

# HISTO-ANATOMICAL PECULIARITIES OF VEGETATIVE ORGANS OF *PHLOMIS TUBEROSA* FROM DAVID'S VALLEY RESERVATION IASI

## PARTICULARITĂȚI HISTO-ANATOMICE ALE ORGANELOR VEGETATIVE DE LA PLANTELE DE *PHLOMIS TUBEROSA*, DIN REZERVAȚIA VALEA LUI DAVID, IAȘI

GOSTIN IRINA, NISTOR ADRIANA

University "Al. I. Cuza" Iasi, Faculty of Biology

**Abstract:** *In this paper the authors followed the structure of the vegetative organs of a Lamiaceae specie sometime cultured as ornamental plant. The type and distribution of the tector and secretory hairs (on the stem and on the leaves), the number, the frequency and location of the stomata, the structure of the mechanical and conducting tissues was followed. In the leaf, the palisade parenchyma is well developed, consist from very long and slim cells. The mesophyll is compact; the tector hairs are numerousness, multicellular and ramified, located in the lower epidermis. The primary xylem has vessels with strong lignified walls; in the secondary xylem fibers with very thick walls are predominant. The air spaces like lacunas are reduced or absent. All these features show the xeromorphic character of the species. In the stem structure, in all developmental stages, a typical primary endodermis could be observed. In the secondary phloem, especially at the stem basis, rare fibers could be observed.*

**Rezumat:** *In aceasta lucrare autorii au urmarit structura organelor vegetative de la o specie din familia Lamiaceae uneori cultivata ca planta ornamentală. Au fost urmarite tipul si distributia perilor tectori si secretori, atat pe frunze cat si pe tulpini, numarul, frecventa si localizarea stomatelor, structura tesuturilor mecanice si conducatoare. La nivelul frunzei tesutul asimilator palisadic este foarte bine dezvoltat, fiind alcatuit din celule foarte lungi si inguste. In general mezofilul este compact, iar perii tectori sunt foarte numerosi, pluricelulari ramificati localizati in epiderma inferioara. Tesutul conductor lemnos este format din vase cu peretii puternic lignificati iar in cazul tesutului lemnos secundar predomina fibrele lemnoase, de asemenea cu peretii ingrosati si lignificati. Spatiile cu aer de tipul lacunelor sunt reduse sau chiar absente. Toate aceste caractere exprima trasaturile xeromorfe ale acestei specii. La nivelul tulpinii se observa, in toate stadiile de dezvoltare, endoderma primara tipica. La nivelul liberului, mai ales spre baza tulpinii am observat rare fibre liberiene.*

## INTRODUCTION

*Phlomis tuberosa* is an herbaceous perennial plant; roots are thick ropey, with tuberous thickenings. Stem are solitary or several, branched to apex, 25-70 cm long. Radical leaves are glabrous, or slightly pubescent, with long hairy petiole, blades tri-angular ovate, its base heart-shaped, crenate at margin, beneath simple or tunicate hairy, sometimes mixed with stellate hairs, very rarely stellate. The flowers appear as pompoms around the flower-stalk, in a multi-tiered effect

that's different from just about any other flower you'll encounter in the garden. Corolla is pink, 15-20 mm long, stellate, or long, tunicate hairy. After the flower stalks are cut back, the bold foliage makes an attractive mound to carry the plant through the season.

Concerning the definitive primary structure of the vegetative organs of some Labiatae species, summary information could be found both in various older publications and more or less new papers (Metcalfe and Chalk, 1979, Napp-Zinn, 1974). Ours attention is focused on: the protective and secretory formations, the general structure planes of axial organs, assimilating parenchyma structure, histogenesis of foliar lamina.

We don't find histo-anatomical data about *Phlomis tuberosa* in consulted literature. An extensive study related to *P. fruticosa* was made by Christodoulakis in 1989 (leaf structure) and Psaras et al. (2004) (wood structure). Bech (1963) publish a paper concerning hair structure in *P. pungens* and Mosquero et al. (2005) investigate the nutlets of some *Phlomis* species from morphological and anatomical point of view.

