# THE STUDY OF *JOVIBARBO SOBOLIFERAE-SAXIFRAGETUM PANICULATAE* ASSOCIATION ON SOHODOL VALLEY (PĂDUREA CRAIULUI MOUNTAINS)

**Păşcuţ Călin Gheorghe*, Burescu Petru***

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048, Oradea, Romania, e-mail: pascutcalin@yahoo.com

***Abstract***

*This paper presents a phytocoenological and comparative study of the Jovibarbo soboliferae-Saxifragetum paniculatae association, studied by us on Sohodol Valley from Pădurea Craiului Mountains (Bihor county), with studies made by Coldea and Pânzaru in 1987 in Maramureş Mountains and Tauber in 1987 in Bistriţei Mountains.*

*The study was conducted in 2016, during which we identified three phytocoenoses belonging to the Jovibarbo soboliferae-Saxifragetum paniculatae association. In the floristic composition of the analyzed association 30 species of cormophyte and 2 species of bryophytes were identified.*

**Key words:** phytocoenoses, association, rocky, floristic composition, comparative study

## INTRODUCTION

The phytocoenosis of this association were studied in Sohodol Valley from Pădurea Craiului Mountains, Bihor county (Fig. 1). Considering territory the lands from Sohodol Valley belong to Căbeşti village and Sohodol village.

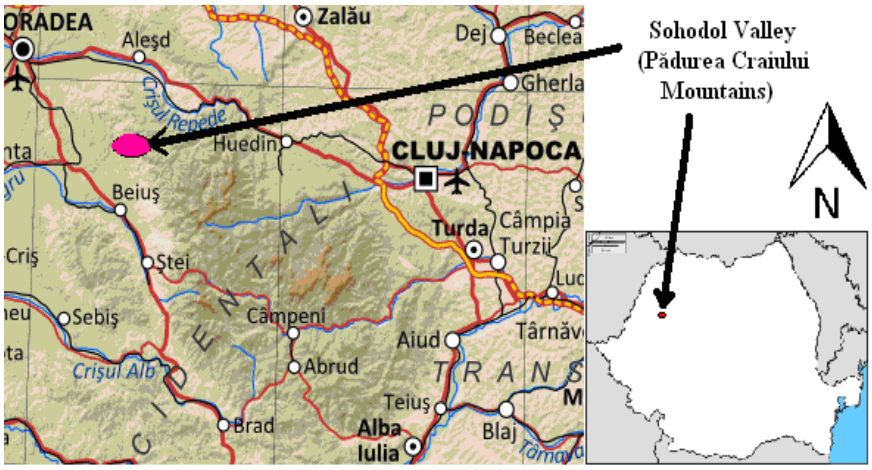


Fig. 1. Position of Sohodol Valley in Romania
(Source: own compilation by https://upload.wikimedia.org/wikipedia/commons/8/87/Romania_general_map-ro.png; http://www.d-maps.com/carte.php?num_car=5819&lang=en)

Sohodol valley is a left tributary of Roşia valley and springs from a point close to the top of the Piciorul Porcului and Cornetului Peak from Pădurea Craiului Mountains.

The geological substratum of the studied area consists for the most part of metamorphic rocks, but rarely igneous rocks occur in the form of diorite, quartzite, riolite, andesites and granodiorites. On strongly inclined slopes in the studied area, the ground was formed on deluviale, eluvial deposits, being thin with large quantities of coarse fragments remaining for a long time in an early stage of development.

The appropriate climate in the studied area is that of high hills and medium mountains. This climate is characterized by a moderate regime of air temperature oscillations. The thermal regime in the area is characterized by annual average temperatures of 8 to 9°C.

Major research on the vegetation from Sohodol Valley has not been done so far. The first floristic research we find in the work of Burescu, Doniţă (2001), Groza (2008). In our country the association is cited on Sâlhoi Rocks (Maramureşului Mountains) by Coldea and Pânzaru (1987) from Pietrele Roşii, Bistriţa Mountains (Harghita county) by Täuber (1987).

