HISTO-ANATOMICAL ASPECTS OF VEGETATIVE ORGANS OF *THYMUS DACICUS* BORB. AND *THYMUS GLABBRESCENS* WILLD.

Irina Berciu*, Constantin Toma
Department of Biology, „Al. I. Cuza" University , Iasi

*** Correspondence:** Berciu Irina, "Alexandru Ioan Cuza" University, Iasi, Department of Biology, Carol I Bd., no. 20A, 700506, Iasi, Romania, tel: +400749036689, E-mail: irinaberciu@yahoo.com
Received: march 2008; Published: may 2008

ABSTRACT. The authors analyze the structure of vegetative organs of two *Thymus* species from Romania flora, evidencing the constant and particular histo-anatomical features of this species. Peculiar attention has been given to the structure, distribution and morphology of the glandular hairs, which are always multicellular having a basal cell, a unicellular stalk and 1, 2 or 8 cells gland.

Keywords: anatomy, *thymus*, glandular hair

INTRODUCTION

Thymus (*Lamiaceae*) is a genus of around 350 species in Europe, Northern Africa, Asia, Canary Islands. In Romania flora are 16 species and 12 hybrids. (Oprea A., 2005). Different *Thymus* species are used around the world as medicinal, ornamental and spicy plants and are a source for essential oils.

Thymus dacicus Borb. is a perennial plant with initial vigorous recumbent stems, then ascendents, very branched. The leaves are elliptic or prolonged, green in color, both faces are covered with hairs, nervures little proeminent. The inflorescence is capitate. The calyx is 3-4 mm long, the corolla is lilac-red, 6-7 mm long (Guşuleac M., 1961).

Thymus glabrescens Willd. is a perennial plant with the aerial steam strong, highly branched. The floral branches are serially disposed, being covered with little hairs only on the sides. The leaves are ovoid to semi-round or elliptical (Ciocârlan V., 2000).

This paper is a first stage of research regarding the structure of glandular trichomes and the essential oils extracted from the two species, for the purpose of eventually linking the cyto-histological information with the biochemical data.

MATERIALS AND METHODS

The biological material studied is represented by two *Thymus* species: *T. Dacicus* Borb., a species collected in June 2007 from Cheile Bicazului (Neamt) and *T. Glabrescens* Willd., species collected in May 2007 from Barnova (Iasi).

For histo-anatomical research the vegetal material was firstly fixed and preserved in ethylic alcohol 70%. We have made cross sections at the vegetative organs (root, stem – the superior third part, the medium third part and the inferior third part; foliar limb), sections lately colored by iod-green and carmine-red.

RESULTS AND DISCUSSION

The root. (Fig.1-2.)

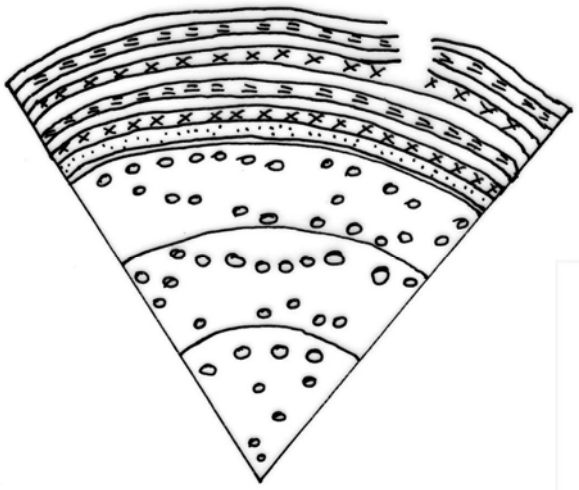

Fig. 1. *T. dacicus*- Cross-section of root

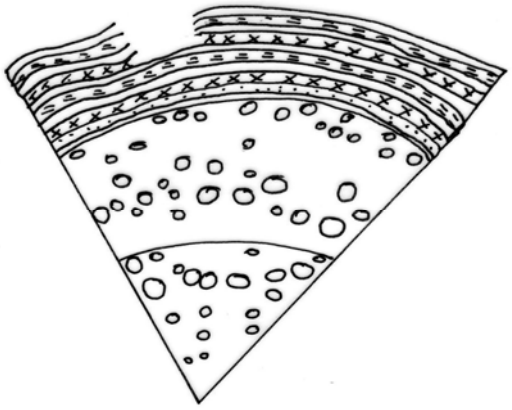

Fig. 2. *T. glabrescens* -Cross-section of root

There have not been observed major differences at the two species analyses; both of them present a root with an early secondary structure generated by the activity of both lateral meristems: the cambium and the phellogen. The phellogens are generated by a few

profound cortical layers and form some thin periderms, the ritidome. First periderms are partial detached and parts of primary cortical parenchyma adhere by de latest periderm. The cork cells present a radial disposition and the phellogen cells are tangential oblongs, with the thin walls.

