Buletinul Grădinii Botanice Iaşi
Tomul 14, 2007

CONSIDERATIONS UPON THE ANATOMICAL FEATURES OF SOME TAXA OF *TRADESCANTIA* GENERA

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Abstract: The structure of two taxa of the *Tradescantia* genre is analyzed by using the classical anatomical methods. The results are correlated with all data of the specialized literature. It is specified the role of the epidemical cells within the water metabolism.

Key words: *Commelinaceae* family, anatomical features

Introduction

Tomlinson is the author who had consecrated a thorough study to is *Commelinaceae* [6,7] family, by supplying valuable anatomical information. As for the *Tradescantia* genre the information are sporadic and incomplete.

Useful information is to be found in the papers presenting the anatomy of the vascular tissues of the *Tradescantia albiflora* [2] stem, the histology of the vegetative offshoots that give birth to the variegated leaves at the decorative sorts [4].

Material and method

The vegetal material is represented by roots, stems and leaves of two taxa: ***Tradescantia albiflora*** Kunth ***'Aureo-vittata'*** and ***Tradescantia fluminensis*** Vell. ***'Albo-vittata'*** (*Commelinaceae* family) [1]. Both taxa were cultivated in the greenhouses of the Botanical Garden of Iaşi.

The fixation and processing of the material (red carmin and fast green coloration) was done according to the usual protocol of the Vegetal Morphology and Anatomy Laboratory belonging to the Biology Department of the University "Al. I. Cuza" of Iaşi [5].

There were made cross sections at the middle level of the root, of the stem and of the leaves. As well there were made superficial sections at the leaf level. The permanent preparations obtained were analyzed and photographed with the optical microscope type Novex.

Results and Discussions

The adventive root (**Fig. 1**) for both taxa has an exfoliated rizoderma; the protective role belongs to the exodermis with irregular-polygonal cells. The cellulose cortical parenchyma presents 3-4 layers (at ***T. albiflora 'Aureo-vittata'***) or 7-8 cell layers with slightly thickened walls (at ***T. fluminensis 'Albo-vittata'***) of big dimensions, which are decreasing towards the center. The endodermis, of tertiary type, presents square type cells, with internal and lateral walls more thickened that the external wall.

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The central cylinder presents four wooden areas (at ***T. albiflora 'Aureo-vittata'***) or six wooden areas (at ***T. fluminensis*** Vell. ***'Albo-vittata'***), which alternates with as many phloem, the latter being better represented. Each wooden area presents 2-3 vessels with strongly woodened walls but slightly lignified. In the middle we can observe one or two big metaxilem vessels with thickened walls but slightly lignified, separated by wooden fascicule.

The stem: the middle internode (**Fig. 2, 3**). The epidermis seen upfront presents rectangular cells and stomata type tetra-cyclic, disposed in rows that alternate from one inter-node to another, very rarely at ***T. albiflora 'Aureo-vittata'***. At this specie we can observe bi-cellular hairs, with sharp tip.

The outline of transvers section has a circular shape. The epidermis has polygonal cells, slightly elongated tangentially, with thickened internal and external walls, the last wall being covered by the cuticle. In the area where the internode is surrounded by the sheath (at ***T. albiflora 'Aureo-vittata'***), some cells are transformed into tri-cellular hairs, with a very thick basic cell with sharp tip. The first two hypodermically layers have the cells with collenchymatous walls. There follows 4-5 layers of assimilating parenchyma, with large cells, some of them containing grains of starch.

The central cylinder gives the impression of some sort of delimitation towards the cork because of the existence of pseudo-endodermis [7]. This is represented by a layer of cells with a special structure, with internal and lateral thickened walls straight forwardly of the leading external fascicles.

The vascular system is made of numerous vascular bundles disposed upon two concentrically rings (at ***T. albiflora 'Aureo-vittata'***) or three concentrically rings (at ***T. fluminensis 'Albo-vittata'***): an external one, immediately under the pseudo-endodermis, and the others internal. The external ring comprises 12 leading fascicles, each with 1-3 xylem vessels, accompanied by very few xylem and phloem parenchyma, with insufficient collenchymas elements.

The internal ring (or the concentrically rings) are disposed in the fundamental parenchyma. All these fascicles are surrounded by a parenchymatic sheath and the xylem is replaced by an aquiferous gap, which can occupy up to 2/3 of the fascicle surface (at ***T. fluminensis 'Albo-vittata'***).

The leaf. The limb (**Fig. 4-6**). The epidermis seen upfront presents polygonal cells with straight lateral walls. Through transparency we can observe oxalate calcium crystals. In the upper epidermis there are presents unicellular hairs with pointed tip, in large number at the edges of the limb. The stomata of tetra-perigenous type are very numerous in the lower epidermis, disposed in parallel rows with the limb edge. In small number (at ***T. albiflora 'Aureo-vittata'***) we can find them in the upper epidermis, mainly towards the edges of the limb, thus the limb is amfistomatous.

