

MORPHO-ANATOMICAL STUDIES OF *VERONICA FILIFORMIS*

STUDII MORFO-ANATOMICE LA *VERONICA FILIFORMIS*

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Abstract: *The Veronica filiformis is a rare taxon within the Romanian flora. The anatomical and morphological studies regarding this taxon are quite sporadically elaborated. This paper is part of a more extensive work putting forward as object of study: The morphology, anatomy, taxonomy and corology of the Veronica species with solitaire flowers from Romania, paper that represent the doctoral dissertation of the author. Within the spectrum of the species studied only Veronica filiformis is perennial. A remarkable feature of this species is constituted by the frequent sterility, which is apparently associated with the vigorous development of a single exemplary. From the anatomically point of view we can ascertain that the adventive root has a primary structure, the stem present a primary structure at the bark level and a secondary structure at the central cylinder level and the leaf has a simple structure, with an homogenous mesophyll between the two epidermis. This morphological and anatomical composition explains the stationary conditions where this plant is encountered.*

Key words: *Veronica filiformis, anatomy, morphology.*

Rezumat. *Veronica filiformis Sm. este un taxon rar în flora României. Studiile de anatomie și morfologie referitoare la acest taxon sunt cu totul sporadice. Lucrarea de față face parte dintr-o lucrare mai mare ce are ca studiu: Morfologia, anatomia, taxonomia și corologia speciilor de Veronica cu flori solitare din România, studiu ce reprezintă teza de doctorat a autoarei acestei lucrări. Dintre speciile luate în studiu doar Veronica filiformis este perenă. De remarcat la această specie este sterilitatea frecventă, care este aparent asociată cu dezvoltarea viguroasă a unui singur exemplar. Din punct de vedere anatomic se poate spune că rădăcina adventivă are structură primară, tulpina structură primară la nivelul scoarței și secundară la nivelul cilindrului central iar frunza are o alcătuire simplă, prezentând între cele două epiderme un mezofil omogen. Această alcătuire morfologică și anatomică explică condițiile staționale în care este întâlnită planta.*

Cuvinte cheie: *Veronica filiformis, anatomie, morfologie.*

INTRODUCTION

The *Veronica* genus is regarded as the most widespread genera among volunteer plants growing wild in Romania (and not only). Within the Europaea Flora (Tutin T.G. & al. 1964-1980) 62 species are set out with numerous botanical infraspecific taxons while the Romanian Flora – vol. VII – reveals 41 species and 3 hybrids (Ghița E. 1960). Recent works related to Romanian Flora (Ciocârlan V. 2000) report only 40 species.

The *Veronica* species are herbaceous, non-perennial or perennial plants, with aerial or underground stems, erect or procumbent stems. The leaves are opposed to one another or verticillated and the flowers are solitary or grouped into axillary or terminal inflorescences. The floral sheath has 4 and sometimes 5 united elements.

The important feature of *Veronica* species among *Scrophulariaceae* is provided by the androecium composed of two epipetals stamens.

MATERIAL AND METHODS

In order to carry out the morphological and anatomical study of this species we took into account the information and references provided by the published literature. Subsequent to the bibliographical documentation numerous inspections on site have been initiated. As this species is characterized by a very limited habitat at the national level, the research stations where it was recorded have been first checked; afterwards, searches have been extended in several places.

The plant material subject to all development stages was collected from the "Al. Borza" Botanical Garden located in Cluj Napoca in order to allow for its further accurate identification; then, all the characteristics of the respective biotype have been marked down.

The collected and stored material was determined using references within the published literature (Ciocârlan V. 2000).

The collected material was brought to the laboratory where the following step consisted in its preservation by pressure (on blotting paper) or in a liquid environment (into a mixture composed of equal amounts of absolute ethyl alcohol, glycerine and distilled water).

The anatomical studies were executed under a Nikon microscope.

RESULTS AND DISCUSSIONS

Veronica filiformis Sm. – a herbaceous climbing plant characterized by thin and soft stems; the leaves margins are slightly crenated, the basal leaves are opposed and the other cary alternate flowers under their axilla; solitary flowers located at the leaves' axilla, with pedicels up to 4 cm long.

The calyx has 3-5 mm lacinias, oblanceolate or elliptical, obtuse; the corolla has a diameter of 10-15 mm and it is light blue-mauve.

The capsule is 4-5 mm wide and forms an acute angle at the level of margins. It is a subglabra species (with long and rare hairs) and reveals a long style of about 3 mm, much longer than the margins of the capsule. The seeds are 1.5 x 1 mm in size, elliptical and slightly concave on one side.

Anatomical studies carried out on vegetative organs reveal the following:

The adventitious root has a primary structure and a thickness of 261 μm . The root epidermis is damaged, noticeable only under the form of fragments (fig. 3). Beneath these fragments lies the unistratified exodermis with an average thickness of 20.25 μm .



Fig. 1. Overview of the place where this species was identified



Fig. 2. A flower detail of *Veronica filiformis*



Fig. 3. Overview of the root structure of *Veronica filiformis* Sm. (Ob. 20 x Oc. 10) – orig.

The external shell is 33.75 μm thick and it is composed of 2-3 layers of large cells, tangentially elongated and provided with sclerenchymatic walls.

The internal shell is composed of smaller cells provided with heavily thickened walls by means of sclerenchymatic phenomena. It is as thick as the external shell.

The core cylinder has a diameter of 83.25 μm ; it does not exhibit a medular parenchyma and the woody beams almost reach the centre of the root.

The stem has a primary structure at the level of the shell and a secondary structure at the level of the core cylinder (fig. 4). Its thickness reaches 828 μm . The epidermis is unistratified, composed of slightly tangential elongated cells,

provided with lined walls. Its outer section reveals a thick cuticle of 1.575 μm . Several elongated pluricellular hairs, usually formed of 3 cells, 63 μm long, are to be found among the epidermal cells.

