

## ENDEMIC SPECIES IDENTIFIED IN THE FLORA OF THE TRANSYLVANIAN PLAIN (MUREȘ COUNTY)

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**ABSTRACT:** The aim of this study is to analyze the floristic diversity of the Transylvanian Plain (Mureș County) and to highlight the presence of some endemic and subendemic species in this area. In Mureș County, the Transylvanian Plain, stretches on the north of the Mureș River and it is a lowland region consisting of gently rolling hills (average elevation – 400 m), with wide valleys formed by the tributaries of the Mureș river that crosses among the hills. The analysis studied the floristical diversity of the area taking into consideration the presence of some endemic species that gives specificity to the flora of the Transylvanian Plain. Among endemic species we mention *Aconitum lycoctonum* L. em. Koelle ssp. *moldavicum* (Hacq.) Jalas, *Astragalus exscapus* L. ssp. *transsilvanicus* (Barth) Jav., *Pulsatilla vulgaris* Mill. ssp. *grandis* (Wender.) Zámels etc. There is a stringent need for effective protection and conservation of these species and their habitats as they are affected by the constantly growing human impact.

**KEYWORDS:** endemic species, Mureș County, Transylvanian Plain

### INTRODUCTION:

The aim of this study is to analyze the floristic diversity of the Transylvanian Plain (Mureș County), to highlight the presence of some endemic and subendemic species in this area. The study includes research results formed in the identification and analysis of the conservation status of 7 endemic/subendemic plant species.

Conservation of the planet's flora and fauna impacting a greater number of species, regardless of their biological importance is one of the biggest tasks of contemporaneity. Endemism and species richness are highly relevant to the global prioritization of conservation efforts. (Kier & al., 2009)

The study area is represented by the part of Transylvanian Plain that belongs to Mureș County. In Mureș County, the Transylvanian Plain, stretches on the north of the Mureș River and it is a lowland region consisting of gently rolling hills (average elevation – 400 m), with wide valleys formed by the tributaries of the Mureș river crossing among the hills.

Previous studies in this area (Oroian&Sămărghițan, 2014) prove that the Transylvanian Plain is a region characterized by a diversity and richness of vegetal taxa: 716 taxa including 692 species, 24 subspecies and 2 forms belonging to 96 plant families. Out of this flora some endemic and subendemic species have a remarkable phytogeographical interest.

### MATERIAL AND METHODS:

The inventory of the flora in the studied area was made using an "itinerant transects" model so the area would be covered throughout (Cristea & al. 2004). Each species has a map of distribution in studied area. For the species identified in field we used ● and for bibliographic data ■.

For each endemic/subendemic species data was recorded such as: species systematic, area, population,

area of habitat/habitats suitable for species, the conservation status and the general trend of conservation status, factors that isolate populations and future prospects (Mihăilescu & al. 2015).

The classification and the assignment of relevés to specific plant associations have been carried out according to Coldea, 2012.

There are no previous studies published regarding the population size. Because of that, the evaluation of the conservation trend namely the decrease of populations was made taking in consideration previous personal field researches and authors' experience.

The name of the species and the endemic status was given in accordance to Ciocârlan (2009) and Sârbu & al. (2013).

The habitat types are coded according to the Interpretation Manual of Natura 2000 Romanian habitats (Gafta & Mountford (eds.) 2008) and according to Habitats in Romania (Doniță & al. 2005).

In determining endangered, rare or vulnerable species, National Red Lists (Boșcaiu & al. 1994, Dihoru & Dihoru 1994, Oltean & al. 1994, Dihoru & Negrean 2009,) were consulted, as well as the latest version of zoological categories published in the *European red list of vascular plants* (Bilz & al. 2011).

