MORPH-ANATOMIC STUDIES AT SPECIES FROM SPONTANEOUS FLORA WITH ORNAMENTAL VALUE

STUDII MORFO-ANATOMICE LA SPECII DIN FLORA SPONTANĂ CU VALOARE ORNAMENTALĂ

***PARASCHIV Nicoleta Luminița*[1], *CHELARIU Elena-Liliana*[1]**
e-mail: luminico2003@yahoo.com

Abstract. *In the current paper are presented the results of a morph-anatomic study at two species from genus Polygonatum*: *P. multiflorum* L. (All.) *and P. odoratum* Mill. Druce (syn. *P. officinale* All.). *Species are from the spontaneous flora of Iaşi County and were cultivated in the experimental field of Floriculture Discipline from USAMV Iaşi. The effectuated research shown, that at both species the general structure plan of aerial stem and leaf is the one of Liliaceum, with some specific particularities. At specie P. multiflorum the contour of the transversal section is circular-coastal, and at P. odoratum is circular. At P. odoratum the walls of epidermal cells are lignified and the ones of wooden parenchyma cells from the leading fascicles on the inner circles are colenchymatized.*

Key words: *Polygonatum multiflorum*, *Polygonatum odoratum,* morph-anatomy, decorative features.

Rezumat. *În această lucrare sunt prezentate rezultatele studiului morfo-anatomic la două specii a genului Polygonatum*: *P. multiflorum* L. (All.) *şi P. odoratum* Mill. Druce (syn. *P. officinale* All.). *Speciile provin din flora spontană a județului Iaşi şi au fost cultivate în câmpul experimental al disciplinei Floricultură, din cadrul USAMV Iaşi. Cercetările efectuate au arătat că la cele două specii planul general de structură al tulpinii aeriene şi al frunzei se încadrează în cel al liliaceelor, cu câteva particularități. La specia P. multiflorum conturul secțiunii transversale este circular-costat, iar la P. odoratum circular. La P. odoratum pereții celulelor epidermice sunt lignificați, iar cei ai celulelor de parenchim lemnos din alcătuirea fasciculelor conducătoare de pe cercurile interne ale tulpinii aeriene, sunt colenchimatizați.*

Cuvinte cheie: *Polygonatum multiflorum*, *Polygonatum odoratum,* morfo-anatomie, însuşiri decorative.

INTRODUCTION

The structure of monocotyledons' vegetative organs has been analysed in both special and in some more general studies (Napp-Zinn, 1984, 1988; Kaussmann B., Schiewer U., 1989) references being sometimes made to the anatomy on mono-facial leaves. In all these papers, special stress in haid on

[1] University of Agricultural Sciences and Veterinary Medicine Iaşi, Romania

the root types of vascular bundles stem and floral peduncle and especially on the leaf.

From the most recent papers regarding some species of *Polygonatum* L. genus we mention the ones of molecular taxonomy and the various studies of histochemistry and pharmacognosis (M.N. Tamura, 1997; M. Szczecińska et al., 2006; F. Dupont, J.L. Guignard, 2007).

Polygonatum, which is commonly called Solomon's-seal, has been used medicinally for thousands of years. The plant is edible and can be made into a tea which has historically been taken to promote healing and to clean out toxins from a number of different organs. The roots can be mashed into a paste and applied topically to injuries to decrease healing time and to stop bleeding. Though none of these potential medical effects has been scientifically studied, scientists in the early 21st century are examining polygonatum for its potential anti-cancer effects.

Polygonatum belongs to the Liliaceae familiy and has a total of 57 species. Its major distribution centres are in East Asia, mainly China and Japan, where 40 species are found (M.N. Tamura, 1997). Apart from this area, *Polygonatum* occurs in the moderate climate zone of North America and Europe.

MATERIAL AND METHOD

The research material is represented by two species of *Polygonatum* genus: *P. multiflorum* L. (All.) and *P. odoratum* Mill. Druce (syn. *P. officinale* All.) – from Romanian flora. Species are from the spontaneous flora of Iaşi County and were cultivated in the experimental field of Floriculture Discipline from USAMV Iaşi, from where the studied biological material was gathered.

The material was fixed and preserved in 70% ethylic alcohol. Cross-sections of the aerial stem and leaf were performed using a manual microtome, coloured with iodine-green and ruthenium-red and embedded in glycerol-gelatine. The obtained permanent slides were analyzed on a Novex (Holland) microscope and photographed at the Olympus VANOX AHBS3 optical microscope with photo camera included.

RESULTS AND DISCUSSIONS

1. *Polygonatum multiflorum* L. (All.) (Solomon's-seal, David's-harp, Ladder-to-heaven)

Aerial stem (figures 1-4**).** The contour of the transversal section is circular-coastal (coasts are slightly prominent, in number of 11-13, with unequal distances between them).

Epidermis, unilayer presents cells with the external walls thickened that the others and covered with a very thin cuticle.