**MATERIAL AND METHOD**

The study is based on our research conducted in 2016 on Sohodol Valley. A number of 3 phytocoenological relevées were made on rocks, assigned to the *Jovibarbo soboliferae-Saxifragetum paniculatae* association Coldea and Pânzaru (1987).

The name of the association is in correlation with the provisions laid down in the International Code of Phytosociological Nomenclature (Weber et al., 2000). Framing the association in corresponding cenotaxonomice units was made in accordance with the systems drawn up by the Sanda et al. (2008), Mucina (1997), Rothmaler (2000).

The phytocoenologic table contains information regarding the floristic composition, the number of relevées, altitude (m.s.m.), GPS coordinates, herbaceous layer coverage (%), moss layer coverage (%), exposition, slope (°), area ($m^2$). The Botanical Nomenclature used is the one developed for the Romanian Flora by Ciocârlan (2009), sustained by information provided by the Code of Botanical Nomenclature (Code de Tokyo, 1993).

**RESULTS AND DISCUSSION**

It is a chasmophile association found on siliceous rocks, with big inclination (60 to 90°), located at altitudes between 512-530 m. The phytocoenosis of this association prefers rocks located on hillsides with Southern, Western and South-Eastern exposition (Table 1).

*Table 1*

*Jovibarbo soboliferae-Saxifragetum paniculatae* association Coldea and Pânzaru (1987)

| | | | | |
|---|---|---|---|---|
| **Number** | | 1 | 2 | 3 |
| **Altitude (m.s.m.)** | | 512 | 514 | 530 |
| **GPS** | **Lat.N** | 46.78236 | 46.78227 | 46.78229 |
| **coordonates** | **Long.E** | 22.51625 | 22.51640 | 22.51716 |
| **Herbaceous layer coverage (%)** | | 50 | 40 | 90 |
| **Moss layer coverage (%)** | | 25 | 20 | 5 |
| **Exposition** | | S | V | SE |
| **Slope (º)** | | 70 | 60 | 90 |
| **Area (m²)** | | 16 | 9 | 8 |
| *Jovibarba globifera* ssp. *globifera* | | + | · | + |
| *Saxifraga paniculata* | | 2 | 3 | 3 |
| ***Cymbalario-Asplenion, Tortulo-Cymbalarietalia, Asplenietea trichomanis*** | | | | |
| *Poa nemoralis* | | 2 | + | · |
| *Asplenium trichomanes* ssp. *trichomanes* | | + | · | + |
| *Polypodium vulgare* | | + | + | + |
| *Sedum maximum* | | + | · | + |
| *Cystopteris fragilis* | | · | · | + |
| ***Festuco-Brometea*** | | | | |
| *Festuca rupicola* ssp. *saxatilis* | | 2 | · | · |
| *Festuca pallens* | | · | + | 1 |
| *Silene bupleuroides* | | + | · | + |
| *Dianthus carthusianorum* | | + | · | + |
| *Hypericum perforatum* | | + | · | · |
| *Potentilla arenaria* | | · | · | + |
| *Thymus comosus* | | + | + | 1 |
| ***Querco-Fagetea*** | | | | |
| *Hieracium transsylvanicum* | | + | + | · |
| *Luzula luzuloides* | | + | · | · |
| *Polystichum aculeatum* | | + | + | · |
| *Salvia glutinosa* | | + | + | · |
| *Veronica urticifolia* | | + | · | · |
| *Hedera helix* | | · | · | + |
| *Campanula persicifolia* | | + | · | + |
| *Geranium robertianum* | | + | + | · |
| *Lamium galeobdolon* | | · | + | · |
| *Asarum europaeum* | | · | + | · |
| *Galium schultesii* | | + | + | · |
| **Variae Syntaxa** | | | | |
| *Luzula sylvatica* | | + | + | · |
| *Gentiana asclepiadea* | | + | + | · |
| *Calamagrostis arundinacea* | | + | 2 | · |
| *Viola tricolor* ssp. *saxatilis* | | + | · | · |
| *Moehringia muscosa* | | · | · | + |
| ***Bryophyta*** | | | | |
| *Ctenidium molluscum* | | 2 | 2 | 1 |
| *Tortula tortuosa* | | 1 | · | · |

Place and date of mapping: 1-2 Sohodol Valley (23.05.2016); 3 Sohodol Valley - Stanul Cucuruzului (23.05.2016)

From the cenotaxonomic point of view the *Jovibarbo soboliferae-Saxifragetum paniculatae* association Coldea and Pânzaru (1987) belongs to the *Cymbalario-Asplenion* alliance, *Tortulo-Cymbalarietalia* order and *Asplenietea trichomanis* class.