### RESULTS AND DISCUSSION:

Of the research area 7 endemic and subendemic plant species were recorded:

*Aconitum lycoctonum* L. em. Koelle ssp. *moldavicum* (Hacq.) Jalas - Moldavian monk's hood (Fig. 1)

- *Symphyto-Fagion*; G, End. carp. ; 2n=16, D; L<sub>6</sub>T<sub>4</sub>U<sub>5</sub>R<sub>5</sub>N<sub>3</sub>. (NT)

It is a perennial mesohygrophilous, helio-sciaphilic and poisonous species that occurs frequently in deciduous forests, meadows, pastures, thickets, forest fringes etc.



Fig. 1. *Aconitum lycoctonum* L. ssp. *moldavicum* in Băla-Ercea (Foto: Silvia Oroian)

In the study area *Aconitum lycoctonum* ssp. *moldavicum* was recorded from forest fringe near Ulieș, several sporadic specimens and also from Băla-Ercea in Copăceni forest (Fig. 2). The species in the study area belongs to coenoses classified within the *Melampyro bihariensis-Carpinetum* (Borza 1941) Soó 1964 em. Coldea 1975 association. These forests populate slopes of slightly or moderately inclined hills with northern or intermediate exposure. They prefer the soils with moderate humidity, to a relatively abundant humidity, on a pseudogley substrate. The type of Natura 2000 habitat which these coenoses belongs is 91Y0 Dacian oak-hornbeam forests.

In the composition of this association can be distinguished 3 layers. In the herbaceous layer beside *Aconitum*, were recorded species such as: *Melampyrum bihariense*, *Anemone nemorosa*, *Corydalis solida*, *Galanthus nivalis*, *Scilla bifolia*, *Ajuga reptans*, *Brachypodium sylvaticum*, *Carex pilosa*, *Galium mollugo*, *Geum urbanum*, *Helleborus purpurascens*, *Stachys sylvatica*, *Stellaria media*, *Viola odorata* etc. The tree's layer is dominated by: *Quercus robur*, *Q. petraea*, *Carpinus betulus*, *Prunus avium* and in the shrubs' layer can mention: *Crataegus monogyna*, *Evonymus europaeus*, *Sambucus nigra*, *Ligustrum vulgare*, *Corylus avellana*.

The main pressures/threats that affect the habitat of this species and also the effective population size are related to human impact. Concerning the conservation status, the field observations show that the populations are decreasing but they are in an average or good state of conservation.



Fig. 2. The distribution of *Aconitum lycoctonum* L. ssp. *moldavicum* in the studied area

*Astragalus exscapus* L. ssp. *transsilvanicus* (Barth) Jav. (Fig. 3)

*Festucion vaginatae*, *Festucion rupicolae*; H, Pont-End; 2n=16, D; L<sub>8</sub>T<sub>6</sub>U<sub>3</sub>R<sub>7</sub>. (NT)

The subspecies *Astragalus exscapus* ssp. *transsilvanicus*, endemic for the Transylvanian Plain, is part of the steppe-sylvosteppe plant species with rare populations, relict from the sylvostepic parts of the Transylvanian Depression.



Fig. 3. *Astragalus exscapus* ssp. *transsilvanicus* (Foto: Silvia Oroian)

In the study area the subspecies was identified in 4 localities: Chețani, Săbed, Sărmășel, Ulieș. Previous studies mention it also from Săbed-Culpiu where the species was recorded in coenoses of *Stipetum pulcherrimae* association (Kovacs, 2008-2009). (Fig. 4)

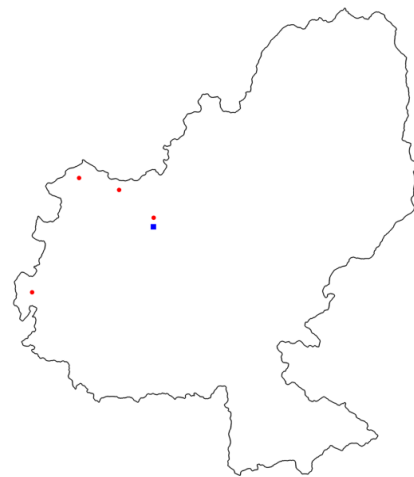


Fig. 4. The distribution of *Astragalus exscapus* ssp. *transsilvanicus* in the studied area

In the Transylvanian Plain the subspecies can still be found in some quite large populations. However all of them are nowadays under a huge anthropic pressure (Bădărău & all., 2000, 2001).

