

ECOLOGY AND PHYTOSOCIOLOGY OF THE SPECIES *CIRSIIUM CANDELABRUM* GRISEB. (SECT. *CIRSIIUM*, ASTERACEAE, CYNAREAE) IN THE UPPER BASIN OF THE GILORT RIVER, CARPATHIANS MOUNTAINS

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Abstract

According to *Flora Europaea*, *Cirsium candelabrum* Griseb. (Asteraceae) includes the territory of the Balkans (Balkan endemic): Bosnia and Herzegovina, Montenegro, Albania, Serbia, Kosovo, Macedonia, Greece, Bulgaria and southwest Romania. *Cirsium candelabrum* occurs in ruderal habitats along roads, especially when natural vegetation has been removed by road construction or reconstruction. The species is found in intensely sunny and extremely dry areas, newly filled warehouses with construction waste, most often in urban and suburban areas. It is an anthropogenic species with tendencies to spread in natural habitats and agro-ecosystems. From a phytosociological point of view, two plant communities built by this species have been described in Europe: *Picridio hieracioidis-Cirsietum candelabri* Jasprica, Milović & Pandža 2015 (Croatia) and *Cirsietum candelabri* Matvejeva ex Čarni, Kostadinovski & Matevski 2001 (North Macedonia and Bosnia) and Herzegovina. In Romania, the species is found sporadically, especially on skeletal, sandy or stony soils, in Hunedoara, Caras-Severin, Mehedinți, Gorj and Vâlcea. From an ecological and phytosociological point of view, the species shows a relatively high variability corroborated with the current eco-pedo-climatic conditions.

Key words: *Cirsium candelabrum*, distribution, ecology, Gilort basin, phytosociology.

INTRODUCTION

The genus *Cirsium* Mill. is one of the largest genera in *Asteraceae*. It contains about 250 species, distributed in Europe, North Africa, Eastern, Central, and South-West Asia, and North and Central America (Davis & Parris, 1975; Petrak, 1979; Yıldız et al., 2009). In Romania, the genus *Cirsium* is represented by 19 taxa, 17 species and 2 subspecies. *Cirsium candelabrum* (Syn. *C. helmeum* Orph.) is a biennial plant that develops a rosette of basal leaves in the first year and a tall, much-branched stem with numerous flower heads in the following year. This plant has a very particular habitus and can be easily distinguished from other *Cirsium* species by the following characteristics: completely glabrous plants, stems very branched from the base to the synflorescence, capitula in groups of 4-12 at the tips of the later (Săvulescu coord, 1964; Werner, 1976). *Cirsium candelabrum* is a Balkan endemic that occurs in ruderal habitats along roads, especially where natural vegetation has been removed by road construction or reconstruction (Borovečki-Voska et al., 2022).

The species occurs in intensely sunny and extremely dry areas, freshly filled construction waste dumps, most often in urban and suburban areas. It is an anthropogenic species with tendencies to spread in natural habitats and agro-ecosystems. In the last 25 years, a lot of construction has been done in the upper basin of the Gilort, especially in the locality of Râncea, this tourist resort becoming a cluster of constructions, many of which were started and not completed, some of which ended up in ruins. This has led to the existence of many plots of land with garbage or waste resulting from construction activities in this area. A specific ruderal vegetation has also developed on these plots. The *Cirsium candelabrum* species that we studied in the period 2023-2024 has found a habitat conducive to development, with populations developed numerically, phenotypically, ecologically, physiologically, and cenotically in many areas. The aim of this study is to describe the chorology, ecology and phytosociology of *Cirsium candelabrum* Griseb. (*Asteraceae*) species in the upper basin of the Gilort, an area where this species has proven to be very widespread along the roads, mostly in

the areas of recent constructions, on the remains or waste collected from them, on the side of the roads, in sunny, drier places, participating in the floristic composition of the ruderal vegetation in this area.



