J. Plant Develop.
23(2016): 179-186

THE DIVERSITY OF MEDICINAL AND AROMATIC PLANTS ENCOUNTRED IN NATURA 2000 6520 HABITAT FROM GURGHIU MOUNTAINS

Silvia OROIAN[1], Mihaela SĂMĂRGHIȚAN[2], Mariana HIRIȚIU[1], Sanda COȘARCĂ[1], Corneliu TĂNASE[1*]

Abstract: Researches on medicinal plants used in various human disorders are particularly important and timely, as an alternative to medication. The studied semi-natural mountainous grasslands occur in the Gurghiu mountains. Special interest today worldwide for herbal medicine has led us to study the Gurghiu Mountains medicinal plants used in various diseases. In order to identify the taxa we used classical methods, described in the literature and statistical analyze was also carried out. In the study area 2 plant associations rich in medicinal plants were identified. They belong to 6520 Mountain hay meadows habitat.

Keywords: grasslands, habitats, medicinal plants, Mureş county.

Introduction

The study area stretches on the part of Gurghiu Mountains that belong to Mureş County. In terms of vegetation this area is characterized by the predominance of forest ecosystems, along with semi-natural mountainous meadows with much lower share. Special interest today, worldwide, for herbal medicine has led us to study especially medicinal plants used in phytotherapy, and the risk of their irrational collection. Also, we plan an assessment of habitat conservation.

Material and methods

The study of medicinal plants was carried out on the basis of own research in the field and of bibliography data [OROIAN, 1998; SĂMĂRGHIȚAN & OROIAN, 1999; OROIAN & SĂMĂRGHIȚAN, 2000; SĂMĂRGHIȚAN, 2005] by using classic techniques and procedures promoted by the literature [CRISTEA & al. 2004], to which was added the statistical analysis. The name of the species was given in accordance to CIOCÂRLAN (2009) and SÂRBU & al. (2013).

The type of habitat has been coded in accordance with Manual interpretation of habitats in Romania [GAFTA & MOUNTFORD, 2008] and Habitats from Romania [DONIȚĂ & al. 2005, 2006]. Habitat structure characterization was done using phytosociological surveys. The inventory of the medicinal species was based on the active principles contained therein, and data obtained from bibliographic information [RÁCZ & al.

[1] University of Medicine and Pharmacy, Târgu-Mureş, Faculty of Pharmacy, Pharmaceutical Botany, 38 Gh. Marinescu Street, RO-540139 Târgu Mureş – Romania
[2] Mureş County Museum, Department of Natural Sciences, 24 Horea Street, RO-540036 Târgu Mureş – Romania
[*] Corresponding author. E-mail: tanase.corneliu@yahoo.com

1970; CIULEI, 1993; ISTUDOR, 1998, 2001; KATHE & al. 2003; STĂNESCU & al. 2004; OROIAN, 2011; YBERRT & al. 2013; EŞIANU & al. 2016].

Results and discussions

The field studies were carried out in 2014 and data analysis was made in 2015.

Two plant associations were identified: *Poo – Trisetetum flavescentis* Knapp ex Oberdorfer 1957 and *Festuco – Agrostetum capillaris* Horv. 1951. They were classified according to COLDEA (2012) and SANDA & al. (2001, 2008) as follows:

Cls. Molinio-Arrhenatheretea
Ord. Arrhenatheretalia
All. Arrhenatherion Koch 1926
Ass. *Poo – Trisetetum flavescentis* Knapp 1951 em. Oberdorfer 1983
All. Cynosurion R.Tx.1947
Ass. *Festuco – Agrostetum capillaris* Horv. 1951

The phytocoenosis of these two associations belong to **6520** – Mountain hay meadows habitat of community interest listed in Annex I of Habitats Directive [Council Directive 92/43/E, 1992].

These meadows have a good and very good conservation status. The field observations found that the trend of global conservation status of the habitat type 6520 is unfavourable-inadequate.

The most important risk factors/threats observed in the area are: overgrazing, land abandonment and the intrusion of invasive species. A major risk is also the massive collection of medicinal plants, which results in the future severe drop in the number of medicinal species which entails changes in the structure and composition of vegetation due to the proliferation of invasive species.

