Marshmallow-Eco

BOTANY

Althaea officinalis L. Marshmallow is a large-sized vigorous herbaceous plant. Within the genus Althea, marshmallow exhibits its characteristic whitish stems up to 1 meter tall or even taller, and its characteristic leaves covered by abundant dense hairs. Stems are renewed every year, the long thick roots being perennial. Flowers are light pink to white, their structure being the typical one of the mallow flowers.

This perennial herbaceous plant grows spontaneously in humid locations in the south of England and Europe. It is native of Europe, where it is widely distributed from Great Britain to Russia.

The parts of the plant usually employed are the roots and occasionally, the flowers and the leaves. Roots must be dug and collected in autumn. They must be picked from already adult plants at least in their second year of age, when roots are 1 to 2 cm thick. After drying, they must be cut into pieces, the bark gently peeled off, until they look completely white.

CHEMISTRY

Marshmallow contains a proportion of mucilage oscillating between 17% and 35% of its total weight. This proportion varies depending on the harvest season.

The contents of mucilage in roots oscillate between 20 and 30%.

Other components present in roots are asparagine (1-2%), pectin (10-12%), large amounts of starch (35%), sugar (5-10%), betaine (2%), tannins (2%) mineral salts (5-8%) and traces of essential oil.

It is also rich in vitamins, mainly Vitamin A, C, E and complex B.

The heavily branched structure of mucilage is composed of D-galactose, L-rhamnose, D-glucuronic acid and D-galacturonic acid. In general, the polysaccharides present in the family Malvaceae exhibit a marked structural similarity to the pectin polysaccharides with rhamno-galacturonic chains and uronic acid and galactose ramifications.

Several components have been identified specifically in these active compounds.

Firstly, a heteropolysaccharide composed by D-galacturonic acid, L-rhamnose, glucuronic acid and D-galactose in a proportion 1:1:1:1 has been found.

There are also a large proportion of polysaccharides. One of them composed by L-rhamnose, D-galactose, D-galacturonic acid and D-glucuronic acid in a 3:2:3:3 ratio. Another one has a trisaccharide as its basic structure and still another contains a large proportion of uronic acid units. Additionally,
Hydrosoluble polymers can be found, whose ramified structure is composed by \( \alpha \)-L-arabinofuranosyl residues linked by \( 1 \rightarrow 5 \), \( 1 \rightarrow 3 \) and \( 1 \rightarrow 2 \) bonds.

Finally, a certain component of the Marshmallow mucilage called Althaea-mucilage O has been identified, which is composed by L-rhamnose, D-galactose, D-galacturonic acid and D-glucuronic acid in a proportion 3:2:3:3. Subsequent studies demonstrated that this fraction has a basic structure composed by 5 oligosaccharides.

**TRADITIONAL USES**

Egyptians already used Marshmallow. Its therapeutic uses are known since the times of Dioscorides. The Greek “Althea” means medical. Romans used to employ it as an edible vegetable. This plant adapted easily to the European climate. It was cultivated as an ornamental plant in the gardens of monasteries during the whole middle Ages, later being cultivated in the fields.

Traditionally, its emollient properties have been employed in the treatment of respiratory diseases, gastric ulcer and inflammation or mouth and skin ulcers.

It has been very useful for inflammations of the digestive tract (gastritis, heartburn, ulcers, constipation, etc.), the respiratory tract (cough, bronchitis, laryngitis, etc.) or the skin.

In certain places, marshmallow roots are employed as a pain reliever for children during dentition. External applications have beneficial effects on skin diseases and helps healing skin wounds, skin burn and irritation.

At present, it is used as an emollient applied in poultices. It is ingested for the regulation of bowel functions because of its slightly laxative effects. Infusion of marshmallow roots is employed as a cold and cough reliever. Marshmallow is a part of the excipient in some pharmaceutical dermatological products.

**COSMETIC PROPERTIES**

The abundance of mucilage in this root gives it several properties that make it useful as:

- **Emollient**: soothing, calming effect on skin and mucosa
- **Anti-inflammatory**
- **Mucosa Protector**: it forms a coating film, which protects mucosa from irritating agents.

Zerehsaz et al. 1999 carried out a double-blind randomized study in order to compare the efficacy of the intra-muscular administration of a purely chemical active compound (glucantime) and the external application of a mixture of vegetal extracts, one of them being Althea officinalis, on patients suffering cutaneous leishmaniasis.