The grasslands where this subspecies was recorded in the study area belong to 62C0\* Ponto-Sarmatic Steppes and 6240\* Sub-pannonic steppic grasslands Natura 2000 habitats. The plant associations in which this subspecies were recorded are *Medicagini minimaefestucetum valesiacae* Wagner 1941 and *Stipetum pulcherrimae* Soó 1942.

The species identified on the observation points are the ones characteristic to these habitats types: *Stipa pulcherrima*, *Crambe tatarica*, *Falcaria vulgaris*, *Festuca rupicola*, *Inula ensifolia*, *Knautia arvensis*, *Achillea setacea*, *Adonis vernalis*, *Ajuga laxmanni*, *Anchusa barbelieri*, *Artemisia pontica*, *Asperula cynanchica*, *Astragalus onobrychis*, *Bupleurum falcatum*, *Asparagus officinalis*, *Astragalus monspessulanus*, *Carex caryophyllea*, *Dianthus carthusianorum*, *Euphorbia cyparissias*, *Filipendula vulgaris*, *Galium verum*, *Linum austriacum*, *Linum tenuifolium*, *Medicago falcata*, *Pimpinella saxifraga*, *Potentilla arenaria*, *Prunella laciniata*, *Salvia verticillata*, *Scabiosa ochroleuca*, *Seseli annuum*, *Teucrium chamaedrys*.

Species of *Astragalus exscapus* ssp. *transilvanicus* are very good indicators for well preserved xeric and mes-oxeric steppe grasslands because they are very sensitive to sheep overgrazing.

The main pressures and threats while targeting both species' habitat and population dynamics are related to intensive grazing of sheep and ruderalisation. Considering these threats and previous observations in the field we can conclude that the studied populations are in a good state of preservation but decreasing, especially the population found in Săbed where the upper part of the hill was transformed into an orchard and the grasslands are intensely pastured.

***Cephalaria radiata*** Griseb. et Schenk *Festuco-Brometea*; H, End;  $2n=...$ ;  $L_7T_6U_3R_7$ ; entomophily. (NT)

One of the most typical Transylvanian endemic species, *Cephalaria radiata* (Fig. 6) is a perennial species meso-xeric to mesic, calciphile (on limestones or basalts) that grows in the area of oak forests, in grasslands developed on marls, often on slopes with various inclinations and exposures.



Fig. 6. *Cephalaria radiata* (Foto Silvia Oroian, Mihaela Sămărghițan)

In the observation points the species was identified in associations that are characteristic to 4 types of habitats: 6210\* Semi-natural dry grasslands and scrubland facies on calcareous substrates *Festuco-Brometea* (\*important orchid sites), 6240\* Sub-pannonic steppic grasslands, 62C0\* Ponto-Sarmatic Steppes and 40A0\* Subcontinental peri-Pannonic scrubs.

Out of the endemic species studied in this area, this is one of the most wide-spread, being recorded in 6 localities (Cozma, Fărăgău, Lechincioara, Săbed, Ulieș, Zau de Câmpie) (Fig. 5). The species was found in the composition of: *Stipetum pulcherrimae* Soó 1942, *Medicagini minimae-Festucetum valesiaca* Wagner 1941, *Brachypodio pinnati-Festucetum rupicolae* Ghișa 1962, *Polygalo majoris-Brachypodietum pinnati* Wagner 1941, *Botriochloëtum ischaemi* (Krist. 1937) Pop 1977 and *Prunetum tenellae* Soó 1947 associations. Also in bibliography the species is mentioned from 6 localities (Săbed-Culpiu, Culpiu, Pănet, Lechincioara, Săbed, Band), being part of the conenoses that characterize: *Stipetum pulcherrimae*, *Potentillo arenariae-Stipetum capillatae*, *Cariceto humilis-Festucetum rupicolae*, *Prunetum tenellae* associations (Kovacs, 2008-2009).