The characteristic and edifying species for the association are *Jovibarba globifera* ssp. *globifera* and *Saxifraga paniculata*. Recognition species for *Cymbalario-Asplenion* aliance, *Tortulo-Cymbalarietalia* order and *Asplenietea trichomanis* class, which make the association are: *Poa nemoralis*, *Asplenium trichomanes* ssp. *trichomanes*, *Polypodium vulgare*, *Sedum maximum*, *Cystopteris fragilis* (Table 1). The total number of species recorded is 30, which were identified in a number of 3 relevées.

In the phytocoenosis of the association there is included a number of species specific to forests and meadows, transgressive from *Festuco-Brometea* class: *Festuca rupicola* ssp. *saxatilis*, *Festuca pallens*, *Silene bupleuroides*, *Dianthus carthusianorum*, *Hypericum perforatum*, *Potentilla arenaria*, *Thymus comosus*, *Querco-Fagetea* class: *Hieracium transsylvanicum*, *Luzula luzuloides*, *Polystichum aculeatum*, *Salvia glutinosa*, *Veronica urticifolia*, *Hedera helix*, *Campanula persicifolia*, *Geranium robertianum*, *Lamium galeobdolon*, *Asarum europaeum*, *Galium schultesii*.

Moss layer is well represented, consisting of *Ctenidium molluscum* şi *Tortula tortuosa*.

It is interesting to compare the floristic composition of the *Jovibarbo soboliferae-Saxifragetum paniculatae* association, phytocoenoses that we studied in Pădurea Craiului Mountains, with the studies done in Maramureşului Mountains of Coldea, Pânzaru (1987) and Bistriţei Mountains by Täuber (1987) (Table 2).

*Table 2*

The floristic composition of *Jovibarbo soboliferae-Saxifragetum paniculatae* association Coldea et Pânzaru 1987, in three geographical regions: Maramureşului Mountains, Bistriţei Mountains and Pădurea Craiului Mountains

| | **Maramureşului Mountains*** | **Bistriţei Mountains**** | **Pădurea Craiului Mountains** |
|---|---|---|---|
| **Year** | 1987 | 1987 | 2016 |
| **Number of relevées** | 8 | 7 | 3 |
| **Number of species** | 28 | 31 | 30 |
| **Altitude (m.s.m.)** | 450-1000 | 1000-1150 | 512-530 |
| *0* | *1* | *2* | *3* |
| *Jovibarba globifera* ssp. *globifera* | x | x | x |
| *Saxifraga paniculata* | x | x | x |
| ***Cymbalario-Asplenion, Tortulo-Cymbalarietalia, Asplenietea trichomanis*** | | | |
| *Poa nemoralis* | x | · | x |
| *Asplenium trichomanes* ssp. *trichomanes* | · | x | x |

