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ANATOMICAL ASPECTS OF THE LEAF BLADE IN FERN *POLYSTICHUM SETIFERUM* (FORSK.) WOYNAR

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Cross sections of the pinnule in *Polystichum setiferum* (Forsk.) Woynar revealed an upper epidermis, a chlorophyllaceous mesophyll and a lower epidermis. Within the homogeneous mesophyll veins are present. Between the lower epidermal cells, stomata occur. In the epidermal cells chloroplasts are present.

Key words: anatomy, pinnule, *Polystichum*, mesophyll, stomata

INTRODUCTION

The knowledge about the anatomy of ferns in Romania is quite limited; those concerning the structure of the frond, especially the pinnule, are almost lacking (TOMA 1977, PALADE 1997, TOMA and RUGINĂ 1998).

This paper attempts to provide further information on the anatomy of the lamina, including stomata in one autochthonous fern, namely *Polystichum setiferum* (Forsk.) Woynar.

MATERIAL AND METHODS

The pinnule was preserved in FAA fixative (formalin-acetic acid-alcohol) dehydrated with graded alcohol series and embedded in paraffin (JOHANSEN 1940). Semi-thin cross sections (10–12 μm) were obtained at a Minot microtome and subsequently stained with iodine green and carmine alumen. Stomata were obtained by scratching the lower epidermal surface of the pinnule. The observations and the drawings were performed with a Nikon bright field microscope, equipped with a Carl Zeiss (Jena), camera lucida.

RESULTS AND DISCUSSION

Cross sections of the pinnule revealed that the upper epidermis consists of one layer of isodiametric cells with chloroplasts, covered by cuticle. Right to the main vein, the upper epidermal cells are smaller and form a median ditch (Fig. 1).

The chlorophyllaceous mesophyll consists of several layers of large parenchymatous cells. Some of them are branched and septate, large intercellular spaces are located among them, especially to the lower epidermis. It can be seen a slight differentiation tendency of the mesophyll into palisade and spongy tissue, but it remains still a homogeneous one (Fig. 1). Many authors consider that the mesophyll of ferns blade is homogeneous (OGURA 1938, RAVEN *et al.* 1992, STERN 1994). In the leaf blade of some species of ferns, such as *Dryopteris filix-mas*, *Athyrium filix-femina*, *Asplenium septentrionale* (BERCU 1998, 2001) also exist an arrangement tendency of the mesophyll cells into a palisade tissue to the upper epidermis and a spongy one, to the lower epidermis.

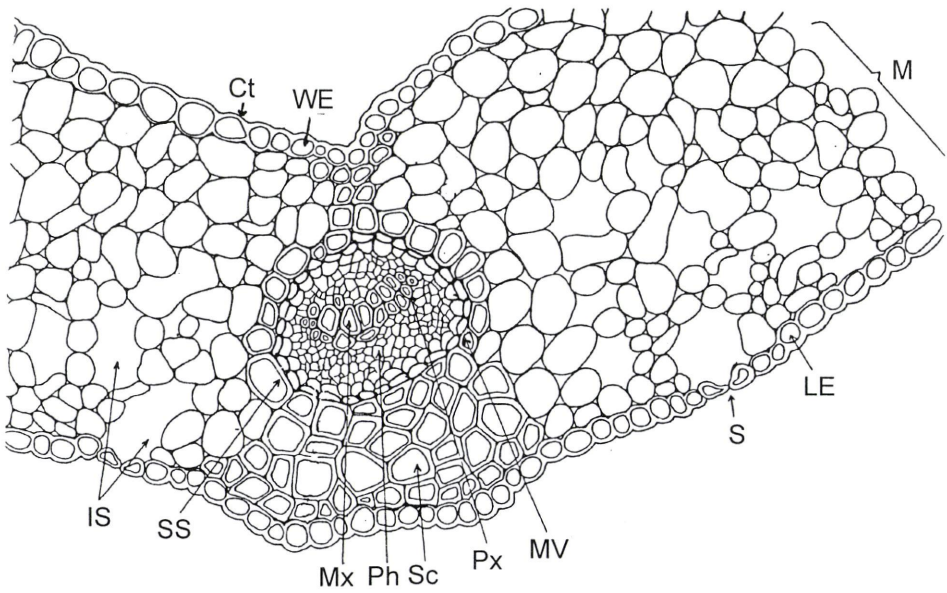


Fig. 1. *Polystichum setiferum* (Forsk.) Woynar. Cross section of the leaf blade: Ct = cuticle, IS = intercellular space, LE = lower epidermis, M = mesophyll, Mx = metaxylem, MV = middle vein, Ph = phloem, Px = protoxylem, S = stoma, SS = sclerenchymatous sheath, Sc = sclerenchyma, UE = upper epidermis. ×375. Orig.

