ENDEMIC PLANTS IN THE MINIŞ GORGES (ALMĂJ DEPRESSION)

SPECII ENDEMICE ÎN CHEILE MINIŞULUI (DEPRESIUNEA ALMĂJULUI)

Alma L. NICOLIN, Ilinca M. IMBREA

Agricultural and Veterinary University of the Banat, Timişoara, Romania
Corresponding author: Alma Nicolin, e-mail: alma_grigoriu@hotmail.com

Abstract: *The Miniş Gorges and the Izvorul Bigăr Nature Reserve are part of the Nera Gorges - Beuşniţa National Park. The region studied is very important for the preservation of some rare and endemic species, as well as of their habitats. The lime gorges of the Miniş River, similar to other gorges in south-western Romania, preserve a flora with an obvious thermophilic character.*

Rezumat: *Cheile Minişului şi Rezervaţia Naturală Izvorul Bigăr fac parte din Parcul Naţional Cheile Nerei – Beuşniţa. Regiunea studiată este foarte importantă pentru conservarea unor specii rare şi endemice, precum şi a habitatelor acestora. Cheile calcaroase ale Minişului, similar altor chei din sud-vestul României, conservă o floră cu evident caracter termofil.*

Key words**:** *Miniş Gorges, endemic species*
Cuvinte cheie**:** *Cheile Minişului, specii endemice*

INTRODUCTION

The Miniş Gorges are located in south-western Romania, in the Almăj Depression. The Miniş River forms sectors of lime gorges and finally flows into the Nera River, at Bozovici. The land under study is part of the Nera Gorges - Beuşniţa National Park and has one of the most famous nature reserves in the area, Izvorul Bigăr.

Besides the landscape diversity, the Miniş Gorges are to be noted for their broad variety of floristic elements, with obvious southern influences and similarities with the vegetal associations of the Balkans.

MATERIAL AND METHODS

The Miniş Gorges have also been studied by Peia (1978). Our research aimed at noticing changes of the vegetal cover in time. In this paper, we present a list of species considered endemic according to the electronic edition of the *Flora Europaea* (http://rbg-web2.rbge.org.uk/FE/fe.html). Though some species on the list we present are not rare for our country, because of their spread over south-east Europe they are considered endemic species. Romanian literature considers some of these species as not endemic, though their spreading area is south-west or south Romania and certain areas of the Balkans. Thus, we question the differences appearing between the European database and our own literature. The species are presented both with their present names, i.e. according to the *Flora Europaea*, and with some older names, frequently supplied by Romanian literature. Ecological indices have been noted after Sanda *et al.*, 2003 and Sanda *et al.*, 1983.

RESULTS AND DISCUSSIONS

Research was carried out starting with the Gura Golâmbului area; the following sector covers the lime slopes bordering the road to the Bigăr reserve and, from there, within the nature reserve, the route crosses the beech woods and portions of the lime detritus. Among all the species from Table 1, at Gura Golâmbului were identified *Allium flavum, Campanula grossekii, Centaurea triniifolia, Erysimum odoratum, Moehringia muscosa, Sedum sexangulare, Sempervivum marmoreum, Sesleria filifolia, Verbascum banaticum*.

At Izvorul Bigăr and on the rocks by the road there are most of the species considered endemic: *Allium flavum, Athamanta turbith* subsp. *hungarica, Campanula crassipes, Campanula grossekii, Centaurea triniifolia, Dianthus petraeus, Dianthus spiculifolius, Digitalis lanata, Erysimum comatum, Knautia drymeia, Minuartia setacea* subsp. *banatica, Moehringia muscosa, Peucedanum longifolium, Sedum sexangulare, Sempervivum marmoreum, Sesleria filifolia, Silene saxifraga, Verbascum banaticum.*

On the higher altitudes in the Bigăr reserve, inside of the beech forest, were identified *Lunaria rediviva* and *Carex pilosa*.

Festuca panciciana (Hack.) K.Richt. appears rather often in Romanian literature under its older name, *Festuca dalmatica* (Hack.) K.Richt. subsp. *panciciana* (Hack.) Beldie. In the *Flora Europaea*, this species does not appear as represented in Romania and is even given as uncertain in other Balkan areas as well, except for Croatia. It is nevertheless cited as a rare species in the Rudăria Gorges and in the Miniş Gorges, on lime rocks (Peia, 1978) and also on the Domogled, at Băile Herculane (Bujorean & Popescu, 1966), on the Danube Valley (Ştefureac *et al.*, 1971), and on the Almăj Mountains (Coste & Arsene, 2000).