| 0 | 1 | 2 | 3 |
|---|---|---|---|
| *Asplenium ruta-muraria* | x | x | · |
| *Polypodium vulgare* | · | · | x |
| *Sedum maximum* | · | x | x |
| *Cystopteris fragilis* | x | x | x |
| *Erysimum wittmanni* ssp. *wittmannii* | x | · | · |
| *Erysimum wittmanni* ssp. *transsilvanicum* | · | x | · |
| *Campanula carpatica* | x | x | · |
| ***Festuco-Brometea*** | | | |
| *Festuca rupicola* ssp. *saxatilis* | x | · | x |
| *Allium lusitanicum* | · | x | · |
| *Festuca pallens* | · | x | x |
| *Anthyllis vulneraria* ssp. *vulneraria* | x | x | · |
| *Geranium rotundifolium* | · | x | · |
| *Silene bupleuroides* | · | · | x |
| *Scabiosa ochroleuca* | · | x | · |
| *Melica ciliata* | · | x | · |
| *Dianthus carthusianorum* | · | x | x |
| *Campanula sibirica* ssp. *sibirica* | · | x | · |
| *Veronica austriaca* | · | x | · |
| *Hypericum perforatum* | · | · | x |
| *Coronilla varia* | · | x | · |
| *Centaurea micranthos* | · | x | · |
| *Potentilla arenaria* | · | x | x |
| *Thymus comosus* | · | x | x |
| ***Querco-Fagetea*** | | | |
| *Hieracium transsylvanicum* | · | · | x |
| *Luzula luzuloides* | · | · | x |
| *Epilobium montanum* | x | · | · |
| *Polystichum aculeatum* | · | · | x |
| *Salvia glutinosa* | · | · | x |
| *Veronica urticifolia* | · | · | x |
| *Fragaria vesca* | x | · | · |
| *Hedera helix* | · | · | x |
| *Campanula persicifolia* | · | · | x |
| *Campanula rapunculoides* | x | · | · |
| *Geranium robertianum* | x | · | x |
| *Lamium galeobdolon* | · | · | x |
| *Cruciata glabra* | x | · | · |
| *Asarum europaeum* | · | · | x |
| *Galium schultesii* | · | · | x |
| ***Thlaspietea rotundifolii*** | | | |
| *Galium anisophyllon* | x | · | · |
| *Poa molinerii* | x | · | · |
| *Acinos arvensis* | · | x | · |
| *Sedum atratum* | x | · | · |
| *Thymus alpestris* | x | · | · |

| 0 | 1 | 2 | 3 |
|---|---|---|---|
| ***Elyno-Seslerietea*** | | | |
| *Carduus glaucinus* | x | · | · |
| *Helianthemum nummularium* ssp. *grandiflora* | · | x | · |
| *Seseli libanotis* | · | x | · |
| *Carex ornithopoda* | x | · | · |
| *Hieracium pojoritense* | · | x | · |
| *Thalictrum foetidum* | · | x | · |
| *Dianthus tenuifolius* | x | · | · |
| *Seseli libanotis* | x | · | · |
| **Variae Syntaxa** | | | |
| *Luzula sylvatica* | · | · | x |
| *Allium fuscum* | · | x | · |
| *Thesium alpinum* | x | · | · |
| *Gentiana asclepiadea* | · | · | x |
| *Chamaecytisus hirsutus* ssp. *hirsutus* | · | x | · |
| *Digitalis grandiflora* | x | · | · |
| *Rosa pimpinellifolia* | · | x | · |
| *Verbascum thapsus* | x | · | · |
| *Centaurea triumfetti* | x | · | · |
| *Calamagrostis arundinacea* | · | · | x |
| *Scabiosa columbaria* ssp. *columbaria* | x | · | · |
| *Cirsium erisithales* | x | · | · |
| *Valeriana officinalis* | · | x | · |
| *Viola tricolor* ssp. *saxatilis* | · | x | x |
| *Moehringia muscosa* | · | · | x |
| ***Bryophyta*** | | | |
| *Abietinella abietina* | x | · | · |
| *Ditrichum flexicaule* | x | · | · |
| *Ctenidium molluscum* | x | · | x |
| *Rhitidium rugosum* | x | · | · |
| *Entodon conicus* | x | · | · |
| *Tortula tortuosa* | x | · | x |
| *Hypnum cupressiforme* | x | · | · |

Note: x presence of the species; * From Coldea, Pânzaru (1987), ** From Täuber (1987)

**CONCLUSIONS**

*Jovibarbo soboliferae-Saxifragetum paniculatae* associations from Pădurea Craiului Mountains is found on siliceous rocks near the forest road of Sohodol Valley. The floristic composition of the association summarizes a number of 30 plant species and 2 species of bryophytes. From the association table it is observed that the greatest abundance is represented by *Saxifraga paniculata*, being found on the rocky shelves and girdle.