The flora of these associations includes many medicinal and fodder varieties, species having indicators of high natural value grasslands. This kind of meadows are considered to be among the best pastures in the country, with a very high productivity and very good nutritional value [SÂRBU & al. 2004; VEEN & al. 2009].

The diversity of medicinal and aromatics plants in the identified plant associations

Ass. *Poo-Trisetetum flavescentis* Knapp 1951 em. Oberdorfer 1983

The coenosis edified by *Trisetum flavescens* (Photo 1), were described in the low montane level on altitudes between 504 and 1634 m a.s.l. They occur on less moist and acid soils, rich in nutrients. Eight phytosociological surveys were taken in following localities of Mureş County: Sălard, Neagra, Ciobotani, Răstolița and Androneasa.

In the floristic composition of the coenosis edified by *Trisetum flavescens* and *Poa pratensis* 141 species were recorded. In mesophilous to xerophilous phytocoenosis prevail the species characteristic to Arrhenatherion alliance: *Arrhenatherum elatius* ssp. *elatius*, *Campanula patula*, *Centaurea nigrescens*, *Centaurea phrygia* ssp. *phrygia*, *Crepis biennis*, *Geranium pratense*, as well as those of Cynosurion alliance: *Cynosurus cristatus*, *Trifolium repens* ssp. *repens*, *Leontodon autumnalis*, *Phleum pratense* and Polygono-Trisetion alliance: *Centaurea pseudophrygia*, *Polygonum bistorta.*

In these coenosis can be found also a significant number of species of Arrhenatheretalia order: *Achillea millefolium* ssp. *millefolium*, *Briza media*, *Campanula glomerata* ssp. *glomerata*, *Carum carvi*, *Dactylis glomerata* ssp. *glomerata*, *Galium mollugo*, *Knautia arvensis* ssp. *arvensis*, *Leontodon hispidus* ssp. *hispidus*, *Leucanthemum vulgare* ssp. *vulgare*, *Plantago media*, *Rhinanthus rumelicus*, *Tragopogon pratensis* ssp. *orientalis*, *Veronica chamaedrys* etc., and of Molinio-Arrhenatheretea class: *Agrostis capillaris*, *Anthoxanthum odoratum*, *Cerastium holosteoides*, *Euphrasia rostkoviana*, *Holcus lanatus*, *Plantago lanceolata*, *Prunella vulgaris*, *Stellaria graminea*, *Trifolium pratense* ssp. *pratense*, *Vicia cracca*, *Viola tricolor* ssp. *tricolor* etc.

Photo 1. 6520 habitat, mountain hay meadows with *Trisetum flavescens* and *Poa pratensis* (foto M. Sămărghiţan)

Ass. *Festuco-Agrostetum capillaris* Horv. 1951

Mesophilic phytocoenosis of the association (Photo 2) were identified in the grasslands that stretch on cleared forests, planes or on slopes with various inclinations and aspects and also on mountain plateaux. 21 phytosociologic surveys were conducted in the following locations of Mureş County: Chiheru de Sus; Câmpul Cetăţii – Pârâul Cald; Câmpul Cetăţii – Nirajul Mic Valley; Chiheru de Jos – Nirajul Mic Valley; Chiheru de Jos – Pârâul Diceau; Gurghiu – Orsova; Lăpuşna; Sovata – Platoul Repaş; Ilieşi – Sig; Sălard –Belciu Valley; Gurghiu – Toaca, Poiana Căpităneasa; Lăpuşna – Poiana Borta; Lăpuşna – Gitea; Răstolița – Peşcoasa Mare; Răstolița – Listeş; Răstolița – Podirei; Răstolița – Borzia; Meştera; Neagra – Jinga Valley; Gudea. The surveys were taken on various elevations between 518 and 1255 m a.s.l.