Figure 1. *Cirsium candelabrum* in the upper basin of the Gilort river (Gorj County)

MATERIALS AND METHODS

Study area. The paper presents the results of the investigations carried out in the ruderal vegetation in the upper basin of the Gilort in the Parâng Mountains, in the Transalpina area, between Novaci and Rânca. From a conservative point of view, the studied territory is an integral part of the ROASC0128 Nordul Gorjului de Est protected area. The upper basin of the Gilort river has significant ecological and economic importance, being an area with high biodiversity and valuable natural resources. It is part of the Jiu River basin, which is characterized by a temperate-continental climate, with variations from north to south and from east to west. This leads to significant variations in temperature and precipitation throughout the year (<https://inundatii.ro>). The relief is characterized by steeply sloping mountain valleys, with predominantly clayey soils and undeveloped soils (<https://www.mmmediu.ro>). The mountainous area, which includes the upper basin of the Gilort, has lower average annual temperatures and more abundant precipitation compared to the plain areas. Precipitation is more frequent in the form of rain and snow, due

to the higher altitude (<https://legislatie.just.ro>). The relief is characterized by steeply sloping mountain valleys, with predominantly clayey soils and undeveloped soils (<https://www.mmmediu.ro>). The mountainous area, which includes the upper basin of the Gilort river, has lower average annual temperatures and more abundant precipitation compared to the plain areas. Precipitation is more frequent in the form of rain and snow, due to the higher altitude (<https://legislatie.just.ro>). The upper basin of the Gilort river presents a climatic characteristic specific to the mountainous areas of Romania. The main climatic characteristics of this region are described below. The average annual temperatures are lower compared to the plain areas, due to the high altitude. In general, the average annual temperature in the mountainous areas of Romania varies between 2°C and 6°C, but can be lower depending on the altitude. Precipitation is abundant, with a high annual average, which can exceed 1000 mm. This can fall in the form of rain or snow, depending on the season. The climate is influenced by cold air masses from the north and warm air from the south, which leads to significant variations in temperature and precipitation throughout the year.

Methods. In order to identify this species, we looked into: Romanian Flora, vol. IX (Săvulescu, T. coord., 1964), Flora Europaea, Vol. 4 (Werner, 1976) and Flora d'Italia (Pignatti, 1982). For the phytosociological studies, the following works developed in Romania by: Coldea, 1991 and Sanda et al., 1997, 2001 were used. Also, works developed at international level by: Mucina et al. (2016, 1993), Oberdorfer (1992) and Rodwell et al. (2002) were consulted.

RESULTS AND DISCUSSIONS

Chorology. *Cirsium candelabrum* popularly called *Candelabra thistle* is a biennial species widespread from the columnar to the upper montane levels. In the southern Carpathians of Romania, this species of Balkan origin is found only in the counties of Hunedoara, Caraș-Severin, Mehedinți, Gorj and Vâlcea. Information about the exact distribution of this species is limited, but it is known to be present in

the lowlands and promontories of the Carpathians, along the Danube. There are also mentions of its presence in the Iron Gates area, where a hybrid form, *Cirsium candelabrum* x *creticum* (Parascan, 2014), taxa subsequently validated, was also identified. There are studies on the ecology and distribution of some species of the genus *Cirsium* in Romania, such as *Cirsium candelabrum*, which were investigated in the context of the vascular flora of the country (Oprea, 2005). The same author mentions that Grințescu studied the presence of *Cirsium candelabrum* in Romania in 1932. The species is mentioned in the context of the chorology of some meridional species in the Carpathians (<https://pnscc.ro>). Regarding the present studies, the species was identified and analyzed in Gorj County, in the upper basin of the Gilort River in the Parâng Mountains, at an altitude of between 600-1750 m. Following field studies carried out in the period 2023-2024, it was observed that this species is quite common in this area, in places with stony or even sandy substrate, in littered places, with a lot of construction waste, on the side of paved or unpaved roads, on the side of paths, on degraded and anthropized lands due to construction works, in the immediate vicinity of buildings under construction or of buildings that have recently been put into use (Figures 2, 3).



Figure 2. *Cirsium candelabrum* in Rânca Resort (Gorj County)

The species was found in Novaci, Rânca Resort, along the Transalpina road, in the areas of La Cârlig and Lupii Râncii, Telescaun Păpușa,

Belvedere Transalpina, Panorama Parângul Mare, as well as in the stream basins: Dâlbănuț, Gilorțel, Romanu, Setea Mare.



Figure 3. *Cirsium candelabrum* in the Coadă Râncii area, on the edge of unfinished constructions

Ecology. *Candelabra thistle* is usually found on nutrient-poor, stony, and dry soils in resorts with lower temperatures, specific to the mountainous area of the Romanian Carpathians. The species can also be found in clearings, at the edge of forest habitats or in thickets, especially of blackthorn or blackberry, if the ecological and especially pedological conditions are favourable. In the researched territory, the species was also found in grassy ditches at the contact limit of the meadows of *Agrostis capillaris* and *Festuca rubra*, in the Romanu and Setea Mare streams, tributaries of the Gilort river (Figures 4, 5).