## MATERIAL AND METHODS

The vegetal material was collected from David's Valley reservation in July 2006 (anthesis phase). The vegetal material were fixed and conserved in ethanol 70%. The sections were made with free hand using a razor blade and colored with red-ruthen and methyl-blue. The photos were made after the obtained permanent preparates using an Olympus microscope with a C 330 photo camera.

## RESULTS AND DISCUSSIONS

### *The adventitious rot*

In the primary structure is tetrarch. It achieves early a secondary structure. The secondary xylem and phloem have ring shapes. In the external part multiple thin peridermis could be observed (consisting in one layer of suber and one layer of phelloderm) (photo 1).

### *The stem*

In the top (under the inflorescence) (photo 2) the structure is already secondary. The contour has square shaped. The epidermis presents relative large cells, with a thin and cutinised external wall. In the stem corners four collenchyma bundles (angular type) could be observed. The cortex is thin, with 2-4 cells layers. The endodermis is from primary type, with large cells. The phloem has sieve tubes, sieve cells and parenchyma cells. The primary xylem presents vessels with thick and strongly lignified cells. The secondary xylem has a small number of vessels; the fibres a preponderant.

In the middle (photo 3) of the stem some modifications occurred. The collenchyma bundles become tangential. The cambium produced small vascular bundles (only with secondary structure) between the initial one.

At the stem basis, cambium produced ring shaped secondary tissues

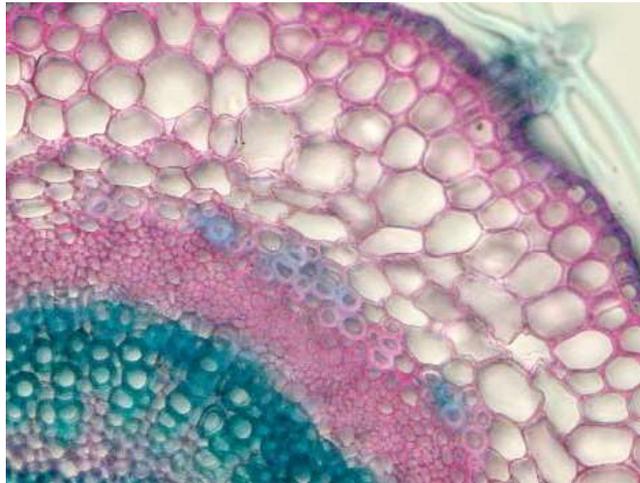
(xylem and phloem). The secondary xylem has a lot of fibres with very thick walls. In the secondary phloem some fibres, with thick and lignified walls could be observed (photo 4). The pith is compact during all stem long.

***The leaf*** (photo 5,6)

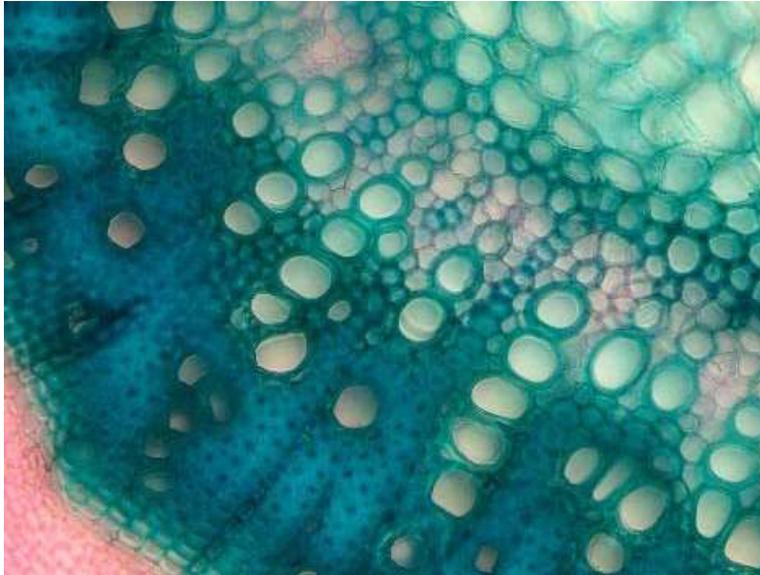
The petiole has V shape. In the middle 2 large, rounded vascular bundles could be observed; in the lateral parts 2 or 3 small vascular bundles are visible. In both epidermis tector hairs are presents and abundant.