Bark, relatively thin is represented by 4-6 layers (up to 8-10 layers at coasts) of rounded cells, which provide between them small meatus.

The central cylinder starts with a multi-layered pericycle (3-5 layers) formed by cells with all the walls uniformed thick and lignified. The leading

fascicles are of a closed collateral type being disposed on around three distinct circles being surrounded by a fundamental parenchyma. On the external circle alternate large and small fascicles (30-32); at the large fascicles, sclerenchyma pericycle it is in contact with the liberian pole of them, while small fascicles are completely integrated in the thickness of this pericycle. The liber of all leading fascicles is formed by riddled tubes and annex cells, and the wood is formed by protoxylem vessels and metaxylem ones (with a V type general design), between them exist cells of wooden parenchyma with the walls lightly thick and lignified at the fascicles on the external circle and only thick but without lignifications at the fascicles on the other two circles.

Fig.1 - Cross-sections through aerial stem (x40)

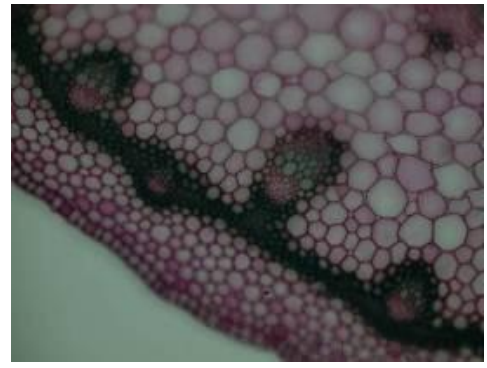

Fig.2 - Cross-sections through aerial stem (x100)

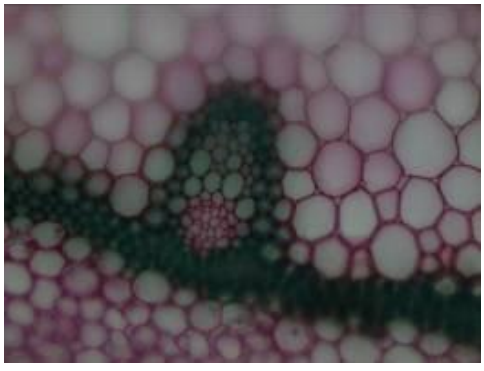

Fig.3 - Cross-sections through aerial stem (x200)

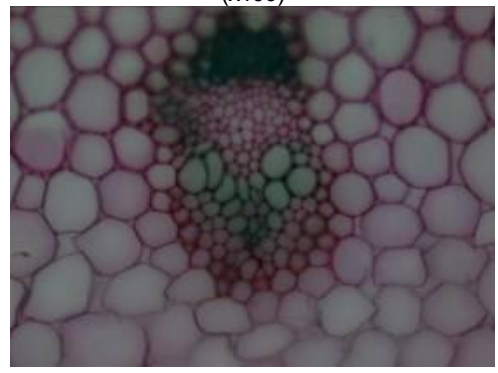

Fig.4 - Cross-sections through aerial stem (x400).

Foliar limb (figures 5 and 6**).** In transversal section have prominent ribs on the inferior side. Epidermis (superior and inferior) are formed by light elongated tangential cells, with external walls more thick and less cutinizated. Most of all, at the inferior side could be observed stomata disposed at the same level with epidermis cells. Mezophile is homogenous, of a lacunars type (7-8 layers), with

cells disposed more compacted at superior side, so the limb have a bifacial ecvifacial centric homogenous structure. Could not be observed the tector hairs neither the secretory ones.

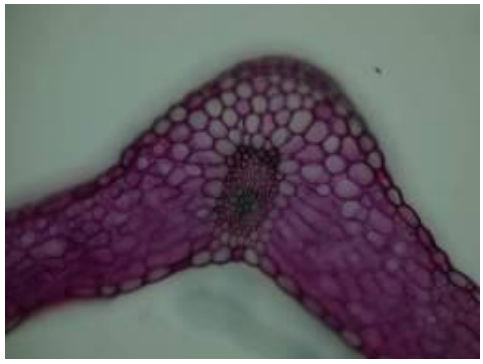

Fig. 5 - Cross-sections through the lamina (x100)

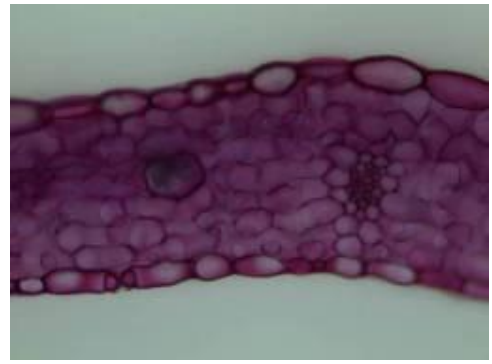

Fig. 6 - Cross-sections through the lamina (x200)

2. *Polygonatum odoratum* Mill. Druce (syn. *P. officinale* All.)

