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# STRUCTURAL ASPECTS OF THE VEGETATIVE OEGANS OF *CRYPTOCORYNE WENDTII* DE WIT. (ARACEAE)

***RODICA BERCU***
*Faculty of Natural and Agricultural Sciences,"Ovidius" University, Constantza*
*University Alley, No. 1, B, 900470, Constantza*
E-mail: prof.rodicabercu@gmail.com

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## *ABSTRACT*

*The paper presents structural aspects of the vegetative organs (adventitious root, stem and leaf) of a monocot herb, native to Sri Lanka and Thailand, namely Cryptocorynewendtii de Wit. It is a green variety of Cryptocorynewendtii, growing both submerged and emerged in its native regions. In our country the plant is known as an aquarium plant. The material fixation and processing was done according to the usual protocol of the Vegetal Morphology and Anatomy Laboratory belonging to the Natural Sciences Department of the our faculty. The adventitious root has a primary monocot structure with small intercellular spaces. The short stem vascular system consists of amphivasal bundles to the center and fewcollateral bundles to periphery.The petiole exhibits epidermis with regularlly arranged cutinized cells, without intercellular spaces, covered by a thik cuticle and poor developed stele vascular system. The leaf mesophyll is homogenous (isobilateral) type, with small intercellular spaces and a poor developed midrib collateral bundle with few conductive elements. The mechanical tissues almost lack. The petiole and blade have sclerenchyma groups of cells bellow the epidermis and for the blade to the lower epidermis.*

## INTRODUCTION

*Cryptocoryne*Fisch. ex Widler, known as water trumpet, is a genus of about 58-60 species, belonging to Araceae family. *Cryptocorynewendtii*de Wit is a herb plant native to Sri Lanka and Thailand. It first wasdescribed by the botanistHedrik de Wit in honor of Albert Wendt an aquarium hobbyst and writer (Seah, 2005; Witt, 1990).

The plant lives submerged but sometimes emers, with completely different shapes and very easily adaptable to environmental conditions (De Graaf, 1987). The plant can reach up to 30 cm and can grow normally with both optimal and intense lighting. Characteristically, *C. wendtii* has a brown color of the rachis and petiole, contrasting with the green color of the rest of the leaf. Dötsch, 1984; Muhleberg, 1982) (Fig. 1).

The radicular system is strongly branched. The short stem (crown) develop 5-10 leaves which, depending on the environment, are very different in shape, size and color (Manthei, 2010). Thus, the submerged plants are smaller and the leaves reach up to maximum of 10-15 cm in length, and can have brown strips with small spots or may be uniform pinkish or brown-olive in color. Leaves of high emerald plants are light green-colored.The leaves may be oval or slightly elongated, with sharp pointed apex and sinuous margins. When the plant grows emerged it blooms rapidly, producing dense flowers grouped in spadix type short inflorescence (5-8 cm). It may blooms in submerse condition as well, but flowers do not open (Möhlmann, 1987; Randell, 2000).

In general, *Criptocorynewendtii*reproduction isvegetative for the submerged plants and a sexually reproduction for those of the emerse plants flowers. At a temperature below 22°C and at a low humidity, the plant growth is embarrassed. In winter, the species can withstand temperatures below 15ºC, but the optimal temperature is 24-30ºC. In heritable

state, the plant can withstand even lower temperatures without losing the leaves, but providing optimal humidity. In a submerged state, the plant can hardly withstand the low temperatures, but with their flower cover loss (Kane, 1993; Möhlmann, 1987).

***Fig. 1.*** *Natural view of Cryptocoryne wendtii de Wit. (Web 1).*

In literature are generally little information on this aquatic plant anatomy, many papers dealing with them in terms of morphological and taxonomic studies (Fassett, 1955; Haynes & Holm-Nielsen, 1986/1994; Somogyi, 2006). In our country, ample studies of aquatic spontaneous aquatic plants were held by Sârbu et al. (2005) and Bercu(2009a,b/2010/2015)most recent aquarium anatomical studies.

