



## **Leontopodium alpinum (Edelweiss)**

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

	page
Introduction	2
Description	3
Biological properties	4
a) anti-inflammatory properties	4
b) antimicrobial properties	5
c) Analgetic and anti-swelling and anti-inflammatory properties	5
d) sun protection properties	5
e) radical scavanger and anti-oxidative effect	5
f) <b>soothing</b>	5
g) Anti-Aging effects	6
Constituents of <i>Leontopodium alpinum</i>	6
References	6

## **Leontopodium alpinum** (Edelweiss)

<b>Scientific name:</b>	<i>Leontopodium alpinum</i> Cass.
<b>Order:</b>	Asterales (Asternartige)
<b>Family:</b>	Asteraceae (Korbblütler)
<b>Subfamily:</b>	Asteroidae
<b>Genus:</b>	<i>Leontopodium</i>
<b>Species:</b>	<i>Leontopodium alpinum</i>



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 "*Bauchwehbleam!*". 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 Asteracea 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 Wülblume (in Switzerland).\_(1)

The name of the plant derives from the typical white hairness (*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 hairness 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** disinfective 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 scavenger 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)

**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****CONSTITUENTS OF LEONTOPODIUM ALPINUM**

Constituents	Pharmacological activities	References
Chlorogenic acid	antioxidant activity, radical-scavenging	5
Luteolin - 4'-O- glucoside	interleukin-5 inhibition,	6
Apigenin -7- glucoside	anti-inflammatory activity	
Luteolin	hyaluronidase inhibition,	7
	antineoplastic activity	8
Bisabolane derivatives	anti-inflammatory activity	9
Tannin	antiseptic, hyaluronidase inhibition,	10
	inhibition of lipid peroxidation	11
$\beta$ - Sitosterol	anti-inflammatory activity	12
	anti-fungal, bactericidal activity	13

5- Keun Yeong Park et al, *Planta Medica*, 65, 457-59 (1999)

6- Kuppusamy et al, *Biochemical Pharmacology*, 40(2), 397-401 (1990)

7- Kuppusamy et al, *Experientia* 47 (1991), Birkhäuser Verlag, CH-4010 Basel/Switzerland

8- Pettit et al, *Journal of Ethnopharmacology* 53, 57-63 (1996)

9- Stuppner et al, *Annual Congress of the Society for Medicinal Plant Research*, Vienna 1998, P G44

10- Scalbert, *Phytochemistry*, 30, 3875-3883 (1991)

11- Okuda et al., in vol.5, p129-165, Wagner, Academic Press, London (1991)

12- Wachter et al., *Cosmetic and Toiletries*, 110, 72-82 (1995)

13- Neuwinger, *Afrikanische Arzneipflanzen und Jagdgifte*, 2. Auflage, wissenschaftliche Verlagsgesellschaft mbH, Stuttgart (1998)

