

## Comparative Leaf Epidermal Studies On *Solanum Macrocarpon* And *Solanum Nigrum*

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**ABSTRACT:** The comparative leaf epidermal studies on *Solanum macrocarpon* and *Solanum nigrum* showed that the upper and the lower epidermal cell wall of *S. nigrum* varied in shape from pentagonal, rectangular to hexagonal while the upper and the lower epidermal cell wall of *S. macrocarpon* are irregular in shape. Although both taxa are amphistomatic but stomata are more abundant at the lower leaf surfaces than the upper leaf surfaces. Both stomata are anomocytic with stomatal index ranging from 5.70%-33.02% in *S. nigrum* and 10.14%-32.35% in *S. macrocarpon*. These observations are important especially as they help to establish interspecific relationships among the two investigated taxa and hence suggest reasons for the two taxa to be in the same genus. [Nature and Science. 2007;5(3):1-4].

**Keywords:** Comparative, Leaf, epidermal studies, *Solanum*, species, Solanaceae

### INTRODUCTION:

The genus *Solanum* belongs to the family Solanaceae. Members of this family are mostly herbs and twinners with about 70 genera and 2,000 species (Willis, 1985). Some workers recorded about 85 genera and 2,200 species (Ahmed, 1964, Patel 1969). Solanaceae is represented in West Africa by 53 species contained in 8 genera (Hutchinson and Dalziel 1963). *S. macrocarpon* and *S. nigrum* are edible. They serve as foliage for feeding livestock but excess intake of *Solanum* plants especially those with bitter taste may lead to fruit toxicity and spinal bifida i.e. non joining of spinal bones due to ingestion of too much solanine. (Schippers, 2001).

From available literatures, the use of leaf epidermal features in systematic botany is now popular just like the use of other markers like DNA sequence and chemical compositions (Edeoga and Ikem, 2001; Mbagwu and Edeoga, 2006). Epidermal structures and stomatal ontogeny of some Nigerian ferns have been found relevant in their recognition (Gill and Karatela, 1985). Olowokudejo (1990) compared the morphology of the leaf epidermis in *Annona* and suggested the utilization of this character in the identification of the species. Edeoga, 1991; Edeoga and Osawe, 1996; Mbagwu and Edeoga, 2006 constantly reaffirmed the point that epidermal and cuticular traits of plants could serve as vital tools exploitable in the systematics of the present day angiosperms. Also, different shapes of epidermal cells, type and arrangement of stomata, size and shape of trichomes and number of vascular bundles are all vital in systematic botany (Nwachukwu and Mbagwu, 2006). Perhaps the most extensive investigated family where anatomical features provided very useful taxonomic characters was the Gramineae and several authors have constructed keys for the identification of some taxa within the family based only on leaf epidermal characters (Davis, 1959). Edeoga and Osawe (1996) used the leaf epidermal morphology of some members of *Costus*, *Senna* and *Boerhavia* species to establish possible relationships among the different species they investigated.

Although the biological significance and implications of leaf anatomical characters have been highlighted in different plant families, there is no specific leaf anatomical documentation on *S. macrocarpon* and *S. nigrum* hence the need for this research investigation.

This paper therefore described the leaf epidermal characters of the two *Solanum* species. It also assesses the relevance of and discusses the extent to which leaf epidermal features might be utilized in the systematic consideration of the two species in view of their perceived similarities in structural and reproductive biology.

### MATERIALS AND METHODS

Fresh leaves from the two *Solanum* species were collected. This work was done at the Crop Science Laboratory at University of Nigeria Nsukka in November, 2006. Epidermal peels were obtained directly from the fresh leaves without any chemical treatment. This was done by free hand peeling with razor blade. The epidermal peels obtained were stained with ethanol safranin for one minute. Excess safranin stain were

washed off and temporarily mounted in aqueous glycerol solution (Cutler, 1978). Photomicrographs of the epidermal features were taken from the slides using Letz Wetzler Ortholux microscope fitted with vivitar-v-335 camera. (Figure 1 a & b).

## RESULTS AND DISCUSSION

The leaf epidermal features of the two *Solanum* species investigated were summarized in tables 1 and 2. The walls of the epidermal cells of the two species showed that the upper and the lower epidermal cell wall of *S. nigrum* varied in shape from pentagonal, rectangular to hexagonal while the upper and lower epidermal cell walls of *S. macrocarpum* are irregular in shape (Tables 1 and 2). The distribution of stomata in both the upper and lower epidermis also varied. This was apparent in the variation of the stomatal index ranging from 5.70% - 33.02% in *S. nigrum* and 10.14% - 32.35% in *S. macrocarpum*. More so the stomatal frequency varied in the lower epidermis of both taxa indicating 136.50% in *S. nigrum* and 137.40% in *S. macrocarpum*. Anomocytic stomata characterized the two species and both species are amphistomatic i.e. stomata are present in both the upper and lower epidermis (Tables 1 and 2).