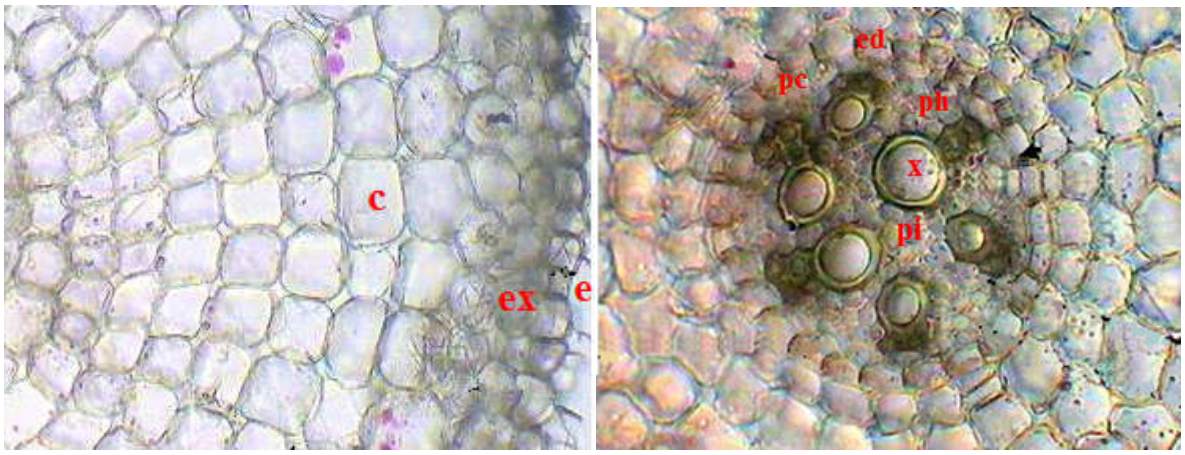
## MATERIAL AND METHODS

The plant belongs to the Vegetal and Morphological Laboratory aquarium of the Faculty of Natural and Agricultural Science. Small pieces of roots, stem and leaf (petiole and lamina) were fixed in FAA (formalin: glacial acetic acid: alcohol 5:5:90). Cross sections and longitudinal sections of the leaf were performed by free hand made technique (Bercu and Jianu, 2003). The samples were stained with alum-carmine and iodine green and mounted in glycerinated gelatin. Anatomical observations and micrographs were performed with a BIOROM–T bright field microscope, equipped with a Topica 6001A video camera.

## RESULTS AND DISCUSSION

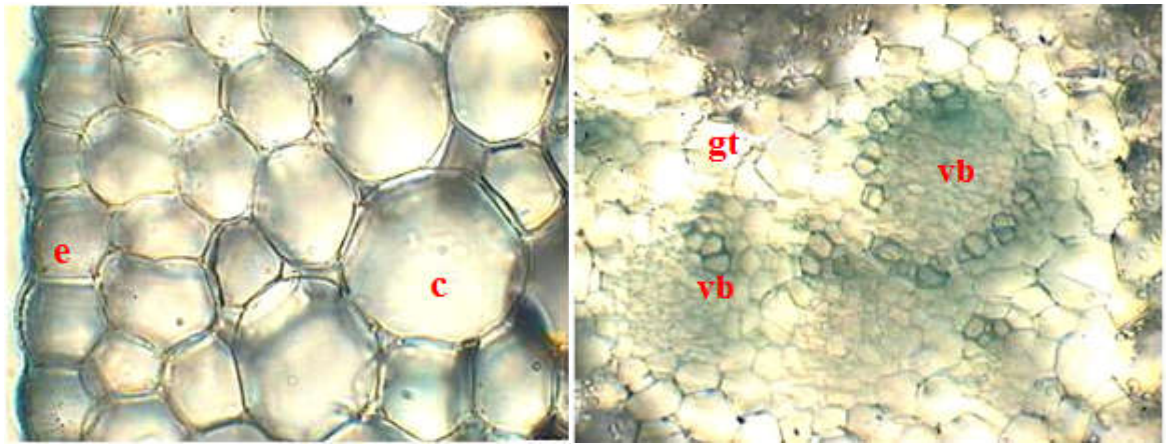
Cross section of the adventitious root discloses the outermost epidermis (rhizodermis) with a single layer of medium cells with slightly tihick cells. The cortex is differentiated into two zones: the first zone consists of three layers of cells with slightly thickened walls (cutis), followed by a multy-layred parencyma with small intercellualar spaces (Fig. 2, A). Such as other monoct roots (Batanouny, 1992; Bavaru and Bercu, 2002; Niculeascu, 2009) the endodermis is formed by a single layer of U-shaped cells with lignified radial and inner wals. In front of the xylem vessels passing cells are present. The vascular bundles consists of xylem and phloem bundles are radially and alternatelyarranged (Fig.2, B).

