Available online at www.sciencedirect.com
SCIENCE DIRECT®
Flora 201 (2006) 326–330
FLORA
www.elsevier.de/flora

The foliar micromorphology of *Solanum pseudocapsicum*

Adamu Aliyu Aliero, Donald S. Grierson, Anthony J. Afolayan*

Department of Botany, University of Fort Hare, Alice, 5700, South Africa

Received 16 August 2005; accepted 5 October 2005

Abstract

Foliar micromorphology of *Solanum pseudocapsicum* was investigated by electron microscopical examination. The leaves are characterized by anisocytic stomata which are more abundant on the abaxial surfaces. The leaves have short multicellular glandular trichomes sparsely distributed over the entire leaf surfaces. Crystal deposits were also observed on the surfaces above the stomata. Energy dispersive X-ray spectroscopy-SEM showed that Al, K, Na and Si were the major constituents of the crystals analyzed. The presence of glandular trichomes in this plant could be the source of poisonous compounds that are characteristic of this species.

Keywords: *Solanum pseudocapsicum*; Micromorphology; Stomata distribution; Glandular trichome; Leaf crystals

Introduction

Solanum pseudocapsicum L. (Solanaceae), known as winter cherry, is a poisonous plant which is often cultivated as an indoor ornamental. It is an erect and highly branched shrub with non-spiny stems reaching a height of 5 m. It bears star-shaped flowers, dark-green lanceolate leaves, and bright red berries.

Although poisonous, the plant is used for the treatment of acute abdominal pain (Boericke, 1927) and in the treatment of boils, gonorrhea and as tonic for men (Batten and Bokelmann, 1966). It contains poisonous solanocapsine and other alkaloids that are reported to be fatal to man and animals (Parisi and Francia, 2000). Other phytochemical investigations of the leaves revealed that it possesses cytotoxic and antitumour properties (Shrishailappa et al., 2003; Vijayan et al., 2003).

Despite the pharmacological and toxicological profiles of *S. pseudocapsicum*, little or no information is available on its foliar micromorphology. Yet, such information can shed light on its structural features and their possible functional attributes. In this paper, we present the micromorphology of foliar appendages of *S. pseudocapsicum* and relate our observations to their possible functional role in the production of toxic compounds. This is part of an ongoing study on the toxic compounds produced by the plant and their possible sites of production.

Materials and methods

The plants used in this study were grown in a greenhouse in the Department of Botany, University of Fort Hare. Fresh leaves, 4–6 mm in length, were removed from the upper part of the plant and were fixed in 6% glutaraldehyde in 0.05 M sodium cacodylate for 24 h. After washing with 0.05 M cacodylate buffer (pH 7.5), samples were dehydrated in a graded series of ethanol (20–100% X3) for

*Corresponding author. Tel./fax: +27 40 6022323.
E-mail address: Aafolayan@ufh.ac.za (A.J. Afolayan).

0367-2530/$ - see front matter © 2005 Elsevier GmbH. All rights reserved.
doi:10.1016/j.flora.2005.10.001

15 min per rinse. This was followed by critical point drying with liquid CO_2 in an Autosampler 810 critical point dryer, and sputter-coating with gold-palladium in a Hummer V-sputter coater. Both the adaxial and abaxial surfaces were observed in a Hitachi S-450 Scanning Electron Microscope, equipped with a Polaroid 454 Camera at 10 KV. For energy dispersive X-ray spectroscopy-SEM, the fixing and dehydration followed the same procedure as in SEM, while a FEI QUANTA 200 oxford EDX analyzer was used for the analysis.

