

ANATOMICAL ASPECTS OF THE STEM AND LEAF OF *SENECIO GRANDIDENTATUS* LEDEB. (ASTERACEAE)

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ABSTRACT

The paper presents anatomical aspects of the stem and leaf of an endangered plant, growing on sandy coastal beaches and loessoid sea-cliffs *Senecio grandidentatus* Ledeb. It was observed that the root has a secondary structure, due to the phelogen and cambium activity, The stem has a one-layered epidermis, covered by cuticle, a differentiated cortex and a large number of collateral vascular bundles, most of them with xylem secondary structure due to the cambium activity. The leaf has a homogenous mesophyll and is amphistomatic. Long and densely non glandular hairs are present in the stem and leaf. The mechanical tissue is represented by sclerenchymatous fibers and tangential collenchyma in the stem and collenchyma tissue in the leaf.

Key words: anatomy, endangered, stem, leaf, *Senecio grandidentatus*

INTRODUCTION

Senecio grandidentatus Ledeb. (syn. *Jacobaea erucifolia* subsp. *arenaria* (Soó) B.Nord. & Greuter) (Alexey and Suslova, 2007) is an endangered (Oprea, 2005) or a critic endangered species, at risk of extinction in the near future about other authors, growing on clay or sandy coastal sea-shore near beaches, moderately moist soils and moderate content of nitrogen. It is a heliophilous of temperate zone plant. In Romania is a rare plant, its chorology in the past shown its presence in Constanţa and Tulcea Counties between Eforie Nord and Eforie Sud, Tuzla, Techirghiol–Movil, the ancient city Histria, Macin–Tulcea) (Oprea, 2005, Dihoru and Negrean, 2009). The plant is densely hairy and gray with simple pinnatifid leaves and denticulate lobes (approx. 10 mm). The leaves of the basal rosette have petioles, cauline (stem) leaves are sessile and both are deeply lobed and alternate. The yellow ligulate flowers are grouped in laxity corimbose inflorescences. The fruit are hairy achenes (Fig. 1). In other countries the plant ecology differs, being common on the halophile meadows (Dihoru and Negrean, 2009; Munz and Keck, 1973).



Fig. 1. Natural view of *Senecio grandidentatus* Ledeb. (original).

Few data are known about this species anatomy, most of researches are taxonomic and chorological such as those of Dihoru and Negrean (2009); Lotfi et al. (2010); Greuter and Raab-Straube (2006). The purpose of this paper is to highlight the some anatomical features of *Senecio grandidentatus* and to contribute with more information to the knowledge concerning this taxon.

MATERIAL AND METHODS

Due to the degree of endangerment of this species, in the anatomical study we used only vegetative organ pieces taken from a vigorous plant, without taken the whole plant. The plant belongs of the small population found by us, in may 2014, placed between Vama Veche – 2 Mai (Constantza County) loessoid sea-cliffs on the Romanian Black Sea shore. Pieces stem and leaf were fixed in FAA (formalin: glacial acetic acid: alcohol 5:5:90). The cross sections of the upper part of the stem and the cauline leaf were performed by the free hand made technique (Bercu and Jianu, 2003). The samples were stained with alum-carmin and iodine green. Anatomical observations and micrographs were performed with a BIOROM-T bright field microscope, equipped with a TOPICA 6001A video camera.

RESULTS AND DISCUSSION

Cross section of the stem, in the superior part, discloses a circular-coasted shape with 6-7 prominent ridges (Fig. 1). The unistratous epidermis is represented by slightly tangentially elongated cells with thik internal and external walls, the latest covered by a thck striated cuticle.

The epidermis continuity is broken by the present of stomata and densely uniseriate long (7-8 cells) non glansular hairs (Fig. 2, B). The hipodermis consists of 4-5 layers of cells between the ridges which alternate with tangential collenchyma, developed in ridges. Bellow the hipodermis is the inner cortex represented by a parenchyma tissue, more reduced in front of the stele vascular bundles. The primary endodermis is an amiliferous sheath. In the perphloem zone groups of peryclcle fibers are present.

