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# THE EFFECTS OF THE CROP'S SUBSTRATE AND OF THE ROOTING STIMULATORS ON THE INTERNAL STRUCTURE OF THE VEGETATIVE ORGANS OF THE GERANIUM PLANT (*PELARGONIUM PELTATUM*)

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***Abstract***

*The propagation by cuttings obtained from the stem is a frequently used way of vegetative multiplication in the species of the Pelargonium genus. The purpose of this work is to highlight the changes induced in the internal structure of the vegetative organs by the crop's substrate and by the growth promoters used for improving the rooting degree. Variations were observed in the number of layers of cells that make up the structure of tabular collenchyma from the stem's structure, in the mesophyll's thickness or in the degree of thickening of the cells' walls.*

***Key words***: *growth promoters, internal structure, vegetative organs*

## INTRODUCTION

Potting-up is a means of vegetative propagation, widely used for the species from the Pelargonium genus. It is necessary that the substrate used for rooting consist of mixtures of light soils, porous for the air, which can retain moisture for long periods and warm up easily [4]. Hastening the rooting is done by using artificial light, growth promoters or regulators. It is known that the plant-produced phytohormons, the auxins play a key role in stimulating the roots' branching and in the rooting of cutting-ins [1]. Besides these, cytokinin and gibberellins also play a role in the intensification of metabolic processes, cell division or growth in length [3]. Associating such compounds to rooting substrates allows the increase of the rooted percentage of the cuttings.
This paper aims at highlighting the influence of the rooting substrate and of the rootedness stimulators on the internal structure of the vegetative organs formed in the node cuttings.

## MATERIAL AND METHOD

The experiments were conducted in the horticulture department's flower greenhouse, in the framework of USAMV Bucharest. The plant material analyzed consisted of cuttings from the tips of shoots harvested from mother plants of the species Pelargonium peltatum from the academic collection. Experimental variants for the rooting substrate were: peat + perlite (1:1), peat, perlite, sand and for stimulating substances: Clonex (gel - mixture of hormones, vitamins and mineral nutrients), Coralite (a powder consisting of vitamin A, the B complex, C, D, E, amino acids, trace elements); Radistim (powder - incentive for rooting).
Provisional anatomical preparations were obtained by cutting across vegetative organs (leaf, stems, and adventitious roots), clarification with chloride hydrate and staining with carmine alun and iodine green and images with a Panasonic DMC-LZ7 digital camera.

## RESULTS AND DISCUSSIONS

The adventitious roots' structure

Most variants had adventitious roots with external primary tissues (epidermis and part of the cortex) peeling due to the formation of a suberized tissue by a monopleuric cork cambium, which appeared in the primary cortex (Photo 1).

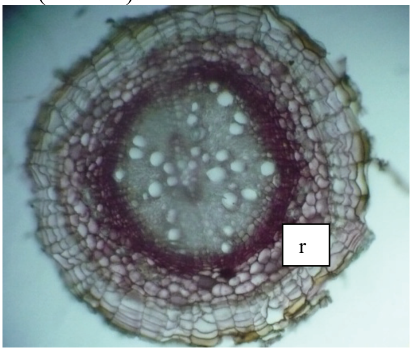

Photo 1. Perlite+peat+Clonex variant: suberized tissue (s)

In some sections, the primary tissue is not removed, although suber is well developed, while in the variant with peat rooting substrate and stimulant Radistim, the cork cambium didn't appear and the tissues of primary origin were kept on the outside (Photo 2).

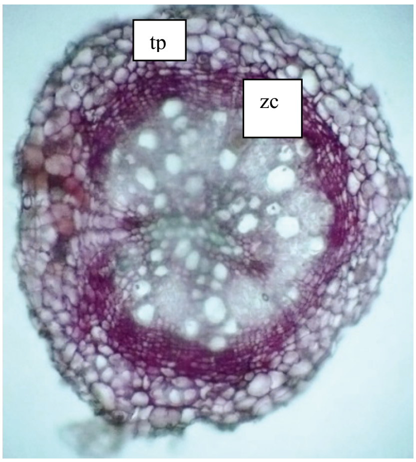

Photo 2. Peat+Radistim: primary tissue (tp); cambial zone (zc)

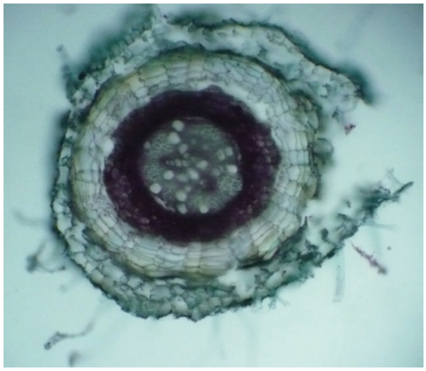
Photo 3. Perlite + peat control variant

In the central cylinder the cambium is active, without cell differentiation occurring yet; the central xylem consisting of elements primary origin for most variants (photo 2). In the control variant (without stimulants) perlite + peat substrate, no start of activity of the cambium was observed (photo 3). Another meristematic whose activity started is the pericycle which in the perlite + peat + Coralite variant, produced lateral roots (Photo 4).

