

# SCIENTIFIC AND TECHNIC REPORT

## Stage 1 – 2014

### **Development of the functional model for sustainable capitalization of the natural populations of *Arnica montana* L. in northern area of the Romanian Eastern Carpathians - initiating experiments**

#### ***Stage summary***

The activities of this phase focused on interdisciplinary approaches regarding the biotic and abiotic components of the studied areas, bioproductivity evaluation in terms of biomass, initiating experimental cultures, preliminary tests on fractionation and chromatographic analysis, NMR respectively. These are considered as complementary parts in the holistic approach of the species capitalization by developing the functional model proposed in the project.

In order to identify the natural populations of *A. montana* in northern area of the Romanian Eastern Carpathians which are the study subject of the project, and to assess the ethno-pharmaceutical traditions in the target area, an ***ethnobotanical study*** was conducted evaluating the knowledge of the local community on the conservation and capitalization of the species. Interviewees, belonging to different age groups (between 13 and 70 years) have demonstrated knowledge and interest for the sustainable exploitation and therapeutic use of the species.

For the identification and inventory of the natural populations field trips were conducted, and phytosociological observations were performed in the perimeters in which *A. montana* species was identified. On the territory of Neamt and Suceava counties, 10 arnica sites were identified (in several mountains: Stânișoarei, Bistrita, Rarău, Dorna Valley, Călimani), 6 of which being studied in this stage. In these natural areas have been identified and characterized five types of plant communities. It was performed an ***analysis of the distribution area*** of the species in the northern area of the Romanian Eastern Carpathians.

Several assessments were performed to identify the ***meteorological and climatic characteristics*** of the studied areas during the studied vegetation seasons. Also we performed ***chemical determinations on soil samples*** collected from natural areas targeted by this study. The preliminary results will be developed for the complex characterization of the abiotic environmental component in natural areas and to correlate it with the bioproductivity data, and for the substantiation of the experimental model in the next phases.

Bioproductivity assessment in terms of biomass was achieved by performing a series of measurements - density of individuals, dry biomass, drying ratio for flower heads (vegetal raw material mainly used) and also for the whole plant, by type of organ, in order to evaluate the potential for full capitalization in prospect for the cultivation of the species. The data of this ***preliminary bioproductivity report*** will be developed in the following stages, in connection with the peculiarities of the biotic and abiotic environmental peculiarities in the natural areas.

For the development of the experimental cultures for *A. montana* species, ***experimental seeding material*** was harvested (achenes and rhizomes). The first experiments on the conventional (*ex situ*) and unconventional (*in vitro*) culture techniques were initiated.

Preliminary tests were conducted on the fractionation of the plant material and on the phytochemical analysis of the plant extracts using spectrophotometric and chromatographic methods (TLC chromatograms) for *A. montana* samples (flower heads and leaves).

There have been tested a number of experimental NMR and chromatographic system parameters for analyzing samples of plant extract and juice from *A. montana*. Good ***chromatographic separations*** were obtained for sesquiterpen-lactones fractions. NMR parameters were tested to obtain the ***1 H-NMR spectra*** of aqueous solutions, without extraction, with minimum addition of deuterated water (10%). By using the NOESYPRESAT irradiation technique, spectral fingerprints with very good intensity were obtained. Tests were developed for the plant material extraction in organic solvents, and the spectral fingerprint of these extracts.

The preliminary results of Stage 1 were disseminated by attending to national (3) and international (1) conferences, and by publishing scientific articles (2), covering all aspects developed in this stage.