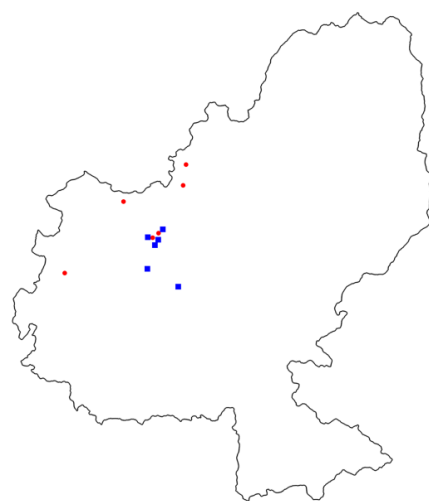


Fig. 5. The distribution of *Cephalaria radiata* in the studied area



The most frequent species noted in the area beside *Cephalaria radiata* were those specific to the *Cirsio-Brachypodion* alliance, *Festucetalia rupicolae*, *Festucetalia valesiaca* orders, and *Festuco-Brometea* class, which emphasize the xerophilous character of these grasslands. The species was found as well in the shrubs coenoses of *Prunus tenella* and *Prunus fruticosa*.

Also in the grasslands where *Cephalaria radiata* was identified, a number of rare, threatened species listed in National Red Lists were noted: *Astragalus exscapus* var. *transylvanicus*, *Salvia transsylvanica*, *Crambe tataria*, *Jurinea mollis* ssp. *transylvanica*, *Cephalaria radiata*, *Salvia nutans*, *Dictamnus albus*, *Iris aphylla*, *Adonis vernalis*, *Orchis morio*, *Orchis coriophora*, *Gymnadenia conopsea*.

The presence of these rare plants in the studied grasslands gives them a high conservation value.

The populations of *Cephalaria radiata* are well preserved in the most observation points. The main pressures/threats concerning both the habitat of the species and the population dynamics are related to land use: both abandonment of the use (especially lack of mowing) and intensive grazing.

Concerning the conservation status, the field observations show that the populations are decreasing but they are in an average or good state of conservation

#### ***Delphinium simonkaianum* Pawl. (Fig. 8)**

- *Seslerion rigidae*, *Cynosurion*, H, End; 2n=...; L<sub>6</sub>T<sub>5</sub>U<sub>2</sub>R<sub>7</sub>.

It is a rare perennial species that can be found in oak and beech belt on calcareous rocks. It is an endemic species in Romania's flora.

The species was identified at Băla-Ercea (Fig. 7), in the forest called Copăceni, where the presence of the *Delphinium simonkaianum* Pawl. species, a threatened endemic taxon, was reported in 1953. In 2011, the taxon was rediscovered, after 58 years, on the upper side of the Copăcel slope, in a mixed oak and hornbeam forest, in the habitat: **91Y0** Dacian oak-hornbeam forests (Oroian, Cotoară, 2012). Here the species was identified in conenoses belonging to *Melampyro bihariensis-Carpinetum* (Borza 1941) Soó 1964 em. Coldea 1975 association. In this area the association is well represented, the tree layer has coverage of 80-90% and it is dominated by *Quercus petraea* and *Carpinus betulus*, species characteristic of the association, along with *Quercus robur*, *Prunus avium*, *Acer campestre*, *Ulmus glabra*. The second

