

CHOROLOGY, ECOLOGY AND PHYTOSOCIOLOGY OF THE ALPINE SEDGE SPECIES IN NORTHERN OLTENIA, ROMANIA

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Abstract

The alpine sedge (*Carex curvula* All.) is an endemic species, characteristic of alpine meadows. This species of conservation interest has a limited distribution at European level, being found in: the Alps, the Pyrenees, the French Massif Central, the Carpathians and part of the highest mountains in the Balkans. Alpine sedge grow on flat or slightly sloping terrain, on humic-silicate soils, strongly acidophilic, oligotrophic and covered with snow until the beginning of summer. In Oltenia, this species is found in the Parâng, Țarcu, Godeanu, Cernei, Lotru and the Căpățâanii Mountains. From a phytocoenotic point of view, this alpine meadow species forms the plant community *Primulo-Caricetum curvulae* Br.-Bl. 1926 em Oberd. 1957, whose composition and floristic physiognomy vary depending on the ecological conditions existing in the different mountain groups in Oltenia. At the same time, this species is part of the floristic composition of other alpine plant communities of *Ericaceae* and other types of secondary alpine meadows, the species presenting a special conservation interest.

Key words: chorology, alpine sedge, phytosociology, distribution, plant communities.

INTRODUCTION

In Europe, *Carex curvula* occurs as the following infrataxa: *C. curvula* ssp. *curvula* and *C. curvula* ssp. *rosae*, especially in the floristic structure of the alpine tundra, but often descends to the subalpine level.

Therefore, the alpine sedge (*Carex curvula* All.) is characteristic species of alpine meadows and has a wide distribution in Europe, especially in the alpine zone of the mountains: Alps, Pyrenees, Massif Central France, Carpathians and on the higher peaks of some mountain ranges in Albania, Bosnia-Herzegovina, Bulgaria and Slovenia. In the Carpathian Mountains the *Carex curvula* ssp. *curvula* infrataxon is found. In Romania the species is found in the Țarcu, Godeanu, Cernei, Retezat, Parâng, Cibin, Căpățâanii, Făgăraș, Iezer-Păpusa, Piatra Craiului and Bucegi Mountains, Rodnei Mountains. From Oltenia, alpine sedge meadows were cited from the Țarcu, Godeanu and Cernei Mountains, by Simionkai (1877), Grecescu (1898), Safta (1943), Buia (1943), Popescu P. C. & Bujoreanu G. (1957), Pop, Nemeș, Boșcaiu et al. (1967), Boșcaiu (1942, 1971), Lupșa (1967), Niculescu et al. (1965), Cernelea et al. (1985) from the following locations: Babei Peak, Bloju

Peak, Căleanu Peak, Gugu Peak, Bulzu, Micușă, Cununii Peak, Pietrei Peak, Țarcu Peak, Vulturul Peak, Godeanu Peak, Moraru Peak, Bloju Mountain, Stâna Mare Mountain, Bulzu, between Gugu and Muraru, Micușă, Stâna Mare Mountain, Borăscu Platform, Gârdomanului Plateau, Borăscu Mic Peak, Gârdomanului Peak, Godeanu Peak, Gugu Peak, Mâțului Peak, Moraru Peak, Paltina Peak, Scărișoara Peak.

The studied plant community, built by *Carex curvula*, was also cited from the Parâng Massif, where it occupies the largest area, in the upper basin of the Gilort, meeting on Parâng Peak, Cârja Peak, Gruitul Peak, the Bengai Coast, on Cioara Mountain, Iezeru, Cârja, Mândra, Dengherul, Picleșă, Gruiu, Bălescu, Urdele, Tidvele, Setea Mare, Setea Mică, Mohorul and Păpușă, between 2100-2518 m (Buia, 1943; Buia et al., 1959; Buia et al., 1963; Aur et al., 2001; Resmeriță et al., 1977; Safta, I., 1943; Samiolă, 1960; Sanda et al., 1989; Șerbănescu et al., 1966). Since 2004, important phytocoenoses of *Carex curvula* have been identified and analyzed in the Căpățâanii Mountains (Niculescu, 2004). Well-individualized phytocoenoses of *Carex curvula* have been cited from the Lotrului Mountains – Șteflești and Frumoasa Peaks (Drăgulescu, 1995). In order to contribute to the study of the flora and practical vegetation of