The main vein embedded in the mesophyll consists of few centrally located xylem vessels, surrounded by phloem, externally protected by a sclerenchymatous sheath. Between the main vein and the inferior epidermis there is a group of sclerenchymatous cells, larger than those between the vein and the upper one (Fig. 1).

The single layered lower epidermis, such as the upper one, is covered by cuticle. Right to the main vein, the cells have an arched arrangement. Among the inferior epidermal cells, stomata occur (Fig. 1). The stomata guard cells are of *Amaryllis*-type, surrounded by 3–5 subsidiary cells. The subsidiary cells and the ordinary epidermal cells are similar (anomocytic type), exhibiting undulated walls and few chloroplasts (Fig. 2).

CONCLUSIONS

According to the present observations the pinnule of *Polystichum setiferum* reveals the usual succession of tissues. Both epidermis are single layered, covered

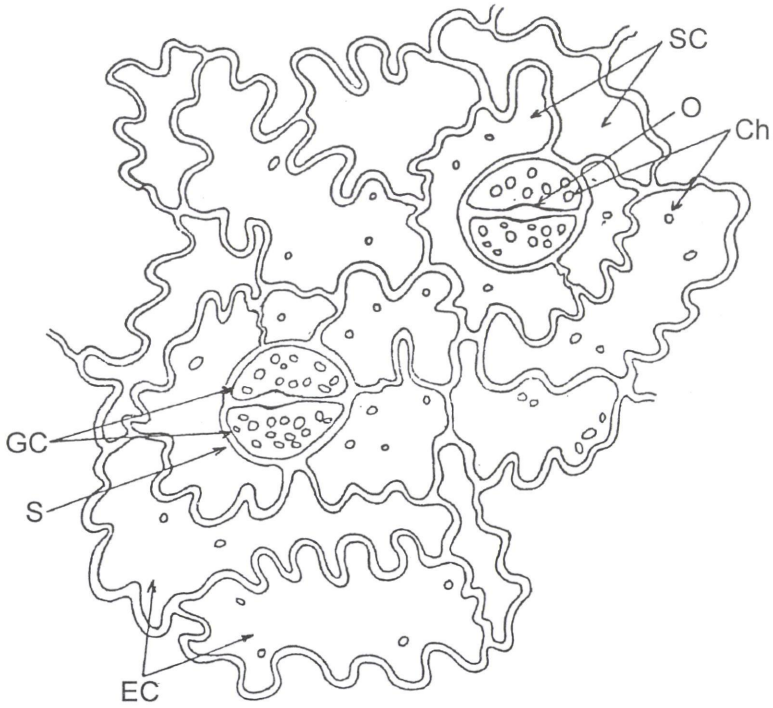


Fig. 2. Portion of the lower epidermis: Ch = chloroplasts, EC = epidermal cells, GC = guard cells, O = ostiole, S = stoma, SC = subsidiary cells. ×444. Orig.

by cuticle. The space between them is filled up with, a more or less homogenous chlorophyllaceous mesophyll. The vascular system consists of a hadrocentric bundle, protected by a sclerenchymatous sheath. Between the main vein and the epidermal cells, groups of sclerenchymatous cells are present. The stomata among the lower epidermal cells are of anomocytic type. In the epidermal cells, guard cells and subsidiary cells, chloroplasts are included.

REFERENCES

BERCU, R. (1998): Anatomical modifications of the corm stele in fern Asplenium septentrionale (L.) Hoffm. – *J. "Šumarškvo" Forestry, Belgrade* **1**: 35–40.

BERCU, R. (2001): *Organizarea histo-anatomică a cormului la unele ferigi autochtone (Polypodiidae) cu referiri speciale asupra sistemului vascular.* – "Ovidius" Univ. Press, Constanza.

JOHANSEN, D. A. (1940): *Plant microtechnique.* – McGraw-Hill Publ., New York, London.

OGURA, Y. (1938): *Vergleichende Anatomie der Vegetationsorgane der Pteridophyten.* – Gebrüder Bornträger, Berlin.

PALADE, M. (1997): *Botanica farmaceutică.* – Editura Tehnică, Bucureşti.

RAVEN, P. H., EVERT, F. R. and EICHHORN, E. S. (1992): *Biology of plants.* (5th ed.) – Worth. Publ. Inc., New York.

STERN, K. R. (1988): *Introductory plant biology.* (4th ed.). – Wm. C. Brown Publisher, Dubuque.

TOMA, C. (1977): *Anatomia plantelor. II. Structura organelor vegetale şi de reproducere.* – Tipografia Univ. "Alexandru I. Cuza", Iaşi.

TOMA, C. and RUGINĂ, R. (1998): *Anatomia plantelor medicinale.* – Editura Academiei Române, Bucureşti.

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