The short stem, in cross section, discloses a well developed parenchyma storage tissue (abundance of starch grains). In the basic parenchyma are embeddeddamphivasal vascular bundles(leptocentric bundles) (the phloem is surrounded by xylem)and few amphicribal bundles (collateral vascular bundles) to the periphery (Fig. 3, A, B).




A B

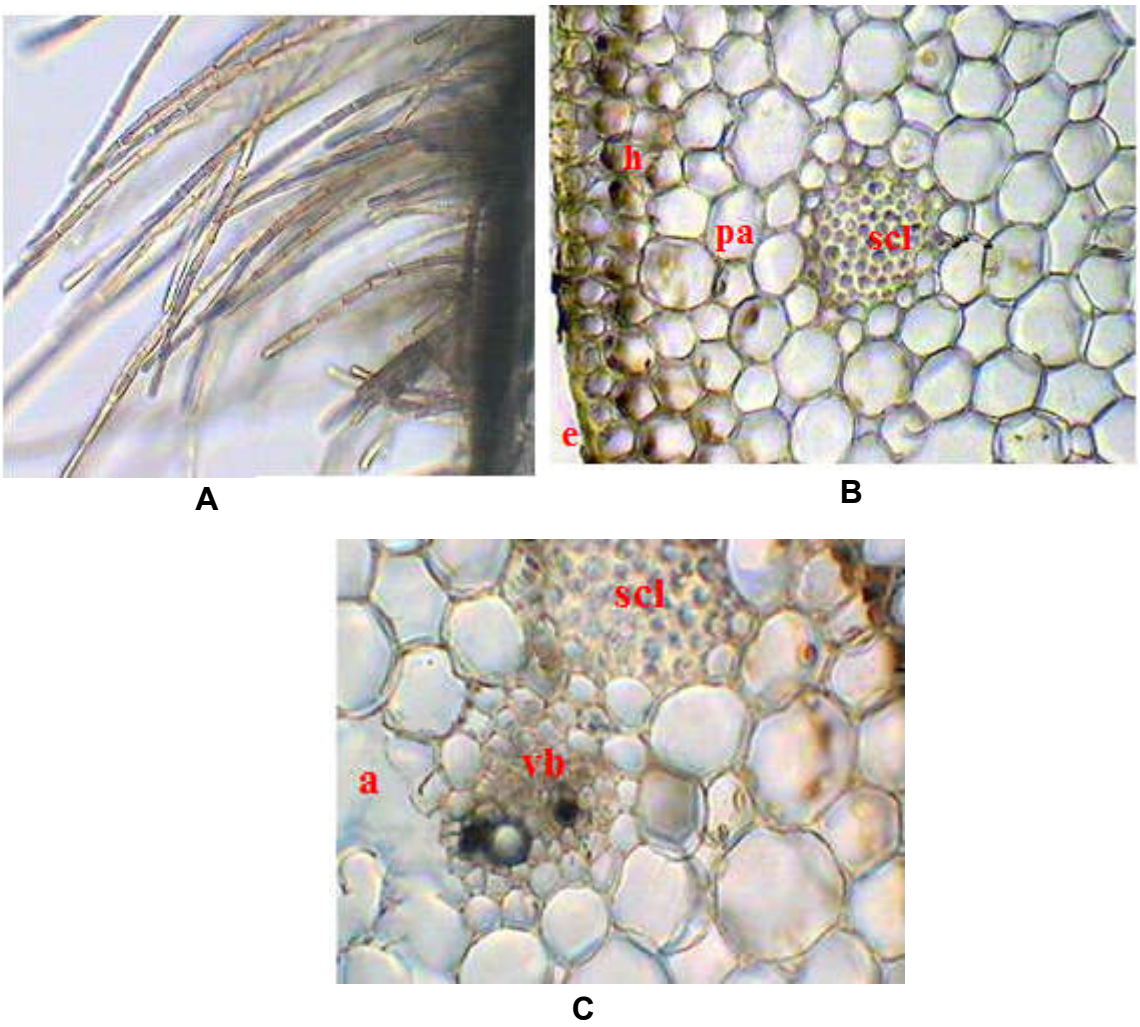
***Fig. 2. Portion with epidermis and cortex (A, x 250). The stele (B, x 270): c- cortex, e- epidermis, ed- endodermis, ex- exodermis, pc- pericycle, ph- floem, pc- periciclu, pi- pith.***




