

ANATOMICAL ASPECTS OF THE ORNAMENTAL PLANT *SPATHIPHYLLUM WALLISII* REGEL

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INTRODUCTION

Spathiphyllum is a genus of about 40 species of flowering plants belonging to the Araceae family.

The genus species are native to tropical regions of the Americas and southeastern Asia (Bogner & Nicolson, 1991; Bunting, 1960). Certain species of *Spathiphyllum* are commonly known as peace lilies. *Spathiphyllum wallisii* Regel white sails, spathe flower or the moon flower is a tropical herbaceous perennial plant.

It was discovered in the late 19th century growing wild in central America (Everett, 1981; Croat, 1988). In our country the plant is commonly known as being a very popular indoor house plant.

It produces typical Aroid flowers, a densely crowded inflorescence called a spadix is subtended by one large bract called a spathe.

The spadix is generally cream or ivory when young, and turns green with age; the spathe is generally white or white with green nerves distally from the margin, turning green with age. Leaves are basal, glossy and somewhat deeply veined, ovate and acuminate.

The petioles are long and the leaves arch gracefully (Mayo et al., 1997). The paper purpose is to show the anatomy of the main decorative organs, exhibiting some features of anatomical interest concerning this Aroids species. In the literature, there are some studies concerning the morphology and anatomy of the leaf of this species correlated with genetic purpose (Vanstechelman et al., 2009) or with cytological value (Nicolson, 1960).

Anatomical studies concerning the vegetative organs of *Spathiphyllum wallisii* are sporadic (Metcalf et al., 1960), and those concerning the flower peduncle and the modified leaf (spathe) almost lack.

MATERIAL AND METHODS

Spathiphyllum wallisii plants were collected from S.C. IRIS INTERNATIONAL S.R.L. greenhouse. Small pieces of the adventitious root, leaf, the flower peduncle and spathe were fixed in FAA (formalin:glacial acetic acid:alcohol 5:5:90).

Cross sections of the vegetative organs were performed with a rotary microtome (Bercu & Jianu, 2003). The samples were stained with alum-carmin and iodine green. Histological observations and micrographs were performed with a BIOROM-T bright field microscope, equipped with a TOPICA-6001 A video camera.

RESULTS AND DISCUSSIONS

Cross section of the adventitious root of *Spathiphyllum wallisii* exhibits small rizodermal cells. Hairs are present.

The cortex is well-developed and differentiated into two zones. The outer cortex – exodermis, present below the rhizodermis, is one-layered with slightly suberized cell walls. The inner cortex is a well-developed region of loosely arranged parenchymatous cells enclosing large intercellular spaces.

Characteristically, the primary endodermis consists of slightly suberized cells possessing, at places, passing cells opposite xylem (Kroemer, 1903).

The vascular system is quite well developed. The vascular bundles of both species are radial type in an alternative arrangement and such as other Araceae species *Monstera deliciosa*, *Spathiphyllum* sp. (Bavaru & Bercu, 2002; Batanouny, 1992), numbering more than six (Fig. 1, A).

The vascular elements consist of xylem and phloem. The metaxylem vessels are few (one for each bundle) and 2-3 protoxylem vessels, with high lignified cell walls. The phloem consists of mainly sieve cells and companion cells showing exarch condition. The central portion of the root is occupied by pith made up of compactly arranged sclerenchymatous thick-walled cells (Fig. 1, B).

The cross section of the blade exhibits an upper epidermis, a lower epidermis and the mesophyll. The one-layered upper and lower epidermis are composed of large radially arranged cells, covered by a thick cuticle.

The mesophyll is more or less homogenous, represented by a spongy tissue with large intercellular spaces. It is composed of large thin-walled cells with a number of chloroplasts (Fig. 2).

Such as Batanouny (1992), Fahn (1990) and Bercu (2009), characteristically for Aroids species the both epidermis continuity is broken by the presence of stomata with large substomatal cavities. It is to be remarked druses in some of the mesophyll cells.

The lower epidermis forms a large prominence in the mid vein zone. The vascular system of the mid vein of *Spathiphyllum wallisii* is composed of numerous collateral bundles (Fig. 3 A).

