

Ecology and biology

9. L. MUNTEAN, A. SALONTAI, M. TAMAS, S. CERNEA, G. MORAR, C. BOTEZ, F. VAIDA, Recherches sur la biologie de l'espèce Galega officinalis L. /Investigation on the biology of Galega officinalis L. species/ . . . . . 113
10. I. ROTAR, A. MOLDOVAN, E. CHIRCA, A. SUTEU, Efectul azotului mineral aplicat unei culturi de lucernă și factorii care concurează la recuperarea lui /Mineral nitrogen effect applied to the lucerna crop and the factor which cooperates to his recover/ . . . . . 119

Chemotaxonomy

11. C. TABACARU, C. SOCACIU, G. NEAMTU, Optimization of lutein-zeaxanthine separation on high performance liquid chromatography. . . . . 125

Books received

- V. CIOCIRLAN, Flora ilustrată a României. . . . . 135

Reviews received

- Zeitschrift für Mykologie . . . . . 137

Content's reviews

- Revue roumaine de Biologie. . . . . 139
- Buletin științific al Univer. de Șt. Agric. Cluj-Napoca . . . . . 140
- Studii și cercetări de biologie . . . . . 142
- Hameiul și plante medicinale . . . . . 143

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THE EPIDERMICAL STUDY OF SWEET CHESTNUT-TREE  
LEAF (Castanea sativa Mill.)

I. MOLDOVAN and AURELIA MOLDOVAN

Abstract

MOLDOVAN, I., A. MOLDOVAN, 1993, The Epidermical Study of Sweet Chestnut-tree Leaf (Castanea sativa Mill.). Not. Bot. Hort. Agrobot. Cluj-Napoca, XXII-XXIII, 5-9. This paper is part of a broader study on the ontogenetic evolution of C. sativa. On detached epidermis, obtained by different methods, the following structural aspects have been studied: the shape and size of the cells of each sample and their number on surface unity, the type of stomata, the size of stomata, the number of stomata on surface unity and the stomatic index. At the same time remarks have been made concerning the protecting and secretive hairs of each sample

Key words: Castanea sativa, epidermis, stomatic system, hairs.

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Data concerning the structure of the stomatic system recorded in previous specialized studies usually refer to representatives of the Fagaceae family (7), but even when they refer to C. sativa (3) the aspects we have relieved in our study are not obvious.

MATERIAL AND METHODS

The material used has been harvested from ten sweet chestnut-trees in the Baia Mare area, carefully chosen, taking into consideration the morphological and ecological variations. In order to obtain the epidermical preparations fresh leaves of different ages have been used. The samples of epidermis have been obtained by removing the bark or by treating the leaves with Schultze reagent, with a differentiated time reaction according to the age of the leaf and thickness of

the cuticle. Some of the items of epidermis have been obtained by treating them with concentrated nitric acid and the epidermis of young leaves has been removed by maceration for 72 hours in diluted nitric acid. The colouring of the epidermis has been done with safranin and green, malachite.

The structural details of the two items of epidermis have been emphasized by the form and shape of epidermic cells, their number on surface unity, the type of stomata, the size of stomatic cells and their surface, the number of stomata on surface unity, the stomatic index, as well as the presence, the frequency, the size and the type of epidermic trichoms. The type of stoma has been established according to the classification of Dilcher (1974), using the terminology of the same author for describing the stomatic system.

The measurements, the photographs and the drawings, executed by projection in ultraviolet rays have been done using the M.C. 1 microscope.

#### RESULTS AND DISCUSSIONS

Our study leads to the idea that *C. sativa* leaf is two-faced and hypostomatic (fig.1)

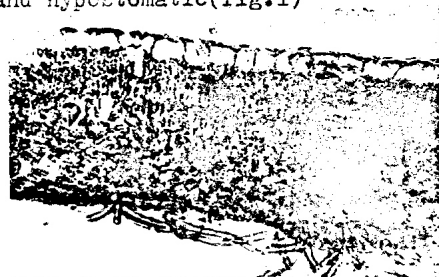


Fig.1 Transsection of leaf X90

In preparations with separate items of epidermis (5) the cells of the superior epidermis ( $1200 - 1250/\text{mm}^2$ ) are rectangular in shape with low amplitude waves on the side walls, which present from place to place thickenings resulted from accumulating mucilaginous substances (7) (fig.2,3). Except for very young leaves, which present dilated secretive trichoms along the median rib, the superior epidermis lacks the stomata and the trichoms.

The inferior epidermis, unistratified, presents in transsection rectangular cells, too, which are smaller ( $10 - 12\mu$  in radial diameter and  $10 - 50\mu$  in tangential diameter) and out of which stomata and trichoms are formed (fig.1).

The superior epidermis, unistratified in transection, presents rectangular cells ( $20 - 25\mu$  in radial diameter and  $20 - 50\mu$  in tangential diameter) with thin cellulose walls, the outer wall slightly curved and pleated. The cuticle, well developed, is about  $1,5\mu$  in thickness (fig.1).