Another problem is that of *Sesleria filifolia* Hoppe presented in the *Flora Europaea* as synonymous of *Sesleria rigida* Heuff. ex Rchb. In Romania, they are considered different species making up different vegetal associations. Thus, *Sesleria filifolia* is hemi-cryptophytic, a Balkan element with ecological indices U_2, $T_{3.5}$, and $R_{4.5}$, while *Sesleria rigida* is a Carpathian-Balkan element with rather different ecological indices: $U_{2.5}$, T_2, and $R_{4.5}$. The differences appear therefore in the factor temperature; Ciocârlan (2000) considers that *Sesleria rigida* can be met on meadows and on lime, sunny rocks, while *Sesleria filifolia*, though characteristic of the same biota, is rare and appears in the Caraş-Severin and Mehedinţi Counties, therefore only the latter is endemic. Other authors consider that *Sesleria rigida* appears frequently on the northern slopes with more shadow and at higher altitudes up to sub-alpine ones.

The species are difficult to identify; though *Sesleria rigida* var. *rigida* has convolute, rigid basal leaves, there is also the var. *haynaldiana* (Schur) Beldie, considered also endemic by the *Flora Europaea*, with more or less plane and soft basal leaves (Ciocârlan, 2000), a species also cited by Peia (1978) in the Miniş Gorges. The main criterion in identifying and differentiating the plants is the leave's anatomy (*Sesleria rigida* has a continuous sclerenchyma layer below the lower epidermis of the basal leaves, while *Sesleria filifolia* has a discontinuous sclerenchyma).

The species *Allium flavum* L. grows in the cleavages of the lime rocks on slopes that are mainly abrupt. It is also met in the Globului Gorges and Rudăria Gorges (Imbrea Ilinca & Nicolin Alma, 2006), in the Nera Gorges (Schrött, 1972), in Valea Mare – Moldova Nouă Reserve, in the Caraş and Gârlişte Gorges (Grigore & Coste, 1979).

From all cited species only *Athamanta turbith* (L.) Brot. subsp. *hungarica* (Borbás) Tutin is considered by the *Flora Europaea* as present just in our country. It is a very rare species that grows on lime and sunny rocks; it was cited before by Peia (1978), but also this species was identified at Băile Herculane in the Domogled Reserve (Bujorean & Popescu, 1966), in the Nera Gorges (Schrött, 1972), in the Caraş Gorges and in the Şuşara Gorges, near Sasca Montană (Grigore & Coste, 1972).

Campanula crassipes Heuff. is cited on the lime rocks on the Danube Valley (Păun *et al.*, 1968) and on the Domogled (Bujorean & Popescu, 1966). *Campanula grossekii* Heuff. has been met here on both almost nude lime rocks and in thermophilic bushes, next to *Syringa vulgaris, Fraxinus ornus, Cotinus coggygria* and other characteristic species. *Campanula grossekii* is cited in the Nera Gorges (Schrött, 1972), in the Caraş and Gârlişte Gorges (Grigore & Coste, 1979), and on the Danube Valley (Grigore & Coste, 1977). Both species of

Campanula are considered rare (Ciocârlan, 2000). On the lime rocks is also met *Campanula sibirica* L. subsp. *divergentiformis* (Jáv.) Domin (*Campanula divergens* Waldst. & Kit.).

Carex pilosa Scop. grows at the shadow of beech forest. It was cited before in the Caraş and Gârlişte Gorges (Grigore & Coste, 1979) and at the Moldova Nouă (Grigore & Coste, 1977). Another frequent species in the beech forests from the Miniş Gorges is *Galium schultesii* Vest.

Centaurea triniifolia Heuff. grows on grassy rocks and is considered a rare species; it was identified on the Domogled by Bujorean & Popescu (1966).

Dianthus petraeus Waldst. & Kit. is sometimes quite frequent on the abrupt lime rocks. The same authors have noted this species on the Domogled, in the Nera Gorges, in the Caraş and Gârlişte Gorges, and in the Danube area. *Dianthus spiculifolius* Schur is rare in the Miniş Gorges, but also between Berzasca and Pescari, on the Danube Valley (Păun *et al.*, 1968), and on the Domogled (Grigore & Coste, 1972).

