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Anatomy of the vegetative organs of *Tradescantia pallida purpurea*

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Abstract: This paper presents an anatomical study of the structure of the roots, stems and leaves of *Tradescantia pallida* cv. *purpurea*. The tuberised root of this species has a primary structure, typical one for the herbaceous monocotyledonous plants. The stem also has a primary structure, with two concentrical rings of closed collateral vascular bundles. The structure of the leaf is a heterogenous one, with adaxial uniseriate epidermis, multiseriate hypodermis, uniseriate palisade mesophyll, multiseriate spongy mesophyll, and uniseriate abaxial epidermis. Leaves are dorsiventral, hypostomatic, with tetracytic stomatal complex. The epidermis presented non-ramified bicellular protecting trichomes and epidermal cells have anthocyanins in the vacuolar sistems. In the parenchyma and collenchyma of these vegetative organs, there are many calcium oxalate crystals, particularly tetragonal ones.

Key words: anatomy, root, stem, leaf, *Tradescantia pallida* cv. *purpurea*

Introduction

Tradescantia pallida cv. *purpurea* originates in the East of Mexic, where it spontaneously grows, creating damages to agriculture (Brandão 1985). In Romania it is considered to be an ornamental plant. Research referring to this species has traced the anatomical and pysiological changes at the level of the lamina (thickness of the mesophyll, of the hipodermis, the contents into photosynthesising pygments, in antocyanins, the stomatae index, epicuticular layer), under the action of light of various intensities (Paiva et al. 2003). The results obtained suggest that this species has a great capacity to adapt, it can colonize a wide range of environments, growing very well both in a strong light and it shady places. Research has also been made attesting to the presence of the calcium oxalate crystals in the parenchyma of all vegetative organs and in the flower, under the form of rafids and tetragonal crystals (Brizuela et. al. 2007).

This work involves the histological and anatomical analysis of the vegetative organs of the species taken into study.

Materials and methods

The vegetative organs of the species taken into study were conserved in alcohol 70º. For the histological studies cross sections were made through the organs and the leaves epidermis were peeled off. The cross sections made through the organs were cleared with natrium hypochlorine and coloured both with Congo red and with ioded zinc chlorine, which enables the outlining of parenchyma of depositing the starch grains. The Congo red colours the cellulosic cellular walls into red (Şipoş 2004). The provisional microscopic prepared material thus obtained were examined and microscopically analysed with various ocular-objective sets (oc.10x and ob. 4x, 10x, 40x) and photographed with a Canon 550 camera, attached to the ocular of the microscope with an adaptater. The photographs were processed with ACD See Photo Manager software.

Results and Discussions

Root anatomy

At *Tradescantia pallida* cv. *purpurea* (Fig. 1A) the root is tuberised (Fig. 1B). The anatomy of the root of this species is the typical one for the herbaceous monocotyledonous plants. Thus, we can talk about a primary structure of the root (Grinţescu 1985). At the exterior there is the exodermis (Fig. 1F). Beneath, there is a parenchyma with the starch grains (Fig. 1D). The depositing parenchyma contains many calcium oxalate crystals, particularly tetragonal ones. The cells of this tissue are disposed in a disordered way to the periphery and extremely orderly (cellular rays) towards the central cylinder. (Fig. 1C). At the level of the last stratum of the cortex, the endodermis, the *Caspary points* can be very well observed; the pericycle, the first layer of cells of the central cylinder can also be observed (Fig. 1E).

In the central cylinder there can be observed a number of 15-17 xilematic vascular bundles, alternatively disposed with the same number of fascicles with vascular tissue (phloem)(coloured in red with red Congo) and divied among them by parechymatic medular rays. The metaxilem of the wooden fascicles is oriented towards the pith, whereas the protoxilem towards the pericycle (Fig. 1E). The pith is a parenchyma full of starch grains and with calcium oxalate crystals.