Aerial stem (figures 7-10**).** The contour of the transversal section is circular. Epidermis, in only one layer, presents cells with all the walls thick and lignified. Hypodermic, could be observed the same characteristics of the cell walls from the first layer of the bark, the rest of the layers (5-6) have cells with thin walls, cellulose-pectin and leaving small auriferous spaces.

Central cylinder starts with a multiple-layered pericycle (5-7 layers) formed by cells with all the walls uniform thick and lignified. Leading fascicles are of a close collateral type being disposed on around three, even four distinct circles being surrounded by a fundamental parenchyma.

On the external circle alternates large and small fascicles (31-35); at the large fascicles sclerenchyma pericycle is in direct contact with their liberian pole, while small fascicles are completely integrated in the thickness of this pericycle.

The liber of all leading fascicles is formed by riddled tubes and annex cells, and the wood is formed by protoxylem vessels and metaxylem ones (with a V type general design), between them exist cells of wooden parenchyma with the walls lightly thick and lignified at the fascicles on the external circle; at fascicles on the inner circles only few, the large ones, have some elements of sclerenchyma light lignified at liberian pole, while at the rest of fascicles the sclerenchyma mechanical elements are missing. Also, the cells of wooden parenchyma on the inner circles present a light collenchymatization of the cellular walls.

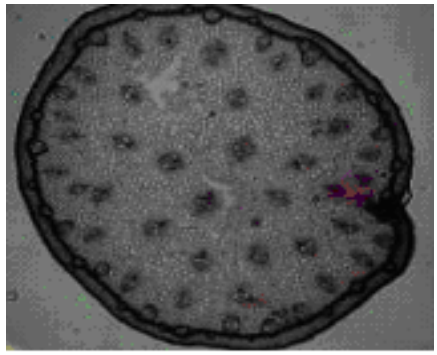

Fig. 7 - Cross-sections through aerial stem (x40)

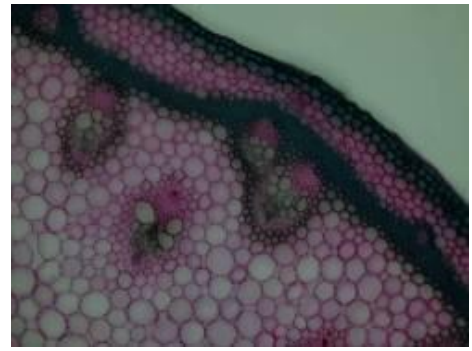

Fig. 8 - Cross-sections through aerial stem (x100)

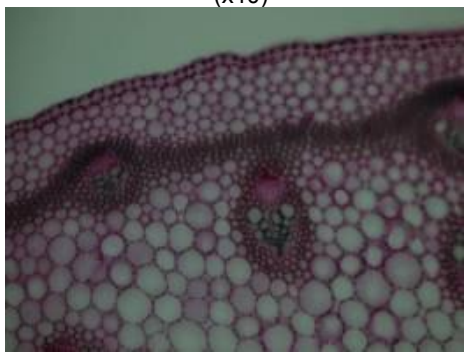

Fig. 9 - Cross-sections through aerial stem (x200)

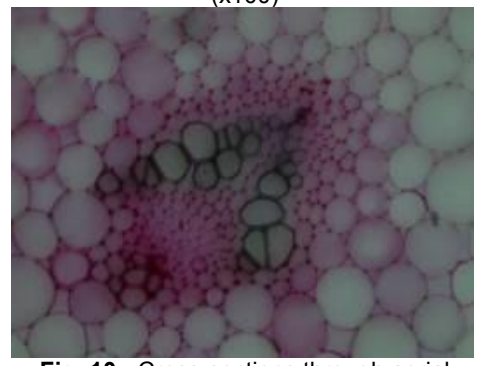

Fig. 10 - Cross-sections through aerial stem (x400)

Foliar limb (fig. 11**)**, in transversal section presents as *Polygonatum multiflorum* a bi-facial ecvifacial centric homogenous structure, being a difference only between the thicknesses of it (only 5 layers of cells, sometimes 6).

Fig. 11 - *Polygonatum odoratum* Mill. Druce Cross-sections through the lamina (x200)

CONCLUSIONS

1. The general structural plan of aerial stem and leaf at *Polygonatum multiflorum* and *P. odoratum* respects in a great way the one of Liliaceum (the presence of a multiple-layered sclerenchyma and lignified pericycle; a great number of leading fascicles of open collateral type disposed on several circles; V disposal of wooden vessels).

2. Particularities for these two species are: contour of transversal section (circular-coastal at *P. multiflorum* and circular at *P. odoratum*); lignified walls of epidermis cells at *P. odoratum*; collenchymatization of wooden parenchyma cellular walls on the inner circles of aerial stem at *P. odoratum*.

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