Leontopodium alpinum (Edelweiss)

Monograph on the biological effects of extracts of L. alpinum used in cosmetics, medical devices and medicinal products

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**Leontopodium alpinum** (Edelweiss)

**Scientific name:** Leontopodium alpinum *Cass.*  
**Order:** Asterales (Asternartige)  
**Family:** Asteraceae (Korbblütler)  
**Subfamily:** Asteroidae  
**Genus:** Leontopodium  
**Species:** Leontopodium alpinum

The first scientific name for Leontopodium alpinum which was validly published according to the current binomial nomenclature is *Gnaphalium alpinum* in the first edition (1753) of Linnaeus's *Species Plantarum*.

**Introduction**

Edelweiss (Leontopodium alpinum Cass.) is the symbol of the Alps. The plant is unequally distributed and prefers rocky limestone places at about 1800–3000 m altitude. It is not toxic, and has been used traditionally in folk medicine as a remedy against abdominal and respiratory diseases. The dense hair appears to be an adaptation to high altitudes, protecting the plant from cold, aridity and ultraviolet radiation. As a scarce short-lived flower found in remote mountain areas, the plant has been used as a symbol for alpinism, for rugged beauty and purity associated with the Alps, and as a national symbol especially of Austria and of Switzerland.

In former days Edelweiss was used as medicinal herb and was cocked with milk and honey and used in case of stomachache. This is also the reason for the Bavarian wording "Bauchwehbleaml". Edelweiß was also used as love potion. Occasionally huge florescences with a diameter of 6-12 cm are named as "Edelweiß kings" in mythology.

The fact that it has so many popular names (e.g. lion.'s foot, beautiful star, glacier star, alpine everlasting flower, glacier queen) reflects its universal appeal. Its name comes from the German words ."edel." meaning ."noble." and ."weiss." meaning white, while its botanical name derives from the Greek for ."lion.'s foot." .-- a reference to the shape of its downy flower.

From June to September, its short, raised and furry stems with whitish woolly leaves carry a corymb-like flower head composed of 30 to 60 flowers. Arranged in the shape of a star, white downy bracts surround the flowers to create the characteristic velvet star which makes the edelweiss so very special.

A perennial belonging to the Asteraceae family, the edelweiss is found in meadows and mainly limestone rocks at altitudes between 1500 and 3400 m. It is a protected species that may not be picked in Europe.
In its natural habitat this plant is subjected to strong UV irradiation, low atmospheric pressure and extreme temperature and humidity changes. During evolution, the edelweiss developed protective metabolites that Nature has optimised over thousands and thousands of years. These compounds may have useful skin-protecting properties.

**Description:**

**Edelweiß** (*Leontopodium alpinum*) is a very famous plant of the alpine region. Further names are: Irlweiß, Almsterndl, Federweiß, seldom also Silberstern and Wüblume (in Switzerland). (1)

The name of the plant derives from the typical white hairiness (*greek*: leon = lion, podion = small foot).

The plant reaches a height of above three to twenty centimeters. The florescence is a specious prosperity. White, hairy spathaceous bracts are responsible for the optical attraction; the many hundred florescences form a star. The white gleam of the spathaceous bracts is caused by many thousand small bubbles reflect the light (signal for insects searching for honey, furthermore protection of evaporation). Plants growing in the lowlands will become higher and show, due to their poor hairiness a greenish color.

Edelweiß blooms between july and september, is harmless and is covered by nature conservancy. The specious prosperity can be preserved until winter.

Edelweiß can be find on stony grasslands, lime stone rocks, seldom on mountain pastures. Edelweiß shows an irregular distribution and prefers stony lime stone rocks in an altitude between 1800 an 3000 meters.

