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THE EPIDERMICAL STUDY OF SWEET CHESTNUT-TREE LEAF (CASTANEA SAVITAE MILL.)

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Abstract

MOLDOVAN, I., A. MOLDOVAN, 1993, The Epidermical Study of Sweet Chestnut-tree Leaf (Castanea sativa Mill.). Hort. Bot. Hort. Agrobot. Cluj-Napoca, XXII-XXXII, 5-5. 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 secretory 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 Tegacocoo 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 Buia 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 emphasised 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 trichoma. 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 U.C. 1 microscope.

RESULTS AND DISCUSSIONS

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

The superior epidermis, unistratified in transection, presents rectangular cells (20-25 μ in radial diameter and 20-50 μ in tangential diameter) with thin cellulose walls, the outer wall slightly curved and pleated. The cuticle, well-developed, is about 1.5 μ in thickness (fig. 1).

Fig. 1: Transection of leaf X90

In preparations with separate items of epidermis of the cells of the superior epidermis (1200-1520/μm²) are rectangular in shape with low amplitude waves on the side walls, which present from place to place thickenings resulted from accumulating mucilaginous substances (fig. 2, 3). Except for very young leaves, which present at first secretive trichomas along the median rib, the superior epidermis lacks the stomata and the trichoma.

The inferior epidermis, unistratified, presents in transection rectangular cells, too, which are smaller (10-12 μ in radial diameter and 10-50 μ in tangential diameter) and out of which stomata and trichoma are formed (fig. 1).

Fig. 2: Superior epidermis X162

In preparations with detached epidermis, the cells of the inferior epidermis (920/μm²) 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. 3: Superior epidermis - detail X350

Fig. 4: Inferior epidermis with stomata and trichoma 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 stomata are almost equal.

The mature stomata have a longer longitudinal diameter (25 μ) as compared to the transversal diameter (18 μ). In this last case the surface of the stoma (5) is about 352 μ². The stomata lack annexed cells, having 3-7 epidermic cells on their edges (fig. 5). The number of stomata is of 150-230/μm², decreasing from the bottom to the top of the limb. The number of stomata on cm², 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 - 1.95, decreasing from the bottom to the
top of the foliar limb.

Within the inferior epidermis many types of trichomes can also be observed; simple unicellular, star-shaped pluricellular, provided with 4-16 arms (2-8 in side diameter and 150 - 200 in longitudinal diameter) with a thick waved cuticle. (Fig. 6, 7) as well as with dilated secreting trichomes also described by Juta in some angiosperms 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 secreting cells.

Fig. 6 Simple defending Fig. 7 Branching defending trichome trichome X162 X500

CONCLUSIONS

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

The greater number of stomata 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.

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