



Maize leaf in cross and longitudinal sections

Zea mays, enlarged approx. 450 times, in SOMSO Plast.

According to Prof. Dr. W. Weber.

Further informations:

<http://en.wikipedia.org/wiki/Maize>

<http://www.agronext.iastate.edu/corn/>

<http://uanews.org/node/11830>

<http://www.lawrencelab.org/Outreach/2006/plants.html>

<http://www.africancrops.net/rockefeller/crops/maize/photos.htm>



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The model shows in a cross section and in various longitudinal sections the special leaf structure of a monocotyledonous plant belonging to C4 plants.

The cross section reveals the structure of a graminean leaf, which is nearly equifacially structured. The mesophyll is not clearly differentiated in palisade and spongy parenchyma.

On the longitudinal section the subepidermal mesophyll cells often take the form of arm palisades. The stomata are to be found in the upper as well as in the lower epidermis. Partly groups of cells of the upper epidermis are enlarged to blister cells. The collateral vascular bundles vary in size. Several smaller vascular bundles lie on both sides of the large vascular bundles. In the large vascular bundles the xylem is clearly differentiated in tracheae, tracheids and xylem parenchyma cells and the phloem is differentiated in sieve tubes, companion cells and phloem parenchyma cells. In the small vascular bundles the xylem and the phloem are more or less reduced. Clearly differentiated sieve tubes may be missing. The vascular bundles are arranged parallel in the longitudinal direction of the leaf. They are laterally interconnected by very small and reduced cross running bundles, the transversal anastomoses, these consisting of tracheids and sometimes of sieve tubes, too. The tracheids of the anastomoses join the vessels of the longitudinal bundles with broadened ends. Both the longitudinal bundles and the anastomoses are enclosed by a complete ring of parenchymatic cells, the bundle sheath. Their cell walls are slightly thickened on the side of

the bundle. In the medium-sized and the smaller vascular bundles the cells of the bundle sheath contain numerous chloroplasts which are distinctly larger than the chloroplasts of the mesophyll cells. The epidermal cells are arranged in parallel longitudinal rows. In some longitudinal cell rows short cells are inserted between the long cells. Other rows again comprises long cells and small bottle-shaped one-celled trichomes which are curved in longitudinal direction of the leaf. The long likewise one-celled trichomes are inserted with their ampoule-shaped base between the surrounding epidermal cells. They are lined up and inclined in the longitudinal axis of the leaf as well. The stomata represent the graminean type. Between two dumbbell-shaped cells there is only a narrow central gap due to the considerable thickening of the cell wall. A guard cell consists of a straight middle part and the blister-shaped ends. The two ends are connected by a narrow channel. As a so-called C4 plant, the maize belongs to the high-yield plants. Such plants are able to extract considerably more CO₂ from the atmosphere for photosynthesis than other plants (C3 plants). During photosynthesis a biochemical division of labor takes place in the leaves between the mesophyll cells and the cells of the bundle sheath. In the mesophyll cells CO₂ is initially incorporated in malate, a C4 compound. This malate is passed on to the cells of the bundle sheath. Here the final conversion of CO₂ into carbon hydrate follows in the Calvin cycle. This biochemical division of labor is anatomically reflected, too, by the diversity of mesophyll cells and cells of the bundle sheath as well as by the different size and structure of their chloroplasts.

