VALORISING MEDICINAL AND AROMATIC PLANTS FROM THE CENTRAL AREA OF THE ANINEI MOUNTAINS (CARAS-SEVERIN COUNTY)

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Abstract: *Research was carried out in the grassland area of the Aninei Mountains, in the central part of the mountains. The goal of the present paper is, on one hand, to identify medicinal and aromatic plants of value in the area and, on the other hand, to determine the amount of dry vegetal product recommended to be harvested. Though harvesting medicinal and aromatic plants from the spontaneous flora and their valorisation is a frequent practice in Romania, research in the field (that concern the mapping of spontaneous medicinal plants over wide areas) these last decades is absent, reason why they cannot estimate the amount to be harvested from a certain area. Harvesting medicinal plants from a certain area without knowing the economic potential of the area can result in serious ecologic unbalance or even to species extinction. The topic of the present paper brings forth both the valuable economic potential of spontaneous species and elements of novelty. Thus, the Digital Romania soft included in the GPS (both of which have been acquired through the research contract supporting the present paper) allows precise spotting in the field of the research team, in each working sit, avoiding the mapping of protected areas, while final results can be easily turned into maps corresponding to each of the analysed areas. The working method is the one introduced by Alexan, Bojor and Crăciun in 1983, regarding the economic mapping of medicinal plants.This work has benefited from a grant awarded by the Romanian Ministry of Education, Research, Youth and Sport, through the National Council for Scientific Research in Higher Education (PN II IDEI no. 1077/2009, project code ID-865). Title: „Identifying medicinal and aromatic plants in the Aninei Mountains with a view to valorisation". Project Manager: Assoc. Prof. PhD Imbrea Ilinca.*

Key words**:** *medicinal and aromatic plants, spontanous flora, quantitative assessment, Aninei Mountain*

INTRODUCTION

Economic mapping of medicinal plants started over 50 years ago, when, in 1956, the Institute for State Control of Medicine initiated a research theme titled "Economic mapping of medicinal plants from spontaneous flora". Until 1970, they studied only 25% of the mountain ranges. Among the studied mountain ranges are the Semenic Mountains (AL. BORZA, 1946), the Retezat Mountanins (AL. BORZA, 1963; Şt. CSUROŞ AND COLAB., 1956; O. BOJOR, 1957, 1962; E.I. NYARADY, 1958), Rodnei Mountains (R. COCIŞ, 1944; A. NYARADY, 1960), the Ceahlău Mountains (I. GRINŢESCU, C. PAPP, 1933; E. I. NYARADY, 1924) etc. but not the Aninei Mountains (ALEXAN ET AL. 1983).

At the same time, they also established the methodology of economic mapping of medicinal and aromatic plants (ALEXAN ET AL. 1983).

Lately, though they have paid special attention to medicinal and aromatic plants with emphasis on ecological products, they have neglected specialised studies concerning the real potential of the different areas the vegetal species are being harvested.

The research area presented in this paper is located in south-western Romania, in the Aninei Mountains, at the border between two national parks: Semenic – Cheile Caraşului in the north of the Aninei Mountains and Cheile Nerei – Beuşniţa in the south of the Aninei

Mountains (BADESCU ET AL. 1998). The protected perimeters were not included in the mapping process.

MATERIAL AND METHODS

Research was carried out between 2008 and 2010, between April and October.

Identifying with accuracy a plant species is extremely important since it supposes, on one hand, mistaking plant species for related species that can be toxic, and, on the other hand, proper report of biochemical analyses results.

As we have already mentioned in the introduction above, the working method was that of economic mapping of both medicinal and aromatic plants from the spontaneous flora introduced by ALEXAN et al. (1983) and by BOJOR (1991). According to the method we carried out releves of 1 m^2, following and recording the medicinal species within each frame. We have calculated average density per m^2 for all medicinal species we came across and that can be recommended for harvesting.

In the quantitative assessment, we took into account the laws of conservation of biodiversity and the need to recover the productive potential of the area. Irrational valorisation of some species can lead to serious ecological unbalance and even to their extinction. Thus, we considered we can harvest only 30% of the rhizomes, bulbs, bulbo-tubers, and roots every five years. Aerial parts (*herba*) can also be harvested 30-40% but annually (we considered it 30%), while flowers, leaves, fruits, and seeds can be harvested annually between 40 and 60% of the individuals, without endangering species perpetuation (we considered it 50%).

The amount of dry substance for each of these species represents the mean of readings with electronic scales. Assessing amounts was done on dry raw matter subjected to valorisation from the basin and expressed in kg of dry substance. For a highest accuracy of data recorded in most species analysed, we have established average amounts of dry matter through our own weighing. Results of quantitative estimates are expressed in kg of dry matter

Species identification was done using Flora României vol I-XIII (1952-1976), Flora României - CIOCÂRLAN (2009) and Florei Europaea (http://rbg-web2.rbge.org.uk/FE/fe.html).