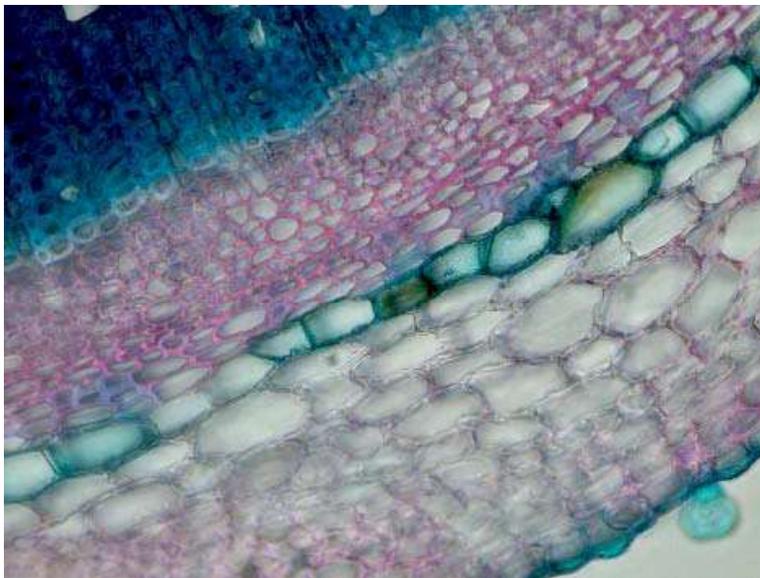
**Photo 1** – Cross section through adventitious root (x200)



**Photo 2** – Cross section through top of the stem (x400)



**Photo 3** – Cross section through the stem (middle part) – details from primary and secondary xylem (x400)



**Photo 4** – Cross section through the stem (basal part) – phloemic fibres could be observed (x400)



**Photo 5** – Cross section through the leaf – the midrib zone (x200)



**Photo 6** – Cross section through the leaf (x400)

The stomata are present only in lower epidermis. Tector and secretory hairs are numerous in lower epidermis.

The upper palisade parenchyma ordinarily consisted of one layer of elongated cells, whereas the lower one of one layer of short cells. The spongy parenchyma contained small intercellular spaces, variously sized vascular bundles.

## CONCLUSIONS

The general structure of the aerial vegetative organs is in concordance with the *Lamiaceae* pattern as it appears in the scientific literature. As a peculiarity, we signalled the presence of the fibres in the secondary xylem (which is quite unusual for the *Lamiaceae* species). The abundance of lignified cells (especially in secondary xylem), the small aeriferous spaces in all vegetative organs is markers for the xerophytism of this plant.

## REFERENCES

1. **Azizian D., Cutler D.**, 1982 - *Anatomical, cytological and phytochemical studies on Phlomis L. and Eremostachys Bunge (Labiatae)*. Bot. J. Linn. Soc. 85: 249 -281.
2. **Bech T. D.**, 1963 - *Anatomic structures of the hairs of Phlomis pungens Willd.* Ukrain. Bot. J. 20. 96-98
3. **Christodulakis N. S.**, 1989 - *An Anatomical Study of Seasonal Dimorphism in the Leaves of Phlomis fruticosa*, Ann Bot 63: 389-394.
4. **Khokhrina T. A.**, 1979 - *A comparative anatomical study of leaf epidermis in Siberian species from the genus Phlomis L.* Ukrain. bot. Zh. 36. 488-90.
5. **Martin Mosquero M. A., J. Pastor J., Juan R.**, 2005 - *Micromorphological and anatomical observations on nutlets of Phlomis L. (Lamiaceae) from South-West Spain* , Acta Botanica Malacitana 30: 31-40
6. **Metcalf C. R., Chalk L.**, 1979 - *Anatomy of the Monocotyledons*. 1. Gramineae, Clarendon Press, Oxford
7. **Napp-Zinn Kl.**, 1973-1974 - *Anatomie des Blattes., II. Angiospermen. In Handbuch der Pflanzenanatomie*, Bd. VIII, A 1-2, Gebruder der Bomtraegen, Berlin, Stuttgart
8. **Psaras GK, Sofroniou I.** 2004 - *Stem and root wood anatomy of the shrub Phlomis fruticosa (Labiatae)*. IAWA Jl. 25. 71-77