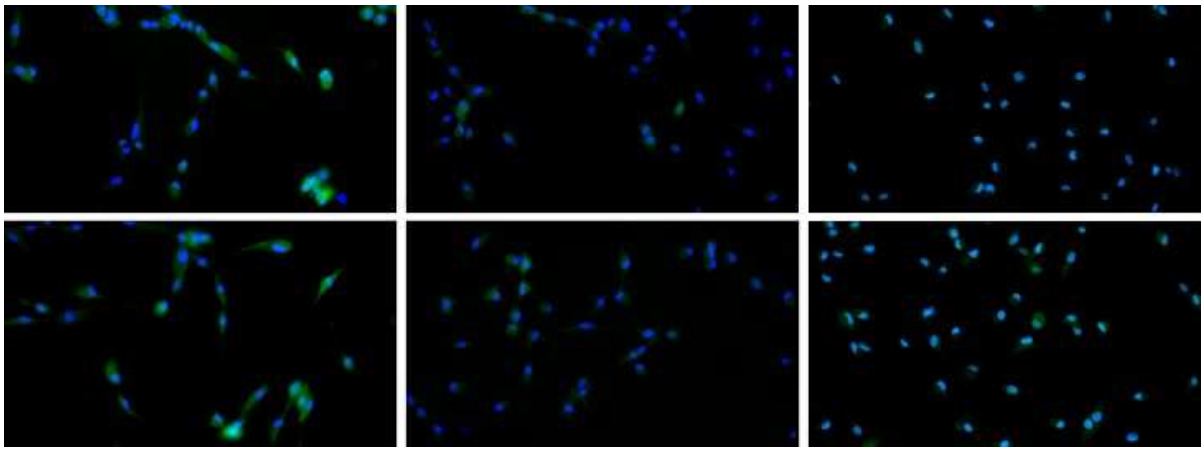
The findings of the study indicate that birch water has a significant anti-age activity. As confirmed by cell cycle analyses and cell proliferation (growth) analysis, birch water speeds up dermal cell regeneration by 25% compared to control (graph 1). In presence of birch water skin cells show significantly lower accumulation of aging markers, indicating that nutrients present in birch water make skin cells stay functional and healthy for a longer period of time and are able to actively synthesize essential youth proteins such as collagen and elastin.





Graph 2. Changes in proliferation of dermal fibroblasts and HaCaT keratinocytes in presence of birch sap at 24 and 48 h of incubation. Data represented as relative changes in cell proliferation activity compared to control. Control level of cell proliferation (100%) is depicted with dashed line. * *p*-value < 0.05, n=3 (ANOVA).

Another significant finding indicates that birch water has strong antioxidant effect, reducing negative impact of environment such as pollution and UV rays. Study showed that dermal cells previously treated with birch sap are considerably more resistant to oxidative damage and there is lower accumulation of free radicals (Graph 3). Birch water is a powerful free-radical scavenger, helping to neutralise aggressive oxygen molecules and repairing damage done to skin cell's DNA.



Control (high oxidative stress) Birch Water 10% (reduced ox.stress) Birch Water 50% (reduced ox.stress)

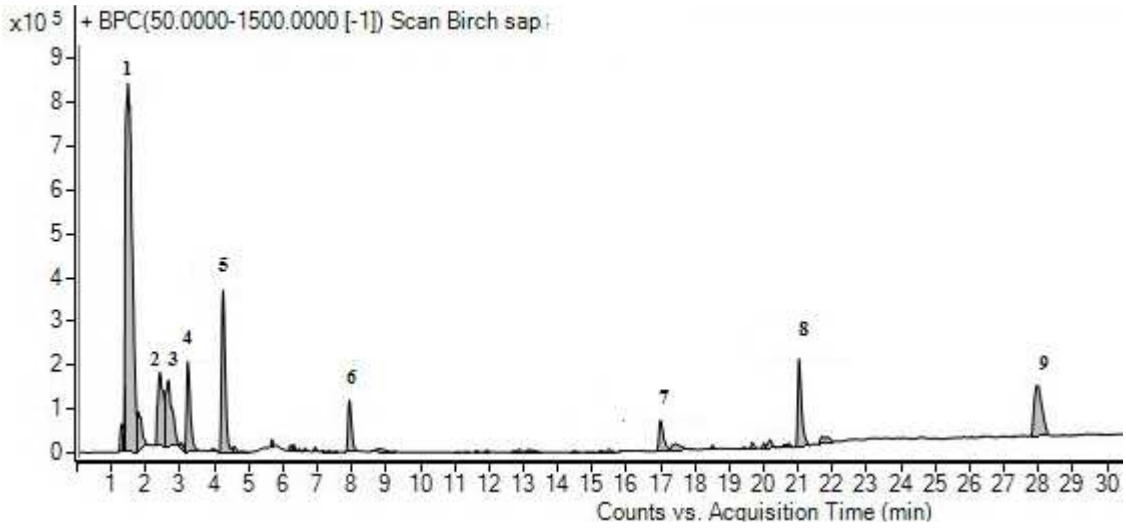
Graph 3. REDUCTION OF OXIDATIVE STRESS. Blue light illuminates skin cell nuclei. Green marker indicates oxidative stress.

