Meadowsweet

**BOTANY**

*Filipendula ulmaria* - also known as Filipendula, Meadowsweet, Queen of the meadow, Queen of the Prairie, belongs to the family Rosaceae. This species grows throughout Europe, except the Mediterranean area.

*Filipendula ulmaria* (L.) Maxim is an herbaceous perennial, growing up to one meter tall, with small white flowers arranged in corymbs and large alternate leaves with serrate margins. The leaves - divided into irregular leaflets - resemble the leaves of elms, a feature that gave rise to the name *Ulmaria*. Despite large disparity in the size of leaves, a constant feature can be observed; a leaf divided into three lobes appears at the end of every branch. All leaves are serrate and whitish beneath due to the presence of numerous thick and short hairs.

Meadowsweet extract is produced from the flowering-ends of *Filipendula ulmaria* (L.) Maxim.
CHEMISTRY

The most important active compounds are phenolic glycosides and flavone glycosides; among them: spiraeoside, hyperoside, rutoside, xyloglycoside of methyl salicylate (monotropitoside) and of salicylic aldehyde.

The amount of salicylates, mostly present in the form of glycosides, is assumed to be less than 0.5% (Zeylstra, 1998; ESCOP, 2003).

Flavonoids, from 3-4% in the flowering herb up to 6% in the fresh flowers, in particular spiraeoside (quercetin-4'-glucoside), also hyperoside, other quercetin and kaempferol derivatives, as kaempferol-4'-glucoside.

Tannins (hydrolysable type, ranging from 1% in ethanolic extracts to 12% in aqueous extracts), predominantly the dimeric compound rugosin D.

Miscellaneous: coumarin (trace), mucilage, carbohydrates, ascorbic acid.

TRADITIONAL USES

The medicinal use of *Filipendula ulmaria* has been described from the late 16th and 17th century (Halkes, 1998). In general, preparations form herb and/or flowers have been used traditionally in inflammatory diseases and as a diuretic. Zeylstra (1998) concludes that the uses of *Filipendula* shifted over the years from a diuretic towards an antirheumatic.

Whereas in the British Herbal Pharmacopoeia (1983) stomachic, mild urinary antiseptic, antirheumatic and antacid actions are listed, the British Herbal Pharmacopoeia (1990) and British Herbal Compendium (1992) describe the action of Filipendula herba as anti-inflammatory.

Topical use: Traditionally used in the symptomatic treatment of minor painful articular conditions” (BHC, 1992).
In 1897, Felix Hoffmann created a synthetically altered version of salicin, derived from the species, which caused less digestive upset than pure salicylic acid. The new drug, formally Acetylsalicylic acid, was named aspirin by Hoffman's employer Bayer AG after the old botanical name for meadowsweet, *Spiraea ulmaria*. This gave rise to the hugely important class of drugs known as NonSteroidal Anti-inflammatory Drugs.

**COSMETIC PROPERTIES**

Meadowsweet is used as herbal medicines and foodstuffs. Its biological and pharmacological properties are mainly attributed to flavonoids, salicylic derivatives and tannins known to be effective antioxidants.

**Anti-inflammatory activity**

The active compounds present in flowers – flavone glycosides and phenolic glycosides – give Meadowsweet extract its astringent and anti-inflammatory properties.

An aqueous, lyophilized extract of meadowsweet leaves inhibited prostaglandin biosynthesis from C-arachidonic acid by 36% at 0.2 mg/ml, a relatively low level of activity compared to 88% inhibition by indomethacin at 2.8 µM. It is also reported to inhibit both prostaglandin biosynthesis and platelet activation factor (PAF)-induced exocytosis/release of elastase (Tunon et al., 1995).

Salicylates are the class of compounds that are widely valued for their pain killing, antipyretic and anti-inflammatory properties (Moncada and Vane 1979; Insel, 1991). They are used extensively for the relief of headache, inflammation, arthritis pain, and some are employed in the treatment of heart attacks and strokes in the elderly (Rainsford, 1984). Their mode of action is the inhibition of the synthesis of prostaglandin and its derivatives that cause inflammation (Moncada and Vane, 1979; Meade et al., 1993).

The anti-inflammatory effects of the compounds on carageenan-induced oedema, salicylates produced a significant reduction in oedema formation. They are prominent agents used for or in combination with agents used in treating inflammation (Fadeyi, 2004).