layer is represented by shrubs species such as: *Crataegus monogyna*, *Corylus avellana*, *Cornus mas*, *Ligustrum vulgare*, *Rosa canina*, *Sambucus nigra*, *Staphylea pinnata*. This layer is poor in specimens; most of them are present particularly in forest clearings or at the edge of the forest. The herbaceous layer is well developed, forming an almost continuous cover and it is formed by species as: *Asarum europaeum*, *Convallaria majalis*, *Dactylis glomerata* ssp. *aschersoniana*, *Galium odoratum*, *Melampyrum bihariense*, *Stellaria holostea*, *Aconitum anthora*, *Aconitum moldavicum*, *Lilium martagon*, *Arum orientale*. Beside these, some rare, endangered plants were also identified in the forest: *Fritillaria orientalis*, *Galanthus nivalis*, *Adonis vernalis*.

The population of *D. simonkaianum* is represented by few specimens covering a small area. The anthropic factor has a negative influence on the habitat and also on population size. Although it is not numerous the population is in a good state of preservation.

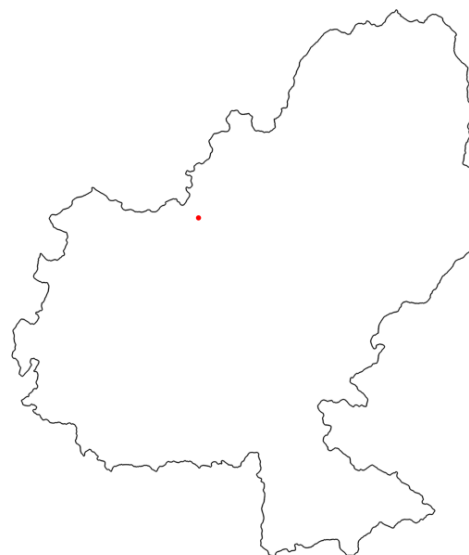


Fig. 7. The distribution of *Delphinium simonkaianum* in the studied area



Fig. 8. *Delphinium simonkaianum* (Foto: Silvia Oroian)

***Jurinea mollis* (L.) Reichenb. ssp. *transylvanica*** (Spreng.) Nyman (Fig. 10)

- *Stipion lessingianae*; H, subEnd; 2n=30; L<sub>8</sub>T<sub>6</sub>U<sub>3</sub>R<sub>7</sub>N<sub>3</sub>; entomophily. (NT)

This is a perennial subendemic species that grows on sunny and dry places in grasslands or shrubs, from steppe to the oak level.

In the Mureș part of the Transylvanian Plain the presence of subspecies was noted frequently in: Cozma, Fărăgău, Herghelia, Lechincioara, Morești, Săbed, Ulieș. The subspecies is also mentioned in the bibliography on the studied territory at: Band, Lechincioara, Săbed, Grebenișu de Câmpie, Săbed-Culpiu, Șincai (Kovacs, 2008-2009). (Fig. 9)

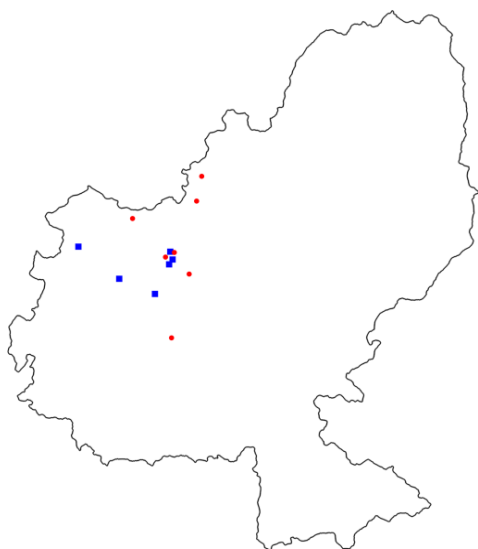


Fig. 9: The distribution of *Jurinea mollis* ssp. *transylvanica* in the studied area

