

PHYSIOLOGICAL PARTICULARITIES OF HYGROPHILOUS PLANTS FROM DOMOGLED-CERNA VALLEY NATIONAL PARK

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Key words: hygrophylous plants, photosynthesis, transpiration, water content

ABSTRACT

The vegetal association Telekio-Petasitetum (Morariu 1967, Resmerita et Ratiu, 1974) is well represented in Domogled –Cerna Valley National Park, across Cerna's valley and its main tributaries. The two enlightening species, Petasites hybridus and Telekia speciosa are characterized by their tall stem, big leaf area and a high photosynthetic efficiency. The water regime of these plants is a characteristic for the hygrophilous species, with a high water content in tissues and raised transpiration values. Due to their evolved root system and their good capacity of regeneration, the plants that have been taken in this study have an important ecological role, forming true corridors along rivers and contributing at the consolidation of river banks.

INTRODUCTION

Domogled-Cerna Valley National Park is a protected area located on the administrative territory of Caras-Severin, Mehedinti and Gorj County, in the South-Western side of Romania.

The National Park stretches across Cerna Mountains and Godeanu Mountains (on the right side) and Vâlcan Mountains and Mehedinti Mountains (on the left side).

Domogled Cerna Valley founded in 1990 with an area of 61211 hectares was declared protected area on March 6, 2000.

The National Park is characterized by an impressive floristic diversity, due to the complexity of climatic conditions and physical and geographical aspects. The scenery found along the valley is gorgeous, being dominated by towering massifs like Godeanu, Cerna Mountains, Mehedinti and Vâlcan Mountains that watch over the Cerna river basin. Limestone formations combine here with rigid rocks and rich vegetation, creating a rare natural phenomenon that must be preserved.

The importance of the site consists in the richness of the flora, of great value in biological, geobotanical and ecological reports, especially regarding the association of various geographical origins species which also generated specific local vegetal associations (Nature 2000 Formulary).

Along Cerna's Valleys and its main tributaries: launa Mica, launa Mare, Craiova, Olanu, Carbunele, the high humidity and the semi-shadow conditions have created conditions for the installation of specific habitats. According to the standard Nature 2000 Formulary (<http://natura2000.mmediu.ro>), the habitat number 6430: *Communities from tall grass hygrophilous fringe of the plains, to mountain and alpine* represents 1% of the total site surface. Within this habitat we can find the vegetal association *Telekio-Petasitetum hybridi* (Morariu 1967, Resmerita et Ratiu, 1974).

Species recognition printed in a specific area characteristic to Romanian Carpathians has the considerable coverage, thanks to the large leaf system of the two

taxa giving the name of the association (Radutoiu D., Marinescu, E., 2014)

Radutoiu D. (2008) find this association in Cerna de Oltet region, and Radutoiu D. Marinescu E. (2014), in Tirnovu Mare-Latorita at 800-1100m altitude, in Nordic exposure.

MATERIAL AND METHODS

Experiences have been effectuated in may-july 2015 in Domogled-Cerna Valley Park, in three different locations:

- Olanu Valley, Lat N 45° 08' 16,9" , Long E 22° 38' 38,5" , 600 m altitude, S-E exposure

- Iana Mica Valley, Lat. N 45 ° 04 ' 15,7 " Long. E 22 ° 33 ' 44,2" , 672 m altitude, N exposure

- Cerna Valley, Lat. N 45 ° 05 ' 58,2 " Long. E 22 ° 38 ' 57,7" , 475 m altitude, E exposure.

For the determinations were used species *Petasites hybridus* (fig.1) and *Telekia speciosa* (fig. 2).