Oltenia, as well as to prevent its reduction through irrational exploitation of mountain meadows, we began a study on the chorology, ecology, phytosociology and syndynamics of the plant community built by alpine sedge, a species with unique morpho-anatomical, physiological, ecological and geobotanical characteristics.

MATERIALS AND METHODS

The territory under study is located in the Southern Carpathians in northern Oltenia, in the subalpine and alpine levels, at over 2000 m altitude, where the eco-pedo-climatic conditions allow the development of the *Carex curvula* species.

For the study of the vegetal carpet, we have used methods of phyto-sociologic research characteristic to the Central European phyto-sociologic School, which was based on the principles and methods elaborated by J. Braun-Blanquet (1928) and adapted by A. Borza (1934) to the particularities of our country's vegetation. The plant communities were identified and distinguished according to the characteristic, edifying, dominant and differential species. For the identification of the plant communities and the coenotaxonomic classification, synthesis works of Mucina et al. (2016), Rodwell (2002) were used. Regarding the studies carried out on the vegetation dynamics, they were taken into account according to the methodology described in the works developed by Cristea, Pedrotti and Gafta (1993; 2004). Following the research on the vegetal carpet, we will take into account its analysis and characterization from a structural, physiognomic and syndamic point of view in close correlation with the profound eco-pedo-climatic changes of recent years (Niculescu, 2025).

RESULTS AND DISCUSSIONS

Following studies carried out in the area included in the mountainous area of northern Oltenia, the plant community *Primulo-Caricetum curvulae* Br.-Bl. 1926 em Oberd. 1957 was identified and analyzed, which was classified in the *Juncetea trifidi* Klika et Hada class. *Carx curvula* meadows were identified and analyzed in the Godeanu Mountains on

Godeanu and Gîrdomanul Peaks, in the Parang massif, on Parangul Mare Peak, Parangul Mic Peak, Tidvele, Carja, Urdele, Dengherul, Mandra, Setea Mare, Setea Mică, Mohorul and Păpușa, in the Căpățânii Mountains, in the upper basin of Luncavăț, on Ursu Peak, Căpățâna Peak and Coșana Peak and in the Lotrului Mountains - Șteflești Peak, Cristești Peak, Baluțu Peak, Puru Mountain and Piatra Albă. Following studies conducted in the Parâng Massif, we can mention that *Carex curvula* meadows have the best development and a well-individualized floristic structure with over 30 species, the lowest altitude at which phytocenoses characteristic of these meadows can be found is 2100. In this area, alongside the edifying species, *Carex curvula* and *Primula minima*, some species of *Cyperaceae* and *Juncaceae* are found with high abundance-dominance: *Juncus trifidus*, *Luzula sudetica*, *Luzula spicata*, *Campanula alpina*, *Gentiana verna*, *Hieracium alpinum*, *Gnaphalium supinum*, *Phyteuma nanum*, *Chrysanthemum alpinum*, *Geum montanum*, *Potentilla aurea* ssp. *chrysocraspeda*, *Ligusticum multelina* are cormophyte species that are not absent from the floristic composition of the phytocenosele analyzed, thus being characterized by a high constancy (K) and abundance-dominance (AD m). *Festuca airoides*, *Agrostis rupestris*, *Nardus stricta* and *Avenastrum versicolor* are dominant species within this type of meadow, under certain eco-pedo-climatic conditions the phytocenoses built by these grasses have the capacity to develop excessively, to evolve towards characteristic meadows, replacing *Carex curvula* meadows, especially at lower altitudes, below 2200 m. In the northwestern part of Oltenia, *Carex curvula* meadows occupy quite important areas, they being identified following studies carried out in the period 2014-2024 on Vf. Godeanu, Gîrdomanul. In the Godeanu Mountains, the phytocenoses with *Carex curvula* have a floristic structure in which a small number of species adapted to develop on very acidic oligotrophic soils, on ridges and plateaus or steep slopes exposed to low temperatures are present. During the surveys carried out on the Godeanu Peak and Gîrdomanul, it was found that, along with the edifying species, the following are also found with a high constant: *Festuca airoidis*, *Juncus*