The Natura 2000 habitats types in which this species was found in the study area are: 6210\* Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometea*) (\*important orchid sites) (*Brachypodio pinnati-Festucetum rupicolae* Ghișa 1962, *Polygalo majoris-Brachypodietum pinnati* Wagner 1941 associations), 6240\* Sub-pannonic steppic grasslands (in *Medicagini minimae-Festucetum valesiaca*e Wagner 1941, *Botriochloëtum ischaemi* (Krist. 1937) Pop 1977 associations) and 62C0\* Ponto-Sarmatic Steppes (*Stipetum pulcherrimae* Soó 1942 association). In the observation points where the specimens of *Jurinea mollis* ssp. *transylvanica* was identified were also noted accompanying species characteristic for *Festuco-Brometea* class, *Stipion lessingianae*, *Festucion valesiaca*e alliance and *Festucetalia valesiaca*e order. Also a number of rare plants with various zoological category were identified including species like: *Astragalus excapus* var. *transylvanicus*, *Astragalus dasyanthus*, *Centaurea trinervia*, *Crambe tataria*, *Cephalaria radiata*, *Echium maculatum*, *Salvia nutans*, *Salvia transylvanica*, *Dictamnus albus*, *Iris aphylla*, *Adonis vernalis* etc.

The main pressures and threats while targeting both species' habitat and dynamics of effective population size are related to land use both abandoning land (in particular the lack of mowing) and intensive grazing of sheep.

The conservation statuses of the identified populations are unfavorable-inadequate and for their preservation future steps following adequate management measures must be implemented.



Fig. 10: *Jurinea mollis* ssp. *transylvanica* in Cozma (Foto: Silvia Oroian)

***Pulsatilla vulgaris* Mill. ssp. *grandis* (Wender.) Zämelis** (Fig. 12)

- *Festucetalia valesiaca*e; H, Eur (centr.)-End.; 2n=32, P; L<sub>9</sub>T<sub>6</sub>U<sub>3</sub>R<sub>7</sub>N<sub>1</sub>. (NT)

This is a perennial species that can be found in xerophilous grasslands, on rocky slopes, mostly in sylvo-steppe.

In the study area this subspecies was identified at Săbed and Morești in the dry grasslands on the steppic slopes with S-SE exposure and 20-25 degree inclination, at an altitude of about 450 meters. The bibliographic data mentioned the presence of this subspecies also in Lechincioara (Kovacs, 2008-2009). (Fig. 11)

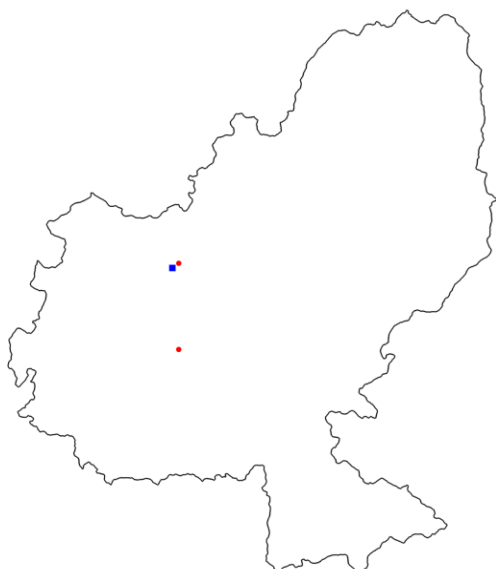


Fig. 11: The distribution of *Pulsatilla vulgaris* ssp. *grandis* in the studied area