The shell is 225 μm thick and brings forward for examination the first layer of small cells, provided with support collenchymatous walls. The remaining part of the shell is composed of large ovoidal and spheroidal cells arranged with spaces between. The chloroplasts are perceived inside the shell's cells.

The starched theca is unistratified, composed of tangentially elongated cells and provided with thin walls.

The pericycle is unistratified, constituted of cells formed of thin walls and slightly more elongated than the liber cells.

The liber is less developed, it is 27 μm thick and it is formed only of liberian vessels.

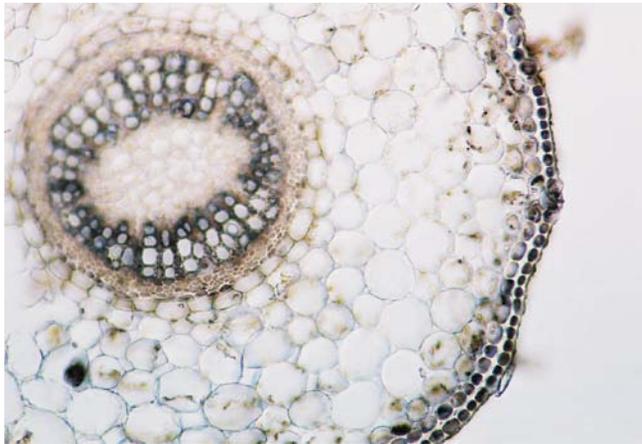


Fig. 4. The stem: Overview of the epidermis, the shell and the core cylinder (Ob. 20 x Oc. 10) – orig.

The woody fibrous vessels are disposed in radial rows and their diameter increases from the medullary parenchyma towards the liber. No difference can be established between the primary and the secondary wood. The thickness of the wood is 72 μm . The central section of the stem is occupied by the medullary parenchyma.

The leaf reveals a homogenous 40.5 μm thick mesophyll between the two epidermises. It has a thickness of 69.075 μm . The upper epidermis is unistratified and it is formed of tangentially elongated cells and it is 15.75 μm thick. The outer part exhibits a thick-0.9 μm cuticle.

The cells of the upper epidermis have strongly sinuous side walls (fig. 5); they do not include inserted stomata but contain elongated pluricellular sharp-edged hairs.

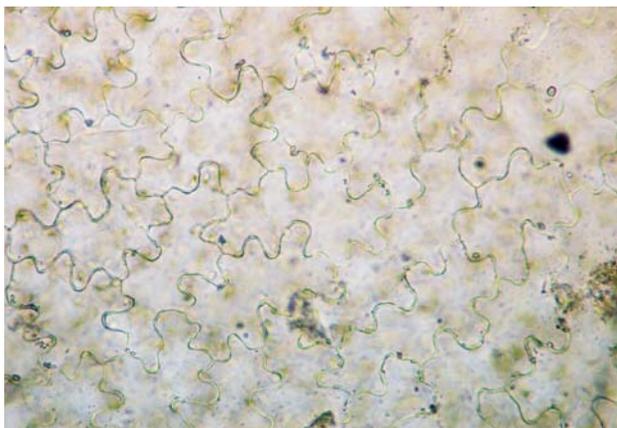


Fig. 5. Strongly sinuous side walls at the level of the upper epidermis (Ob. 40 x Oc. 10) – orig.

The composition of the lower epidermis is similar to that of the upper epidermis; unlike it, both the lower epidermis and the cuticle are thinner: the epidermis is 11.25 μm thick and the cuticle is 0.675 μm thick; among the epidermal cells there are anomocytic stomata.

Within the Romanian Flora, volume VII, this botanical taxon is not mentioned. *Veronica filiformis* Baumg. et auct transs., non Sm. is to be found among the synonymies of the species *Veronica persica* Poiret, but in this case another botanical taxon is mentioned.

The presence of this botanical taxon within the Romanian flora might have been doubtful until that time. After several years, Al. Beldie indicates the presence of this botanical taxon within the Romanian flora – Illustrated Determinative Manual of Vascular Plants, vol. II (1979).

The Europaea Flora states that this botanical taxon is located in the North-West and in the central part of Europe; România is not specified under the chorology column.

It could be easily mistaken for *Veronica persica* Poiret. The main recognition character is as follows: *V. filiformis* represents a perennial species, a chamaephyte plant while *V. persica* is a non-perennial plant. La acestea se mai adaugă:

1a. Vigorous stems, crenated, tooth-like leaves particularly on the edges; a wide corolla between 7 and 15 mm, the capsule is 7 to 10 mm wide and forms an obtuse angle at the level of the boundary **Veronica persica** Poiret

1b. Thin and soft stems. The leaves present slightly crenated edges; the corolla has 5 to 8 mm in diameter and the capsule is 4 to 5 mm wide and forms an acute angle at the level of the boundary **Veronica filiformis** Sm.

CONCLUSIONS

Subsequent to the morphological and anatomical analysis of the species *Veronica filiformis* Sm. the following conclusions can be drawn:

- the embryonic root of this plant is ephemeral, its place being taken by adventive roots;

- the absence of varieties which flower and fructify is compensated by the high percentage of vegetative regeneration of the respective species.

- the adventive roots have a primary structure, the root epidermis is damaged in contact with the soil particles and it is characterized by the absence of medular parenchyma;

- the stems are procumbent, with a primary structure at the level of the shell and with a secondary structure at the level of the core cylinder;

- the leaves are constituted of a homogenous mesophyll and the epidermal cells exhibit strongly sinuous side walls.

- the analysis of reproductive parts is becoming more and more difficult as very few species reach the stage of blooming and fructification.

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