## References:

- (1) Manuel Werner: Welche Alpenblume ist das?, Franckh-Kosmos, Stuttgart, 2011, ISBN 978-3-440-12576-2,
- (2) Dobner Michael J; Sosa Silvio; Schwaiger Stefan; Altinier Gianmario; Della Loggia Roberto; Kaneider Nicole C; Stuppner Hermann:  
“Anti-inflammatory activity of *Leontopodium alpinum* and its constituents”,  
*Planta medica*, (2004 Jun) Vol. 70, No. 6, pp. 502-8.
- (3) Dobner Michael J; Schwaiger Stefan; Jenewein Ilse H; Stuppner Hermann:  
“Antibacterial activity of *Leontopodium alpinum* (Edelweiss)”,  
*Journal of ethnopharmacology*, (2003 Dec) Vol. 89, No. 2-3, pp. 301-3.
- (4) Raskin I., Pouley A.:  
*Bactericides and fungicides elicited from plants*  
U.S. Pat. Appl. Publ., 65 pp., Cont.-in-part of U.S. Ser. No. 130,185,
- (5) Costa S; Schwaiger S; Cervellati R; Stuppner H; Speroni E; Guerra MC 2008  
*In vitro* evaluation of the chemoprotective action mechanisms of leontopodic acid against aflatoxin B1 and deoxynivalenol-induced cell damage.  
*Journal of applied toxicology : JAT*; VOL: 29 (1); p. 7-14 /200901/
- (6) H.Sheridan, D.Hennessy, A.McGee, 1989  
*Hydroxy cinnamic acid esters from cell Suspension cultures and plants of leontopodium alpinum*  
*Effects of von Hydroxy cinnamic acid esters from L. alpinum are antiseptic, anti-inflammatory, stimulatory for the granulation in poor wound healing and chillblains, antiparasitic (acaridae). Phytochemistry. 1989.28,489-490*
- (7) Speroni Ester; Schwaiger Stefan; Egger Philipp; Berger Anna-Theres; Cervellati Rinaldo; Govoni Paolo; Guerra Maria Clelia; Stuppner Hermann;  
“In vivo efficacy of different extracts of Edelweiss (*Leontopodium alpinum* Cass.) in animal models”,  
*Journal of ethnopharmacology*, (2006 May 24) Vol. 105, No. 3, pp. 421-6.
- (8) Stuppner, H. [Reprint author]; Dobner, M. J. [Reprint author]; Sosa, S.; Della Loggia, R.; Dunzendorfer, S.; Wiedermann, C. J.  
“Anti-inflammatory activity of *Leontopodium alpinum*,”  
*Phytomedicine (Jena)*, (2000) Vol. 7, No. Supplement 2, pp. 97. print.  
Meeting Info.: 3rd International Congress on Phytomedicine. Munich, Germany. October 11-13, 2000. European Scientific Cooperative on Phytotherapy; Gesellschaft fuer Phytotherapie e.V.; Gesellschaft für Arzneipflanzenforschung. ISSN: 0944-7113.
- (9) Li L Y; Ye J M; Yin H; Zhu Y M; Tian J M; Gao F  
“Effect of *Leontopodium leontopodioides* (Willd.) Beauv. on inflammation induced by animal reversed passive arthus (RPA)”,  
*Zhongguo Zhong yao za zhi = Zhongguo zhongyao zazhi = China journal of Chinese materia medica*, (1994 Mar) Vol. 19, No. 3, pp. 174-6, 192.



- (10) Dast, E  
*Natural cosmetics - the science behind the image*  
6<sup>th</sup> international scientific-practical conference, "cosmetic products and raw materials: efficacy and safety", organized by pcar - perfumery and cosmetics association of russia, moscow, russia, 20-21 november 2001, proceedings, part iii: biologically active substances in cosmetic products, paper iii-12, pages 136-137, abstract only
- (11) Schwaiger, S., Cervellati, R., Seger, C., Ellmerer, E.P., About, N., Renimel, I., Godenir, C., André, P., Gafner, F., Stuppner, H. (2005):  
*Leontopodic acid – a novel highly substituted glucaric acid derivative from Edelweiss (Leontopodium alpinum Cass.) and its antioxidative and DNA protecting properties.*  
*Tetrahedron* 61(19), 4621-3
- (12) <http://www.biocosmetic.lv/imgsatures/edelweiss.pdf>
- (13) Hans – Peter Kei (2003):  
*Interaction of Allium sativum L. and Leontopodium alpinum Cass. with mediators of inflammation involved in the molecular mechanisms of atherosclerosis*  
*Dissertation zur Erlangung des Doktorgrades der Fakultät für Chemie und Pharmazie der Ludwig-Maximilians-Universität München (Ph D Thesis, University of Munich, pharmaceutical and chemical faculty)*

### **Further Review articles:**

COSSMA, (2004) Vol. 5, No. 8, pp. 34-35:  
"A new power-ingredient from Edelweiss"

Dweck A.C.:  
"Edelweiss (*Leontopodium alpinum*)",  
*Kosmetika & Meditsina* (2005), (2), 34-36

Dweck, A. C.  
*SOFW Journal* (2004), 130(9), 65-66,68

Ziolkowsky, B.:  
"Natural actives for cosmetics",  
*SOFW Journal* (2002), 128(1-2), 19-23

Carello A.:  
"Pharmacological action of *Leontopodium alpinum*",  
*Chimie et Industrie (Paris)* (1936), 37, 523-524