Studies on the Mucilaginous Cells in the Leaf of *Spartocytisus filipes* W.B.

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**Abstract.** The structure and ultrastructure of epidermal cells with thick mucilaginous inner walls were investigated in leaves of *Spartocytisus filipes*. Identification of the main constituents of the wall was attempted by means of histochemistry and polarized light and compared with the ultrastructure of the wall, which showed a mosaic structure alternating with electron dense bands.

**Key words:** Leaf epidermis — Mucilaginous cells — *Spartocytisus filipes*.

**Introduction**

Epidermal cells with mucilaginous inner walls are common in many plant families (Metcalfe and Chalk, 1957; Napp-Zinn, 1973/74). Such cells have a thickened inner wall which occupies the greater part of the whole cell and in which a layering, parallel to the surface, is usually to be seen. The cell lumen is very reduced and contains a dense cytoplasm. The outer epidermal wall shows no difference from the outer walls of normal epidermal cells.

The number of mucilaginous cells in the epidermis varies greatly from species to species. In some plants they are found in great numbers in both epidermises, in others they are scattered and often restricted to one side.

Epidermal cells with mucilaginous inner walls were carefully investigated by several early workers. Among others, Westermaier (1884), Volkens (1887) and especially Walliczek (1893) described the structure, occurrence and possible function of such cells. Tschirch (1889) classified slime into either “cellulose slime” or “true slime” according to the presence of cellulose as shown by reaction with IKI and H$_2$SO$_4$. Later authors, reviewed by Sperlich (1939), added other histochemical reagents and polarized light for slime identification, and Tunmann and Rosenthaler (1931) made chemical analyses to classify the slime types in mucilaginous cells. In modern times epidermal cells with mucilaginous inner walls do not seem to have attracted much attention. Ultrastructural observations appear to be lacking and the function of these walls has yet to be explained. Seed mucilages, however, have been investigated both chemically (Jones and Smith, 1949; Aspinall, 1959, 1969) and by electron microscopy (Mühlethaler, 1950; Hyde, 1970).

Leaves of *Spartocytisus filipes* W.B. were investigated with special reference to the epidermal cells with mucilaginous inner walls. Observations were carried out with histochemistry, polarizing, and electron microscopy. The ultrastructure of the mucilaginous cells is described and the location of pectic substances and cellulose is discussed.

**Materials and Methods**

Leaves of plants from the Canary Islands and the Botanical Garden in Copenhagen were studied.

For light microscopy, leaves fixed in formalin-acetic acid-alcohol (FAA) were sectioned on a freeze microtome (20 µm), stained with light-green safranin, dehydrated, and embedded in Canada balsam. Hand-sections of fresh leaves were used for histochemical reactions which included zinc-chlor-iodine for cellulose, sudan IV for lipids, ruthenium red for pectins, and ferric chloride for tannins.

For electron microscopy, leaves were fixed in 3% glutaraldehyde in 0.1 M KH$_2$PO$_4$-buffer and post-fixed in 2% OsO$_4$ in the same buffer. After the usual procedure of dehydration and embedding in EPON (Juniper et al., 1970), sections were made on a LKB ultratome and, after staining in uranyl acetate followed by lead citrate, they were investigated in a JEOL JEM T7 electron microscope.

For scanning electron microscopy air dried leaves were prepared by normal procedures.

**Anatomy of the Leaves**

*Spartocytisus filipes* is a broom-like tree endemic to the Canary Islands where it grows in the lower xeric...
zone (0–700 m) among lava blocks (Burchard, 1929; Ceballos and Ortuno, 1951; Lems, 1960).

The leaflets are dorsiventral, Figure 1. The cells of the upper epidermis are papillous and have a thin outer cellulose wall covered by a thin cuticle and stel-
late epicuticular wax bodies, Figure 2. Slightly sunken stomata are found on both leaf surfaces. The mucilaginious cells are few and occur singly in the lower epidermis only.

Figs. 1–3. *Spartocytisus filipes*. Fig. 1, Cross section of leaflet. Black bodies in epidermal cells are tannins. Bundle sheaths surround minor veins. Mucilaginous cells are not seen. EPON-embedded material. × 180. Fig. 2, Scanning electron micrograph of upper surface of leaflet. Stelate wax bodies cover the cells except on the stoma. × 1125. Fig. 3, Mucilaginous cell (M) in lower epidermis of leaflet. Inner wall very thick and layered. Lumen (L) very narrow, (thick white line is caused by separation of cuticle from embedding material). Phase contrast, × 900