The central cylinder present a thin secondary, external phloem ring (consisting in sieved tubes, companion cells and parenchyma cells) and a few (2-3) thicker secondary xylem rings, both resulted from the activity of the cambium. Annual rings of secondary xylem are streaky unequal as thickness, every one of them having xylem vessels of large diameter and less lately xylem vessels of smaller diameter, separeted by libriform. The xylem parenchima is terminal and is form by the end of each year of vegetation.

First two annual rings presents a few vessel with a smoll diameter and in the center of root are a few cells of parenchim moderate thickened. Looking with attention, in center is distinguishing 3 bundles of xylem from primary structure.

The stem (Fig. 3-8)

In cross section of the superior level of the stem, both analyzed species present round ribs. At *T. dacicus* the epidermis presents izodiametric cells, with thickened internal and external walls, the external wall being covered by a very thick cuticle. Rarely secretory trichomes and tector trichomes are present, especially in the ribs. The tector trichomes are mostly localized on the ribs; their lengthiness is variable being formatted on ones or more cells. At *T. glabrescens* the epidermis presents isomorphs and izodiametric cells, with thickened external walls and covered by a very thick cuticle. From place to place, are present the stomata, many tector trichomes and secretory trichomes, mostly with unicellular gland. The tector trichomes have different lengthiness, being unicellular, bicellulars or multicellulars.

On both analyzed species, the cortex is collenchymatised in the ribs and parenchymatic-cellulosed in the rest.

The cortex presents a Casparyan type endodermis, with large cells, weakly tangentially elongated cells, at both investigated species.

At *T. dacicus* the central cylinder is thick with primary structure, but the conducting vessels are represented by a tenuous external phloem ring (consisting in sieved tubes and companion cells) and a thicker xylem ring. Between this two rings there is a thicker procambium ring (consisting in 3-4 layers). The pith is thick, parenchymatic-cellulosed, of meatus type; the cells from perimedular aria are moderated colenchimatouses.

At *T. glabrescens* the central cylinder present a particular secondary structure, being formed from a very tenuous external phloem ring (consisting in sieved tubes, companion cells and a few parenchyma cells) and a thicker xylem ring formed mostly by libriform fibers with external wall very thick and partial lignified. In the inferior part of the xylem ring on perceive a few xylem vessels that can be solitary or grouped in cross. The pith is thick, parenchymatic-cellulosed, of meatus type; most of the cells from central part being disorganizated or in process of disorganization, resulting a big aerifer cavity, with fitful configuration.