Petasites hybridus , ord *Asterales*, *Asteraceae* family is a perennial herbaceous plant with a distinctive smell. In the soil it has a thick, gnarled and branched rhizome from which start very long fleshy roots and also thick (1 cm across), cylindrical, smooth, having more than 1 m in length stolons. The plant flowers in March-April, before the appearance of leaves. Stems which carry the inflorescence have a height of 15-40 cm, are unbranched, straight, thick. Inflorescences are long, at the beginning of the flowering process they are dense, later they get sparse. Flowers are tubular, red, have a length of 10-11 mm. Leaves are very large, round, with a diameter of 50 cm, heart-shaped. The petiole is thick, 30-80 cm long, cylindrical, empty inside. The plant grows on stream banks, in wet places, around springs, from plain areas to mountains.

Telekia speciosa, ord *Asterales*, familia *Asteraceae*, is an perennial herb , with a height of 60-150 cm.

The stem is finely haired, green-violet, violet-dark or reddish brown and strongly scented.

Flowers form 5–7 cm (2–3 in.) wide, single flower-like capitula surrounded by involucre bracts. Capitulum's ray-florets yellowish orange, tongue-like; disk florets brownish yellow, tubular, small. Stamens 5. Gynoecium composed of 2 fused carpels. Involucre bracts overlapping in many rows, outer ones leafy, ovate, recurved, hairy; inner ones wide. Capitula borne in a lax corymbose cluster.

Leaves: Alternate, lower stalked, upper stalkless, almost amplexicaul. Blade lower down ovate, cordate based, 30–40 cm (12–16 in.) long, higher up widely elliptic, double-toothed, thin, rough underneath, almost glabrous on top.

Fruit: Bristly, glabrous achene crowned by a fine membranous ring (<http://www.luontoportti.com>).



Fig. 1. *Petasites hybridus* (original)



Fig. 2. *Telekia speciosa* (original)

On the biological material were determined: the intensity of leaf transpiration, the intensity of photosynthesis, the content of assimilatory pigments and the water content. Transpiration, photosynthesis and respiration in leaves were determined using LCi portable device.

The chlorophyll content of leaves was determined with the Minolta portable chlorophyll meter (SPAD units).

The water content and the dry matter were gravimetrically determined by maintaining the biological material to a temperature of 105°C until reaching a constant weight (Nicolae I., 2008).

RESULTS AND DISCUSSIONS

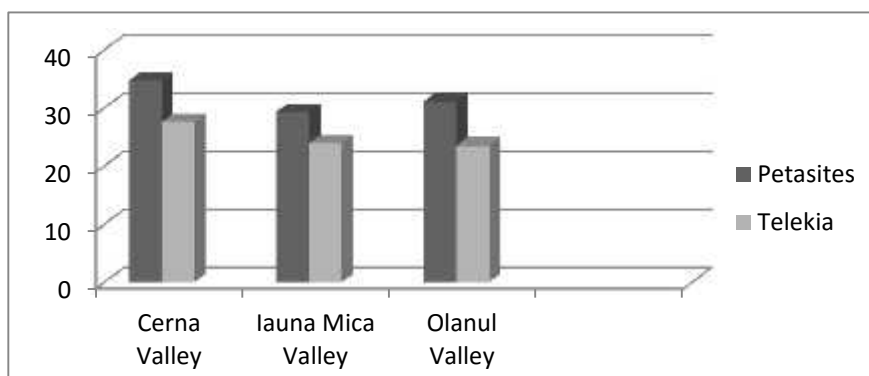
1. Photosynthesis

The intensity of leaf photosynthesis was determined at different hours of the day, data which was presented represents the average value of the conducted determinations. According to graph 1, the highest values of photosynthesis were recorded at leaves of *Petasites hybridus* from Cerna Valley. The higher air temperature, the east exposure and the lower altitude are the factors which favor the intensification of the process.

At *Telekia speciosa*, the intensity of photosynthesis maintains at high values but lower than those which were recorded at *Petasites*.

The high photosynthetic efficiency has a great importance, leading to the accumulation of a great quantity of biomass and to fast growths in short periods of time.

The light factor is not a limited one for these plants; they are able of achieving high values of photosynthesis, even at low intensities of light.

