Birch oil

**BOTANY**

*Betula alba* L. belongs to the *Betulaceae* family; often called with its synonym, *Betula pubescens*. The fruit of these trees is an achene, very common in wet areas.

Birch is up to 20 m height, with brown hanging branches that have white bark when they are young and grayish or brownish when they age, and in addition, it has cracks at the base of the trunk. Its leaves, with a very long petiole, are in alternating arrangement. Flowers are arranged in inflorescences; they are yellowish brown if they are males, and green if they are females. It has a slightly aromatic and pungent odor. The fresh leaves are bitter.

Birch is originally from Central and Northern Asia, widespread in Central and Southern Europe, as well as in the north of USA and Canada. It grows in grasslands, forests and other humid zones, because it doesn’t tolerate shadow.

Birch oil is obtained by maceration of *Betula alba* L. leaves in sunflower oil (*Helianthus annuus* L.).
CHEMISTRY

Triterpenic derivatives

It contains triterpenic alcohols and sesquiterpene esters, such as damaran with malonate at C3 or C12 acetate. It also contains triterpenes derived from lupan, such as lupeol or its hydroxylated derivatives, and lupan derivatives characteristics of birch tree, like betulin, betulinol and betulinic acid.

Essential oil

It has essential oil, 90% of which is composed by a monotropitoside that can be hydrolyzed in methyl salicylate and triterpenes.

Other components

It also contains saponins and lignans.

TRADITIONAL USES

Although birch is not a Mediterranean tree, it was known in ancient times because it was abundant in neighboring countries of the North and for its wood and branches. Indigenous people directly placed fresh leaves on wounds and abscesses for the astringent action caused by the tannins. In the 12th century, the first mention came, which talks about the diuretic power of its leaves and its virtual capacity to remove urinary calculi (Alonso, 2004).

In ancient times, birch was called "tree of wisdom", since teachers used a stick made of wood to punish distracted students at the school.

In Finland, the sauna has been used for centuries to wash the bodies, stay healthy and young, and improve the treatment of different diseases. “Vihta” o “vasta” (a bunch of birch branches) (Fig. 1) is a complement used in saunas, which is used to massage the body during the bath. People give themselves mild knocks with the “vihta” on the body to promote blood circulation, sweat and clean the skin; that is why this practice has some healing and magical effects (Peräsalo, 1988).

Today, birch is recognized for its diuretic and depurative activity. Specially, it is particularly useful in cellulite treatment because it improves the elimination of body toxins.
COSMETIC PROPERTIES

Firming activity

The elasticity of the connective tissue may be affected by the presence of elastases, enzymes that act on elastin causing its fragmentation and a loss of tissue elasticity.

Human leukocyte elastase (LEC) is one of the most powerful enzymes since it is capable of degrading elastic fibers at neutral pH and other proteins present in the connective tissue. This enzyme is involved in inflammatory problems and processes that involve skin tissue destruction.

Various pentacyclic triterpenoids, such as betulinic acid, can inhibit elastase activity, with an IC(50) of 10.81 g/mL on porcine pancreatic elastase; that way, they prevent the hydrolysis of elastin and other connective tissue proteins. Thus, they prevent the loss of firmness, improve skin elasticity and, consequently, improve orange peel appearance (Ying, 1991; Sultana, 2007).

In addition, collagen, the main protein of the dermal matrix, is known to provide elastic properties to the skin. Its degradation increases with aging process and UV exposure, and this causes the appearance of wrinkles and the skin becomes lax. Betulinic acid increases collagen synthesis and thus helps to strengthen the dermal matrix. Therefore, wrinkles are reduced and it can also beneficial for the treatment of cellulite by improving orange peel appearance.

For this reason, the Birch oil is used in cosmetic formulations as a skin tissue firming agent.

Anti-inflammatory activity

Birch oil is rich in monotropitosides that create methyl salicylate. This is an ester mainly used as flavoring agent and it has the advantage that is absorbed through the skin. Once absorbed, methyl salicylate can hydrolyze to salicylic acid, which acts as an analgesic, calming the pain of the affected tissues.

A Swedish study evaluated the anti-inflammatory activity of birch leaves and its inhibitory activity on prostaglandins, thromboxanes and leukotrienes. In vitro action wasn't very significant though the anti-inflammatory activity in vivo was much more relevant due to the metabolic activating action on the saligenins (present in phenolic compounds), which are transformed into salicylic acid (Tunón, 1995).
For this reason, birch oil is highly recommended for cosmetics with anti-inflammatory activity, for sensitive or irritated skin, and anti-acne products.

**Anti-seborrhea activity**

It is due to the content of saponins. Saponins have detergent or surfactant properties because they contain both water-soluble and fat-soluble components. They consist of a fat-soluble nucleus, having either a steroid or triterpenoid structure, with one or more side chains of water-soluble carbohydrates (Cheeke PR, 2000).

Alopecia is often related to an excess of sebum in the scalp, which is logical, if we consider the sebaceous gland androgen dependence. For this reason, a way to reduce seborrheic alopecia is using surfactant in cosmetics (Lemmel Montoya J, 2006).

Therefore, birch oil is useful for cosmetic products with seboregulating and anti-hair loss activities.

**Antimicrobial and antiseptic activity**

The compounds responsible for these properties are salicylic acid and methyl salicylate, two known germicidal and bactericidal in drugs world. They protect the skin from bacterial infections and fungi.

Birch oil is macerated with sunflower oil, that way there is a synergy of their cosmetic activities.

Sunflower oil has barrier function stimulating activity. This action of sunflower oil is also helpful in preventing bacterial infections.

Darmstadt *et al.* (2004) applied 3 times daily a topical application of sunflower seed oil to preterm infants in order to test the impact on preventing infectious diseases. Treatment with sunflower seed oil resulted in a significant improvement in skin condition and a highly significant reduction in the incidence of nosocomial infections compared with infants not receiving topical prophylaxis (Darmstadt, 2004).

Thus, birch oil is highly recommended in the formulation of cosmetic products with purifying and antiseptic activity.
COSMETIC APPLICATIONS

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RECOMMENDED DOSE

The recommended dose is between 0.5% and 5.0%.

BIBLIOGRAPHY