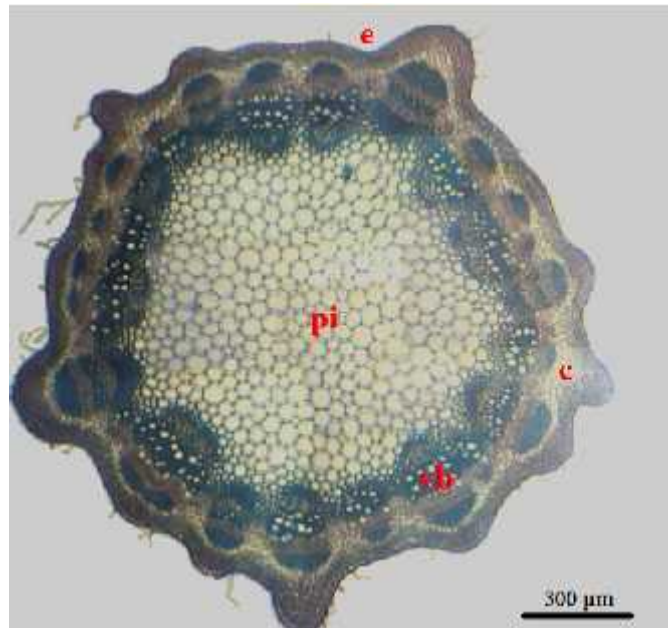
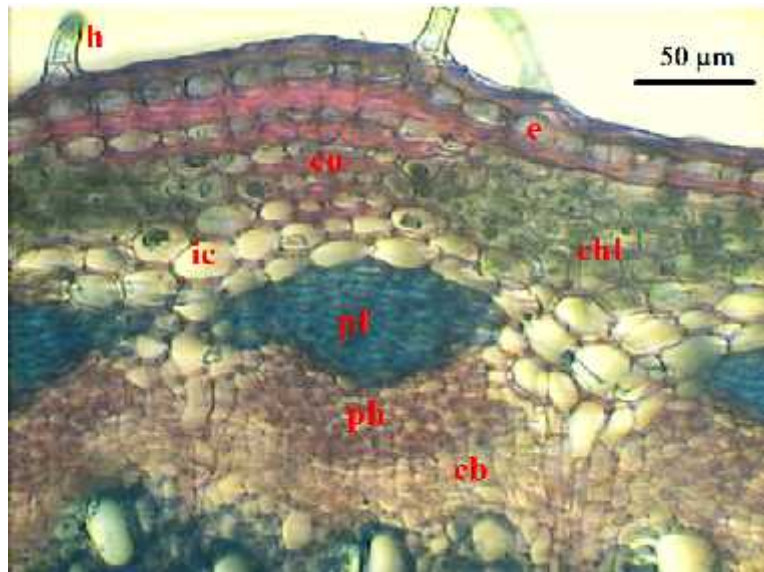


Fig. 1. Cross section of the stem – ensamble: c- cortex, e- epidermis, pi- pith, vb- vascular bundle.