The phytocoenoses of *Jovibarbo soboliferae - Saxifragetum paniculatae* association from Pădurea Craiului Mountains are closer in

terms of flora to the phytocoenoses described by Täuber from Bistriţei Mountains, a number of 10 species being found in both descriptions: *Jovibarba globifera* ssp. *globifera*, *Saxifraga paniculata*, *Asplenium trichomanes* ssp. *trichomanes*, *Sedum maximum*, *Cystopteris fragilis*, *Festuca pallens*, *Potentilla arenaria*, *Dianthus carthusianorum*, *Thymus comosus*, *Viola tricolor* ssp. *saxatilis*. It is observed that in the phytocoenoses described by us from Pădurea Craiului Mountains the transgressive species come from the *Festuco-Brometea* (7 species) and *Querco-Fagetea* (11 species) classes. In Bistriţa Mountains the most transgressive species that fall in the floristic composition of the association belong to the *Festuco-Brometea* class (13 species), followed by *Elyno-Seslerietea* class (4 species).

The floristic composition of the association described from Maramureşului Mountains differs from the study undertaken by us, of the total species identified only 6 plant species (*Jovibarba globifera* ssp. *globifera*, *Saxifraga paniculata*, *Poa nemoralis*, *Cystopteris fragilis*, *Festuca rupicola* ssp. *saxatilis*, *Geranium robertianum*) and 2 of bryophytes (*Ctenidium molluscum*, *Tortula tortuosa*) are common. The transgrevive species in the phytocoenoses described by Coldea and Pânzaru from Maramureşului Mountains, belong to *Querco-Fagetea* class (5 species) *Thlaspietea rotundifolii* class (4 species) and *Elyno-Seslerietea* class (4 species). We can also notice in this case a large share of bryophytes (7 species), which denotes a higher humidity of the area where these transitional plant associations live.

**REFERENCES**


1. Burescu P., Doniţă N., 2001, Contribuţii la cunoaşterea diversităţii floristice a pădurilor din Munţii Pădurea Craiului. Analele Universităţii Oradea, Fascicula Silvic, vol. VI, pp.57-164
2. Ciocârlan V., 2009, Flora ilustrată a României. Pteridophyta et Spermatophyta, Editura Ceres, Bucureşti, pp.1141
3. Coldea G., Pânzaru G., 1987, Aspecte floristice şi fitocenologice din rezervaţiile botanice Piatra Ţibăului şi Stâncăriile Sâlhoi-Zimbroslavele (Munţii Maramureşului). Ocrot. Nat. Med. Înconj., Bucureşti, pp.141-145
4. Groza G., 2008, Flora şi vegetaţia Munţilor Pădurea Craiului. Editura Risoprint, Cluj-Napoca, pp.303
5. Mucina L., 1997, Conspectus of Classes of European Vegetation. Folia Geobot. Phytotax, Praha, 32, pp.117-172
6. Rothmaler W., 2000, Exkursionsflora von Deutschland, Band 3. Gefäßpfanzen: Atlasband. Spektrum Akademischer Verlag Heidelberg-Berlin
7. Sanda V., Öllerer K., Burescu P., 2008, Fitocenozele din România. Sintaxonomie, structură, dinamică şi evoluţie. Edit. Ars Docendi, Bucureşti, pp.570
8. Täuber F., 1987, Vegetations-beiträge zu den Südostkarpaten (I). Contribuţii Botanice, Cluj-Napoca, pp.133-142

9. Weber H.E., Moravec J., Theurillat J.P., 2000, International Code of Phytosociological Nomenclature. 3rd edition, Journal of Vegetation Science, Opulus Press Uppsala, 11, pp.739-768
10. ***, 1995, Code of Botanical Nomenclature (Tokyo, 1993). Boissiera, 49, Geneve, 1995, pp.1-85
11. http://www.d-maps.com/carte.php?num_car=5819&lang=en
12. https://upload.wikimedia.org/wikipedia/commons/8/87/Romania_general_map-ro.png