Digitalis lanata Ehrh. is characteristic for the sunny bushes and grassy rocks, beeing rare compare to *Digitalis grandiflora*.

Erysimum comatum Pančić (*Erysimum banaticum* auct.) is a rare species met on rocky meadows, identified on the Domogled (Bujorean & Popescu, 1966), on the Danube Valley (Grigore & Coste, 1977) and in the Nera Gorges (Grigore & Coste, 1972). *Erysimum crepidifolium* Rchb. (*Erysimum banaticum* sensu Nyár.) can be met in similar biotopes, and *Erysimum odoratum* Ehrh. is met rather rarely at the borders of the beech associations, in bushes grown on a stone substratum.

Knautia drymeia Heuff. is rare in bushes and forests from the cited locations. *Lunaria rediviva* L. is characteristic for the beech forests with soils enrich in humus; in our samples it can reach 20% from the layer cover.

Minuartia setacea (Thuill.) Hayek subsp. *banatica* (Rchb.) Nyár. can be met on the sunny rocks where it reach 30% from the general cover. The species is cited also in the Caraş and Gârlişte Gorges (Grigore & Coste, 1979), and in the Domogled Reserve (Bujorean & Popescu, 1966). *Moehringia muscosa* L. grows in the beech associations, on the shadowed and humid rocks.

Peucedanum longifolium Waldst. & Kit. appears rarely, at the foot of the rocks, on grassy detritus, next to *Seseli gracile* Waldst. & Kit. and *Seseli rigidum* Waldst. & Kit., another two endemic species for the south-west of Romania, identified by us in Rudăria and Globului Gorges. *Peucedanum longifolium* has been cited in the Nera Gorges (Schrött, 1972) and in the Valea Mare – Moldova Nouă Reserve (Grigore & Coste, 1977).

Sedum sexangulare L. grows on the rocks and gravel, beeing also present in the Caraş and Gârlişte Gorges (Grigore & Coste, 1979) and in the Globului Gorges. *Sempervivum marmoreum* Griseb. (*Sempervivum schlehanii* Schott) is rare, on the sunny rocks, in the Caraş and Gârlişte Gorges, in the Nera Gorges, but also on the Domogled.

Silene saxifraga L. is a rare species that grows in the cleavages of the lime rocks; it is less cited in Almăj Depression, but it was identified in the Domogled Reserve (Bujorean & Popescu, 1966).

Verbascum banaticum Schrad. grows on the grassy rocks and on the lime detritus. It has been cited in different locations in Banat and in the Globului Gorges is quite frequent, in similar biotopes.

Though Peia P. (1978) describes the *Iris reichenbachii* (var. *lutea*) on the rocks in the Miniş Gorges, we have noticed this species only in the Globului Gorges, a natural reserve situated to the east of Almăj Depression. It is an endemic species growing in relatively horizontal rock crevasses where there is little humus and some more water than on the steep slopes.

Some endemic species cited by Peia (1978) were not identified by us in the Miniş Gorges: *Isopyrum thalictroides* L., *Hypericum rochelii* Griseb. & Schenk, *Genista radiata* (L.) Scop., *Helleborus odorus* Waldst. & Kit., *Helleborus purpurascens* Waldst. & Kit., *Aconitum lycoctonum* L. subsp. *vulparia* (Rchb.) Nyman (*Aconitum vulparia* Rchb.), *Silene heuffelii* Soó, *Erythronium dens-canis* L.

But we have noticed some species, cited by different authors in Banat, but not in the Miniş Gorges by Peia (1978): *Campanula crassipes* Heuff., *Digitalis lanata* Ehrh., *Peucedanum longifolium* Waldst. & Kit., *Silene saxifraga* L. Some other species, *Erysimum comatum* Pančić, *Sedum sexangulare* L., *Verbascum banaticum* Schrad. are noticed by Peia in Almăj Depression, but not in the Miniş Gorges.

Among the species we identified in the Miniş Gorges or cited by other authors in the area, some are included in the List of endangered species at European level and can be also met in Romania (Coldea *et al.*, 2003): *Fritillaria orientalis* Adams, *Ruscus aculeatus* L., *Galanthus nivalis* L. In the List of endemic and endangered species in Romania (*National Red List*) we can find: *Athamanta turbith* (L.) Brot. subsp. *hungarica* (Borbás) Tutin, *Dianthus giganteus* d'Urv. subsp. *banaticus* (Heuff.) Tutin, *Linum uninerve* (Rochel) Jáv. Some other species are included in the List of the sub-endemic and endangered species in Romania (*National Red List*): *Crocus banaticus* J.Gay, *Dianthus spiculifolius* Schur, *Peucedanum rochelianum* Heuff., *Sesleria rigida* Heuffel ex Reichenb subsp. *haynaldiana* Gergely & Beldie, *Veronica spicata* L. subsp. *crassifolia* (Nyman) Hayek.