RESULTS AND DISCUSSIONS

Research was carried out in the meadow areas located in the central part of the Aninei Mountains, more precisely in the neighbourhood of the town of Anina. Thus, we delimitated four wide areas of meadows, as follows: the Meadow area N and N-E from Anina (120 ha), the Meadow area Mărghitaş (86 ha), the Meadow area Staier (74 ha) and the Meadow area between the localities Anina and Oraviţa (43 ha).

In the quantitative assessment of the material harvestable from the species *Crataegus* sp., we took into account only the mature, well developed specimens. We noticed the presence of a very large number of small, immature shrubs, which was also noticed in other shrubby species (*Rosa* sp. and *Rubus* sp.).

As for the species *Leucanthemum vulgare*, the meadows in the Anina area is characterised by an outstanding abundance of the individuals, with such large numbers of individuals in bloom as 40-45 per m^2 in certain samples. Both leaves and flowers are known to be used in folk tradition for their cicatrising and disinfectant properties (PÂRVU 2000).

In exchange, in the meadow area between the localities Anina and Oraviţa, such species as *Leucanthemum vulgare*, *Filipendula vulgaris*, and *Fragaria vesca* can be found with less frequency and the harvested amounts are below 15 kg of dried matter: this is why they were not mentioned in the table.

The fern *Pteridium aquilinum* is present only on the meadows of the Marghitaş area. The total area covered by this fern is 25 ha, and the medium density of the individuals is 14 per

m^2. The same density we find also in Northern part of the mountains (IMBREA et al., 2009).

For the dog rose (*Rosa canina*) we calculated that if one individual yields on the average 50 fruits weighing 0.7 g dry weight per fruit we can harvest 35 g per individual. For *Rubus* the amount of harvestable leaves from an individual is on the average 20 g of dry substance, by our measurements.

The main medicinal and aromatic plants that can be harvested in the studies area are presented below, in an alphabetical order (Tab.1).

Table 1.

Medicinal and aromatic plants recommended to be harvested in the area

Scientific name	Product used	Average amount of dry matter in g	Amounts to be harvested in kg of dry matter
Meadow area N and N-E from Anina - 120 ha			
Achillea sp.	herba	0.8	1267
Achillea sp.	flos	0.4	1056
Ajuga reptans	herba	0.7	151
Crataegus monogyna	folium cum flos	200	126
Crataegus monogyna	fructus	1000	630
Filipendula vulgaris	flos	0.3	126
Filipendula vulgaris	herba	0.6	151
Galium verum	herba	0.8	518
Genista sagittalis	herba	0.1	349
Hypericum perforatum	herba	2.1	1134
Leucanthemum vulgare	flos	0.2	1140
Leucanthemum vulgare	folium	0.1	570
Plantago lanceolata	folium	0.25	480
Prunella vulgaris	herba	0.4	403
Rhinanthus rumelicus	herba	0.85	459
Rosa canina	fructus	35	63
Rubus sp.	folium	20	132
Salvia pratensis	folium	1.1	1122
Salvia pratensis	flos	0.5	510
Taraxacum officinale	herba	0.6	302
Taraxacum officinale	radix	0.7	353
Teucrium chamaedrys	herba	0.4	1368
Thymus sp.	herba	0.08	547
Viola tricolor	herba	0.5	342
Meadow area Mărghitaş - 259 ha			
Achillea sp.	herba	0.8	1864
Achillea sp.	flos	0.4	1554
Agrimonia eupatoria	herba	1.3	910
Crataegus monogyna	folium cum flos	200	259
Crataegus monogyna	fructus	1000	1300
Eryngium campestre	radix	4.8	373
Filipendula vulgaris	flos	0.3	1321
Filipendula vulgaris	herba	0.6	1585
Fragaria vesca	folium	0.3	1204
Galium verum	herba	0.8	2486
Genista sagittalis	herba	0.1	699
Hypericum perforatum	herba	2.1	4859
Peucedanum oreoselinum	folium	0.9	1515
Plantago lanceolata	folium	0.25	1004
Prunella vulgaris	herba	0.4	528
Rosa canina	fructus	35	136
Rubus sp.	folium	20	207
Salvia pratensis	folium	1.1	1994
Salvia pratensis	flos	0.5	907
Teucrium chamaedrys	herba	0.4	1865