In cross section, the limb had the shape of a ribbon, the median nervure being slightly prominent upon the inferior side of the limb.

The upper epidermis has rectangular, very high cells (occupying almost half of the limb thickness at ***T. albiflora 'Aureo-vittata'***), with hyaline appearance, with all walls thin, the external one being bulged and covered with a very thin cuticle. Towards the edges of the limb, the epidemical cells are diminishing and among them we can observe some bi-cellular hairs, with the basis at the level of the epidemical cells and with a terminal cell with pointed tip and thick walls.

The lower epidermis presents square cells (almost half of the height of those of the upper epidermis), of small dimensions upfront the medial nervure and at the edges of the limb, with all walls slightly thickened. Some cells have slightly undulated lateral walls but

all cells have bulge external walls and covered by a thin cuticle. From place to place we can notice small stomata, with very large substomatal chamber.

The middle nervure had a similar structure with the two taxa, presenting a vascular bundle covered by an obvious parenchymatic sheath. In both situations the xylem is very slightly developed, being represented by 1-2, respectively 3-4 vessels with slightly thickened and lignified walls, as well as by a few cells of xylem parenchyma. At ***T. fluminensis 'Albo-vittata'*** we can notice also elements of phloem. In the secondary nervures the fascicles presents a well defined parenchimatic sheath at ***T. albiflora 'Aureo-vittata'***, while at ***T. fluminensis 'Albo-vittata'*** this sheath is absent.

Between the nervures the mesophyll is homogenous towards the edges of the limb at both taxa, and in the rest is differentiated in palisade tissue and a spongy parenchyma at ***Tradescantia albiflora 'Aureo-vittata'*** and homogenous parenchyma at ***T. fluminensis 'Albo-vittata'.*** The palisade has only one layer of not so tall cells which contain chlorophyll in the green areas of the limb. The spongy parenchyma is bi-layered, with slightly rounded cells, with small intercellular space between them.

Conclusions

- The differences between the two taxa are more obvious at the limb level;
- The epidermis cells with large dimensions are adapted to the function of accumulating water. Between the development of the mesophyll and the size of the epidermis cells there is well defined correlation;
- The presence of the sclerenchyma around the leading fascicules in leaves mentioned in literature [3] has not been observed at the studied material.

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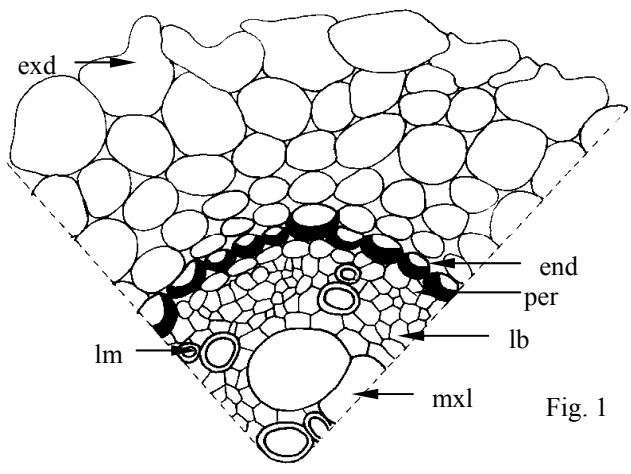
Explanation of figures:

Fig. 1. ***Tradescantia albiflora*** Kunth ***'Aureo-vittata'*** - Root structure (detail of cork and central cylinder).
Fig. 2. ***Tradescantia albiflora*** Kunth ***'Aureo-vittata'*** - Stem structure (middle level - detail of vascular bundle in cork) (x 700).
Fig. 3. ***Tradescantia albiflora*** Kunth ***'Aureo-vittata'*** - Stem structure (middle level - detail of vascular bundle in central cylinder) (x 700).
Fig. 4. ***Tradescantia albiflora*** Kunth ***'Aureo-vittata'*** – Upper and lower epidermis structure (details).
Fig 5. ***Tradescantia fluminensis*** Vell. ***'Albo-vittata'*** – Lower epidermis structure (details of trichomes).
Fig. 6. ***Tradescantia albiflora*** Kunth ***'Aureo-vittata'*** – Lamina structure (details)(x 700).
Fig. 7 ***Tradescantia fluminensis*** Vell. ***'Albo-vittata'*** – Lamina structure (details)(x 700).

Abreviations

cam. subst - substomatal chamber; **cel. ep** - epidermal cells; **cel. st** - stomatal cells; **end** -endodermis; **exd** - exodermis; **ep** - epidermis; **ep. i** - lower epidermis; **ep.s** - upper epidermis; **fs. cond** - vascular bundle; **lb** - phloem; **lm** - xylem; **mez** - mesophyll; **mxl** - metaxylem; **par. asimil** - asimilating parenchyma; **par. clz** – cellulosic parenchyma; **p. t** - hair; **sc** - cork; **tc. par** - parenchymatous sheat; **tc. sc** - sclerenchimatic sheat; **ț. lc** - spongy parenchyma; **ț. psd** - palisade parenchyma.