Figure 4. *Cirsium candelabrum* in the Romanu stream basin



Figure 5. *Cirsium candelabrum* in the Setea Mare stream basin

Phytosociological assessment of *Cirsium candelabrum* in plant communities

In Romania, the species is found sporadically, especially on skeletal, sandy or stony soils, in Hunedoara, Caraș-Severin, Mehedinți, Gorj and Vâlcea.

From an ecological and phytosociological point of view, the species shows a relatively high variability corroborated with the current eco-pedo-climatic conditions.

From a phytosociological point of view, two plant communities built by this species have been described in Europe: *Picrido hieracioidis-Cirsietum candelabri* Jasprica, Milović & Pandža 2015 from Croatia and *Cirsietum candelabri* Matvejeva ex Čarni, Kostadinovski & Matevski 2001 from North Macedonia and Bosnia and Herzegovina.

In Romania, there is no study on the coenology of this species.

In the upper basin of the Gilort River, *Candelabra thistle* is found in the floristic structure of ruderal plant communities, most frequently in *Tussilaginietum farfarae* Oberd.

1949 (Syn. *Poo-Tussilaginietum* Tx. 1931) plant community (Table 1).

This plant community is found on eroded land, broken banks, at the edge of roads and paths, next to streams, stony and sandy-loamy soils, on usually sloping slopes but also in the habitats produced by the degradation of larger areas in construction works alongside the edifying species *Tussilago farfara* meeting *Cirsium candelabrum* but also other ruderal species, some of them invasive: *Erigeron annuus*, *Conyza canadensis*, *Picris hieracioides*, *Chondrilla juncea*, *Cichorium intybus*, *Artemisia absinthium*, *Melilotus officinalis*, *M. albus*, *Crepis foetida*, *Ambrosia artemisiifolia*, *Lotus corniculatus*, *Daucus carota*, *Poa annua*, *Plantago major*, *Ranunculus repens*, *Rumex obtusifolius*, *Equisetum arvense*, etc.

From an ecological point of view, the structure of these phytocoenosis is dominated by mesophilic, micro-mesothermic and euryonic species.

We can mention that in many locations in the studied area, the species *Cirsium candelabrum* was found in populations of over 10 individuals, being accompanied by an assemblage of a few species, many of which are ruderal. Thus, our field studies show that a series of species in the coenotic structure that have a greater constancy and abundance-dominance: *Melilotus albus*, *Echium vulgare*, *Galeopsis speciosa*, *Urtica dioica*, *Lapsana communis*, *Cichorium intybus*, *Daucus carota*, *Echium vulgare*, *Senecio ovatus*, *Verbascum chaixii*, *Hypericum perforatum*, *Conyza canadensis*, *Scrophularia nodosa*, *Thymus pulegioides*.

This assemblage of species, from a phytosociological point of view, is similar to that characteristic of the plant community *Cirsietum candelabrum* Matvejeva ex Čarni, Kostadinovski & Matevski 2001 from North Macedonia (Haziri, 2015), Slovenia (Grošelj, 2012; Šilc & Čarni, 2012), Bosnia and Herzegovina.

In order to establish with certainty the presence of this plant community in the studied area, more field studies and at least two more growing seasons are necessary to establish the exact cenotic core and, most importantly, the syndromancy of the phytocoenosis that we consider to be built by *Cirsium candelabrum*.