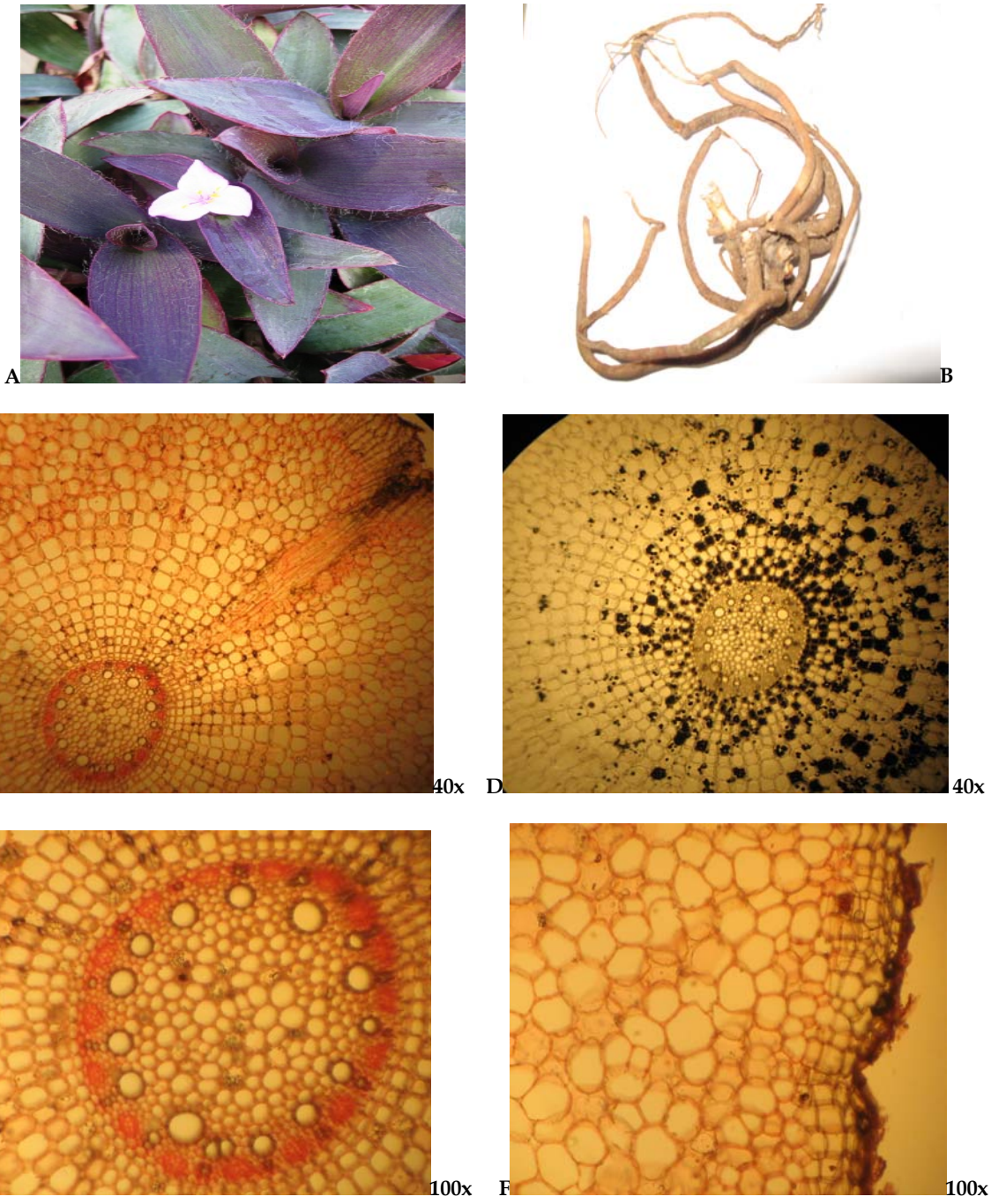

Figure 1. *Tradescantia pallida* cv. *purpurea* (A), tuberised root (B), root anatomy – coloration with red Congo (C), root anatomy – coloration with iodate chloride of zinc (D), structure detail regarding the central cylinder (E), structure detail regarding the exodermis (F).