A B

***Fig. 3. Portion with epidermis and cortex (A, x 370). Portion of the stem (B, x 170): c- cortex, e- epidermis, gt- ground tissue, vb- vascular bndles.***

The leaf. The petiole in cross section exhibits to the exterior a unistratous epidermis with regularlly arranged cutinized cells, without intercellular spaces, covered by a thik cuticle. Long and soft bristles hairs (hirsute hairs) appear from place to place (Fig. 4, A), fllowed by the cortex cosisting of a number of laayers of cells. The first layer of cells possess small parenchyma cells, beneath the epidermis with few choroplasts. It s followed by 3-4 layers of round-oval, large parenchymatous cells with more or less air spaces characteristic of aquatic plant (Fig. 4, B). In this parenchyma basic tissue is the stele which is formed by a number of variables small poor developed vascular collateral bundles (few xylem and phloem elements). In the vicinity of the vascular bundles are some sclerenchyma groups of cells with mechanical role (Fig. 4, B, C).



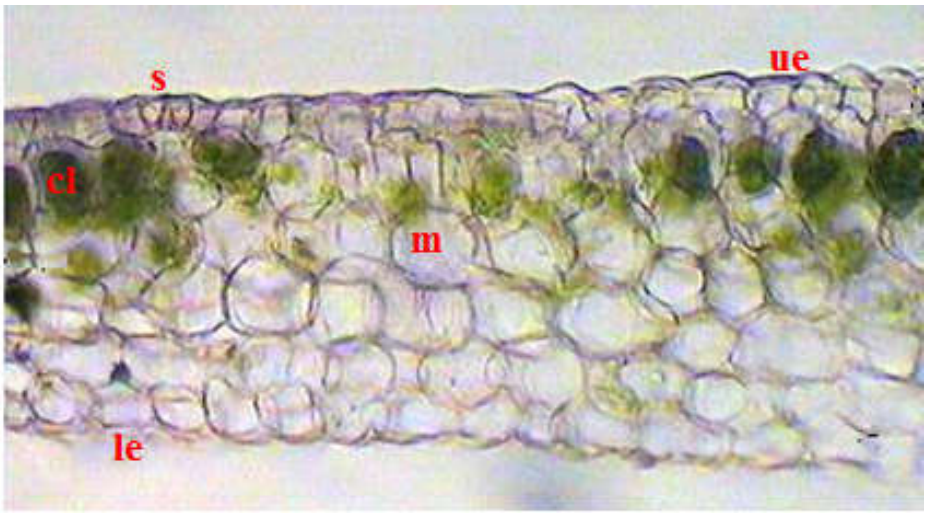

A B C

**Fig, 4. Cross sections of the petiole. Hirsute petiol hairs (A, x 500). Portion with epidermis and cortex (B, x 390). A sele vascular bundle (C, x 500): a- aerenchyma, e- epidermis, h- hypodermis, pa- parnchyma, scl- sclerencyma, vb- vascular bundle,**