Scientific name	Product used	Average amount of dry matter in g	Amounts to be harvested in kg of dry matter
Thymus sp.	herba	0.08	870
Viola tricolor	herba	0.5	466
Meadow area Staier – 74 ha			
Achillea sp.	herba	0.8	800
Achillea sp.	flos	0.4	667
Crataegus monogyna	folium cum flos	200	89
Crataegus monogyna	fructus	1000	445
Filipendula vulgaris	flos	0.3	444
Filipendula vulgaris	herba	0.6	266
Fragaria vesca	folium	0.3	155
Galium verum	herba	0.8	426
Genista sagittalis	herba	0.1	178
Hypericum perforatum	herba	2.1	233
Leucanthemum vulgare	flos	0.2	222
Leucanthemum vulgare	folium	0.1	111
Plantago lanceolata	folium	0.25	278
Prunella vulgaris	herba	0.4	178
Rhinanthus rumelicus	herba	0.85	660
Rosa canina	fructus	35	65
Rubus sp.	folium	20	111
Salvia pratensis	folium	1.1	122
Salvia pratensis	flos	0.5	56
Taraxacum officinale	herba	0.6	34
Taraxacum officinale	radix	0.7	39
Teucrium chamaedrys	herba	0.4	799
Thymus sp.	herba	0.08	267
Viola tricolor	herba	0.5	56
Meadow area between the localities Anina and Oravița – 43 ha			
Achillea sp.	herba	0.8	248
Achillea sp.	flos	0.4	206
Bellis perennis	herba	0.1	165
Crataegus monogyna	folium cum flos	200	65
Crataegus monogyna	fructus	1000	323
Galium verum	herba	0.8	310
Genista sagittalis	herba	0.1	130
Hypericum perforatum	herba	2.1	271
Mentha longifolia	herba	2.2	170
Peucedanum oreoselinum	folium	0.9	252
Plantago lanceolata	folium	0.25	273
Prunella vulgaris	herba	0.4	21
Rhinanthus rumelicus	herba	0.85	165
Rosa canina	fructus	35	38
Rubus sp.	folium	20	60
Salvia pratensis	folium	1.1	71
Salvia pratensis	flos	0.5	32
Teucrium chamaedrys	herba	0.4	273
Thymus sp.	herba	0.08	124

Teucrium chamaedrys is a plant used in popular tradition. The species is prohibited for trade in Romania and in other European countries, being associated with the appearance of some hepato-toxicity cases (RADER et al., 2007, ÖZEL et al., 2006). In the U.S.A., the species is sued to aromatise alcoholic drinks. Latest research confirms the antimicrobial and antioxidating properties of its phenolic compounds (GURSOY and TEPE 2009). In the area, it is present in considerable amounts: this is why we took into account its mapping.

We also analyzed the antioxidant capacity of *Filipendula vulgaris* fined frequently in Aninei Mountains. The samples collected from the central part of these mountains have a maximum poly-phenolic content (0.660 mg/mL) in comparison with the the northern (0.368 mg/mL) and the southern areas (0.446 mg/mL). Also the iron, zinc, copper, manganese, cobalt and aluminum content showed the highest values in the extract taken from this area but they are within admitted limits (IMBREA et al., 2010).

CONCLUSIONS

Total amount of raw dry matter to be assessed and that we present in the order of their scientific names are: *Achillea* sp. –herba 4.215 kg, *Achillea* sp. – flos 3.483 kg, *Agrimonia eupatoria* – herba 910 kg, *Ajuga reptans* – herba 151 kg *Bellis perennis* – herba 165 kg, *Crataegus monogyna* – folium cum flos 539 kg, *Crataegus monogyna* – fructus 2.698 kg, *Eryngium campestre* – radix 373 kg (5 years intervals), *Filipendula vulgaris* – flos 1.891 kg, *Filipendula vulgaris* – herba 2.002 kg, *Fragaria vesca* – folium 1.359 kg, *Galium verum* – herba 3.740 kg, *Genista sagittalis* – herba 1.356 kg, *Hypericum perforatum* – herba 6.497 kg, *Leucanthemum vulgare* – flos 1.362 kg, *Leucanthemum vulgare* – folium 681kg, *Peucedanum oreoselinum* – folium 1.767 kg, *Plantago lanceolata* – folium 2.035 kg, *Prunella vulgaris* – herba 952 kg, *Rhinanthus rumelicus* – herba 1.284 kg, *Rosa canina* – fructus 257 kg, *Rubus caesius* – fructus 510 kg, *Salvia pratensis* – folium 3.309 kg, *Salvia pratensis* – flos 1.505 kg, *Taraxacum officinale* – herba 336kg, *Taraxacum officinale* – radix 392 kg (5 years intervals), *Teucrium chamaedrys* – herba 4.305 kg, *Thymus* sp. – herba 1.808 kg, *Viola tricolor* – herba 864 kg.

It is necessary to emphasise the importance of preserving the area biodiversity and the necessity of observing the harvestable amounts per individual depending on the product used.

Though the harvestable amounts of dried matter can seem low in some species, we need to take into account that all harvestable species are produced ecologically and, therefore, valorising them on the market is done at much higher prices unlike cultivated medicinal plants.

At present, the economic activity of the area is much lower, particularly due to the closing of the Anina mine. From this point of view, the results of the study provide the inhabitants with an alternative source of income, harvesting being possible for 6 months a year, from May to October.

Romania enjoys particularly favourable climate conditions for a large number of plants, including medicinal and aromatic ones. Assessing them properly, together with the confirmation of optimal content in active principles, recommends their valorisation in larger numbers and higher amounts than so far.

ACKNOWLEDGEMENT

This work has benefited from a grant awarded by the Romanian Ministry of Education, Research, Youth and Sport, through the National Council for Scientific Research in Higher Education (PN II IDEI no. 1077/2009, project code ID-865). Title: „Identifying medicinal and aromatic plants in the Aninei Mountains with a view to valorisation”. Project Manager: Assoc. Prof. PhD Imbrea Ilinca.

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