

AN OVERVIEW ON THE IMPORTANCE, SPREAD, SUSTAINABLE CULTIVATION AND PRESERVATION OF THE MOUNTAIN ARNICA

Diana-Elena Maftai

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INTRODUCTION

This present scientific study is a sequel of our previous research on this valuable medicinal species [6, 9, 10]. *Arnica montana* is a valued species in our country and worldwide; its inflorescences are mainly used (*Arnicae flos*) in the pharmaceutical industry. Arnica comprises: anti-inflammatory sesquiterpenic lactones (among which the most valuable for medicine is the helenaline), flavonoids (responsible for the tonifying action on the blood vessels, and for the local anti-inflammatory property as well), polyphenols and polyacetilens (antimicrobial and antifungal).

The vegetal product contains 0.2 – 0.35% volatile oil (coloured in orange), and of a semisolid consistency.

Arnica serves mainly for external use. It may be administered internally with much caution (as an infusion, tincture, oily extract) in hyperpressure, respiratory stimulant. Its most important properties are: antiseptic, wound healing, antirheumatic, analgesic, being cicatrizing, antirheumatic, analgesic; it is recommended in the treatment of sprains, dislocations, bruises, haematoma, edema associated with fractures, superficial phlebitis, inflammation caused by insect stings, inflammation of the mucous membrane.

Arnica is part of hundreds of industrial products (e.g. tinctures, ointments, gels, infusions, gargles, cataplasms).

Used externally as an anti-inflammatory, and in external bruises, sprains, arthritis, phlebitis and thrombophlebitis, venotonic, varicose veins, etc. Used internally, it causes gastrointestinal disorders and hypertension.

The species bears many folk names in various countries: in England - mountain tobacco, wolfbane, leopard's bane, mountain arnica; in Denmark: gouldomme, bjerg volverlei; in France: arnica, amique panacea des chutes, tabac des vosges, souci des alpes, amique des montagnes; in Italy: arnica; in Germany: arnika, kraftwurz, fallkraut; in Russia: arnica gornaia, amika, barannik; in Hungary: mariafii, arnika, arnyekfii, amgylitoefii. Matthaeus Sylvaticus named the species *arnich*, a word of Arab origin.

MATERIAL AND METHOD

Arnica montana is an endemic species in Europe, widely spread in hundreds of sites. The populations of arnica are stable in some countries and endangered in others. The reasons of this decline are represented by its harvesting for medicinal purposes and, to some extent, by the habitat diminishing. The species is keen to the alpine and subalpine meadows, and to the acidic soils rich in nutrients. The arnica's preservation status is a favourable one in Romania due to its abundance. Nevertheless, in the near future its status should be thoroughly monitored as the specific habitats will begin their decline [1, 3, 11].

This scientific study aims to analyze the distribution of this species in Europe and in our country, the types of habitats in which the species were identified, the relation between arnica and the environment, the possible menaces that would lead to its extinction, and management regulations for a sustainable preservation.

RESULTS AND DISCUSSIONS

The description of the species

Arnica montana (the mountain arnica) is a perennial species with a cylindrical underground thick rhizome, of which fibrous roots sprout, exclusively in the wild flora.

The stem is erect, simple, rarely bearing secondary branches, of 20 to 50 cm in height, and short hairs; it bears an inflorescence at its superior end. There are rarely 3 to 5 inflorescences, an axial one, and the others near the leaf petiole.

The basal leaves are large, ovate-lanceolate, rough, hairy, rosette-arranged, and the stem leaves are oposed and small, compared to the basal ones. The flowers are yellow, disposed in a calatidium; the ligulate outer ones are large, 4-8 cm, and the inner ones are tubulous, numerous, and protected by an involucre with 2 rows of bractei. The fruits are hairy achenes, with a rough black pappus (photos 1, 2).

The habitat: It is frequent from the beech level up to the alpine level, in meadows and bushes.

Arnica is a species that prefers acidic, very fertile and humid, sandy soils rich in humus.

In Europe, it is spread as it follows: as a native species in states such as: Andorra, Austria, Belarus,

Belgium, Bosnia and Herzegovina, Croatia, Czech Republic, Denmark, Estonia, France, Germany, Italy, Liechtenstein, Lithuania, Luxembourg, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovenia, Spain, Sweden, Switzerland, Ukraine.

It is a regionally extinct species in Hungary (according to IUCN).

It is encountered within the entire Carpathian mountain chain, from 600 m in altitude up to 2800 m. It is generally quite rare, but may be locally abundant.

