ANATOMIC ASPECTS IN *PARNASSIA PALUSTRIS* L.

ASPECTE ANATOMICE LA *PARNASSIA PALUSTRIS* L.

STĂNESCU Irina[1], MARDARI C.[1], BÎRSAN C.[1], TĂNASE C.[2], DRAGHIA Lucia[3]

[1]'Anastasie Fătu' Botanic Garden, 'A. I. Cuza' University of Iasi, Romania
[2] Faculty of Biology, 'Alexandru Ioan Cuza' University of Iasi, Romania
[3] University of Agricultural Sciences and Veterinary Medicine Iasi, Romania

Abstract*. The authors emphasize a detailed presentation of the anatomic characters of Parnassia palustris L. The root has a primary structure. The stem has a star profile, with 5 long and narrow branches. The central cylinder starts with a pericycle as a sclerenchymatic ring, while the conductive tissue consists of three vascular bundles. Leaves are petiolated, numerous, oval, with chordate base and straight edges. The petiole has a crescent profile in cross section; in the fundamental parenchyma three vascular bundles are embedded, each one of them being surrounded by a primary endodermis, with casparian thickenings in the component cells. The foliar limb is hypostomatic, with bifacial-heterofacial structure and normal dorsiventrality.*

Key words*: Parnassia palustris,* star profile

Rezumat*. Studiul are ca scop prezentarea detaliată a elementelor anatomice caracteristice speciei Parnassia palustris L. Rădăcina prezintă structură primară. Tulpina are forma unei stele cu 5 braţe lungi şi înguste. Cilindrul central începe cu un periciclu de tip inel sclerenchimatic, iar fasciculele conducătoare sunt în număr de trei. Frunzele bazale sunt peţiolate, numeroase, ovale, cu baza profund cordată şi margini întregi. Peţiolul are formă de semilună în secţiune transversală; în el sunt implântate trei fascicule conducătoare libero-lemnoase, fiecare fiind înconjurat de o endodermă de tip primar, în pereţii dintre celulele componente observându-se îngroşări Caspary. Limbul foliar este hipostomatic, având o structură bifacială-heterofacială cu dorsiventralitate normală.*

Cuvinte cheie: *Parnassia palustris,* formă de stea

INTRODUCTION

Grass of Parnassus is the English name for the genus *Parnassia*, also known as Bog-stars, because of the shape of the flowers (Kopyt'ko Ya. F., 2003).

Parnassia palustris L. is a herbaceous dicotyledonous species belonging to *Saxifragaceae* family. It bears numerous small roots and un-branched erect ribbed stem. Leaves are numerous, ovate with chordate basis and straight edges. Flowers are white, solitary, of 1.5-4 cm diameter. It prefers wet meadows, from plain regions to the mountain regions. It is a hemicryptophyte, with circumpolar origin; it prefers full light and can support large variations of temperature. It is frequently seen in Romanian mesohygrophile and mesophile lawns.

Species of *Parnassia* genus have always attracted the interest of numerous researchers. Arber A. (1915) tried to emphasize the anatomy of the stamens in

certain species of *Parnassia*, while Cunnell G. J. (1959) explained the arrangements of sepals and petals of *Parnassia palustris*. The same species were investigated from biochemical point of view by Kopyťko Ya. F. (2003) who determined the composition of amino-acids and fatty acids in homeopathic matrix tinctures of grass of Parnassus prepared from fresh or dry plants of *Parnassia palustris*. The author also reminds the importance of homeopathic preparations made of grass of Parnassus in the treatment of eye disorders, epilepsy and pulmonary hemorrhage.

The morphology of leaf epidermis in some *Parnassia* species was investigated by means of light microscopy and scanning electron microscopy; this study (Wu Ding, Wang Hong, LU Jin-Mei, LI De-Zhu, 2005) mentioned that all examined species bear anomocytic stomata on abaxial epidermis and only a few bear stomata on both (abaxial and adaxial) epidermis. Metcalfe C. R. & Chalk L. (1972) showed a few anatomic characters for *Saxifragaceae* species.