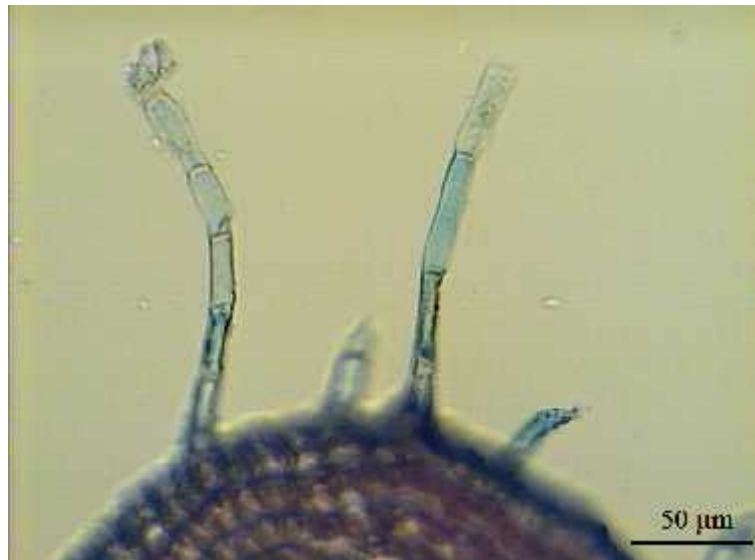
The vascular system is represented by 19-20 open and collateral bundles separated by more or less sclerified pith rays in xylem zone and cellulosic in the phloem region. The xylem has mostly a secondary structure due to the cambium activity, but some primary bundles are present as well. The phloem compared to xylem is reduced and is composed of phloem vessels, companion cells and phloem parenchyma.

Groups of sclerenchyma cells are present as well below the phloem (Fig. 2, A; Fig. 3 A).

The central part of the stem is occupied by the pith, composed of large parenchymatous cells with intercellular spaces (Fig. 3, B).

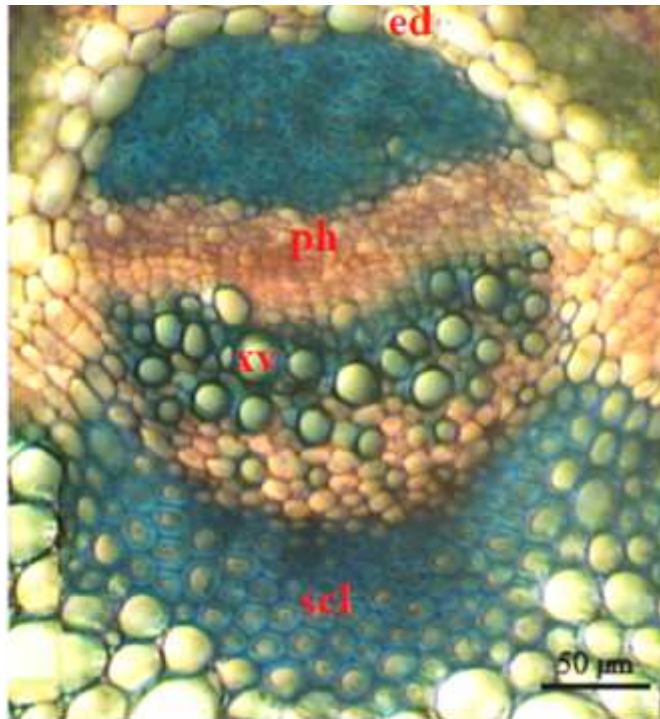


A

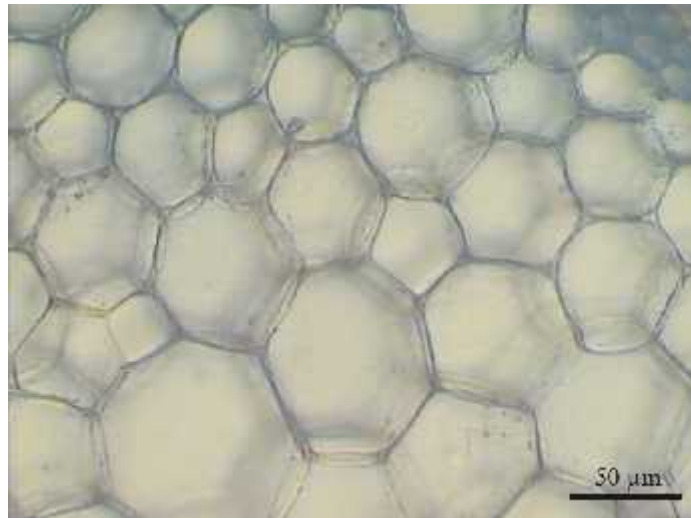


B

Fig. 2. Cross section of the stem with epidermis and cortex (A). Portion of epidermis with non glandular hairs (B): cb- cambium, chl- chlorenchyma, co- collenchyma, e- epidermis, h- hair, ic- inner cortex, pf- pericycle fibers, ph- phloem.