trifidus, *Oreochloa disticha*, *Pedicularis verticillata*, *Phyteuma confusum*, *Avenula versicolor*, *Gnaphalium supinum*, *Veronica bellidioides*, *Potentilla aurea* ssp. *chrysocraspedae*, *Ligusticum mutellina*, *Campanula alpina*, *Cetraria islandica*, *Thamnolia vermicularis*.

In the Lotrului Mountains in Northern Oltenia, in the transition zone to Transylvania, we have carried out complex studies in recent years on the mountain, subalpine and alpine meadows, especially in the Lotrului Valley, the Frumoasa Valley, Mănăileasa and Latorița. Regarding the *Carex curvula* species, we can mention that the most important populations of this species that build well-defined phytocenoses are found in the area of Șteflești Peak (2242 m): the species being dominant on these high plateaus. On smaller areas, the species was identified on Cristești Peak (2202 m) but also in the area of Baluțu, Puru and Piatra Albă Peak, at over 2000 m altitude.

In the Căpățânii Mountains, in the upper basin of the Luncavăț, the *Primulo-Caricetum curvulae* plant community is rarely found, occupying small areas on the peaks and ridges exceeding 2000 m altitude. The hornbeam meadows take root on flat or slightly sloping terrain, on humiciferous-iluvial podzol soils, oligotrophic and covered with snow until the beginning of summer. In the Căpățânii Mountains, studies were carried out to re-evaluate and analyze the floristic composition and synphytonomics of the *Carex curvula* phytocenoses on Ursu Peak (2124 m), Coșana Peak (2004 m), Căpățâna Peak (2113 m) and Balota Peak (2094 m), but they were not shown in the phytosociological table, because they occupy much smaller areas.

The vegetation coverage varies primarily with altitude and is in close correlation with the eco-pedoclimatic conditions of each phytocenosis, being between being between 70-100%. In the phytocenoses analyzed in the Căpățânii Mountains, a smaller number of species are found in the floristic structure, so besides the two edifying species of the plant community, *Carex curvula* and *Primula minima*, the following species are also found with high constancy: *Juncus trifidus*, *Oreochloa disticha*, *Hieracium alpinum*, *H. villosum*, *Campanula alpina*, *Festuca airoides*, *Agrostis rupestris*,

Luzula spicata, *Carex atrata*, *Cetraria islandica*. Within this plant community, hemicryptophytes predominate as bioforms, and as floristic elements, the largest share is held by circumpolar species. From an ecological point of view, the meadows, following the analyses carried out within the phytocenoses of this plant community, are dominated by mesophilous, hexistothermic and acidophilic species.

Karyologically, the most numerous are polyploid species, the diploidy index has the value of 0.70.