From the Tabel 1 we can observe that most of the species are hemi-criptophytes. The geographical elements show the spreading area of the most species: Carpathian, Balkan, Mediterranean, Pontic and Dacian. The ecological indices emphasize the xerophitic and xero-mesophitic species (except species characteristic for the forests or humid rocks: *Lunaria rediviva, Moehringia muscosa, Knautia drymeia*), and also their termophile character. The indices for soil reaction point out the limy substratum on which these species grow.

Table 1

Some endemic species in the Miniş Gorges
ecological indices, constancy (* the number of samples in which the species appears compare to the total of 36 samples) and the maximum cover of each species

Bio-form	***Geo-element***	***U***	***T***	***R***	***Species (sub-species)***	***Constancy* / Maximum cover (%)***
G	Euc-Med	1.5	3	4.5	*Allium flavum* L.	II (11) / 10%
H	Carp (End)	2	3.5	4.5	*Athamanta turbith* (L.) Brot. subsp. *hungarica* (Borbás) Tutin	I (4) / 5%
H	Carp-Balc	1.5	4	4	*Campanula crassipes* Heuff.	I (2) / 5%
H	Balc	2	4	3	*Campanula grossekii* Heuff.	II (14) / 5%
H	Balc-Dac-Pan	2.5	4	4	*Campanula sibirica* L. subsp. *divergentiformis* (Jáv.) Domin (*Campanula divergens* Waldst. & Kit.)	I (2) / 5%
G	Euc	2.5	3	3	*Carex pilosa* Scop.	I (1) / 5%

H	Carp-Balc	1.5	4	4.5	*Centaurea triniifolia* Heuff.	I (4) / 5%
H (Ch)	Carp-Balc	2	3.5	4	*Dianthus petraeus* Waldst. & Kit.	II (9) / 20%
H (Ch)	Carp (End)	2	3.5	4	*Dianthus spiculifolius* Schur	I (2) / 5%
TH-H	Balc-Pan	1.5	4	4.5	*Digitalis lanata* Ehrh.	I (1) / 5%
TH (H)	Carp-Balc	2	4	3	*Erysimum comatum* Pančić (*Erysimum banaticum* auct.)	I (1) / 5%
TH (H)	Euc	2	4	4	*Erysimum crepidifolium* Rchb. (*Erysimum banaticum* sensu Nyár.)	I (2) / 5%
TH	Pont	2.5	3	4	*Erysimum odoratum* Ehrh.	I (4) / 5%
G	Euc	2.5	3	3	*Galium schultesii* Vest	I (3) / 5%
H	Euc-Balc	3.5	3.5	3	*Knautia drymeia* Heuff.	I (3) / 5%
H	Eur	4	3	4	*Lunaria rediviva* L.	I (7) / 20%
H	Alp-Carp-Balc	1.5	0	4	*Minuartia setacea* (Thuill.) Hayek subsp. *banatica* (Rchb.) Nyár.	II (9) / 30%
H	Euc (Mont)	4	2	4	*Moehringia muscosa* L.	I (5) / 20%
H	Dac-Balc	1.5	4	4.5	*Peucedanum longifolium* Waldst. & Kit.	I (2) / 5%
Ch	Euc-Med	2	3	0	*Sedum sexangulare* L.	I (2) / 5%
Ch	Carp-Balc	1.5	2.5	2.5	*Sempervivum marmoreum* Griseb. (*Sempervivum schlehanii* Schott)	I (5) / 5%
Ch	Balc	2	3.5	4	*Silene saxifraga* L.	I (1) / 5%
TH	Pont-Balc	2	4	4	*Verbascum banaticum* Schrad.	II (11) / 5%

Though the covering by endemic species of the area under study is generally low, there are also species making up vegetal associations that cover larger areas. Thus, *Sesleria rigida* (*S. filifolia*) covers up to 40% of the rocky slopes at Gura Golâmbului and even 80% at Bigăr. The species constancy in the samples we have taken is shown in Table 1.