The coenosis occur on low acid soils, moderately moist, rich in humus, developed on crystalline schists. They are cohesive, have very good vegetation coverage (97-100%)

with a continuous and dense plant canopy. The grasslands edified by *Festuca rubra* and *Agrostis capillaris* have a remarkable floristic diversity proved by the 186 taxa recorded in 21 surveys. Along with the association`s diagnose species *Festuca rubra* and *Agrostis capillaris*, there are many species belonging to the superior syntaxonomic units, which the association was reported to, as well a series of transgressive species of the xeromesophilous grasslands. Thus were recorded species from Arrhenatherion alliance such as: *Arrhenatherum elatius* ssp. *elatius*, *Campanula patula*, *Centaurea nigrescens* ssp. *nigrescens*, *Centaurea phrygia* ssp. *phrygia*, *Crepis biennis*, *Geranium pratense*, *Orchis coriophora* ssp. *coriophora*, *Trisetum flavescens* and from Cynosurion alliance: *Carum carvi*, *Centaurea pseudophrygia*, *Cynosurus cristatus*, *Leontodon autumnalis*, *Phleum pratense*, *Trifolium repens* ssp. *repens*, *Veronica serpyllifolia* ssp. *serpyllifolia.*

Also numerous species of Arrhenatheretalia order were identified: *Achillea millefolium* ssp. *millefolium*, *Ajuga reptans*, *Briza media*, *Dactylis glomerata* ssp. *glomerata*, *Daucus carota*, *Galium mollugo*, *Heracleum spondylium* ssp. *spondylium*, *Knautia arvensis* ssp. *arvensis*, *Leontodon hispidus* ssp. *hispidus*, *Leucanthemum vulgare* ssp. *vulgare*, *Lotus corniculatus*, *Plantago media*, *Rhinanthus rumelicus*, *Senecio jacobea*, *Stellaria graminea*, *Tragopogon pratensis* ssp. *orientalis*, *Trifolium hybridum*, *Veronica chamaedrys* etc., and species belonging to Molinio-Arrhenatheretea class such as: *Alopecurus pratensis*, *Anthoxanthum odoratum*, *Cerastium holosteoides*, *Euphrasia rostkoviana*, *Festuca pratensis*, *Holcus lanatus*, *Ononis arvensis*, *Plantago lanceolata*, *Primula veris*, *Prunella vulgaris*, *Rumex acetosa*, *Poa pratensis*, *Trifolium pratense* ssp. *pratense*, *Viola tricolor* ssp. *tricolor*, *Myosotis arvensis*, *Medicago lupulina* etc.

Photo 2. 6520 habitat, *Festuco – Agrostetum capillaris* association (foto Mihaela Sămărghiţan)

These mountain hay meadows assigned to 6520 habitat, are rich in medicinal species. As they are a vegetable treasure of inestimable value and therefore their inventory enables us their quantitative knowledge in order to rational exploitation without jeopardizing

their existence. A comparative analysis of the floristic composition of the two associations included in 6520 habitat (Tab. 1), shows that of the 148 species present in the phytosociologic surveys of *Festuco – Agrostetum capillaris*, 74 species have certain content in therapeutic chemical compounds. These species are classified as medicinal and aromatic herbs and are used in traditional medicine and phytotherapy. In the second association *Poo – Trisetetum flavescentis*, recording 141 species, 57 species are considered medicinal and aromatic.

The most common herb, whose presence in phytosociologic surveys is very high (**81-100%**) are: *Achillea millefolium* ssp. *millefolium*, *Plantago lanceolata*, *Prunella vulgaris* and *Trifolium pratense* ssp. *pratense*, followed by those with high frequency (**61-80** %): *Alchemilla xanthochlora*, *Carum carvi*, *Equisetum arvense*, *Euphrasia rostkoviana*, *Pimpinella saxifraga*, *Plantago media*, *Rumex acetosella*, *Thymus pulegioides*, *Veronica chamaedrys*, *Viola tricolor* ssp. *tricolor* etc. The following species have an average frequency between **41-60**%: *Daucus carota*, *Fragaria vesca*, *Galium mollugo*, *Galium verum*, *Mentha longifolia*, *Polygala vulgaris*, *Potentilla erecta* etc.