Table 1 - *Tussilaginietum farfarae* Oberd. 1949 plant community

No. of relevée	1	2	3	4	5	6	7	8	9	10	K	ADm
Altitude m.o.s. (x 10 m)	70	85	110	120	110	75	90	120	90	110		
Exposure	10	5	10	10	7	5	10	15	15	10		
Inclination (in grades)	SE	SV	E	SE	NE	E	V	SE	S	E		
Canopy (%)	70	75	75	80	80	80	60	70	60	80		
Coverage of herbaceous layer (%)	30	10	20	25	25	20	25	20	10	30		
Char. ass.												
<i>Tussilago farfara</i>	3-4	4	4	4	5	4	4	4	4	5	V	66.25
Artemisietea et Artemisietea												
<i>Arctium lappa</i>	+	+	-	-	+	-	-	-	-	-	II	0.15
<i>Urtica dioica</i>	+	+	-	-	+	+	-	-	+	-	III	0.25
<i>Rumex obtusifolius</i>	-	-	+	+	-	-	+	+	-	+	III	0.25
<i>Cirsium candelabrum</i>	2	1	2	1	2	2	2	2	1	2	V	13.75
<i>Chondrilla juncea</i>	+	+	-	-	-	+	+	-	-	+	III	0.25
<i>Artemisia absinthium</i>	-	-	+	+	-	-	-	-	-	+	II	0.15
<i>Cichorium intybus</i>	+	+	-	-	+	-	+	-	-	+	III	0.25
<i>Crepis foetida</i>	+	-	+	+	+	+	-	+	-	+	IV	0.35
<i>Ambrosia artemisiifolia</i>	-	+	+	+	-	-	+	+	-	-	III	0.25
Chenopodietea												
<i>Daucus carota</i>	-	-	+	+	-	-	-	-	-	+	II	0.15
<i>Echium vulgare</i>	+	+	+	-	-	-	-	-	-	-	II	0.15
<i>Capsella bursa-pastoris</i>	+	+	-	-	-	+	-	-	-	-	II	0.15
Plantaginietea majoris												
<i>Lolium perenne</i>	+	+	-	-	-	+	+	-	-	+	III	0.25
<i>Plantago major</i>	+	+	+	-	+	-	+	+	-	+	IV	0.35
<i>Poa annua</i>	1	+	-	+	-	1	+	-	+	+	IV	1.25
<i>Ranunculus repens</i>	1	1	+	-	+	-	+	+	+	+	IV	1.30
<i>Rorippa sylvestris</i>	+	+	-	-	-	+	+	-	-	+	III	0.25
<i>Melilotus officinalis</i>	+	1	1-2	1	+	+	+	1	+	+	V	3.40
<i>Melilotus albus</i>	+	+	+	-	+	-	+	+	-	+	IV	0.35
<i>Cirsium arvense</i>	+	+	-	-	+	+	-	-	-	-	II	0.20
Molinio-Arrhenatheretea												
<i>Dactylis glomerata</i>	+	+	-	-	-	+	-	-	+	-	II	0.20
<i>Taraxacum officinale</i>	-	+	-	-	+	-	-	-	-	-	I	0.10
<i>Lotus corniculatus</i>	-	+	+	-	-	-	-	-	-	-	I	0.10
Variae Syntaxa												
<i>Deschampsia caespitosa</i>	-	+	+	+	-	-	-	+	+	-	III	0.25
<i>Ajuga reptans</i>	+	+	-	-	-	-	-	-	-	-	I	0.20
<i>Erigeron annuus</i>	1	1	+	-	+	-	+	+	+	+	IV	1.30
<i>Conyza canadensis</i>	1	+	-	+	-	1	+	-	+	+	IV	1.25
<i>Equisetum arvense</i>	1	1	1	+	+	+	1-2	+	+	V	3,40	1
<i>Rumex obtusifolius</i>	+	+	-	+	+	-	-	+	-	-	III	0.25

Place and data of the relevés: 1-10, Upper basin of the Gilort river, 17.V.2023, 23.VI.2023, 18.VII.2024, 10.VIII.2024

CONCLUSIONS

Cirsium candelabrum is a Balkan endemic species, in Romania it is found sporadically, especially in the southwestern part of Romania, preferring oligotrophic soils. Most often it settles on degraded surfaces, with waste resulting from construction sites. Sometimes it finds habitat suitable for development in some anthropized, dry meadows or on the edge of roads and paths, especially paved ones.

From a phytosociological point of view in the upper of the Gilort river, *Candelabra thistle* is found in the floristic structure of ruderal plant

communities, most frequently in the *Tussilaginietum farfarae* Oberd. 1949 (Syn. *Poo-Tussilaginietum* Tx. 1931) plant community but can also form the *Cirsietum candelabra* Matvejeva ex Čarni, Kostadinovski & Matevski 2001 plant community described in North Macedonia and Bosnia and Herzegovina. The species is of conservation interest and has a pedogenetic role.

Considering the physiognomy, structure and floristic composition of the phytocoenosis studied in the upper basin of the Gilort river, as well as the high frequency and abundance-dominance of this species, it is important to

carry out complex cenotic studies not only in the area but also in other locations in the southwest of the country where the species constantly vegetates.

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