The level at which populations interact as well as the levels of inbreeding and local adaptation were investigated in the endangered species *Parnassia palustris* living in contrasted habitats, more exactly in 14 populations of northern France, in order to set up conservation policies.

MATERIAL AND METHOD

The paper is focused on a detailed presentation of the anatomic characters of *Parnassia palustris*. In order to carry out the histological analysis, the vegetal material represented by the vegetative organs of *Parnassia palustris* has been fixed and preserved in 70% ethylic alcohol and then washed with sodium hypochlorite, acetic acid and coloured with iodine green and ruthenium red, as in the methods used in vegetal anatomy studies (Andrei M. & Paraschivoiu Roxana Maria, 2003; Şerbănescu-Jitariu Gabriela et all., 1983).

The histological sections were mounted in gel; then they were analyzed in Optika light microscope. The light micrographs were performed using a Canon A540 camera.

RESULTS AND DISCUSSIONS

The cross section through the young roots presents a primary structure. The epidermis consists of big isodiametric cells and few stomata (fig. 7). The cells of the exodermis are flattened; the cortical parenchyma bears 9-11 layers of cells bigger than those of the exodermis. There is no layer as an endodermis. The central cylinder has three xylem bundles and three phloem bundles. All xylem vessels have thickened and lignified walls. The rhizome (figs. 1 and 2) is thick in cross section, with isodiametric cells in the epidermis, a short cortex and vascular bundles disposed as two rings (a xylem ring and a phloem ring). The xylem vessels have thickened and lignified walls, as well as most of the xylemic parenchyma.

The upper part of the stem has a star profile (fig. 3) in cross section, with 5 long and narrow branches. Epidermis is formed of cells of various dimensions and small stomata. The cortical parenchyma of the stem has small cells which form big meatus; in the branches, the parenchyma is collenchymatized (fig. 4). At the

outer part of the central cylinder there is a pericycle, represented by a few layers of sclerenchyma (fig. 5 and 6) disposed on a ring; the fibers bear thickened and lignified walls. The central cylinder bears three vascular bundles which seem to consist, each one of its own, of two smaller bundles (fig. 6). Xylem consists of vessels with thickened and lignified walls and few cells of cellulosed xylemic parenchyma, while phloem of sieved tubes and guard cells. The centre of the cylinder is occupied by medullar cellulosed parenchyma (fig. 8) with cells of various dimensions.

The other regions of the stem (figs. 9 and 10) show no particular elements in comparison to the upper region.

The petiole (fig. 11) has a crescent form in cross section. The epidermis bears isodiametric cells, having the external walls covered by thick cuticle. The fundamental cellulosed parenchyma is thick, formed of big cells. Here are present three vascular bundles, each one of them being surrounded by a primary endodermis, with casparian thickenings (fig. 12) in the component cells. Xylemic elements, represented by vessels of small diameter, have thick and lignified walls and are disposed on an arch. Almost the entire arch is surrounded by phloemic elements (sieved tubes and guard cells).

In front side view, the epidermis of the foliar limb shows big cells with waved lateral walls (figs. 13 and 14), more waved in the lower epidermis, where anomocytic stomata are present (fig. 14), so the foliar limb is hypostomatic.

The foliar limb has a linear shape (fig. 15) in cross section. The epidermis consists of big cells. The middle vein has a single vascular bundle (fig. 16) with a similar structure to that of the bundles from the petiole. In the lateral parts of the middle vein, the mesophyll is differentiated into palisade tissue with short cells towards the upper epidermis and lacunary tissue, towards the lower one, formed of small cells which form lacunae of various dimensions between them.