CONCLUSIONS

The Miniş Gorges and the Izvorul Bigăr Nature Reserve are part of the Nera Gorges - Beuşniţa National Park. The region studied is very important for the preservation of some rare and endemic species, as well as of their habitats. The lime gorges of the Miniş River, similar to other gorges in south-western Romania preserve a flora with an obvious thermophilic character. This biota with characteristic flora and vegetation are important not only nationally, but also at European level.

Analysing comparatively endemic, rare or endangered species, we could draw the conclusion that there is some lack of consistency between the European database and Romanian literature. Some species considered endemic by the *Flora Europaea* do not appear as such in Romanian literature maybe because some of them are relatively frequent in Romania or in the Banat area. In the same database, other rare species present in Romania are not considered certain for our country. It is therefore necessary to re-evaluate Romanian literature (in which numerous species are presented under their old names), followed by the checking up in the field, the photographing, and maybe also by the sampling of some species that still rise questions. Some other species have not been considered rare so far, but reducing the size of their area in different parts of the world and also in Romania resulted in including them on the lists of species that have become endangered globally, at European level or nationally. The network of national parks and of nature reserves begins to take contour in Romania too, in the interest of species and their habitats protection.

BIBLIOGRAPHY

1.BUJOREAN G., POPESCU P. C., 1966 – *Rezervaţia Naturală Domogled (Băile Herculane)*, Ocrotirea Naturii, Tomul 10, Nr. 1, Ed. Acad. R.S.R.

2.CIOCÂRLAN V., 2000 – *Flora ilustrată a României*, Ed. Ceres, Bucureşti

3.COLDEA GH., CRISTEA V., NEGREAN G., CRISTUREAN I., SÂRBU I., SÂRBU ANCA (COORD.), OPREA A., POPESCU GH., 2003 – *Ghid pentru identificarea importantelor arii de protecţie şi conservare a plantelor din România*, Ed. "alo, Bucureşti!", Bucureşti

4.COSTE I., 1974 - *Flora şi vegetaţia Munţilor Locvei*, Teză de doctorat, Univ. "Babeş - Bolyai", Cluj – Napoca

5.COSTE I., ARSENE G., 2000 – *Speciile de cormofite endemice şi rare în sud-vestul României (Banat)*, Stud. şi comunic., Muzeul Judeţean Satu-Mare

6.GRIGORE S., COSTE I., 1972 – *Conservarea naturii şi folosirea resurselor naturale în Banat*, in "Aspecte din flora şi vegetaţia Banatului", Timişoara

7.– Ştiinţe Naturale, Muzeul Banatului Timişoara

8.GRIGORE S., COSTE I., 1979 – *Contribuţii la studiul vegetaţiei xerofile de stâncării din Cheile Caraşului şi Cheile Gârliştei*, Tibiscus – Ştiinţe Naturale, Muzeul Banatului Timişoara

9.IMBREA ILINCA, NICOLIN ALMA, 2006 – *Aspecte privind flora (de stâncărie) a rezervaţiei naturale Cheile Rudăriei*, Simpozionul internaţional „Agricultura durabilă – Agricultura viitorului", Ediţia a II-a, 23-24 noiembrie 2006, Craiova, ISSN – 1582-9391

10.PĂUN M., CÎRŢU MARIANA, CÎRŢU D., POPESCU GH., 1968 – *Materiale pentru flora dintre Berzasca şi Pescari, Judeţul Caraş-Severin*, Buletin Ştiinţific Nr. X, Universitatea Craiova

11.PEIA P., 1978 – *Flora vasculară a Depresiunii Almăjului* (Jud. Caraş-Severin), Teză de doctorat, Univ. „Babes – Bolyai", Cluj – Napoca

12.SANDA V., BIŢĂ-NICOLAE CLAUDIA, BARABAŞ N., 2003 – *Flora cormofitelor spontane şi cultivate din România*, Ed. „Ion Borcea", Bacău

13.SCHROTT L., 1972 - *Flora şi vegetaţia rezervaţiei naturale Beuşniţa - Cheile Nerei (Munţii Aninei)*, Teză de doctorat, Univ. Bucureşti

14.– *Tricule (Clisura Dunării)*, Comunicări de Botanică, Vol. XII, Bucureşti

15.http://rbg-web2.rbge.org.uk/FE/fe.html