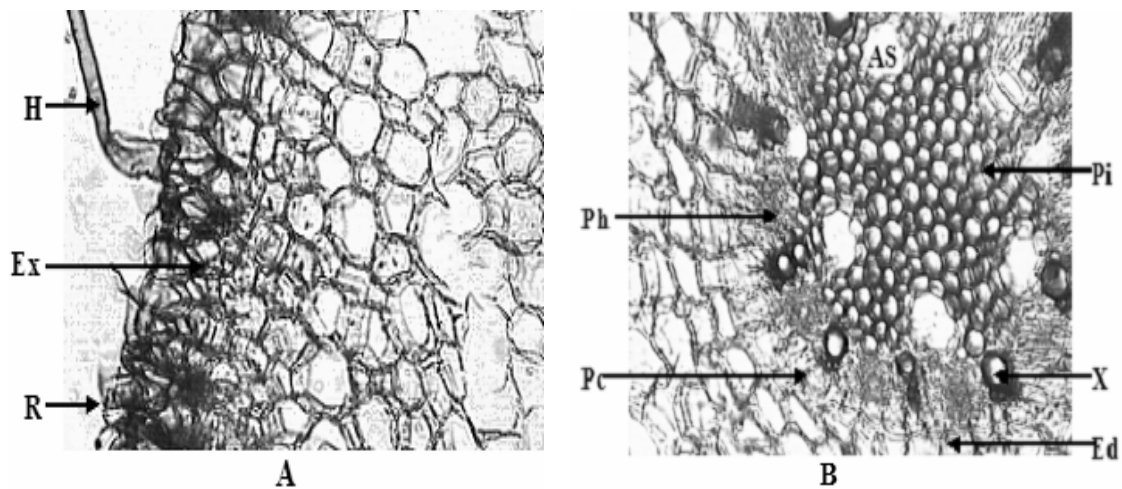


Fig. 1. Cross sections of the adventitious root. Portion with rhizodermis and cortex (A). X 320. The stele (x 220): (B). AS- air space, Ed- endodermis, Ex- exodermis, H- hair, Pc- pericycle, Ph- phloem, Pi- pith, X- xylem (orig.)

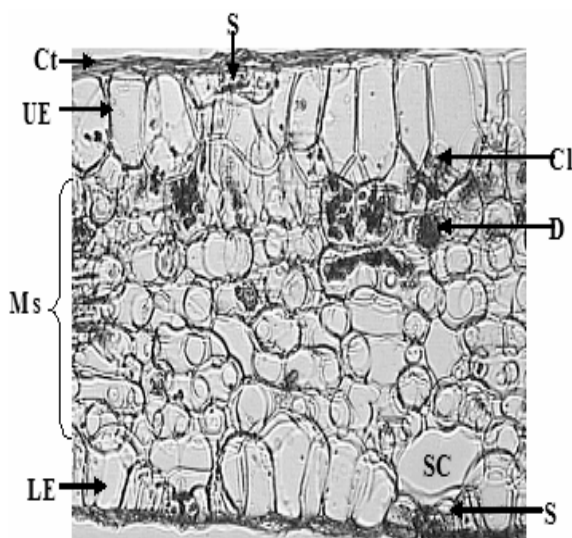


Fig. 2. Portion of a cross sections of the blade (x 240): Cl- chloroplasts , Ct- cuticle, - druse, LE- lower epidermis, Ms- mesophyll, S- stoma, SC- substomatal cavity, UE- upper epidermis (orig.)