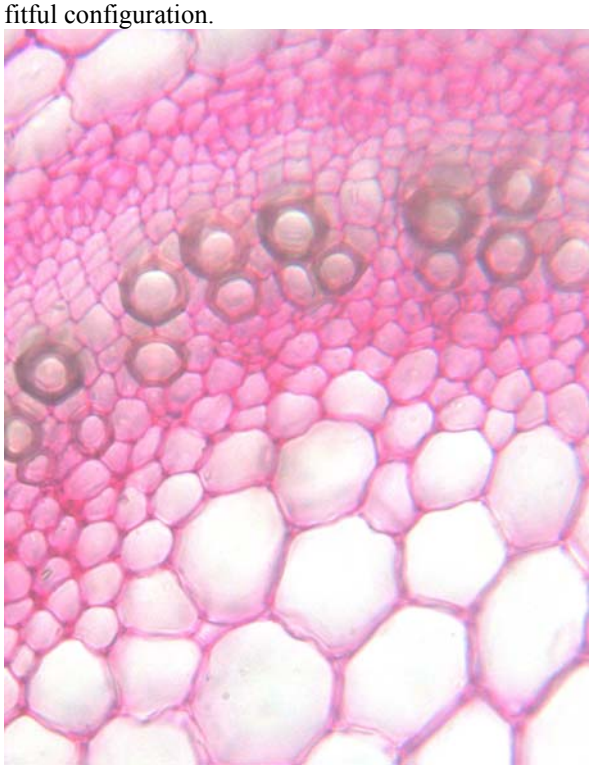

Fig. 3. *T. dacicus*-Cross-section of stem (superior level), x400

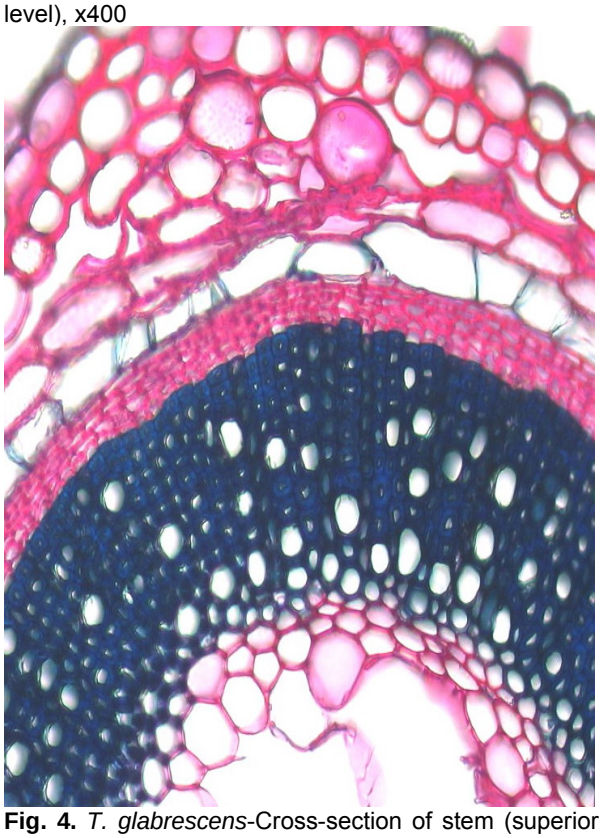

Fig. 4. *T. glabrescens*-Cross-section of stem (superior level), x400

In cross section of the median level of the stem, at *T. dacicus*, in comparison with superior level, the cuticle is thicker (especially in ribs); the cortical parenchyma presents big aerifer cavity and the central cylinder present a secondary structure being

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represented by a tenuous external phloem ring (consisting in sieved tubes, companion cells and a few parenchyma cells) and a thicker xylem ring (with libriform and a few vassels).

At *T. glabrescens* in median level of the stem the structure is similar with the superior level, with the followings different: the cuticle is thicker, the tector hairs are more numerous, the xylem ring presents more vessels, dispersed in libriform fundamental mass.

Fig. 5. *T. dacicus*-Cross-section of stem (middle level), x400

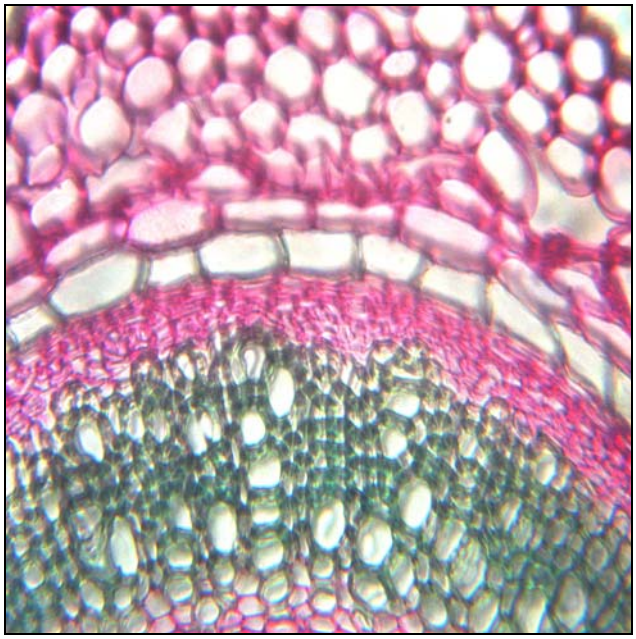


Fig. 7. *T. dacicus*-Cross-section of stem (inferior level), x400

In cross section of the inferior level of the stem, at *T. dacicus,* the configuration of cross section remain the same with the preceding level, but the ribs are a little salient. The xylem ring is thicker and the central aerifer cavity is tighter.

At *T. glabrescens* the structure remain the same with the preceding level, with the mention that the configuration of cross section is round and the cuticle is very thick.