Research concludes that similar to its activity on the tree promoting the growth of young leaves, birch water speeds up regeneration of dermal and epidermal cells, making a powerful cellular anti-age ingredient. Antioxidant properties of birch water reduce the negative effects of photo-aging, environmental pollution and consequences of inflammation.

Strongest stimulating and skin protecting effects of birch water were established at high concentration of sap, indicating that a skincare product with at least 50% of birch water will provide age-defying and damage-reversing benefits and suggesting that replacing regular water with birch water maximizes rejuvenating properties of a cosmetic formulation.

Chemical analysis of birch water

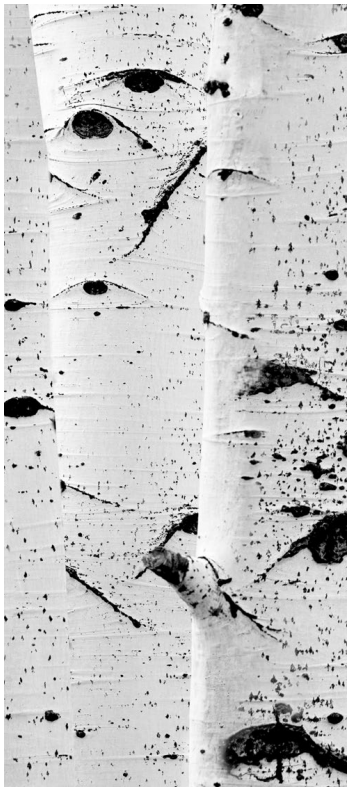
In a recent study aiming at characterising the chemical components of birch water (The University of Latvia, **2017**) 55 biologically active compounds were separated from Birch sap. Most dominant peak with retention time at 1.49 min contains a very polar fraction of birch water, including three organic acids succinic acid, malic acid and citruline (represented about 6.7% of the total amount), five amino acids and phenolic compound metabolite tyrosol 4-sulphate (represented about 32.6% of the total amount). Overall nine different amino acids were separated from birch sap and represented about 16.8% of the total amount, including leucine (2), isoleucine (3), glutamine, phenylalanine. It should be noted that organic acids and amino acids separated from our Birch sap sample are widely distributed and described in the birch sap products. It was found that Birch water is not very rich with phenolic compounds, but some of them were spared such as homovanillic acid (4), (+)-catechin 3-O-glucose (6), resveratrol 3-O-glucoside (8). Birch sap contains betulin (7) which represents about 2,4% of the total amount and some undidentified tannins.



Graph 4. Base Peak Chromatogram (BPC) of the Birch sap. Only individual compounds with concentrations exceeding 2% are numbered. 1-peak of very polar Birch sap fraction containing organic acids, amino acids and tyrosol 4-sulfate; 2-leucine; 3-isoleucine; 4-homovanillic acid; 5-phanylalanine; 6-(+)-catechin 3-O-glucose; 7-betulin; 8-resveratrol 3-O-glucoside; 9-unidentified tannin.

Brief history of birch water and its historic records

With the first medical records dating back a thousand year, harvesting and consuming birch water is a remarkable tradition of folks living in the subarctic regions of Northern Europe.



German abbess, writer and philosopher Hildegard von Bingen was the first to document the healing properties of birch in 12th century in PSYSICA, encyclopaedic book on healing plants.

Italian botanist Pietro Andrea Mattioli praised medicinal effects of birch water in 1561 and Estonian physician Johannes Raicus praised birch sap, comparing its healing properties with those of mineral water in 1631.

Danish botanist Simon Paulli describes birch water in 1648. Birch sap has also been used for medicinal purposes and was included in the "Danish pharmacopeia" in 1772.

Swedish cartographer Olaus Magnus made a brief note in 1555 that Scandinavians were tapping birch for sap and using it as a fresh drink. Ethnographical records from various provinces give detailed information on the gathering and manufacturing of the sap into drinks or its use as an ingredient in various food stuffs.

In Finland and Carelia birch sap was tapped off in the spring and used as a refreshing drink. The Saami in Finland also made a refreshing beverage of birch sap

In the Norwegian medieval "Flatey book" ("Flateyjarbók"), completed in 1394, there is a description of how King Sverre and his men "spent two nights in the wilderness and had no food but sap they could suck from the trees"

In Latvia and Estonia month of April known as "sulu mēnesis" (in Latvian) meaning "birch sap month", indicating that sap usually flows and is gathered in April.

Records of traditional medicine indicate that birch water helps to treat in prevent several diseases, like stomach diseases, kidney stones, colds, deficient liver function, scurvy, headaches, skin diseases.

Birch water was widely used both by the peasantry and the nobility. The tonic, revitalizing and nutrient properties of birch have been mostly appreciated after winter, when human body was weakened by the long period of winter and deficiency of fresh produce. Most of the sap produced has been used as a fresh drink, but in some areas they added yeast, and in more recent times also sugar or other aromatic plants to produce a variety of refreshing drinks or a kind of wine.