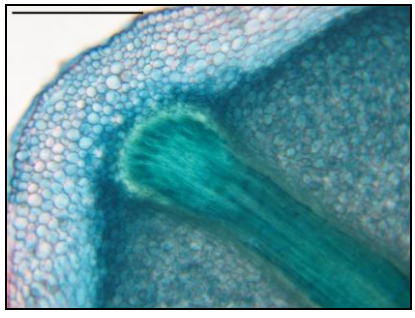

Fig. 1. Rhizome

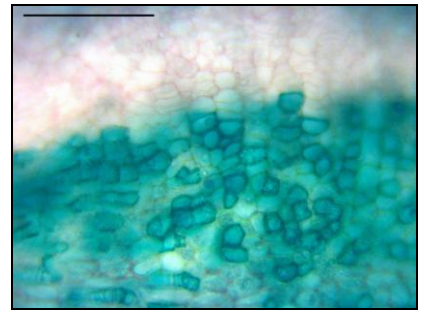

Fig. 2. Xylem and phloem of the rhizome

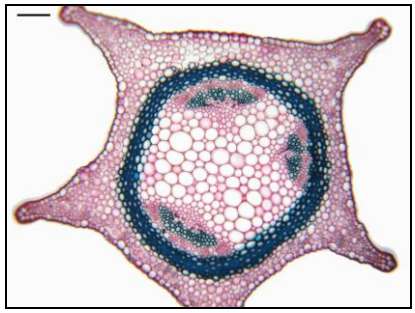

Fig. 3. Structure of the stem in the upper region

Fig. 4. Collenchyma in one branch of the stem

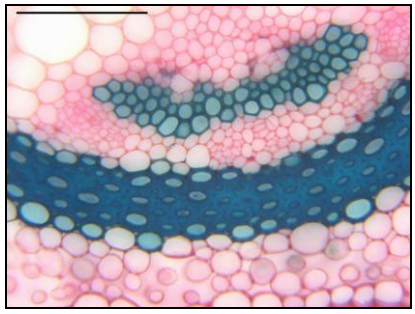

Fig. 5. Pericycle and vascular bundles of the stem

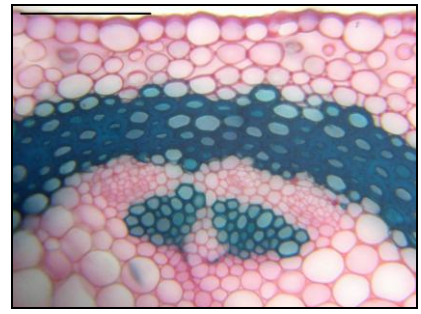

Fig. 6. Pericycle and vascular bundles of the stem

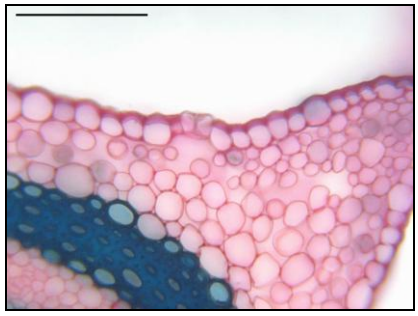

Fig. 7. Stomata in the epidermis

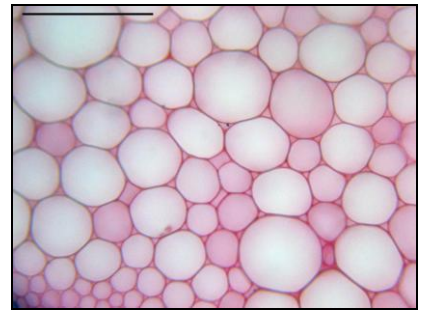

Fig. 8. Medullary parenchyma

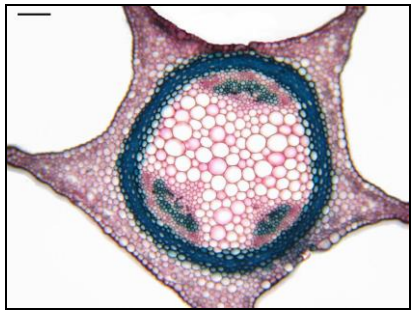

Fig. 9. Structure of the stem in the lower region

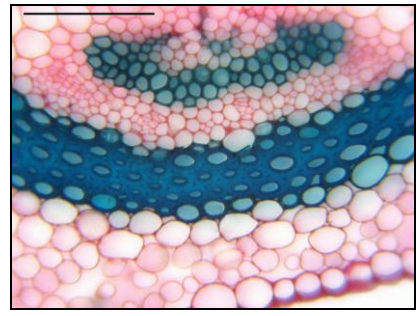

Fig. 10. Pericycle and vascular bundle of the stem

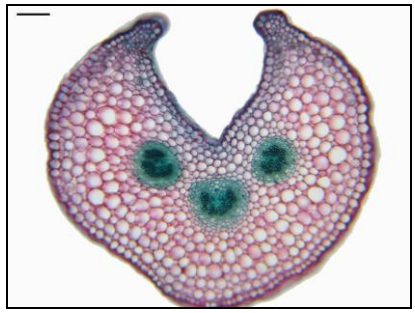

Fig. 11. Cross section through the petiole

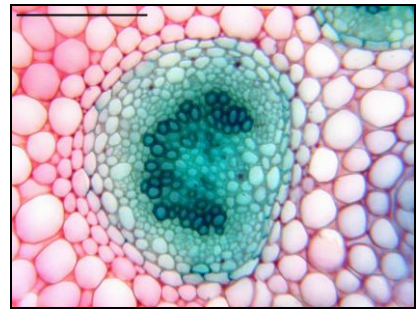

Fig. 12. Vascular bundle of the petiole

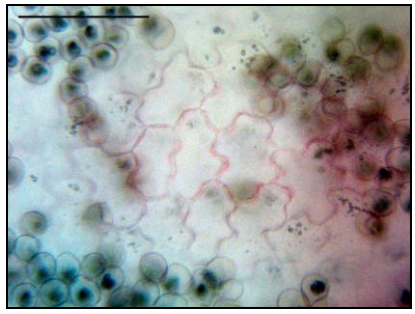

Fig. 13. Upper epidermis of the foliar limb