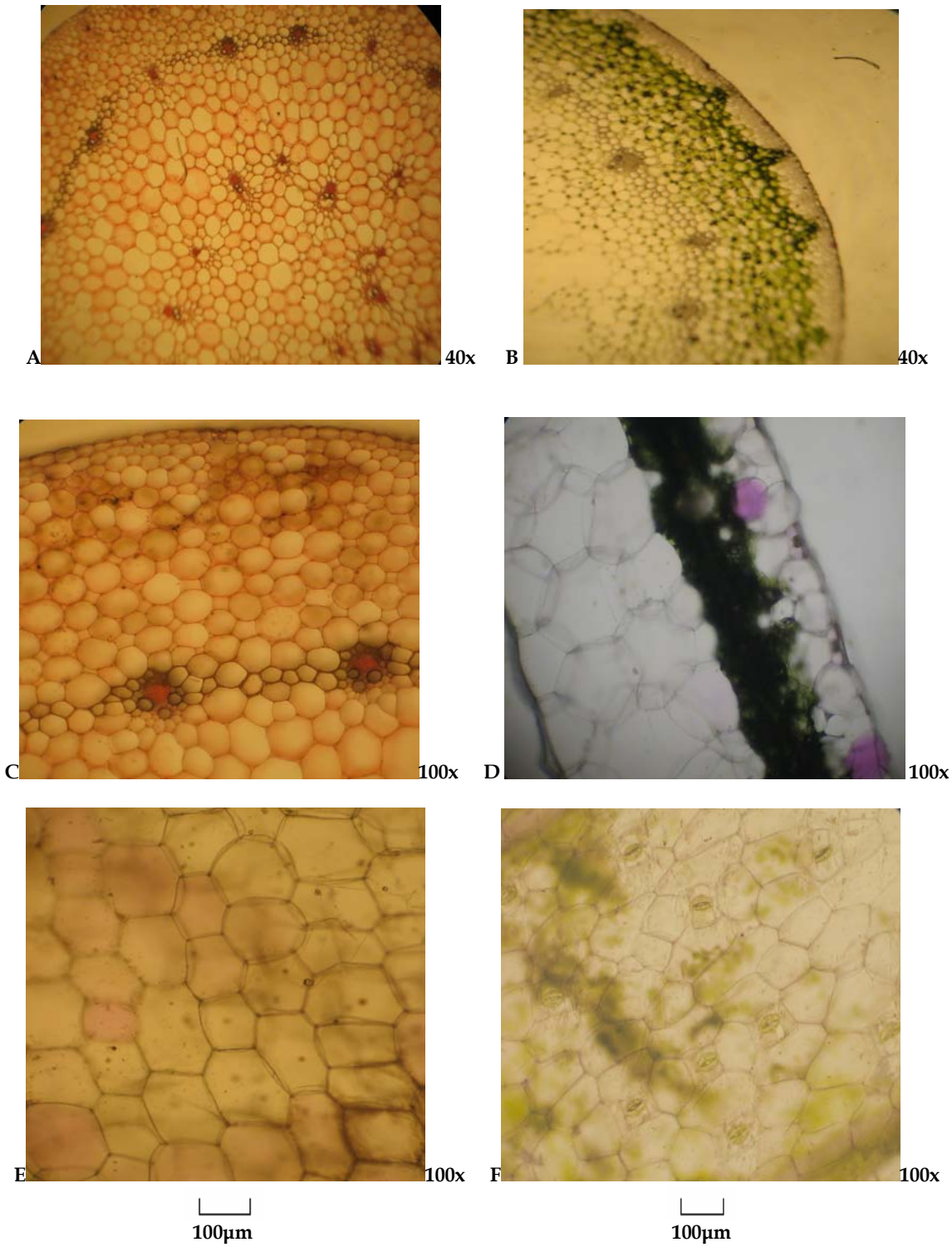

Figure 2. *Tradescantia pallida* cv. *purpurea* stem anatomy- coloration with red Congo (A), stem anatomy – without coloration (B), structure detail regarding the stem– coloration with red Congo (C), anatomy of the lamina (D), adaxial epidermis (E), abaxial epidermis (F).