The species comes after the ice-age from innerasiatic velds to the alps. Edelweiß is not a typical plant of the rocks and not domestic in Europe. (1)

**Biological properties of L. alpinum extracts of interest:**

In the scientific literature one can find evidence for pharmacological, physical as well as topical properties.

a) **anti-inflammatory properties**

Chemotaxis is the phenomenon whereby somatic cells, (and also eg. bacteria, and other single-cell or multicellular organisms ) direct their movements according to certain chemicals in their environment. This is important in inflammation, where inflammatory cells (e.g. leucocytes) immigrate into dermis. This directed movement is inhibited in vitro and in vivo by extracts from L. alpinum. (2,13)
b) **antimicrobial properties**

Extracts and individual constituents of Leontopodium alpinum Cass.(Asteraceae) were tested for their antibacterial activity in two different assays. (1. agar diffusion assays, 2. microbroth dilution method for MIC determination according to NCCLS criteria.) Significant antimicrobial activities were found against various strains of Enterococcus faecium, Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, Streptococcus pneumoniae, and Streptococcus pyogenes strains. These results support the ethnomedicinal use of Leontopodium alpinum for the treatment of respiratory and abdominal disorders. (3, 4)

Antifungal desinfective activity are proven against Aspergillus niger (5), anti-parasitic activities are demonstrated against Acaridae (6)

c) **Analgetic and anti-swelling and anti-inflammatory properties**

Extracts of Edelweiss (Leontopodium alpinum Cass.) were investigated for their anti-inflammatory and analgesic effects after oral administration to mice. The highest activity in rat's paw edema assay was found for the lipophilic extracts of the aerial plant parts (dose 200 mg/kg), exhibiting a swelling reduction of 72% to 80%. Histological evaluation of the treated paws showed a significant reduction of the inflammatory response in the pre-treated specimens. On the contrary the root extract exhibited more pronounced analgesic effects suggesting a different pattern of active compounds. As far as gastrointestinal effects are concerned, oral administration of aerial parts (200 mg/kg) to mice induces a highly significant inhibition in gastrointestinal propulsion. Moreover, the antioxidant capacity of some extracts was studied in order to establish a possible correlation with anti-inflammatory properties. (7, 8, 9,12)

d) **sun protection properties**

A high amount of flavonoids and phenolic are responsible for a certain sun protection property (10)

e) **radical scavanger and anti-oxidative effect** : protection against cell damages by internal and external agents is described. L. alpinum extract displays high-performance antioxidant and radical-scavenging properties. The effects of phenolic acids derived from hydroxy-cinnamic acid, such as chlorogenic acid, are potentialized by tannins (inhibition of lipid peroxidation, free radical scavengers, superoxide ion formation inhibitors, leading to an increased type III collagen protection). In addition, the compounds contained in edelweiss display enzyme inhibiting properties. They have, for example, been shown to inhibit hyaluronidase, 5- lipoxygenase and elastase activation (11, 12)

f) **soothing**

The presence of beta-sitosterol, luteolin-4'-O-glucoside and bisabolane-derivatives, accounts for the soothing effect of EDELWEISS extract. (12)
g) **Anti-Aging effects**

Leontopodium extracts contain elastase inhibitors which may contribute to a certain anti-aging effect. (11)

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**Constituents of Leontopodium alpinum**

A number of different constituents of extracts from various parts of the plant, the roots, the leaves were already identified. Table 1 gives an overview of the most important constituents and their potential biological activities. (extracted from reference 12)

**Table 1**

<table>
<thead>
<tr>
<th>Constituents</th>
<th>Pharmacological activities</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorogenic acid</td>
<td>antioxidant activity, radical-scapenging</td>
<td>5</td>
</tr>
<tr>
<td>Luteolin - 4’-o-glucoside</td>
<td>interleukin-5 inhibition</td>
<td>6</td>
</tr>
<tr>
<td>Apigenin - 7’-glucoside</td>
<td>anti-inflammatory activity</td>
<td>7</td>
</tr>
<tr>
<td>Luteolin</td>
<td>hyaluronidase inhibition</td>
<td>8</td>
</tr>
<tr>
<td>Bisabolane derivatives</td>
<td>anti-inflammatory activity</td>
<td>9</td>
</tr>
<tr>
<td>Tannin</td>
<td>antiseptic, hyaluronidase inhibition, inhibition of lipid peroxidation</td>
<td>10, 11</td>
</tr>
<tr>
<td>β-Sitosterol</td>
<td>anti-inflammatory activity</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>anti-fungal, bactericidal activity</td>
<td>13</td>
</tr>
</tbody>
</table>

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