

Ecotypic exploration and characterization trials to promote conservation of *Arnica montana* L. in Northern Europe

Crop Wild Relative case study by Å. Asdal¹, J. Labokas², K. Olsson³, J. Radušienė² and K.W. Bladh⁴

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Taxonomy and biology

Arnica montana L. is divided into two subspecies; ssp. *montana* grows in Scandinavia and Central Europe while ssp. *atlantica* is found in the south of France, Spain and Portugal. The geographical distribution of *A. montana* in the Nordic countries is shown in fig. 1. *Arnica* is common in the western part of Denmark and in the south-western part of Norway. It is also found in Southern Sweden, where it is richest in Småland, but due to loss of its habitat it has declined during the last decades. Lithuania is on the north-eastern border of the distribution in the Baltic region (Fig. 2).

A. montana is a perennial herb. The plant flowers in June to July with an orange-yellow flower with a size of about 5-8 cm. Pollination is done by insects. The growing conditions of *A. montana* are light open areas with nutrient poor and acidic soil.



Figure 1. Distribution of *Arnica montana* L. in Scandinavia



Figure 2. Distribution of *Arnica montana* L. in Lithuania

Ecotypic variation in Lithuania

In its main distribution area, Central and Western Europe, *Arnica montana* is a species of meadows, pastures and heaths, mainly in mountains. In Lithuania, on the north-eastern border of its distributional range, the species evolved into a lowland forest ecotype which occurs in light and dry pinewoods in the southern and south-eastern parts of the country.

The former, mountain-meadow ecotype, occurs only in one location, occupying less than 1 hectare of wet grassland near Medininkai village in the Vilnius district. This ecotype develops more vigorously compared to the forest one.

This ecotypic differentiation is not reported from the central area of its distribution and may be attributed to an increased ecological adaptability of the species as a consequence of its occurrence on the border of its distributional range. Such ecotypic variation is useful for plant selection for the development of cultivars. This would facilitate the conservation of genetic resources of the species as the demand for its medicinal raw material is far from saturated (Radašienė, 2004).

In situ conservation within a network of protected areas is the preferred conservation mode of *Arnica montana* in Lithuania (Labokas, 1999). *In situ* conservation ideally maintains evolutionary processes as witnessed in the Lithuanian *A. montana* ecotypes.

Medicinal uses: historical and current

A. montana has been applied for centuries in folk medicine to treat swelling, soreness and bruising. Other species of *Arnica* have been utilized by American Indians who make healing ointments and tinctures from *A. fulgens* Pursh., *A. sororia* Greene and *A. cordifolia* Hook. (Reynolds, 2005). Active components in *Arnica* are sesquiterpene lactones, helenalin and dihydrohelenalin and their short esters (Douglas et al., 2004).

An estimated 50,000 kg of dried flowers are used annually in Europe. This is equivalent to 250,000-300,000 kg of fresh flowers. In addition, hundreds of kilos of dried roots are utilized each year (Lange, 1998). *Arnica* is mainly harvested from the wild. The main sources of *Arnica* for medicinal use are the Balkan countries, Spain and Switzerland. The demand for *A. montana* has remained consistently high in face of continuing declines in availability in the wild. There is a great need to find better ways of managing wild material (Behrens, 2001).



Figure 3. *Arnica montana* L. thrives in a habitat of poor acidic soil. The plant prefers partial shade in pasture meadows.

Threats: a problem of European scale

A. montana has greatly declined European-wide due to loss of habitats and over-harvesting. In the Nordic region, changes in agriculture are major factors for the reduction. In Norway loss of habitat is the main problem and *A. montana* is now on the Norwegian Red List with status DC (declining/care demanding). If the changes in agriculture persist, the distribution will be even more reduced (Asdal, 2005).

The species is regarded as critically endangered in Belgium, Bosnia, Croatia and Luxembourg; endangered in Belarus and the Netherlands; vulnerable in Estonia, Germany, Latvia, Lithuania, Portugal and Romania; and near threatened in Denmark and Norway (TRAFFIC Network, 2005).

European countries should develop general guidelines for sustainable collection of indigenous medicinal and aromatic plant species and promote their implementation (Lange, 1998). *A. montana* is an example of a threatened species for which specific guidelines for particular habitats and countries should be developed. Annual quotas of the amount of plant parts that may be harvested should be established.

Promoting conservation: the SPIMED project in Sweden, Lithuania and Finland

Arnica montana L. is one out of eight target taxa of the Nordic Gene bank project "Spice and medicinal plants in the Nordic and Baltic countries. Strategies for conservation of genetic resources" (SPIMED). The project makes initiatives and efforts to conserve medicinal- and aromatic plants in the Nordic and Baltic countries, formulates conservation recommendations and will be finalised this year. Cultivation trials will be recommended as means to avoid exploitation of vulnerable populations.

SPIMED included collecting and characterisation of accessions of the target species and collections of plants with a broad diversity have been established. Descriptors for the vegetative and generative plant parts of the species have been developed and tested. Collections of *Arnica* have been established and compared in Sweden, Lithuania and Finland. The accessions in Sweden (29) and Lithuania (18) originate from indigenous populations, while the plants in Finland (7), are collected from botanical gardens or imported material. The characterization work was carried out at Svalöv in Sweden, in Vilnius in Lithuania and at Mikkeli in Finland.



Figure 4. View of the *Arnica* collection in Finland, Mikkeli

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