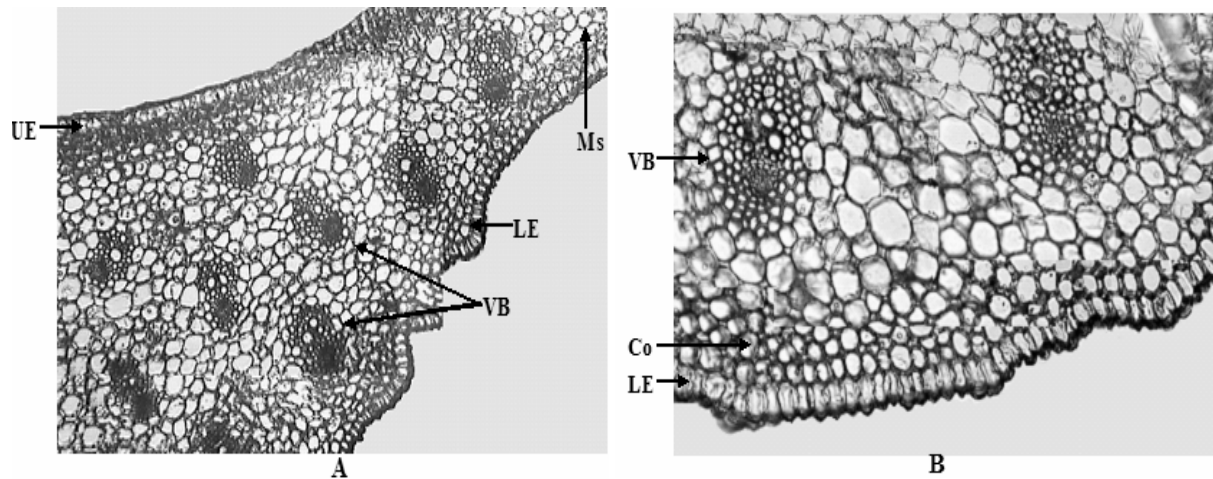


Fig. 3. Cross section of the mid vein. Portion with vascular bundles (A) (x 107). Portion with lower epidermis (B) (x 150): Co- collenchyma, LE- lower epidermis, Ms- mesophyll, UE- upper epidermis, VB- vascular bundle (orig.)

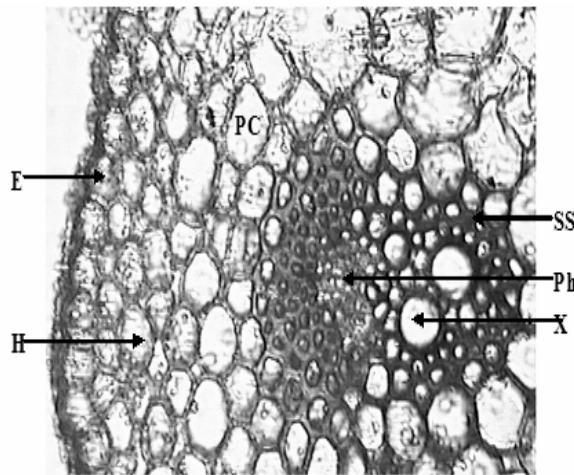


Fig. 4. Portion of a cross sections of the petiole (x 240): E- epidermis, H- hypodermis, Ph- phloem, PC- parenchyma cortex, SS- sclerenchymatous sheath, X- xylem (orig.)

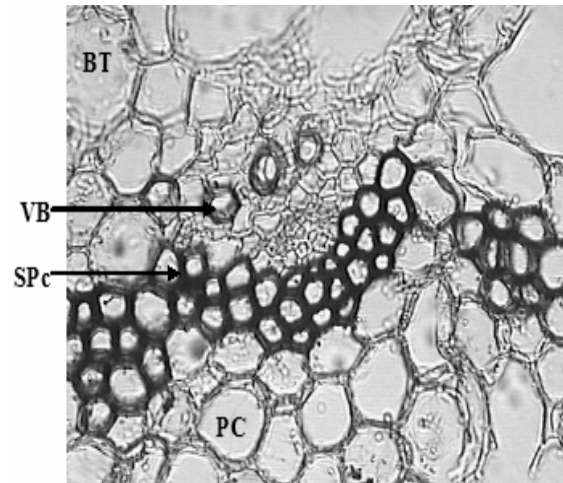


Fig. 5. Cross sections of the flower peduncle (x 240): BT- basic tissue, PC- parenchymatous cortex, SPc- sclerenchymatous pericycle, VB- vascular bundle (orig.)

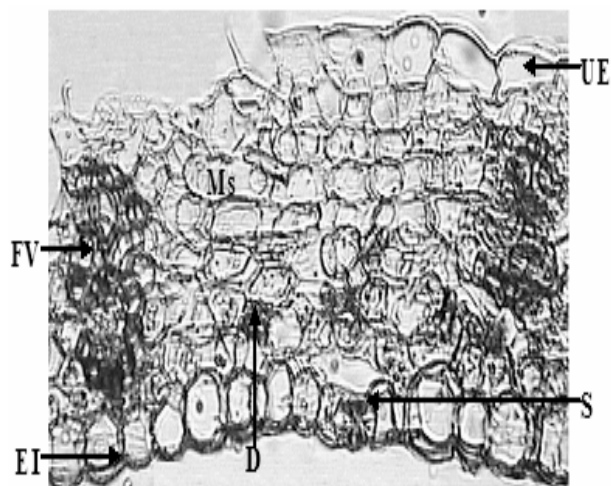


Fig. 6. Cross section of *Anthurium andreaeanum* spathe (x 300): LE- lower epidermis, Ms- mesophyll, UE- upper epidermis, VB- vascular bundle (orig.)