The dendrogram of the *Primulo-Caricetum curvulae* Br.-Bl. 1926 em Oberd. 1957 (Figure 1) plant community highlights the grouping of the surveys into two well-individualized clusters, whose Bray-Curtis quantitative index has very close values, ranging between 0.31 and 0.27, this leading to the idea that, within the association, the floristic composition of the phytocenoses is very homogeneous and stable. The first cluster groups the surveys: 1, 3, 2, 5, 9 and 7, and the second 4, 8, 6 and 10. The separation of the surveys into the two clusters is very obvious, the first cluster groups the surveys in which the abundance-dominance of the *Carex curvula* species has a value of 4, in the second cluster this value being 5. Survey 2 within the first cluster is separated based on the *Primula minima* species, being the only survey in which this has AD=1-2. Also in this cluster, the separation of a subcluster with releves 5, 9 and 7 is observed, this grouping being due to the abundance-dominance value of the *Juncus trifidus* species which has the value 1. Releve 6 within the second cluster is separated by the absence of the species *Oreochloa disticha* and *Avenastrum versicolor*.

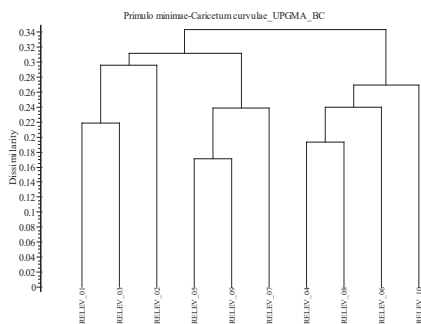


Figure 1. Dendrograma of the *Primula minima*-*Caricetum curvulae* plant community

Table 1. Floristic composition of the *Primula minima*-*Caricetum curvulae* Br.-Bl. 1926 em. Oberd. 1957 plant community

No. of relevée	1	2	3	4	5	6	7	8	9	10	K
Altitude m.o.s. (x 10 m)	212	212	212	223	223	230	232	225	240	221	
Exposure	SV	V	-	-	-	NE	-	E	-	-	
Inclination (in grades)	10	5	-	-	-	10	-	5	-	-	
Canopy (%)	90	90	85	90	95	85	90	90	90	90	
Area (m ²)	10	10	25	25	100	10	25	100	100	25	
Char. ass.											
<i>Carex curvula</i>	4	4	4	4	4	4	4	4	4	4	V
<i>Primula minima</i>	+	1	+	+	+	+	+	+	+	+	V
Caricion et Caricetalia curvulae											
<i>Agrostis rupestris</i>	+	+	-	-	+	+	1	+	+	+	IV
<i>Festuca airoides</i>	+	1	+	+	1	+	1	+	1	+	V
<i>Oreochloa disticha</i>	+	1	+	+	1	-	+	+	+	+	V
<i>Phyteuma confusum</i>	+	+	+	+	+	+	+	-	+	-	IV
<i>Campanula alpina</i> ssp.											
<i>bucegiensis</i>	+	+	+	+	+	+	-	+	+	-	IV
<i>Luzula spicata</i>	+	-	+	+	+	+	+	-	+	-	IV
<i>Carex atrata</i>	1	+	+	+	+	+	+	+	+	+	V
<i>Avenastrum versicolor</i>	+	+	1	1	1	+	1	+	1	+	V
Juncetea trifidii											
<i>Juncus trifidus</i>	1	1	+	+	1	+	1	+	1	+	V
<i>Pulsatilla alba</i>	-	-	-	+	+	+	+	+	+	+	IV
<i>Hieracium alpinum</i>	+	+	+	+	+	-	-	+	+	-	IV
Loiseleurio-Vaccinion											
<i>Vaccinium gaultherioides</i>	+	-	+	-	-	+	-	+	-	+	III
<i>Loiseleuria procumbens</i>	+	-	+	+	+	-	-	+	-	-	III
<i>Cetraria islandica</i>	+	+	+	1	+	1	1	+	1	1	V
<i>Thamnolia vermicularis</i>	+	+	+	1	1	1	+	+	1	1	V
Androsacion et Androsacetalia											
<i>Poa laxa</i>	+	+	+	+	-	-	+	-	-	-	III
<i>Veronica baumgartenii</i>	+	+	-	-	+	-	+	-	-	-	II
Potentillo-Nardion											
<i>Ligusticum mutellina</i>	-	+	-	+	-	+	-	-	+	-	II
<i>Potentilla aurea</i> ssp.											
<i>chrysocraspeda</i>	+	+	+	+	-	+	+	+	+	-	IV
<i>Pedicularis verticillata</i>	+	-	-	+	-	+	+	+	-	-	III
<i>Thymus balcanus</i>	-	-	-	+	-	+	.	+	-	-	II
<i>Geum montanum</i>	+	+	+	-	+	+	+	-	+	+	IV
<i>Poa media</i>	+	+	-	-	-	+	-	-	+	-	II
<i>Poa alpina</i>	+	-	-	+	-	-	-	-	+	+	II
Nadetalia et Nardo-Callunetea											
<i>Nardus stricta</i>	-	+	-	-	+	+	-	+	+	-	III
<i>Festuca nigrescens</i>	+	+	-	.	-	+	+	-	-	+	III
Salicetalia herbaceae s.l.											
<i>Gnaphalium supium</i>	-	+	+	-	+	-	-	+	+	-	III
Variae Syntaxa											
<i>Carex sempervirens</i>	-	-	+	-	+	-	-	-	+	+	II
<i>Deschampsia flexuosa</i>	-	-	+	-	-	-	+	-	+	-	II
<i>Veronica bellidioides</i>	-	-	-	-	-	+	+	+	-	-	II
<i>Rhododendron myrtifolium</i>	+	+	+	-	-	-	-	-	-	-	II
<i>Hieracium villosum</i>	1	+	+	+	1	+	+	+	1	+	V
<i>Polytrichum juniperinum</i>	-	+	-	+	-	-	-	-	-	-	I