Stem anatomy

The outline of the cross section through the stem is round. The stem has a primary structure. It presents from the exterior towards the interior: the epidermis, the cortex and the central cylinder. The epidermis is contains a single layer of cells. It contains stomatae and is covered with a thin cuticulae (Fig. 2C). Below the epidermis there is an angular colenchyma made up of 3-4 layers of cells, interrupted at the level of the stomatae with the chlorenchyma (Fig. 2B). There cannot be observed the endodermis and the pericycle, the central cylinder comprising of two concentrical rings of closed collateral vascular bundles, specific to the monocotyledonous plants (Fig. 2A) (Grinţescu 1985). In the exterior ring, the fascicles are protected by sclerenchyma, thicker above the phloem (coloured in red with Congo red) and thinner below the metaxilem. These facicles are linked among them by the sclerenchyma (Fig. 2C). The central fascicles are different from the exterior one by the fact that at their level the presence of a lisigene lacune can observed. These fascicles and are not surrounded by the sclerenchyma (Fig. 2A). Towards the leaf pod, in the internal ring, the presence of several fascicles can be observed (Fig. 2A).

Leaf anatomy

The upper epidermis of the lamina is made up of hexagonal cells with antocyanins; it is without stomatae (Fig. 2E). The size of the cells of this adaxial epidermis were as follows: in length 225-250 µm, and in width around 175-225 µm. Beneath there is a hypodermis made up of 2-3 layers of turgescent cells (Fig. 2D). The mesophyll of the leaf represents around 25% of the thickness of the lamina (Fig. 2D) and is made up of palisadic tissue, disposed towards the hipodermis and of the spongy parenchyma, towards the abaxial epidermis. This ratio suggests - according to the research made by Paiva (2003) - that the plants sectioned by us have developed at light. Paiva (2003) has studied the anatomical and physiological changes from the leaves of *Tradescantia pallida* cv. *purpurea*, under the action of light of various intensities. He has noticed that at a weak light the leaf diminishes its thickness. With the hypodermis, the quantity of carotenoids pigments and antocyanins decreases and the cuticule is thinner but the stomatic index was little influenced (value of stomatic index was 17-18). At the level of the stomatae the spongy tissue was into contact with the stomatic bags full of air (Fig. 2D). Lamina is crossed by a parallel nervation. The abaxial epidermis is made up of epidermal cells with antocians in the vacuolar sistems, smaller than the cells of the upper epidermis (the lengths 125-225 µm and the width around 80 -125 µm) and with tetracytic stomatae (Wilkinson 1983) (Fig. 2F). The non-ramified bicellular protecting trichomes, a few millimeters long, visible to the naked eye (Fig. 1A) are disosed especially on the margins of the lamina. The pods have a structure similar to that of the lamina, they have a homogenous mesophyll and are crossed by 18-20 closed collateral vascular bundles.

In conclusions, at *Tradescantia pallida* cv. *Purpurea*, the tuberised root has a primary structure, typical one for the herbaceous monocotyledonous plants. The stem also has a primary structure, with two concentrical rings of closed collteral vascular bundles. The structure of the leaf is a heterogenous one, with adaxial uniseriate epidermis, multiseriat hypodermis, uniseriat palisade mesophyll, multiseriat spongy mesophyll, and uniseriate abaxial epidermis. Leaves are dorsiventral, hypostomatic, with tetracytic stomatal complex. The epidermis presented non-ramified pluricellular protecting trichomes and epidermal cells have antocyanins in the vacuolar sistems. In the parenchyma and collenchyma of these vegetative organs, there are a lot of calcium oxalate crystals.

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