Xylem and phloem consists of vascular elements (2-3 meta- and protoxylem vessels and a reduced number of phloem vessels and phloem parenchyma). Each vascular bundle is protected by a sclerenchymatous sheath.

Collenchymatous cells are present in the abaxial zones of the mid vein (Fig. 3 B). The circular undulate-shaped petiole, in transversal section, discloses that the regularly arranged epidermal cells are covered by a thick cuticle. The petiole cortex is differentiated into two zones. The external region (hypodermis) is slightly collenchymatous, possessing chloroplasts, followed by the inner zone represented by 2-3 layers of parenchyma tissue. The *Spathiphyllum wallisii* petiole stele is represented by a number of poor developed collateral vascular bundles embedded in the basic tissue, with the typical caulinar arrangement of the conductive tissues. Xylem and phloem are represented by 2-3 xylem vessels, few xylem parenchyma cells and few phloem elements, surrounded by a sclerenchyma sheath (Fig. 4).

The flower peduncle in cross section discloses almost the same features such as the petiole but it is to be remarked that the petiole inner cortex zone represented by a 3-6 layers of parenchyma tissue. It is to be remarked the presence of a sclerenchymatous many-layered pericycle (Fig. 5).

The petiole stele is represented by more or less nine close collateral vascular bundles, aleatory embedded in the basic tissue, with the typical caulinar arrangement of the conductive tissues. Each vascular bundle possesses 3 xylem vessels and few phloem elements, unprotected by bundle sheaths. Characteristically some air spaces are present (Fig. 5).

The *Spathiphyllum wallisii* transversal section of the spathe (bract) reveals the usually succession of a blade tissues. The upper and lower epidermis is one-layered with large epidermal cells, covered by a thin cuticle. Between them, a homogenous mesophyll is present, consisting of parenchymatous cells (spongy tissue) and intercellular spaces. Few poor developed vascular bundles occur in the mesophyll, protected, such the blade bundles, by groups of sclerenchymatous cells (Fig. 6).

CONCLUSIONS

The adventitious root, in transversal section, exhibits a more or less monocot primary structure. The presence of exodermis, provide mechanical strength to the otherwise soft and delicate roots. Characteristically to the Aroids, the blade mesophyll is homogenous with a number of

collateral bundles, aleatory embedded in the ground tissue of the mid vein. Stomata are present in both epidermises (upper and lower epidermis). The petiole and flower peduncle cortex is differentiated into a collenchymatous region, with chloroplasts, and the inner zone is parenchymatous. The flower peduncle stele is represented by a number of poor developed vascular bundles, embedded in the ground tissue whereas those of the petiole are well developed. It is to be remarked the many-layered pericycle of the flower peduncle.

The mechanical tissue is poor-developed in all *Spathiphyllum wallisii* studied organs. However, in the blade it is represented by some collenchyma cells placed in the abaxial position of the mid vein whereas in the petiole by a collenchymatous tissue. In the flower peduncle it is represented by the many-layered sclerenchymatous cells of the pericycle.

ABSTRACT

The article comprises anatomical aspects of the adventitious root, leaf, flower peduncle and bract of one of the most beloved ornamental houseplants in Romania *Spathiphyllum wallisii* Regel. The plant organs disclose certain features of anatomical interest, in accordance with Araceae family nature.

Each tissue has been described and discussed, illustrations included. The anatomical features of the adventitious roots exhibit a primary structure but some specific anatomical aspects occur. The blade possesses a typical homogenous mesophyll. The vascular bundles of the mid vein are well developed with an aleatory arrangement of the vascular bundles. The petiole and flower peduncle stele is composed of numerous vascular bundles, embedded in the ground tissue.

Mechanical tissue is poor developed in almost all studied plant organs. In the literature, studies concerning the vegetative organs anatomy of *Spathiphyllum wallisii* are sporadic and those concerning the flower peduncle and the modified leaf (spathe) almost lack.

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