

Original Article

Research Concerning the Study of Germination in *Arnica Montana* L. Specie

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Abstract

The name of the plant called arnica derives from the Greek word *ptarmica* (la Discorides), which is derived from the verb *ptario* = to sneeze, because the roots and the stems of the plant produce sneeze. As vegetal product flowers from mountain arnica are used (*Arnicae flos*). In mountain arnica there are found: flavonoids, di- and triterpenes, helenalin, dihydrohelenalin. The pharmaceutical preparates based on mountain arnica flowers have action: antiseptic, anti-inflammatory, bacteriostatic, fungicide, choleric, cholagog, anti-sclerotic. In *Arnica Montana* L. seeds from Germany and from Gheţari, the germinative faculty records the biggest values one year and four months after harvesting, and after two years and four months there is a sharp decrease of values. Among four variants of soil mixtures taken into study, the best were variant V₃ (50% terra rosa, 25% peat, 25% sand) and variant V₄ (germinative pills) on which the best *Arnica Montana* L. rising. According to our research, the following results were obtained: for the sample harvested from Poiana Horii area, a content of 0.039 g% flavonoids was recorded and for those harvested from Scărişoara cave a content of 0.4949 g% flavonoids.

Keywords: germinative faculty, mixtures, active principles

1. Introduction

The name of the mountain arnica derives from the Greek *ptarmica* (la Discorides), which became from the verb *ptario* = to sneeze, because the roots and the flowers of the plant produce sneeze. In the XVIIth century, as result of the distorsion of the word *ptarmica* appeared mountain arnica (*montanus* = of mountain) and this shows the plant origin place.

The plant was appreciated by Goethe who, each evening, drunk mountain arnica tea. German writer and botanist, Goethe claimed that mountain arnica saved his life.

Studies concerning the bio-ecology and valuation of this specie were performed in our country by F. Păcurar and I. Rotar, 2004; M. Tămaş et al., 2006, B. Michler et al., 2006, etc. [3].

From mountain arnica inflorescences are used (*Arnicae flos*).

They contain volatile oil in share of 0.05 - 0.15% (Grigorescu E. et al., 2001) and 0.04-3.8% (Crăciun F. et al., 1977), function of biological material and vegetation conditions, as well as triterpenic alcohols, (helenalin), yellow pigments, bitter principles [2, 1].

In mountain arnica from the area of Apuseni Mountains, Tămaş M. et al., 2006, reported a content of 0.74 - 1.08% sesquiterpenic lactones, helenaline [4].

The active principles from mountain arnica have a complex action: antiseptic, anti-

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inflammatory, bacteriostatic, fungicide, choleric, diuretic, hypotensive.

2. Material and Method

The researches, which are the subject of this study were carried on during 2008 - 2010 with the aim of contributing to the thoroughing of the knowledge concerning the seeds germination.

The main objectives of our study were:

1. The influence of the seeds age on the germinative faculty in *Arnica montana* L.

According to the SR 1634/99 standard, for determination of germination, we used four repetitions of 100 seeds/each variant, that were introduced in germinating device at constant: temperature - 20° C, humidity - 70%, and permanent light. We used two types of seeds harvested in 2008:

1. Rieger Hofmann GmbH – Germany
2. Ghețari – village of Gârda de Sus (county of Alba) - Romania

The practical importance of determining the germinative faculty aims to seeds groups destined for sowing. Function of obtained values, the quantity of seed needed for sowing by area unity is settled, in order to supply an appropriate emergence and an optimal plant density.

Three variants were taken into study (figs. 1 and 2):

- **V₁** (Control) - 4 months from harvesting (nov 2008)
- **V₂** - 1 year and 4 months from harvesting (nov 2009)
- **V₃** - 2 years 4 months from harvesting (nov 2010)



Figure 1. Mixture variant V₃ (50% terra rosa, 25% peat, 25% sand) with emerged plantules of *Arnica montana* L.



Figure 2. Variant V₄, germinative pills with emerged plantules of *Arnica montana* L.

2. The influence of soil mixtures on emerging of *Arnica montana* L. plants

We used in the experiments: terra rosa (soil from Apuseni Mountains – Gârda village), peat, sand and germinative pills (pills that increase their volume by watering).

We used seeds from Ghețari – village of Gârda – Romania. We took into study four mixture variants (table 1).

With each mixture, an experience was put into practice, in three repetitions with 100 seeds each.

The maintaining conditions consisted of daily irrigation, and weekly monitoring of emergence degree in plants.

Table 1. Variants of mixtures

V₁	50%	peat
	25%	terra rosa
	25%	sand
V₂	40%	terra rosa
	20%	sand
	20%	manure
	20%	peat
V₃	50%	terra rosa
	25%	peat
	25%	sand
V₄	Germinative pills	

3. Identification of the flavonoid content in *Arnica montana* L. specie

The qualitative phytochemical study, of the flavonoids from *Arnica montana* L. specie was performed using thin layer chromatography at the Faculty of Pharmacy from Cluj - Napoca, at the Unit of Pharmacognosie.