Tab. 1. Presence of medicinal and aromatic species in 6520 habitat

SPECIES	Ass. *Festuco rubrae – Agrostietum capillaris*	Ass. *Poo – Trisetetum flavescentis*	SPECIES	Ass. *Festuco – Agrostetum capillaris*	Ass. *Poo – Trisetetum flavescentis*
	K	**K**		**K**	**K**
Achillea millefolium	V	IV	*Mentha longifolia*	III	II
Agrimonia eupatoria	I	-	*Ononis arvensis*	I	-
Ajuga reptans	II	II	*Origanum vulgare*	II	-
Alchemilla xanthochlora	III	IV	*Pastinaca sativa*	I	-
Anchusa officinalis	I	-	*Petasites hybridus*	-	I
Anthyllis vulneraria	I	II	*Picea abies*	II	-
Artemisia vulgaris	II	I	*Pilosella officinarum*	II	I
Bellis perennis	I	-	*Pimpinella saxifraga*	IV	IV
Carum carvi	IV	III	*Plantago lanceolata*	IV	V
Centaurium erythraea	II	-	*Plantago major*	II	-
Cichorium intybus	I	II	*Plantago media*	III	IV
Clematis vitalba	I	-	*Polygala comosa*	-	I
Colchicum autumnale	I	I	*Polygala vulgaris*	III	III
Convolvulus arvensis	II	II	*Polygonum bistorta*	-	II
Crataegus monogyna	I	-	*Populus tremula*	I	-
Cruciata glabra	-	II	*Potentilla argentea*	I	-
Cruciata laevipes	II	II	*Potentilla erecta*	III	III
Daucus carota	II	III	*Potentilla recta*	I	-
Digitalis grandiflora	I	-	*Potentilla reptans*	II	I
Echium vulgare	II	-	*Primula veris*	II	II
Equisetum arvense	I	IV	*Prunella vulgaris*	IV	V
Eupatorium cannabinum	I	-	*Rosa canina*	I	-
Euphrasia rostkoviana	IV	IV	*Rubus idaeus*	I	-
Filipendula ulmaria	I	I	*Rumex acetosa*	II	III
Fragaria vesca	II	III	*Rumex acetosella*	III	IV
Fragaria viridis	I	-	*Rumex crispus*	I	I
Galium mollugo	III	III	*Salix alba*	-	I
Galium verum	III	II	*Senecio jacobaea*	II	II

Genista tinctoria	I	-	*Stachys germanica*	II	-
Gentiana asclepiadea	I	-	*Stachys officinalis*	II	II
Geranium robertianum	I	I	*Symphytum officinale*	I	I
Geum urbanum	-	I	*Taraxacum officinale*	-	II
Glechoma hederacea	I	I	*Thymus glabrescens*	II	1
Heracleum sphondylium	II	II	*Thymus pulcherrimus*	-	I
Hypericum maculatum	II	II	*Thymus pulegioides*	III	IV
Hypericum perforatum	II	-	*Trifolium pratense*	IV	V
Juniperus communis	I	-	*Tussilago farfara*	I	-
Linaria vulgaris	I	I	*Urtica dioica*	I	I
Lysimachia nummularia	I	II	*Veratrum album*	I	-
Lythrum salicaria	I	I	*Verbascum lychnitis*	I	I
Malus sylvestris	I	-	*Veronica chamaedrys*	II	IV
Medicago falcata	I	II	*Veronica officinalis*	II	I
Medicago lupulina	II	I	*Vincetoxicum hirundinaria*	I	-
Melilotus officinalis	I	-	*Viola tricolor*	IV	III
Mentha arvensis	I	-			

These species were gathered according to the dominant active principles for which they are used in traditional medicine or phytotherapy [Farmacopeea Română, 1993; European Pharmacopoeia, 2015]

The most numerous species contain: tannins (16.66%), essential oils (12.22%), coumarins (11.11%), flavonoids (10%), saponins (8.88%), alkaloids and mucilage (6.66% each), iridoids, bitter compounds and organic acids, vitamins and provitamins (4.44% each) etc. (Fig. 1)

Conclusions

The purpose of this study was a better knowledge of taxa of medicinal plants with high content of active compounds in Gurghiu Mountains.

There were identified semi-natural mountainous meadows rich in medicinal plants. The most numerous species contain: tannins (16.66%), essential oils (12.22%), coumarins (11.11%), flavonoids (10%) etc.