The results showed that after a 6 weeks treatment, those patients treated with the chemical product recovered up to 27.1% while those patients treated with the mixture of extracts recovered up to 74.4%. Adverse side effects only appeared in the patients group treated with the chemical product.

It seems that the possible action mechanism of the vegetal complex could consist in **boosting the patients’ cellular immunity**.

A recent study (Kobayashi et al. 2002) found that Marshmallow might be used as a depigmenting ingredient. The extract acts on human melanocytes by inhibiting the activation of endothelin-1 (ET-1) in cell proliferation and simultaneously, the activation of the protein kinase involved in the cell transduction process without inhibiting its binding to the specific receptor.

Such an inhibitory effect has also been observed on normal keratinocytes. On the basis of these results, it can be suggested that the action mechanism of Marshmallow is the inhibition of intracellular calcium mobilization and of cell proliferation induced by ET-1. The results suggest that the extract significantly reduces the physiological action of ET-1 in human melanocytes after UVB irradiation. ET-1 is known to
activate several intra cellular processes in the transduction pathways of melanocytes. ET-1 binds to a specific receptor on the surface of the melanocyte, thus activating phospholipase C by mediation of the G protein. This process yields IP3 and diacylglycerol as a result of the inositol phospholipid metabolism. As a consequence of this activation, IP3 induces the release of calcium from the endoplasmic reticulum, thus increasing the intracellular calcium levels, which in turn activate the specific protein kinase.

It is believed that the Marshmallow extract acts by inhibiting the intracellular calcium mobilization and the activation of the specific protein kinase in keratinocytes as well as in melanocytes. However, this extract has been found not to inhibit the enzyme tyrosinase or the related enzymes, which are the main target of de-pigmenting products.

**EFFICACY TEST**

**Enzymatic Inhibition**

Hyaluronidase is an enzyme located in skin, whose main function is to catalyze the degradation of hyaluronic acid and other mucopolysaccharides in the connective tissue. Hyaluronic acid has several functions such as organizing the dermis structure, maintaining the moisture levels of skin and participating in wound healing processes.

The products of the hyaluronic acid degradation processes have been described to induce the expression of cytokines involved in inflammation. Therefore, excessive hyaluronic acid degradation has negative effects on skin, such as aging and generation of inflammatory processes.

An assay to evaluate the MARSHMALLOWS-ECO induced inhibition of hyaluronidase has been carried out.

1. **Experimental method**

The substrate (sodium hyaluronate 1.2 mg/ml) degradation reaction starts when it is incubated together with the enzyme (Bovine Hyaluronidase, Boehringer Manheim, ref. 106.500) and with the substances to be tested in a bath at 37º C. After 40 minutes, the reaction is interrupted and the N-acetylglucosamine residues, derived from the hyaluronic acid degradation, are stained. Subsequently, absorbance reading at 585 nm is carried out.

Buffer acetate 0.1M pH=3.5 was used as the negative control. Rutin and Heparin were used as the positive controls. The final concentrations of these substances in the assay medium were 0.81 mM for Rutin and 0.068 mg/ml for Heparin. The final concentration of MARSHMALLOWS-ECO in the assay medium was 2.7%.

Maximum absorbance values were recorded for the tubes corresponding to the negative control. Inhibition of the enzyme hyaluronidase would generate smaller amounts of N-acetylglucosamine residues and consequently smaller absorbance values.

2. **Results**

The following graphic shows the values recorded during this assay.

It can be observed that MARSHMALLOWS-ECO exerts inhibitory activity on hyaluronidase resulting in 25.61% inhibition.
In agreement with these results, it can be concluded that MARSHMALLOW-ECO exerts remarkable inhibitory effects on the hyaluronic acid degradation, which results in beneficial effects for skin such as the maintenance of moisture levels, the prevention of aging and the reduction of inflammatory processes.

**COSMETIC APPLICATIONS**

- **SKIN CARE** treatments: anti-irritant and moisturizing products for sensitive skins.
- **BODY CARE** treatments: hydrating, calming and anti-oxidative products.
- **HAIR CARE:** soothing and protector products.

**RECOMMENDED DOSE**

The recommended dose is between 0.1 – 4.0 %

**BIBLIOGRAPHY**