Due to its anti-inflammatory properties, Meadowsweet extract can be added to decongestive body treatments, aimed at tired legs and sensitive skin.

**Stimulating action on blood circulation**

Tannins have been successfully employed to treat several vascular conditions: capillary fragility (couperosis) and chronic peripheral vein insufficiency. Up to the moment, their capillary protective action has been attributed to their tendency to improve the tonicity and resistance of the capillary walls and to
their specific affinity to bind compounds in the elastic fibers (collagen and elastin) thus making them more resistant to the degrading actions of elastase and collagenase (Muñoz O. et al., 2003).

Therefore, Meadowsweet extract is recommendable to formulate cosmetic products with vessel-protection and venotonic activities.

**Elastase inhibiting activity**

Skin elasticity is a mechanical property due to the presence of elastin, a protein located in the dermis, which is part of the connective tissue together with collagen and glycosaminoglycans. Elastases impair the elasticity of skin connective tissue; these enzymes act on elastin, by fragmenting it and consequently reducing elasticity.

From 42 Rosaceae species, only the Rosoideae species such as *Filipendula ulmaria* exhibit high tannin content and elastase inhibiting activity. Extracts of meadowsweet flowers and leaves inhibited the activity of the proteolytic enzyme elastase by 100% and 92% respectively, measured by spectrophotometry using an amino acid-nitroanilide substrate and attributed to the tannin content of the materials (Lamaison, 1990).

Thus, these results show Meadowsweet extract is of great use to formulate cosmetic products with firming activity.

**Antioxidant activity**

A number of tannins, especially hydrolyzable tannins, inhibit ADP-induced and Fe$^{3+}$- induced lipid peroxidation in rat liver mitochondria. In *vitro*, tannins act as free radical scavengers, as inhibitors of superoxide ion formation, and, some of them, as lipoxygenase – but not cyclooxygenase – inhibitors, in rat peritoneal granulocytes (Bruneton J., 2001).

Flavonoids also have an antioxidant action, mainly due to their free radical scavenging and metal chelating actions, which prevent the catalyst actions of free radicals (López Luengo, M.T., 2002).

A study by Fecka in 2009 was conducted to evaluate the distribution of hydrolysable tannins and other polyphenols in *Filipendula ulmaria* and *Rosa canina*. 27 polyphenols were estimated in meadowsweet, such as rugosins A, B and E, apart from phenolic acids, flavonoids and tannins (Fecka, 2009).

The antioxidant activity of the methanol extract of *Filipendula hexapetala* flowers was assessed by the assay for ferric-reducing antioxidant power (FRAP), the assay for DPPH free radical scavenging ability (DPPH) and the assay for the influence of lipid peroxidation in liposomes, induced by Fe$^{3+}$/ascorbate system and measured by the TBA test (LP). The activity of the investigated extract in all test-systems
was found to be significant. The principal constituent responsible for the observed effects was isolated and identified as spiraeoside, which is also found in the Meadowsweet extract (Maksimović, 2007).

Thus, Meadowsweet extract is of great use to formulate cosmetic products for the protection of the skin and hair integrity against oxidative processes.

**Astringent activity**

This activity is due to the tannin content of this plant. The astringent action of tannins is due to their capacity to form complexes with different substances.

Applied topically, tannins coat the outermost layers of skin and mucosa, thus protecting the deeper layers. These compounds also act as vasoconstrictor agents on superficial micro-vessels. By restricting fluid loss and preventing environmental damage, tannins promote tissue regeneration (epithelizing) in superficial wounds or burns (Bruneton J., 2001).

Therefore, Meadowsweet extract is recommendable to formulate cosmetic products with regulatory activity on sebum secretions and epithelizing action.

**Antimicrobial activity**

*In vitro* bacteriostatic activity of several 70% ethanolic and aqueous flower extracts against a range of urinary tract pathogens (Halkes, 1998; ESCOP, 2003; Barnes et al., 2007) have been described.

Growth-inhibitory effects (in vitro) against a variety of bacteria were also demonstrated for a combination of 70% ethanolic and aqueous extracts (Csedõ et al., 1993).

Therefore, Meadowsweet extract is recommendable to formulate cosmetic products with purifying and antiseptic activities.
COSMETIC APPLICATIONS

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RECOMMENDED DOSE

The recommended dose is 2 - 5%.

BIBLIOGRAPHY