These meadows have a good and very good conservation status.

The most important risk factors/threats observed in the area are: overgrazing, land abandonment and the intrusion of invasive species.

A major risk is also the massive collection of medicinal plants, which results in the future severe drop in the number of medicinal species which entails changes in the structure and composition of vegetation due to the proliferation of invasive species.

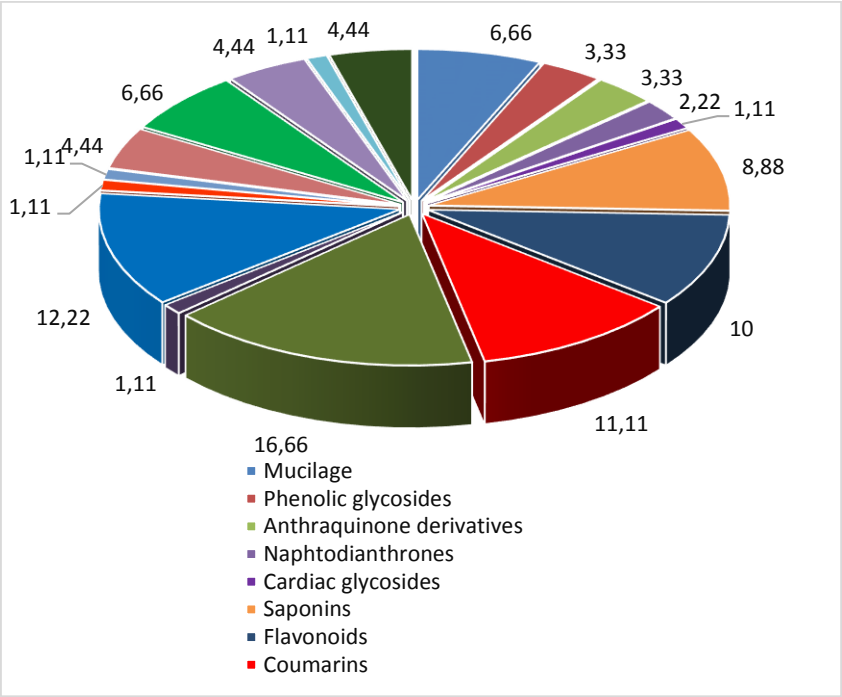

Fig. 1. The spectrum of active principles contained in the identified medicinal plants

References

CIOCÂRLAN V. 2009. *Flora ilustrată a României. Pteridophyta et Cormophyta*. Bucureşti: Edit. Ceres.

CIULEI I., GRIGORESCU E. & STĂNESCU U. 1993. *Plante medicinale, fitochimie şi fitoterapie*, vol. 1-2, Bucureşti: Edit. Medicală, 733/741 pp.

COLDEA G. (red). 2012. *Les associations végétales de Roumanie*, tom 2. *Les associations herbacées anthropogène*. Cluj-Napoca: Edit. Presses Universitaires de Cluj, 482 pp.

CRISTEA V., GAFTA D. & PEDROTTI F. 2004. *Fitosociologie*. Cluj-Napoca: Edit. Presa Universitară Clujeană, 394 pp.

DONIŢĂ N., POPESCU A., PAUCĂ-COMĂNESCU M., MIHĂILESCU S. & BIRIŞ I. A. 2005. *Habitate din România*. Bucureşti: Edit. Tehnică Silvică Bucureşti, 496 pp.

DONIŢĂ N., POPESCU A., PAUCĂ-COMĂNESCU M., MIHĂILESCU S. & BIRIŞ I. A. 2006. *Habitatele din România, modificări conform amendamentelor propuse de România şi Bulgaria la Directiva Habitate* (92/43/EEC). Bucureşti: Edit. Tehnică Silvică, 95 pp.

EŞIANU S. & al. 2016. *Manual de farmacognozie*, vol. 1, Litografia U.M.F. Tg-Mureş, 266 pp.

EŞIANU S. 2016. *Manual de farmacognozie*, vol. 2, Litografia U.M.F. Tg-Mureş, 278 pp.

GAFTA D. & MOUNTFORD O. (eds). 2008. *Manual de interpretare a habitatelor Natura 2000 din România*. Cluj-Napoca: Edit. Risoprint, 101 pp.