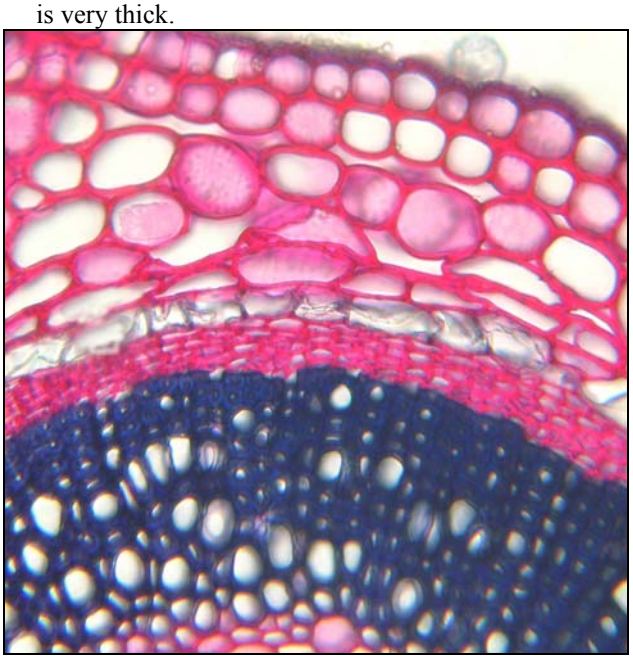


Fig. 6. *T. glabrescens*-Cross-section of stem (middle level), x400

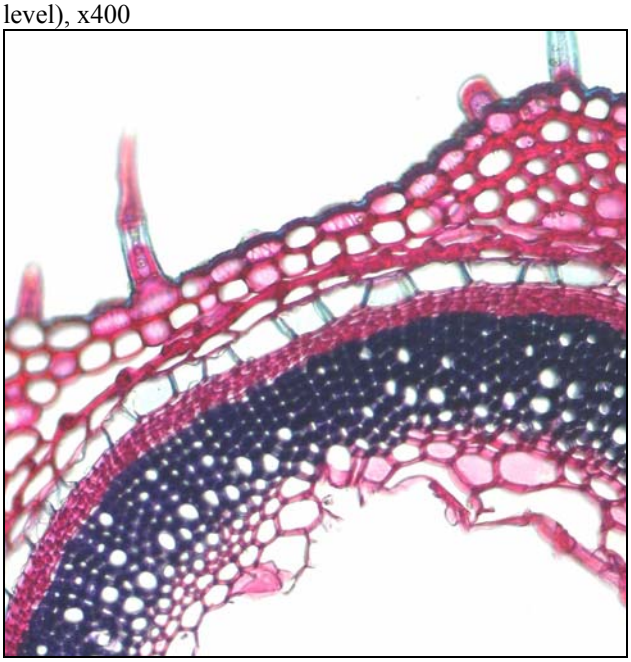


Fig. 8. *T. glabrescens*-Cross-section of stem (inferior level), x400

The foliar blade (fig. 9).

At both analyzed species, in front side view, the epidermis consists of irregularly-shaped cells, with weak waved walls. Both epidermis present stomata of diacytic type, so, the limb are amfistomatic. Here and there a lot of secretory and non-secretory (tector) trichomes are present. The borders of foliar blade have practically all cells transformed in aculeiform hairs, unicellular, with external walls very thick; a few hairs are multicellular having the terminal cell with blind apex.