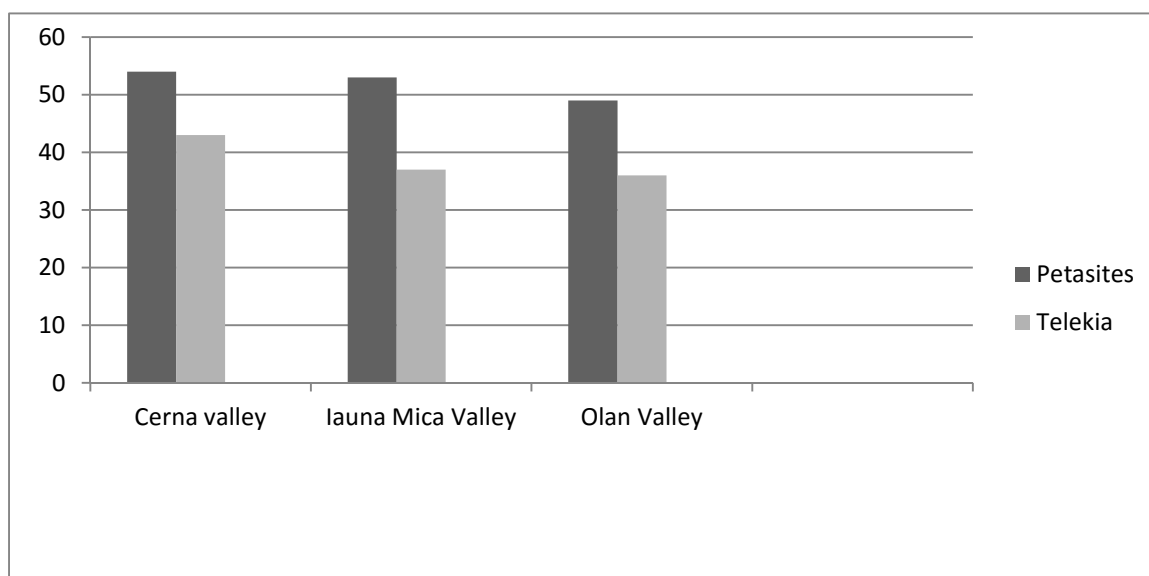


Gr. 1. The intensity of leaves photosynthesis ($\mu\text{molCO}_2/\text{m}^2/\text{s}$)

2. Content in assimilating pigments

Determinations made in June at leaves of the plants from the three locations have not highlighted significant differences in what concerns the content of chlorophyll pigments. In comparison with *Telekia speciosa*, at which the maximum content was of 43 SPAD unities, *Petasites hybridus* recorded the maximum value of 54 SPAD unities (gr. 2).

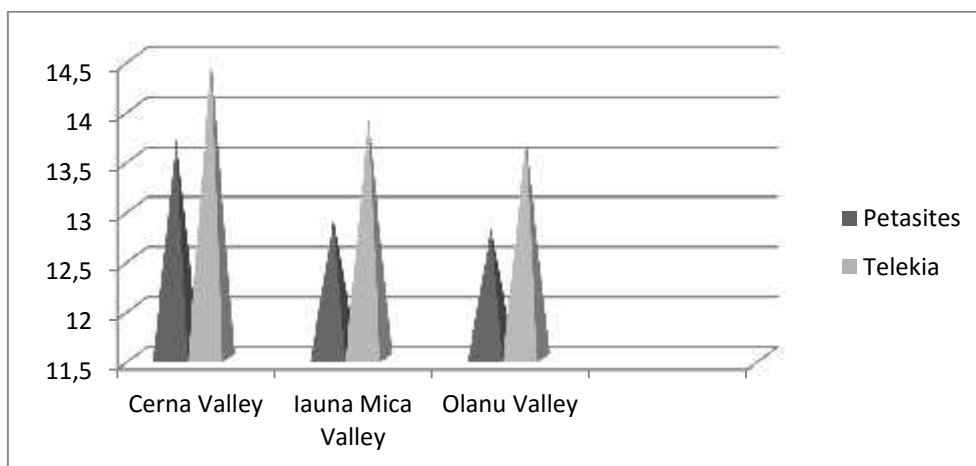
The higher quantity of assimilative pigments and the foliar structure with mesofil and large ribs give this plant an advantage in adaptation, realizing a fast grow of both aerial parts and the root system which strongly fixes the plant in the unstable soil.



