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Leaf Micromorphology of the African Medicinal Plant *Xysmalobium undulatum*

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Xysmalobium undulatum (L.) R.Br. belongs to the family Apocynaceae (subfamily Asclepiadoideae) and is a large perennial herb that grows throughout the grassland regions of southern Africa. It is known on the European market by the name *Uzara*, While primarily used as an antidiarrhoeal and for menstrual cramps, *X. undulatum* is also used in the treatment of a variety of other ailments, including skin diseases, fever, coughing, influenza, urinary tract infections, and gonorrhoea. Although there are numerous studies available on its pharmacology and taxonomy, no studies have been conducted on its leaf micromorphology [1]. This study aims to redress this by investigating the foliar micromorphology and relating its findings to the possible functional roles played in the plant.

Leaves were prepared for scanning electron microscopy using conventional procedures.

Observations with the SEM revealed a densely pubescent indumentum bearing numerous probably non-glandular hair-like trichomes on both the abaxial and adaxial leaf surfaces (Figs.1&2). However in older leaf samples very few trichomes were present. The trichomes are more abundant on the abaxial leaf surfaces where they are mainly distributed on the veins (Fig.2). They are characterised as being septate, uniseriate and erect. Each trichome possesses a prominent basal cellular pedestal (Fig.1). The surface of the trichomes displays numerous blunt warty outgrowths.

Leaves are amphistomatous, having equally abundant stomata on both the adaxial and abaxial leaf surfaces. Cuticular striations were also observed on both leaf surfaces. Crystalline secretory deposits were observed at the base and tips of trichomes.

Non-glandular trichomes serve various functions in the plant including heat load reduction and reflectance of incoming UV light both mechanisms that help maintain a constant leaf temperature, prevention of ovideposition by insects and protection against herbivores. The presence of a dense network of trichomes on the abaxial surface also suggests that they prevent water loss by shielding and trapping air over the stomata; a xeromorphic adaptation.

The amphistomatic condition and presence of sunken stomata on the adaxial surface confirm the xeromorphic nature of this species. Another xeromorphic feature is the cuticular striations which reflect incoming UV light thus aiding in the reduction of water loss and maintenance of leaf temperature.

The basal cellular pedestal provides both mechanical support and serves as a point of attachment for the trichome. It has been suggested that the cuticular warts are micro-ornamentations of the trichomes and arise from either the cell wall or cuticle. The presence of warts on trichomes is indicative of maturity and is probably part of the self-cleaning mechanism of this plant [2].

The trichomes present in *X. undulatum* bear close resemblance to the non-glandular trichomes found in many Lamiaceous species [3]. Further investigation is required to establish the exact nature of the hair-like trichomes present on the leaf surface and whether they play a part secreting the toxic cardioglycosides this family is known for. Also the xeromorphic characteristics displayed by the plant requires further ecophysiological investigation.

[1] V. Steenkamp et al., J Ethnopharm 95: 353-357 (2004).
[2] E. Werker, Adv Bot Res. 31: 1-35 (2000).
[3] L. Ascensao, Ann of Bot 75: 619-626 (1995).

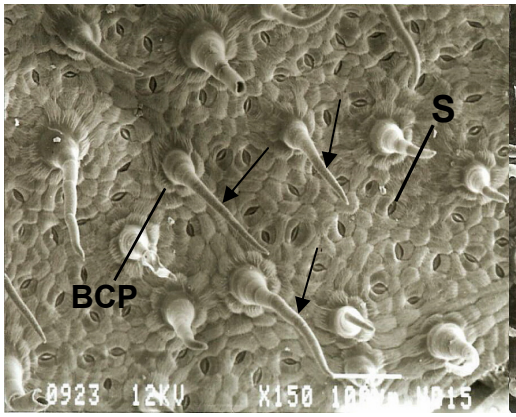

Fig 1. Adaxial leaf surface of *X.undulatum* showing hair-like trichome distribution (arrows), basal cellular pedestal (BCP) of trichome, sunken stomata (S) and cuticular striations.

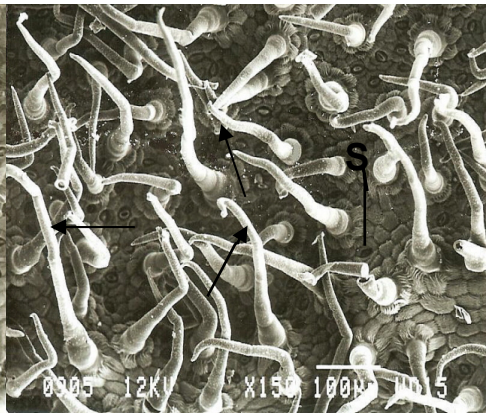

Fig 2. Abaxial leaf surface of *X.undulatum* showing hair-like trichome distribution (arrows), stomata (S), and cuticular striations.

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