Place and data of the relevés: 1, 2, 3 - Ursu Peak, 18.07.2004; 4, 5 - Godeanu Peak, 20.06. 2023; 6, 7 - Setea Mare Peak, 15.06.2024; 8 - Urdele, 10.06.2018; 9 - Parangul Mare Peak, 23.06.2014; 10 - Șteflești Peak, 19.05.2019.

From a syndinamic point of view, these meadows can evolve in close correlation with the existing eco-pedo-climatic conditions towards meadows of *Agrostis rupestris* (when overgrazed), *Festuca airoides* or *Poa alpina* and sometimes they can be replaced by thickets of *Loiseleuria procumbens* or *Vaccinium gaultherioides*.

Importance. Horn meadows have a low economic importance, because in the studied territory they occupy small areas and have a low fodder productivity. However, considering that in the floristic composition there are several species with fodder value, even if the productivity is low, of approximately 2000kg/ha, the nutritional value is good, these meadows being very well consumed by sheep. However, at the end of June and in July, flocks of sheep are frequently found on many of the peaks and ridges on which we have conducted studies, at altitudes exceeding 2000 m.

CONCLUSIONS

Alpine sedge meadows take root on flat or slightly sloping terrain, on humic-silicate soils, strongly acidophilic, oligotrophic and covered with snow until the beginning of summer. In Oltenia this plant community is found in the Parâng Mountains, the Godeanu Mountains, Lotru Mountains and the Căpățâni Mountains. The *Primulo-Caricetum curvulae* plant community occupies larger or smaller areas in the Carpathians of Northern Oltenia, being in close correlation with the current eco-pedo-climatic conditions, meeting on the highest peaks and ridges exceeding 2000 m. From an economic point of view, the described association does not present a particular importance, having a low forage value. Intensive grazing has a negative impact on the biodiversity of the studied area, by decreasing the plant biomass and the number of species with forage value. The large number of sheepfolds as well as the too large number of animals in these sheepfolds can lead to the degradation of meadows with forage value and to the increasing expansion of sedges.

These meadows built by *Carex curvula* have a special role from a pedogenetic point of view but also from a floristic and conservative point of view, so they must be preserved with a favorable conservation status by applying adequate protection measures.

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