KATHE W., HONNEF S. & HEYM A. 2003, *Medicinal and aromatic plants in Albania, Bosnia-Herzegovina, Bulgaria, Croatia and Romania* (BfN-Skripten 91), Bundesamt für Naturschutz, Bonn, 200 pp.

ISTUDOR V. 1998, 2001, 2005. *Farmacognozie, Fitochimie, Fitoterapie*, vol. 1, 2, 3, Bucureşti: Edit. Medicală. 399/385/406 pp.

OPREA A. 2005. *Lista critică a plantelor vasculare din România*. Iaşi: Edit. Univ. "Al. I. Cuza" Iaşi, 488 pp.

OROIAN S. 1998. *Flora şi vegetaţia Defileului Mureşului între Topliţa şi Deda*. Târgu-Mureş: Casa de Editură Mureş, 426 pp.

OROIAN S. & SĂMĂRGHIŢAN M. 2000. Plantele medicinale din flora spontană a Defileul Mureşului între Topliţa şi Deda, *Acta Horti Botanici Bucurestiensis*, Bucureşti, **2**: 191-198.

OROIAN S. 2011. *Botanică Farmaceutică*. Târgu-Mureş: Edit. University Press,701 pp.

RÁCZ G., LAZA A. & COICIU A. 1970. *Plante medicinale şi aromatice*. Bucureşti: Edit. Ceres, 682 pp.

SANDA V., POPESCU A. & STANCU D. I. 2001. *Structura cenotică şi caracterizarea ecologică a fitocenozelor din România*, Bucureşti: Edit. Conphis, 539 pp.

SANDA V., ÖLLERER K. & BURESCU P. 2008. *Fitocenozele din România – Sintaxonomie*, *structură*, *dinamică şi evoluţie*. Bucureşti: Edit. Ars Docendi, 570 pp.

SÂRBU A., COLDEA G., NEGREAN G., CRISTEA V., HANGANU J. & VEEN P. 2004. *Grasslands of Romania*. Final report on National Grassland Inventory 2000-2003, University of Bucharest & Royal Dutch Society for Nature Conservation.

SĂMĂRGHIŢAN M. 2005. *Flora şi vegetaţia văii Gurghiului*. Târgu-Mureş: Edit. University Press, 510 pp.

SĂMĂRGHIŢAN M. & OROIAN S. 1999. Inventarierea plantelor medicinale din valea Gurghiului. *Note Botanice*, în Catalogul de Seminţe al U.M.F.Tg-Mureş, **XXV**: 43-60.

SÎRBU I., ŞTEFAN N. & OPREA A. 2013. *Plante vasculare din România*, *Determinator ilustrat de teren*. Bucureşti: Edit. Victor B. Victor, 1320 pp.

STĂNESCU U., MIRON A., HĂNCIANU M. & al. 2004. *Plante medicinale de la A la Z. Monografii ale produselor de interes terapeutic*, **I-II**, Iaşi: Edit. Gr. T. Popa, 646 pp.

VEEN P., JEFFERSON R., DE SMIDT J. & VAN DER STRAATEN J. (eds.). 2009. *Grasslands in Europe of high nature value*. KNNV Publishing, Zeist, Netherlands, 320 pp.

YBERRT E. & DELESALLE-FEAT T. (coord.). 2013. *Larousse des Plantes Medicinales-Identification*, *preparation*, *soins*, Franţa: Edit. Encyclopedia of Medicinal Plans, ed. a II-a, 335 pp.

*** Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

*** Farmacopeea Română. 1993. Editia a X-a, Bucureşti: Edit. Medicală.

*** European Pharmacopoeia 8th Edition EDQM, 2015.

How to cite this article:

OROIAN S., SĂMĂRGHIŢAN M., HIRIŢIU M., COŞARCĂ S. & TĂNASE C. 2016. The diversity of medicinal and aromatic plants encountred in Natura 2000 6520 habitat from Gurghiu Mountains. *J. Plant Develop*. **23**: 179-186.

Received: **11 November 2016 / *Revised***: **7 December 2016 / *Accepted***: **9 December 2016**