Gr. 2. The chlorophyll content of leaves (SPAD unities)

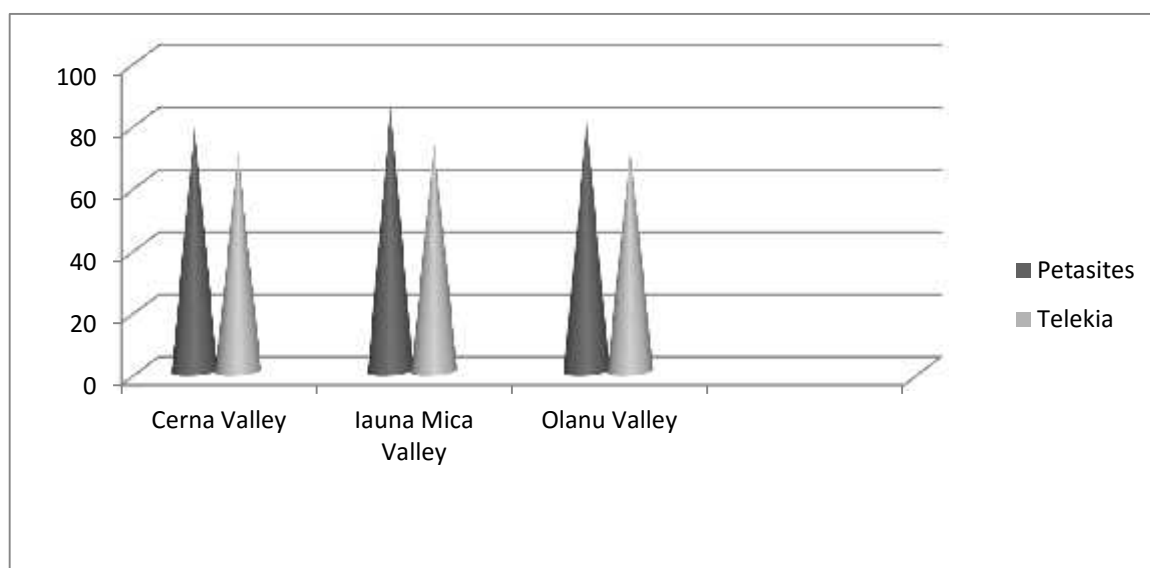
3. Leaf transpiration

The intensity of leaf transpiration records very high values at both species (gr. 3). These values are due to the great quantity of absorbed water, the big foliar surface and the high number of stomata from the leaves. In semi-shadow conditions, the intense transpiration can be utile, leading to the elimination of the water excess, but in conditions of illumination and at raised temperatures, especially at plants which have no root system near water, it can be a drawback, leading to a accentuated dehydration.



Gr. 3. The intensity of leaves transpiration (mmol H₂O/m²/s)

The water content of leaves records maximum values at plants which are situated in the Iana Mica Valley - Nordic exposure (gr. 4). Of the two species studied, *Petasites hybridus* presents much higher values of the water content, with a maximum of 85%, in comparison with *Telekia speciosa*, at which the maximum is of 73%.



Gr. 4. The water content of leaves (%)

CONCLUSIONS

- Hygrophilous species *Petasites hybridus* and *Telekia speciosa* are well represented in Domogled Cerna Valley National Park
- These perennial species with a high stem and well developed root system have an important ecological role, fixing the banks
- High values of the photosynthesis intensity lead to the accumulation of a great quantity of biomass, especially at *Petasites hybridus*
- High values of the photosynthesis intensity could have been induced at the *Petasites hybridus* species by the high amount of chlorophyll
- Transpiration intensity has very high values at both species; at plants that live in places with less water this can be a disadvantage

- Water content of leaves is very high; highest values have been measured at *Petasites*.

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