A

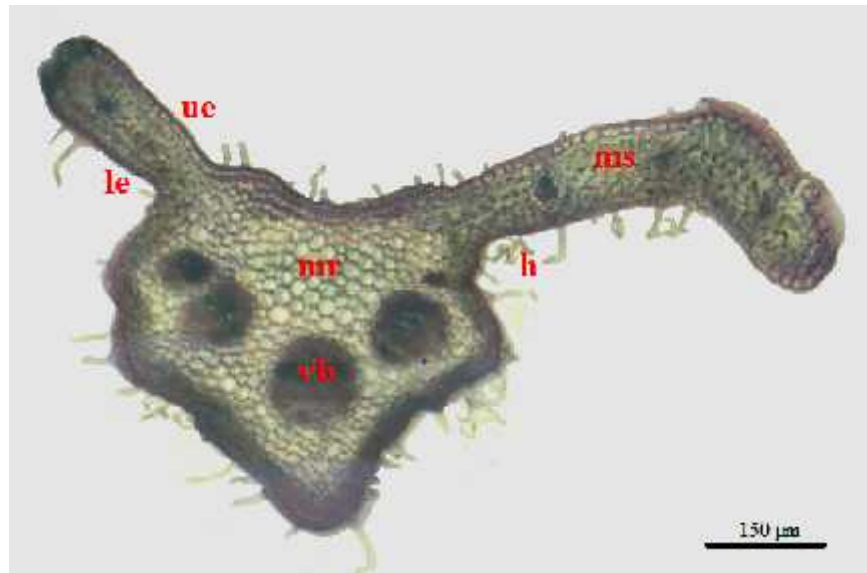


B

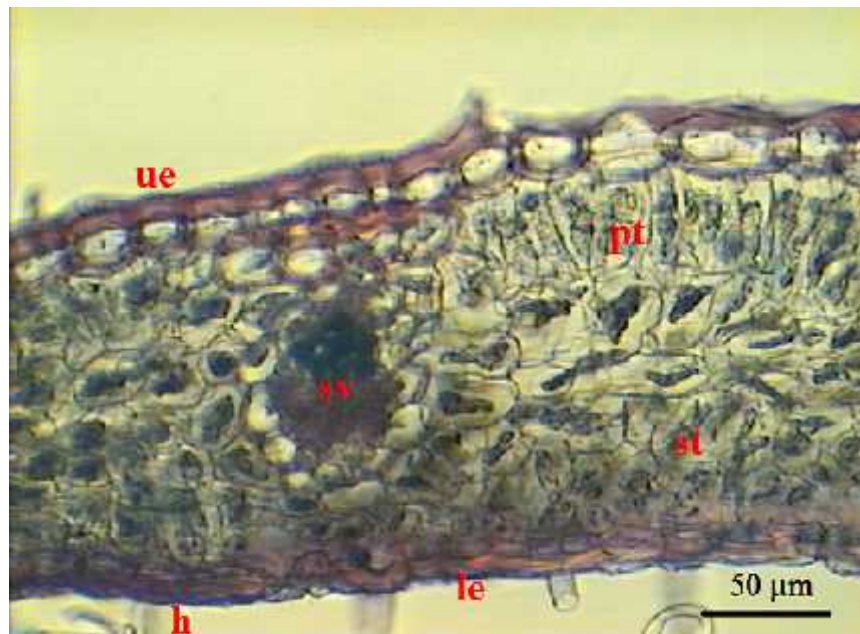
Fig. 3. Cross sections of the stem. A stele vascular bundle (A). Medular portion (B): ed- endodermis, ph- phloem, scl- sclerenchyma, xv- xylem vessel, fl- floem, scl- sclerenchim, vx- vase de xilem.