These coenoses with *P. vulgaris* ssp. *grandis* were framed in two plants associations: *Medicagini minimaie-Festucetum valesiacaie* Wagner 1941 and *Stipetum pulcherrimae* Soó 1942 belonging to Festuco-Brometea class. These associations are characteristic of two types of Natura habitats: 6240\* Sub-pannonic steppic grasslands and 62C0\* Ponto-Sarmatic Steppes. The species identified on the observation points are the ones characteristic to these habitat types: *Vinca herbacea*, *Salvia austriaca*, *Festuca valesiaca*, *Centaurea biebersteinii* ssp. *biebersteinii*, *Jurinea mollis*, *Inula ensifolia* and *Verbascum phoeniceum*. Outspread species characteristic to the dry grasslands belonging to Festuco-Brometea class, such as: *Euphorbia cyparissias*, *Teucrium chamaedrys*, *Eryngium campestre*, *Medicago falcate* were noted. The habitats are characterized by a great wealth in species assigned to different zoological categories: *Agrimonia pilosa*, *Crambe tatarica*, *Pulsatilla pratensis* ssp. *nigricans*, *Pulsatilla vulgaris* ssp. *grandis*, *Astragalus exscapus* var. *transsilvanicus*, *Cephalaria radiata*, *Salvia transsylvanica*, *Adonis vernalis*, *Serratula radiata*, *Iris aphylla*, *Salvia nutans*, *Dictamnus albus*, *Prunus tenella*, and *Orchis morio*. The presence of these species makes these habitats have a high conservation value.

The natural range of habitats and areas they cover within this site are slightly decreasing due to intensive grazing or sheepfolds and also due to the extension of agricultural land. As a result, the state of conservation of the identified populations of *Pulsatilla vulgaris* ssp. *grandis* is unfavorable-bad.



Fig. 12: *Pulsatilla vulgaris* ssp. *grandis* in Săbed (Foto: Silvia Oroian)

*Salvia transsylvanica* (Schur ex Griseb.) Schur (Fig. 14)

- *Stipion lessingianaie*; H, End;  $2n=...$ ;  $L_8T_6U_3R_7N_3$ ; entomophily, proterandry, epizoochory. (NT)

This endemic species can be found sporadically in dry grasslands growing on eroded soils, from sylvo-steppe to oak forest level.

In the study area it was identified in 8 localities: Balda, Bozed, Chețani, Fărăgău, Miheșu de Cîmpie, Săbed, Ulieș, Zau de Cîmpie (Fig. 13). The most numerous population is the one identified in Zau de Cîmpie, in the other localities only several individuals were noted. The bibliographic data record this species in several associations: *Stipetum lessingianaie*, *Stipetum pulcherrimae*, *Potentillo arenariaie-Stipetum capillataie*, *Cariceto humilis-Festucetum rupicolaie*, *Botriochloetum ischaemi*, *Prunetum tenellae* studied in 5 localities: Band, Lechincioara, Culpiu, Mădăraș, Săbed-Culpiu, (Kovacs, 2008-2009).

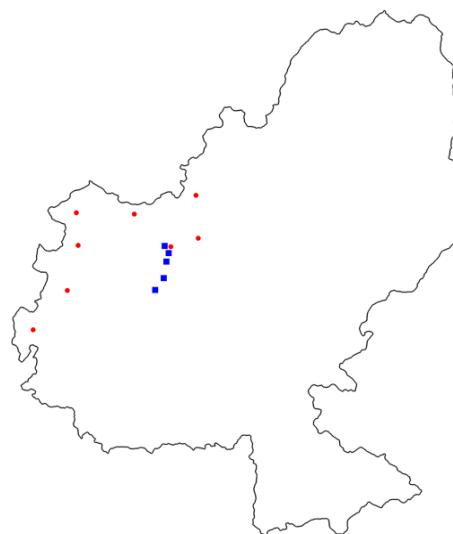


Fig. 13: The distribution of *Salvia transsylvanica* in the studied area

*Salvia transsylvanica*, in the observation points, prefers the sunny slopes south and south-west faced with various inclinations between 20-40 degrees.