Fig.2 Superior epidermis X162

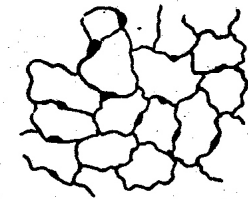


Fig.3 Superior epidermis - detail - X350

In preparations with detached epidermis, the cells of the inferior epidermis ( $920/\text{mm}^2$ ) are rectangular in shape, too, their side walls present waves of middle amplitude, which lack the thickenings resulted from mucilaginous substances (fig.4,5)

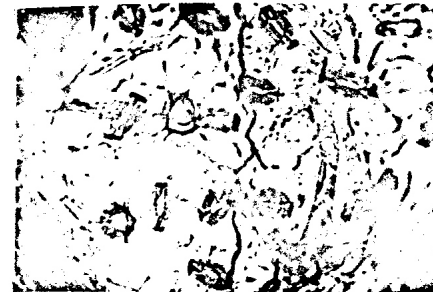


Fig.4 Inferior epidermis with stomates and trichom X350

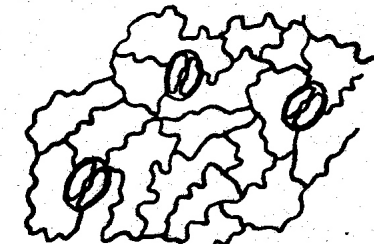


Fig.5 Inferior epidermis, cells and stomata X350

Within the inferior epidermis stomata of the Ranunculus type presenting a T - thickening on each pole with a thickened poral wall and a thin epidermal wall are to be found. The stomata on very young leaves as well as those on the young parts of the limbs have the poral wall thin, too, and lack the T - thickenings and the two diameters of the stoma are almost equal.

The mature stomata have a longer longitudinal diameter ( $25\mu$ ) as compared to the transversal diameter ( $18\mu$ ). In this last case the surface of the stoma (5), is about  $352\mu^2$ . The stomata lack annexed cells, having 3-7 epidermic cells on their edges (fig.5). The number of stomata is of  $160 - 230/\text{mm}^2$ , decreasing from the bottom to the top of the limb. The number of stomata on  $\text{mm}^2$ , obtained with our items is obviously greater than those previously mentioned in specialized studies (3). The value of the stomatic index (6) is between 1,5 - 1,9% decreasing from the bottom to the

top of the foliar limb.

Within the inferior epidermis many types of trichoms can also be observed; simple unicellular, star-shaped pluricellular, provided with 4-16 arms (2-8 in side diameter and 150 - 200 $\mu$  in longitudinal diameter) with a thick wavy cuticle (Fig. 6, 7) as well as with dilated secretive trichoms also described by Lutz in some Quercus species (7) observed by us, too, in the studied species on the young leaves along the median rib formed by a short pedicle (2-3 cells) and 4-8 secretive cells.

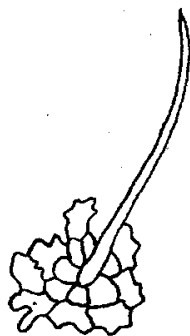


Fig. 6 Simple defending trichom X162

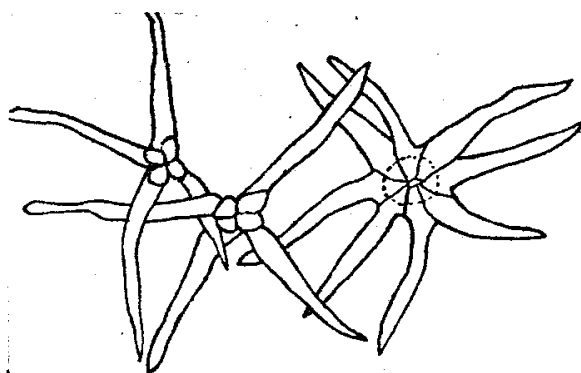


Fig. 7 Branching defending trichoms X350

#### CONCLUSIONS

The two items of epidermis differ both in form, size, number of the cells on the surface unity and in presence or absence of epidermic formation.

The greater number of stomatic cells on surface unity, with all the items studied by us as compared to the bibliographical data, can be connected with the variation of pedoclimatic conditions.

The mathematical indices watched for the anatomic details of the items of epidermis are close to each other in all the items studied.

#### R e z u m e t

MOLDOVAN, I., AURELIA MOLDOVAN, 1993. Studiul epidermic al frunzei de castan (*Castanea sativa* Mill.). (In limba engleză). *Not. Bot. Hort. Agrobot. Cluj-Napoca*, XXIII-XXIII, 5-9. Lucrarea face parte dintr-un studiu mai amplu privind dezvoltarea ontogenetică a castanului. Pe epiderme detașate, obținute prin diferite metode,

au fost studiate următoarele aspecte structurale; forma și mărimea celulelor celor două epiderme și numărul lor pe unitatea de suprafață, tipul de stomate, mărimea stomatelor (suprafața), numărul de stomate pe unitatea de suprafață și indicele stomatic. De asemenea au fost făcute observații asupra perilor așători și secretori de pe cele două epiderme.

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