Results and discussion

The micromorphology of the leaf surfaces of *S. pseudocapsicum* is presented in Figs. 1–3. The leaves are characterized by anisocytic stomata which are more abundant on the abaxial than adaxial surfaces (Figs. 1A and B). This is a natural phenomenon in most angiosperms (Fahn, 1967). The leaves have short multicellular glandular trichomes (Figs. 2A–D), which are sparsely distributed over the entire leaf surfaces. Each trichome is morphologically divided into three regions that are easily distinguishable as head, stalk and the basal cavities (Fig. 2D). The development of the trichomes from the epidermis usually results from differential enlargement and subsequent divisions of the epidermal cells and their derivatives (cf. Carlquist, 1958). The possession of glandular trichomes is characteristic of the genus *Solanum* and of many other Solanaceae, with the exception of *Nicotiana glauca* and *Solandra nitida* (Maiti et al., 2002). Glandular trichomes are characterized by

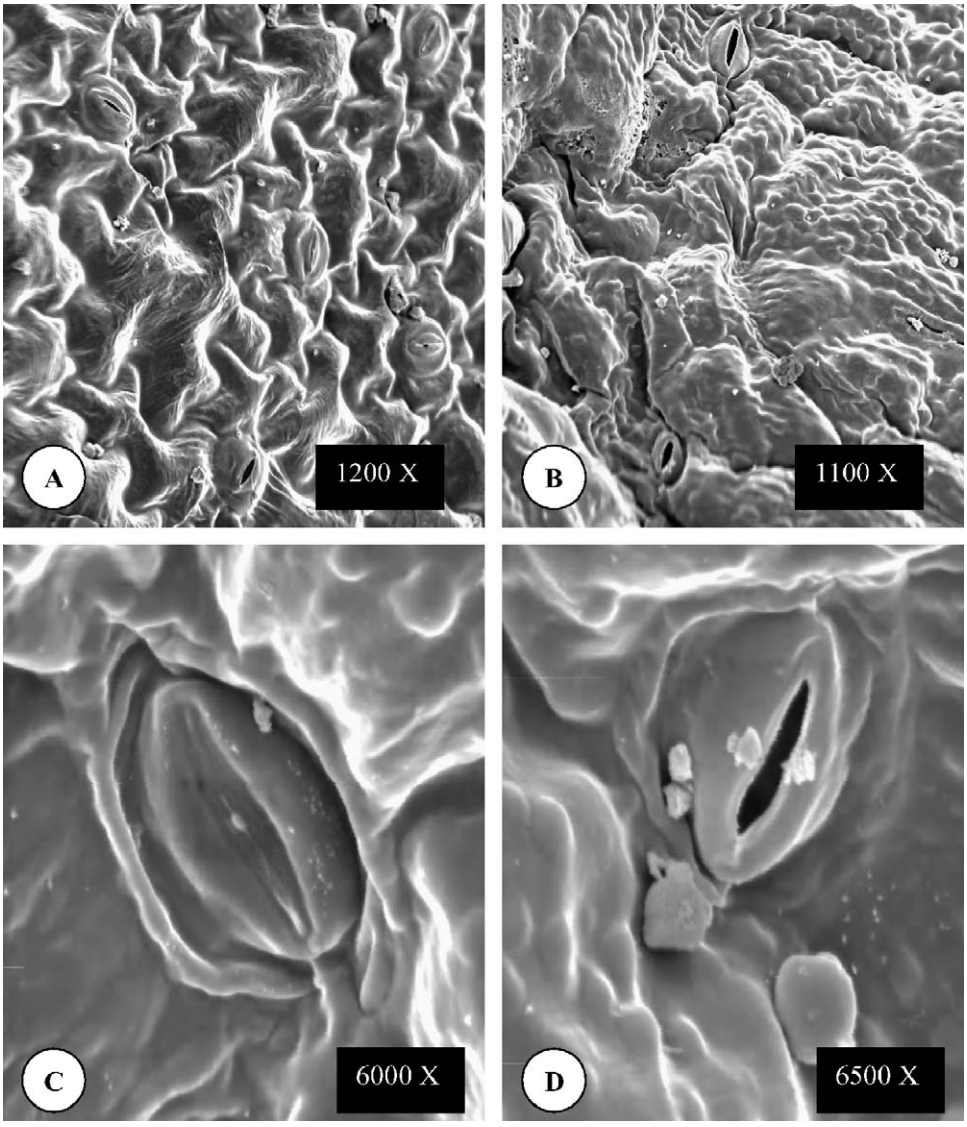

Fig. 1. Stomatal distribution in *S. pseudocapsicum.* (A) abaxial surface, (B) adaxial surface, (C, D) higher magnifications of a stoma from abaxial and adaxial surface, respectively.