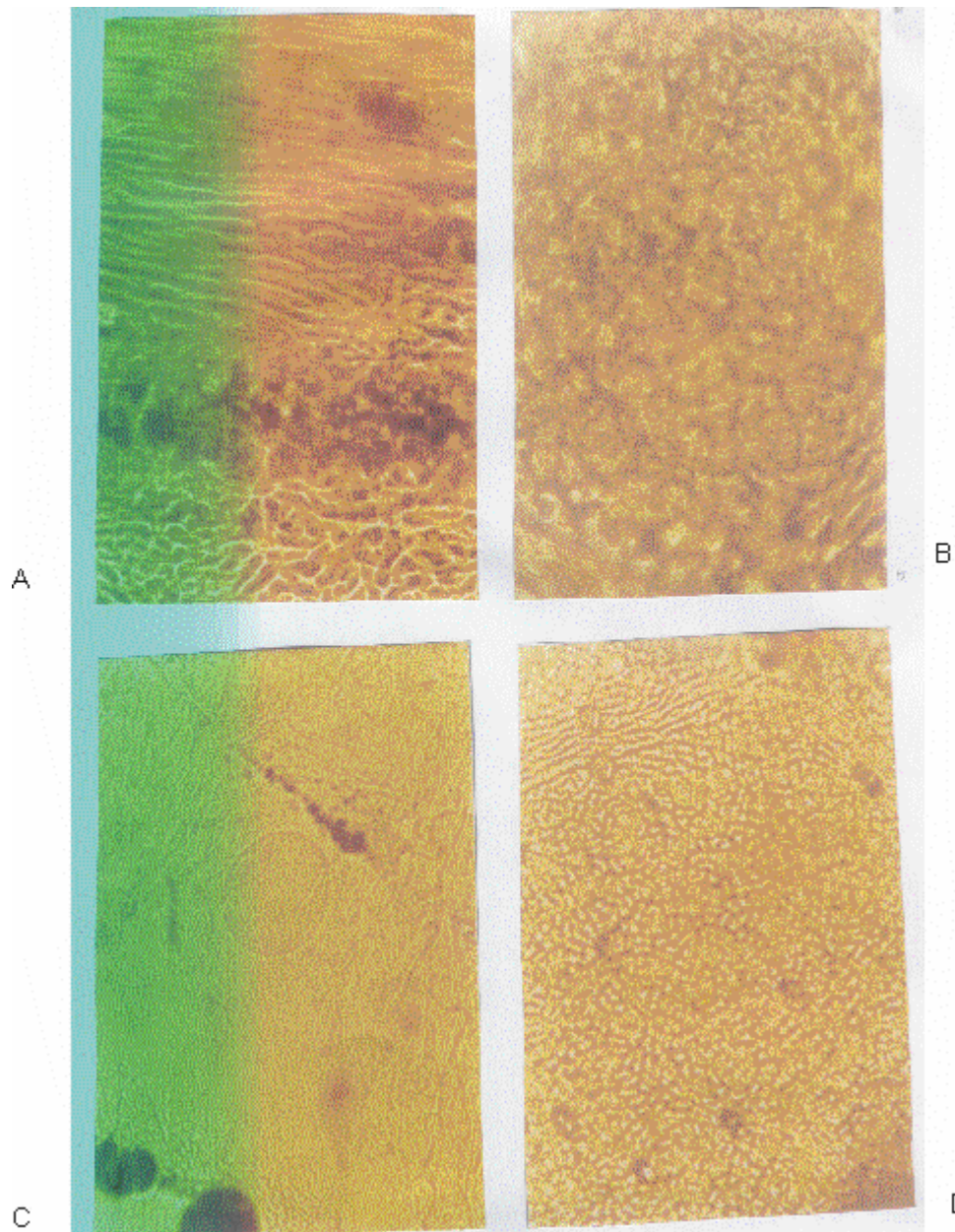
Although stomata appeared on both the upper and lower leaf surfaces but they are more on the lower leaf epidermis. This is probably an adaptation to water loss. This is in agreement with Metacalf and Chalk (1950), Mbagwu and Edeoga (2006) who observed that stomata are present on both surfaces of leaf but are usually more on the lower epidermis in species of *Amaranthus* and *Vigna* respectively. The anomocytic type of stomata that characterized the two taxa is not strange since Edeoga and Ikem (2001) observed the same in *Boehavia* species, Metcalfe and Chalk, (1960) observed the same in some dicotyledonous plants and Mbagwu and Edeoga (2006) also noticed the same in *Vigna* species. In each of this study, the authors emphasized the importance of epidermal features and their relevance in systematic botany. The observations made in leaf epidermal features of the two *Solanum* species are important especially as they help to establish interspecific relationships among the two investigated taxa. For example the similarities in leaf epidermal features showed strong interspecific relationship and thus suggest reasons for the two taxa to belong to the same genus whereas the differences suggest reasons for the two taxa to exist as different species.

**Table 1. Epidermal Characteristics of the lower leaf epidermis of *S. macrocarpon* and *S. nigrum***

CHARACTERS	<i>S. macrocarpon</i>	<i>S. nigrum</i>
Type of Stomata	Anomocytic	Anomocytic
Stomatal Index	10.14-32.35%	5.70-33.02%
Stomatal frequency	137.40	136.50
Stomatal appearance	Amphistomatic	Amphistomatic
Shape of epidermal cells	Irregular	Pentagonal to rectangular
No of epidermal cells	284.25	347.00

**Table 2: Epidermal Characteristics of the Upper leaf epidermis of *S. macrocarpon* and *S. nigrum***

CHARACTERS	<i>S. macrocarpon</i>	<i>S. nigrum</i>
Type of Stomata	Anomocytic	Anomocytic
Stomatal Index	6.41-6.80%	3.21-3.64%
Stomatal frequency	39.20	26.10
Stomatal appearance	Amphistomatic	Amphistomatic
Shape of epidermal cells	Irregular	Pentagonal rectangular to hexagonal
No of epidermal cells	347	426



**Figure 1 (a-d). Upper and lower leaf epidermis characteristics of the two solanum species studied.**

- a** Upper leaf epidermal characteristics of *S. nigrum*
- b** Upper leaf epidermal characteristics of *S. macrocarpum*
- c** Lower leaf epidermal characteristics of *S. nigrum*
- d** Lower leaf epidermal of *S. macrocarpum*

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