Arnica grows in various counties of our country: Alba, Bistrița-Năsăud, Cluj, Argeș, Hunedoara, Suceava etc. It is abundant in its wild form in the Apuseni Mountains and Northern Moldavia. The species may be found on the next mountains: Surul, Parâng, Neagoiul, Bucegi, Postăvarul etc.

On the Ghețari plateau – Poiana Călineasa, some previous research on the endemic medicinal studies started in 2000 as part of the Apuseni Grant (www.proiectapuseni.org). It was ascertained that there were 242 species of medicinal value in the area of the Ghețari village (8 km²) [11]. The inflorescences of *Arnica montana* were harvested and retailed at a very low price. An areal of 287 ha of *Arnica montana* meadows was detected in Ghețari – Poiana Călineasa, which represented 6% of the entire plateau surface and 22% of the agricultural lot [11]. The species was monitored by means of transects of 30m in length and 2 m in width (60 m²) and the yield was of 8.68 kg dry substance/ha in 2001 and 10.24 kg dry substance/ha in 2002, according to the above mentioned studies. The exploitation of the mountain arnica was not a sustainable process, as most of the profit after selling did not remain in the region. Therefore, a sustainable exploitation system for arnica, designed to preserve the species in its native

habitat and to bring income to the inhabitants of that region, was perfected [11].

As a consequence of the previous studies, in 2004 a grant for the preservation of medicinal plants in Eastern Europe was started. The sub-project was focussed on *Arnica montana* in Romania. The grant was initiated by WWF-UK in collaboration with WWF-DCP, USAMV Cluj, and the city hall of the Gârda de Sus commune, financed by the Darwin Foundation from Great Britain. Its aims were: the research on this species' ecology, the sustainable capitalization, the socio-economic aspects, the training and workshops for the local inhabitants in order to harvest the plants sustainable methods, providing a fresh and qualitative arnica herba, the sustainable maintenance and exploitation of the arnica habitats, the start for some associations of the people interested in growing and commercializing the mountain arnica.

Thorough studies were made and subsequently 597 arnica meadows were encountered and monitored in this region of the Apuseni mountains. The whole amount of arnica inflorescences in the Gârda de Sus commune was of 15 t, among which 2.8 t could be part of the sustainable processing.

As we observed during our previous field research of the arnica habitats in the mountains of Nemira [10], the threats for arnica are represented by: the excessive harvesting, the excessive pasturage, the invasive species, the climate changes, the environmental alterations, the pollution;

The pasturage areas and the maximum number of sheep/surface unit should be established depending on each pasture and its degree of degradation. The pasturage should be forbidden in the regions with floristically degraded meadows, comprising invasive plant species, until the habitat is reestablished. This is a way to establish the sustainability for each pasture.



Photo 1 – mountain arnica in bloom



Photo 2 – seeds with pappus

CONCLUSIONS

The mountain arnica is an endemic species in Europe, widely spread in hundreds of sites. The populations of arnica are stable in some countries and endangered in others.

The arnica's preservation status is a favourable one in Romania, but tending to decay. The threats for this species is the decline of its habitats in some areas and the wrong harvesting of the arnica plants (underground rhizome included). The threats for this species are: intensive pasturage by sheep, advanced growth of the young spruce trees, plant harvest for medicinal purposes, climate changes, tourism, fire, trotting the plants to their destruction.

Several regulations to diminish the impact were recommended, so that arnica should keep its favourable preservation status for a long time.

During the latest years, we were keen on this valuable species, that we studied thoroughly, including by means of the *in vitro* cultures, in order to provide the qualitative biological clones to repopulate the endangered habitats of arnica in our country.

ABSTRACT

Arnica montana L. is a valuable medicinal species, one of the best-known homeopathic remedies. It is an alpine plant, growing in nutrient-poor soil. It can potentially reach a height of 60 cm, but this is unusual given the harsh conditions at high altitudes. It grows in meadows up to 3,000 metres above sea level, where it is exposed to strong sunlight. The higher the altitude, the more aromatic the plant will become. It is spread throughout the entire Europe. Arnica (mountain arnica) is included in the Compositae family, about 30cm tall, with yellow flowers that bloom in June-July. The inflorescences are used (*Arnicae flos*) in therapy and comprise volatile oil (0.05 - 0.15%).

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- ****www.proiectapusenii.org

AUTHOR'S ADDRESS

MAFTEI DIANA ELENA - 'Vasile Alecsandri' University of Bacău, e-mail: diana.maftei@ub.ro.