The conenoses where this species occur were framed in 3 types of Natura 2000 habitats: 6240\* Sub-pannonic steppic grasslands in the association *Medicagini minimae-Festucetum valesiacae* Wagner 1941, 62C0\* Ponto-Sarmatic Steppes (*Stipetum pulcherrimae* Soó 1942 association) and 40A0\* Subcontinental peri-Pannonic scrub (*Prunetum tenellae* Soó 1947 association). Among the species recorded alongside this endemic species we observed: *Festuca valesiaca*, *Allium flavum*, *Iris pumila*, *Teucrium chamaedrys*, *Medicago minima*, *Helianthemum canum*, *Potentilla arenaria*, *Artemisia austriaca*, *Astragalus austriacus*, *A. onobrychis*, *Oxytropis pilosa*, *Carex humilis*, *Festuca rupicola*, *Stipa pulcherrima*, *Stipa capillata*, *Botriochloa ischaemum*, *Prunus tenella* etc. In the floristic composition of these coenoses we reference also the presence of some rare threatened species such as: *Astragalus excapus* var. *transylvanicus*, *Crambe tataria*, *Jurinea mollis* ssp. *transylvanica*, *Cephalaria radiata*, *Salvia nutans*, *Dictamnus albus*, *Iris aphylla*, *Adonis vernalis*, *Orchis morio*, *Gymnadenia conopsea* conferring a good conservation value.



Fig. 14: *Salvia transsylvanica* in Ulieş (Foto: Silvia Oroian)

The potential threats/risk factors estimated following the field studies, which involve both the species habitat and the population size dynamics, are particularly caused by anthropogenic factors: extension of scrub, ruderalisation of vegetation, penetration of invasive species. To these, activities related to land use are added as intensive sheep and goat grazing. These factors can lead to the deterioration and replacement of the habitat, which affects the long-term perpetuation of the species individuals. The populations are in an average and good state of preservation, but are expected to decrease in the future.

## CONCLUSIONS:

Of the investigated area, 7 endemic and subendemic species were identified: *Aconitum lycoctonum* L. em. Koelle ssp. *moldavicum* (Hacq.) Jalas, *Astragalus excapus* L. ssp. *transylvanicus* (Barth) Jav., *Cephalaria radiata* Griseb. et Schenk, *Delphinium simonkaianum* Pawł., *Jurinea mollis* (L.) Reichenb. ssp. *transylvanica* (Spreng.) Nyman, *Pulsatilla vulgaris* Mill. ssp. *grandis* (Wender.) Zämelis and *Salvia transsylvanica* (Schur ex Griseb.) Schur.

Regarding their conservation status six of the species are classified as NT (near threatened) – Likely to become endangered in the near future.

Among the identified species, the most widespread are *Cephalaria radiata*, *Jurinea mollis* ssp. *transylvanica* and *Salvia transsylvanica* which occur most often on the studied dry grasslands.

These seven endemic/subendemic species belong to phytocoenosis framed into 5 types of Natura 2000 habitats of community interest (6210\* Semi-natural dry grasslands and scrubland facies on calcareous substrates *Festuco-Brometea* (\*important orchid sites), 6240\* Sub-pannonic steppic grasslands, 62C0\* Ponto-Sarmatic Steppes, 40A0\* Subcontinental peri-Pannonic scrub and 91Y0 Dacian oak-hornbeam forests).

The general trend of conservation status is unfavourable-inadequate, the populations of endemic/subendemic species are predominantly in an average and good state of preservation, but in the future the populations are expected to decrease.

Besides the endemic/subendemic species, within the plant study area we identified different plant species important in phyto-geographical terms and rare species present in the international and national red lists.

The main factors that have a negative influence on the both species' habitat and dynamics of effective population size are intensive grazing, ruderalisation and abandoning land (in particular the lack of mowing).

Because endemic species have geographically restricted distributions, they tend to be highly vulnerable to extinction as a result of the activities of humans. To prevent that, adequate management measures are required for the restoration, maintenance or improvement of a favorable conservation status of species and habitats in the studied territory.

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