In order to quantitative determination of flavonoids two samples were taken into study:

- from Poiana Horii area, Apuseni Mountains – sample 1
- area of the Scărișoara cave, county of Alba – sample 2

harvesting - 45%) up to 2009 (at one year and four months from harvesting - 73%) and then it strongly decreases in November 2010 (at two years and four months from harvesting - 34%).

It explains the fact that after four months from harvesting the seeds are in sowing pause and as consequence the seeds germination is lower.

The Variant V₂ (at one year and four months from harvesting – 73%) recorded very significant positive differences compared to control variant (at four months from harvesting – 45%), and variant V₃ (at two years and four months from harvesting – 34%) recorded very significant negative differences compared to control variant V₁.

3. Results and Discussions

1. The influence of the seeds age on the germinative faculty in *Arnica montana* L. specie

1.1. The germinative faculty in seeds from Germany

In table 2 an increase of the germinative faculty from november 2008 (four months after

Table 2. The germinative faculty in *Arnica* seeds from Germany, function of seeds age (Cluj-Napoca, 2011)

Variants	Seed age	Germinative faculty		± Difference	Significance
		Germinated seeds %	%		
V1 (Mt)	November 2008	45	100	0	-
V2	November 2009	73	163.7	29	xxx
V3	November 2010	34	74.9	-11	000
DL 5%= 2.07		DL 1%= 2.90		DL 0.1%= 4.10	

1.2. The germinative faculty in seeds from Ghețari

The table 3 shows an increase of the germinative faculty from November 2008 (at four months from harvesting – 38%) up to 2009 (at one year and four months from harvesting - 83), then it suddenly decreases in November 2010 (at two years and four months from harvesting - 28). In this case, too, we can say that the mountain arnica seeds are in seminal repose in the first four months from harvesting.

This explains the low germination percent in this period.

The variant V₂ (at one year and four months from harvesting – 83%) recorded differences very significant positive compared to control variant (at four months from harvesting – 38%), and variant V₃ (at two years and four months from harvesting – 28%), recorded negative distinct significative differences compared to control sample V₁.

Table 3. The germinative faculty in *Arnica montana* L. seeds from Ghețari, function of seeds age (Cluj-Napoca, 2011)

Variants	Seed age	Germinative faculty		± Difference	Significance
		Germinated seeds %	%		
V1 (Control)	November 2008	38	100	0	-
V2	November 2009	83	218,4	45	xxx
V3	November 2010	28	73,7	-10	00
DL 5%= 5.44		DL 1%=7.63		DL 0.1%= 10.78	

2. The influence of the soil mixture on plants emergency in *Arnica montana* L. specie

The table 4 shows that mixture variants V₃ (50% terra rosa, 25% peat, 25% sand – 60.33%) and V₄ (germinative pills – 87,67%), have a large number of emerged plants and recorded positive

very significant differences compared to control sample (40% terra rosa, 20% sand, 20% manure, 20% peat), and variant V₁ (50% peat, 25% terra rosa, 25% sand) recorded very significant negative differences compared to control variant V₁.

Table 4. The germinative faculty in *Arnica montana* L. seeds from Ghețari, function of used mixture (Cluj-Napoca, 2011)

Mixture	Emerged plants		± Difference	Significance
	Emerged plants %	%		
V2 (Mt)	48.33	100	0	-
V1	24.33	50.3	-24	000
V3	60.33	124.8	12	xxx
V4	87.67	181.4	39.33	xxx
	DL 5%= 4.87	DL 1%= 7.3	DL 0.1%= 11.84	

3. Determination of flavonoid content in *Arnica montana* L. specie

The table shows that in sample 2 (from the area of Scărișoara cave, county of Alba) the flavonoid content is bigger compared to sample 1 (from the Poiana Horii area, Apuseni Mountains).

For seedlings the following mixture variants

Table 5. The quantitative content of flavonoids from both harvested samples

Active principle	Sample 1	Sample 2
Flavones g%	0.039	0.4949

4. Conclusions

1. In *Arnica Montana* seeds from Germany and Ghețari, the germinative faculty recorded the biggest values after one year and four months from harvesting, and after two years and four months from harvesting the values recorded a sharp decrease. For inseminating the *Arnica montana* L. seeding, we recommend their use up to a maximum age of one year and four months, in order to benefit of a maximum germinative capacity.

2. Of all four mixture studied variants, the best were the variants V₃ (50% terra rosa, 25% peat, 25% sand), and V₄ (germinative pills) on which the best emerging rate of *Arnica Montana* L. plants was recorded.

of mountain arnica were used: V₃ (50% terra rosa, 25% peat, 25% sand) and V₄ (germinative pills).

The differences between both values resulted from the quantitative analyze, may be put on the factors connected with the harvesting, drying, not appropriate preservation, and age of the medicinal vegetal product.

3. Our research emphasizes the following results: the sample from Poiana Horii area has a content of 0.039 g% flavonoids and the sample from the Scărișoara cave area, 0.4949 g% flavonoids.

The differences may be the result of the factors connected to harvesting, drying, not appropriate preservation, or age of the vegetal product.

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