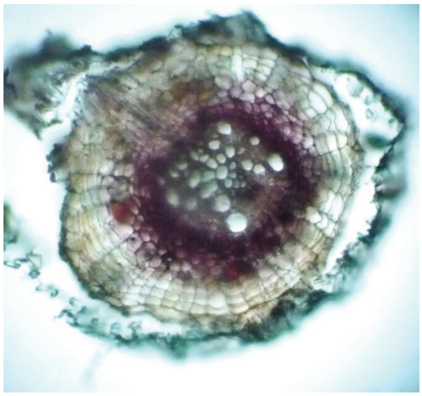
Photo 4. Perlite+ peat+ Coralite: lateral root (r)

Petiole structure

Petiole has a similar composition to the pulvinus - structures involved in the change of the leaf blade's position [2]: in the central area there is a conducting tissue surrounded by parenchyma. In the control variant (without rooting stimulators) substrate of sand, stem structure, representative of most cases of the experiment, shows, from the outside to the centre, the following types of tissues (Photo 5): external epidermis, with one cells layer, provided with stomata and secretory structures (hairs, scales); hypodermis – one cells layer consisting of a tabular collenchyma; clorenchyme, composed of 4-5 layers of cells with chloroplasts, sclerenchymatous pericycle, consisting of 1-2 layers of cells in the interfascicular area; central cylinder composed of a fundamental parenchyma in which nine small bundles are arranged circularly, outward, and in the center a large bundle, all of the collateral type with the active interfascicular cambium (Photo 6).

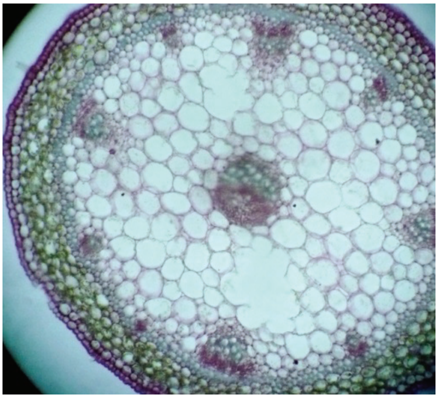

Photo 5. Sand variant: petiole structure

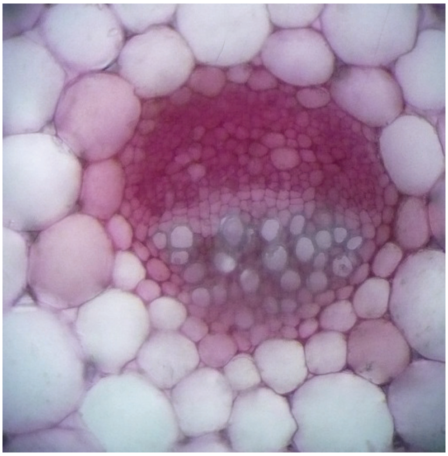

Photo 6. Central bundle, collateral, with cambium in activity

In the variants in which the Coralite product has been used as a rooting agent, parenchyma cells are larger and clorofilian parenchyma tissue consists of 7-9 layers of cells (photo 7).

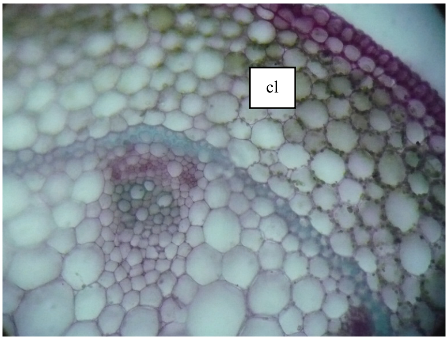


Photo 7. Perlite+peat+Coralite: clorenchyme (cl)

Leaf blade structure

Leaf blade is defined by an upper epidermis provided with secretory hairs and a lower one, in which, in addition to hairs, there are stomata (Photo 8).

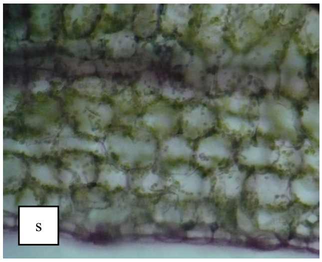


Photo 8. Stomata in lower epidermis (s)

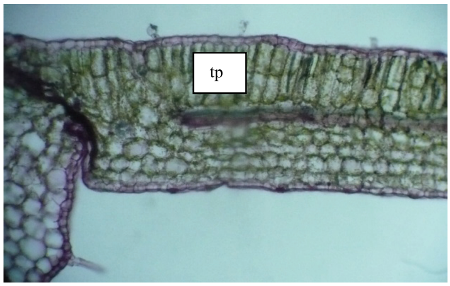


Photo 9. Perlite variant: palisade tissue (tp)

The bifacial type of mesophyll consists of a palisade tissue with two cell layers and a spongy parenchyma oriented towards the lower epidermis. The palisade tissue, in the variants with perlite as rooting substrate is composed of cells whose length exceeds about 3 times the width (Photo 9). In the remaining variants, the palisade tissue cells are nearly isodiametric, the mesophyll having a homogeneous aspect (Photo 10).

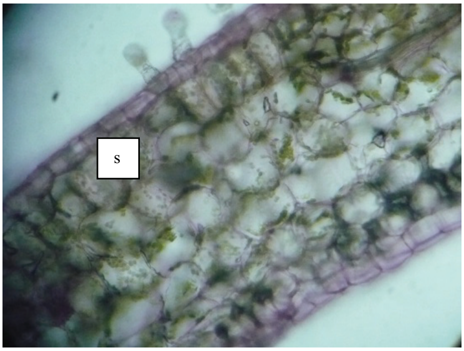

Photo 10.Peat variant: palisade tissue (tp)

## CONCLUSIONS

The two factors - the rooting substrate and the rooting process stimulators produce ± relevant changes in the internal structure of the vegetative organs.

At the root level, they affect differently the activity of primary meristems - pericycle and of the secondary ones – cambium and cork cambium.

In stems, parenchyma cell size and number of constitutive layers of the collenchyma are increased in the variants based on Coralite. The palisade tissue in the leaves' mesophyll is clearly distinguishable from the spongy tissue by the cells' shape in variants with perlite as rooting substrate.

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