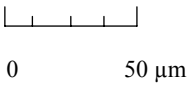


Fig. 1

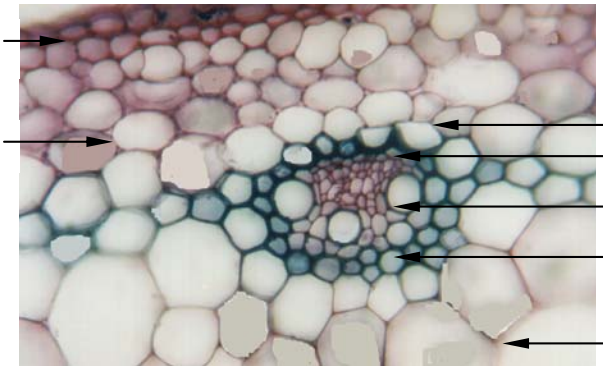


Fig. 2

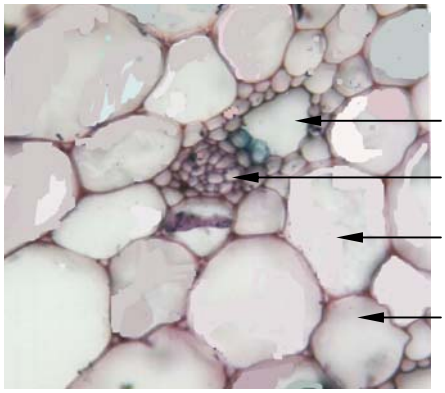


Fig. 3

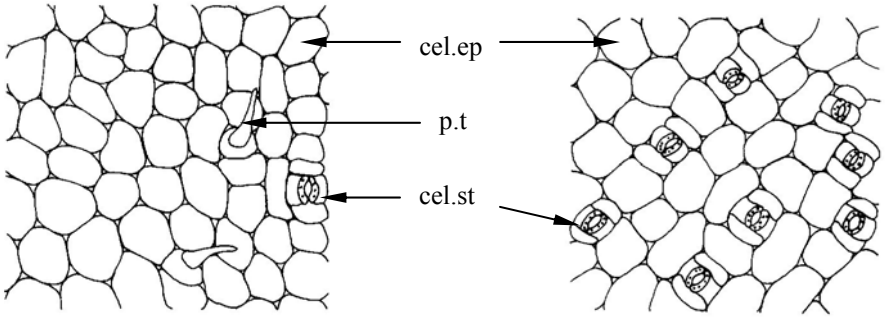
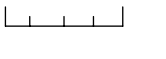


Fig. 4



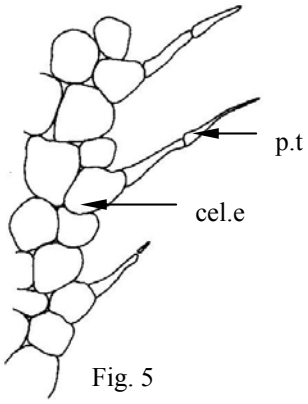


Fig. 5

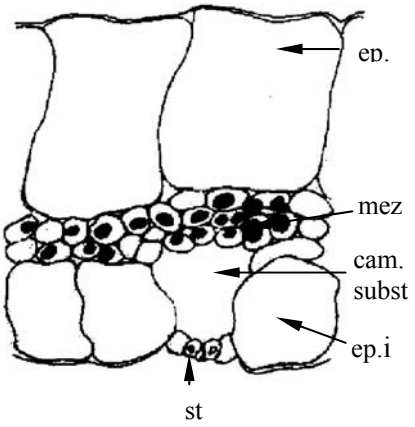


Fig. 7

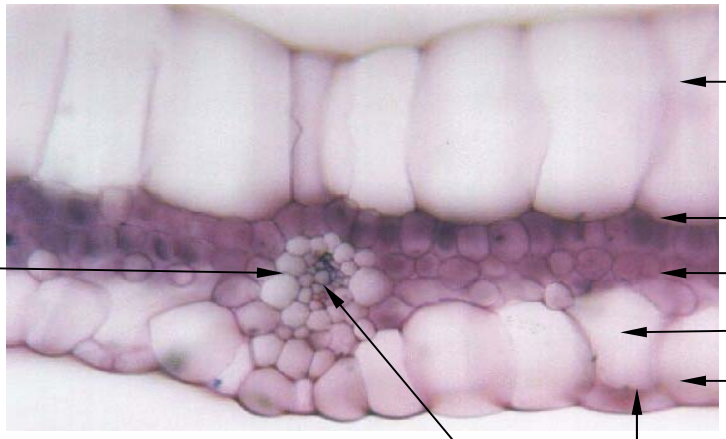


Fig. 6