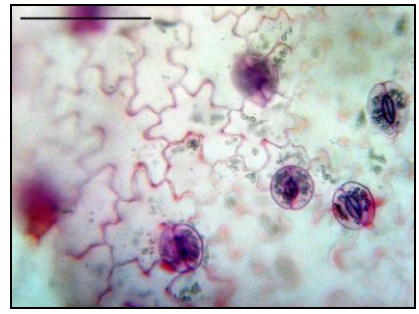

Fig. 14. Lower epidermis of the foliar limb

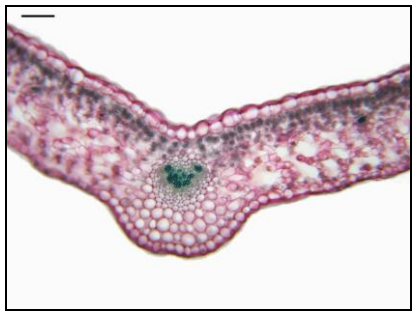

Fig. 15. Cross section through the foliar limb

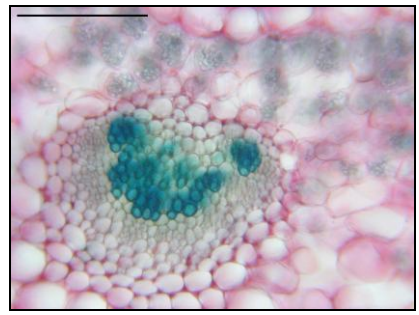

Fig. 16. Cross section through the middle vein

CONCLUSIONS

The cross section through the young roots presents a primary structure.

The rhizome is thick in cross section.

All parts of the stem have a star profile in cross section, with 5 long and narrow branches, where the parenchyma is collenchymatized. The pericycle is represented by a few layers of sclerenchyma disposed on a ring. The central cylinder bears three vascular bundles.

The petiole has a crescent form in cross section and three vascular bundles, each one of them being surrounded by a primary endodermis, with casparian thickenings in the component cells.

The foliar limb is hypostomatic and has a bifacial-heterofacial structure, with normal dorsiventrality.

ACKNOWLEDGEMENTS

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