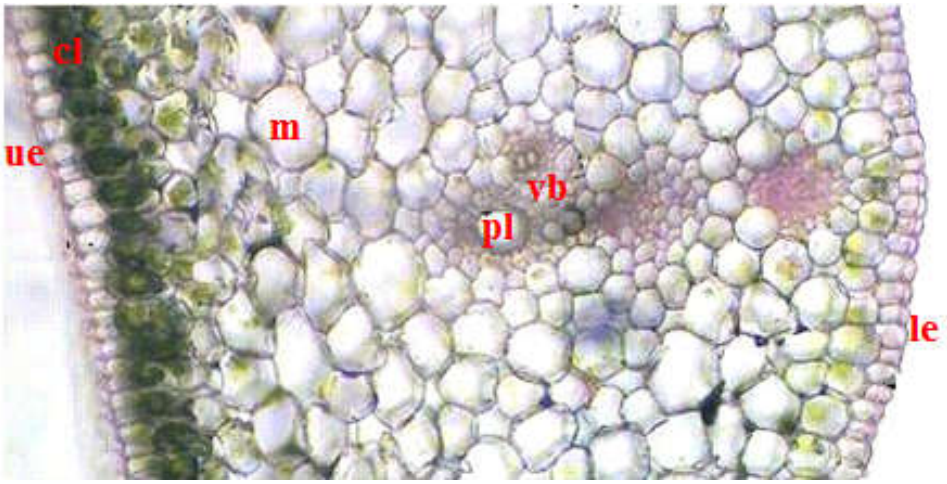
The blade, in cross section, exhibirs the usual succesion of tissues: two unistratous epidermis (upper an lower) and the mesophyll between them The epidermal cells are covered by a more or less thick cuticle. The epidermis continuity is broken by the presece of stomata. The mesophyll is homogenous with irregular in shape cells and arranged very loosely with conspicuous intercellular spaces. Bellow the upper epidermis are 2-3 layers of cells with a number of chloroplasts (chlorenchyma tissue) (Fig. 5, A). The lower epidermis is slightly proeminent (Fig. 5 B). As the mesophyll is undifferentiated and is alike at both surfaces, the lraves are called as isobilateral leaves (Fig. 5, B) such was described by Bercu (2009a,b; 2010, 2015)in other aquatic plants mesophyll.

The rest of the cells, especially those in the midrib area, are larger with cellulosic thin walls, fewer chloroplasts and with not too large intercellular spaces between them. On the margins, the mesophyll is narrow to 4 layers of cells, two of them with more chloroplasts (Fig. 5, A).

The midrib is represented by a closed collateral bundle with few conductive elements. Xylem faces towards the upper epidermis and is formed by 2-4 xylem vessels and a large protoxylem lacuna. Phloem faces towards the lower epidermis and is represented by few phloem vessels. Sclerenchyma group of cells are present bellow the vascular bundle with mechanical role (Fig. 5, B).




**A**




**B**

***Fig. 5. Portion of the leaf with mesophyll (A). The midrib zone of the blade (B) (A, B, x 210): cl- chlorolasts, m- mesophyll, le- lower epidermis, pl- protoxylem lacuna, s- stoma, ue- upper epidermis, vab- vascular bundle.***

## CONCLUSIONS

The adventitious root has a characteristic monocot primary structure, with a well-developed aerenchym tissue around the stele. The stem structure is characteristic to all aquatic plants with amphyvasal and collateral bundles.

The petiole exhibits a unistratous epidermis with regularlly arranged cutinized cells, without intercellular spaces, covered by a thick cuticle and poor developed stele vasculr system..

The leaf mesophyll is homogenous (isobilateral) type, possessing small intercellular spaces mostly near by the midrib vein and a poor developed midrib collateral bundle with few conductive elements. The mechanical tissues almost lack, only the petiole and blade has sclerenchyma groups of cells, bellow the epidermis and respectively bellow the upper respectively the lower epidermis for the blade midrib.

*Crypocorynewendti* vegetative organs has revealed some specific aquatic characters such as the presence of the large intercellular spaces with air chambers, the lack of proper roots but the presence of adventitious roots, a short stem and the presence of stomata for the petiole and leaf.

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