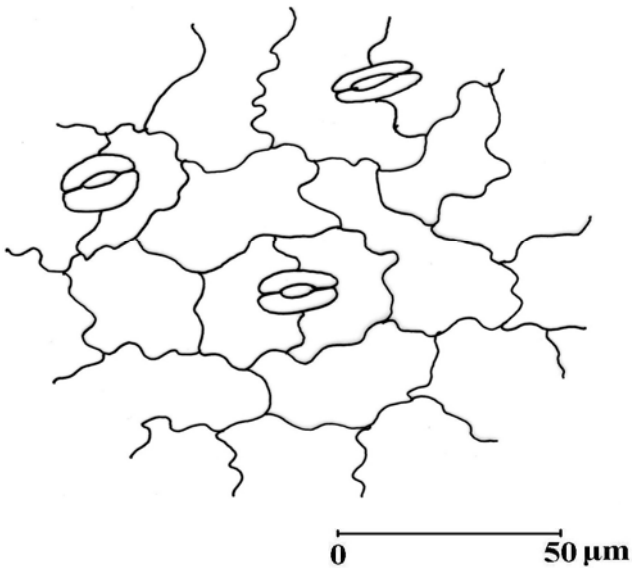


Fig. 9 A *T. dacicus*- the lower epidermis of the limb

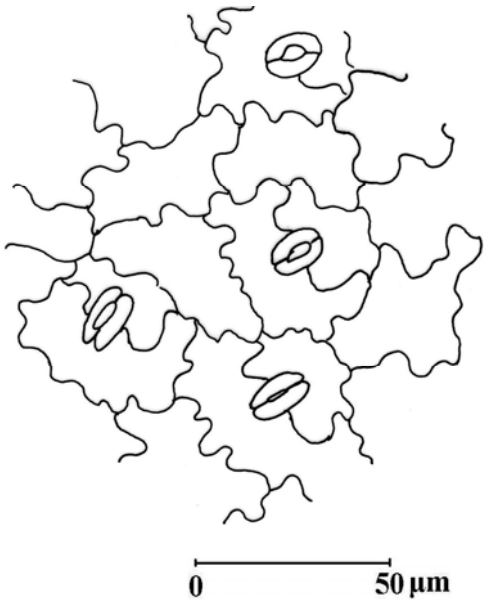
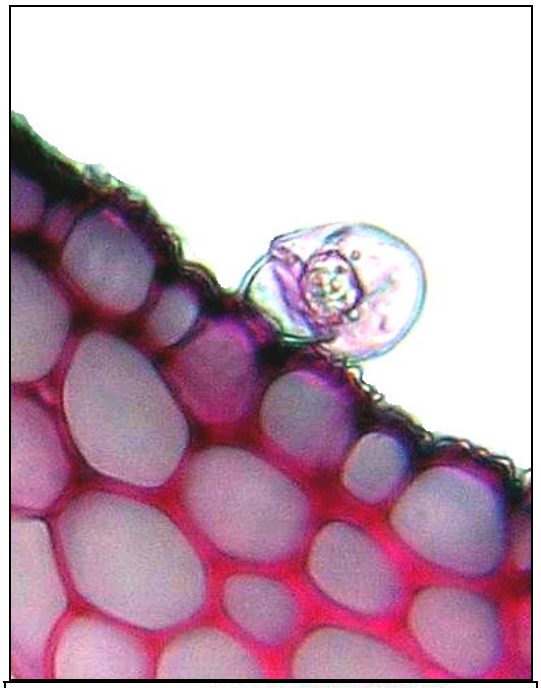


Fig. 9 B *T. glabrescens*-- the lower epidermis of the limb



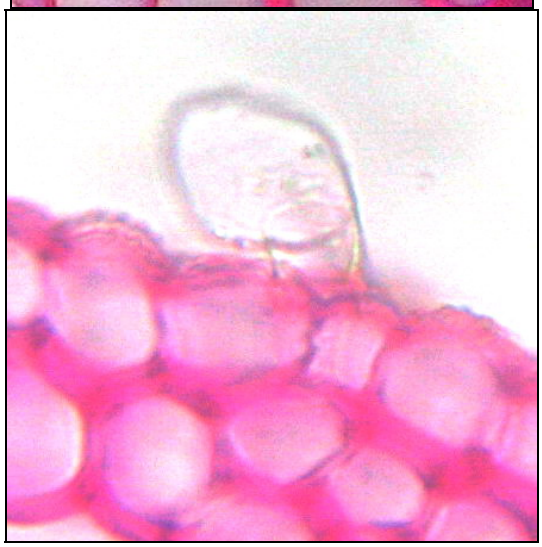


Fig. 10. Secretory trichomes belonging to *T. dacicus,* x400

Fig. 11. Secretory trichomes belonging to *T. glabrescens,* x400

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In cross section, at both analyzed species, the mesophyll is formed by palisade tissue at the upper side and lacunary tissue at the lower one, so, the blade has a bifacial-heterofacial (dorsiventral) structure.

At *T. dacicus,* the palisade tissue is bistratified, dense, with the hypodermic layer cells higher and with winding lateral walls. The lacunary tissue present 5-6 layers by rounded cells or fitful cells, with small aerifer lacunae between cells. To the border of foliar blade whole the mesophyll is on palisadyc type. The conducted vessels form more bundles, the biggest one presents at the periphery of the phloem cordons of sclerenchymatous fibers, with very thick walls but moderated lignified.

At *T. glabrescens,* the palisade tissue is bistratified, with hypodermic layer cells higher. The lacunary tissue compass about 4 layers cells, isodiametric or tangent elongated, with small aerifer lacunas between them.

CONCLUSIONS

At both analyzed species, the root presents a secondary structure, resulting for din activity on both lateral meristems: the cambium and the fellogen.

On both analyzed species there are two types of trichomes: tector trichomes, more often multicelular, and secretors trichomes, always multicelular, consisting in a basal cell, a unicellular pedicel and a uni- or multicellular gland.

The endoderm of Casparyan types became visible in the median third of the *T. dacicus* stem.

At *T. dacicus* to the border of foliar blade whole the mesophyll is on palisadyc type.

On both analyzed species, the stomata are diacitic type and there are presents on both sides of the foliar blade.

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