Cross section of the leaf exhibits the upper epidermis such as the lower one are represented by a single layer of cells. However the lower epidermal cells are smaller than the upper one. The both epidermes cells are slightly elongated covered by a thick cuticle. The upper epidermal cells are larger in between the veins areas (Fig. 4, B). Both epidermes are interrupted by the presence of stomata (amphistomatic blade) and non glandular hairs the latest the same as

those of the stem. The non glandular hairs are abundant to the lower epidermis and in the mid rib area (Fig. 4, A).



A



B

Fig. 4. Cross sections of the leaf. Ensemble (A). Portion with mesophyll (B): h- hairs, le- lower epidermis, mr- mid rib, ms- mesophyll, st- spongy tissue, pt- palisade tissue, sv- secondary vein, ue- upper epidermis, vb- vascular bundle.

The mesophyll is differentiated into one layered palisade tissue and spongy tissue in rest. The mid rib is prominent to the lower epidermis with 4-5 ridges where the mid rib vascular bundles are present (Fig. 4, A, B). Between the epidermes and the mid rib a collenchyma tissue is present. It is well developed to the lower epidermis and reduced to the upper epidermis. A more

or less collenchymatous sheath surrounds the vascular bundles. The vascular bundles of the secondary veins are protected by a parenchyma sheath with large cells and chloroplasts (Fig. 5).

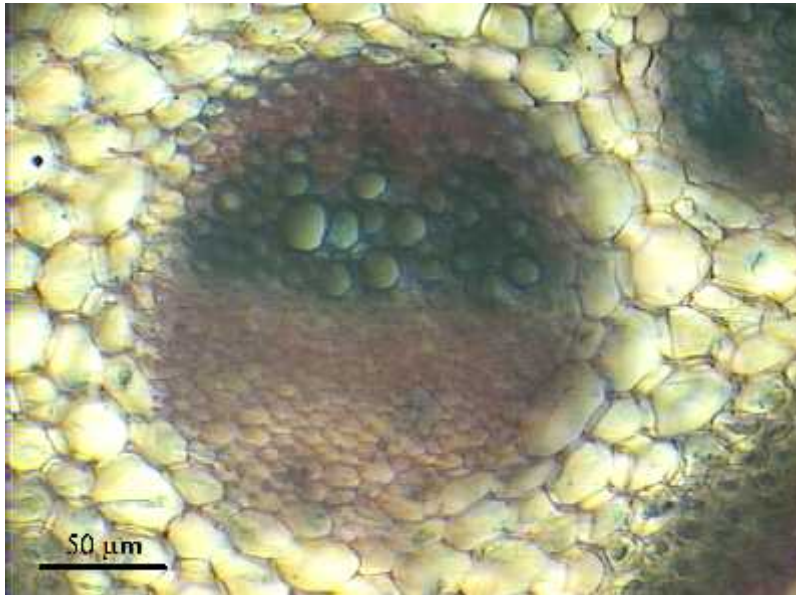


Fig. 5. A vascular bundle of the mid rib in cross section.

CONCLUSIONS

The stem possesses a differentiated cortex represented by a tangential collenchyma in the ridges and a chlorenchyma in the rest. An amilipherous sheath is present as well. The vascular system is represented by numerous vascular collateral bundles with secondary xylem, separated by sclerified and cellulosic pith rays.

The blade is homogenous and amphistomatic with 4-5 vascular bundles in the mid rib vein.

Uniseriate non glandular are abundant in the stem and leaf.

The mechanical tissue is represented by sclerenchyma and tangential collenchyma tissues placed in the stem and collenchyma tissue in the leaf.

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