Cuticular Studies of Some Nigerian Species
of Senna Tourn. ex Mill. (Syn. Cassia Tourn. ex L.):
Leguminosae—Caesalpinioideae

H. O. EDEOGA and PATRICIA I. OSAWE

Department of Botany, Edo State University, P. M. B. 14, Ekpoma, Edo State, Nigeria

Abstract. A comparative study of the leaf epidermis of five Nigerian leguminous species has been done using the light microscope. Some of the differences recorded in the epidermal cell wall architecture, trichomes, size, distribution, frequency and morphology of the stomatal complex have been discussed in line with their taxonomic significance. The nature of the unicellular and multicellular trichomes are described for the first time in these species of Senna, and S. hirsuta is diagnostic in acquisition of these two types of trichomes. The stomatal index varied from 47.1 % (S. spectabilis) to 98.2 % (S. alata).

Key Words: leaf, Leguminosae, Senna, trichome

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According to Airy Shaw (1973), Senna Tourn. ex Mill. (Syn. Cassia Tourn. ex L.) is a large genus of about 600 species distributed in tropical and warm temperate regions of the world. There are about 22 indigenous species and some aliens in West Africa which are used for medicinal and decorative purposes.

Morphological features of some species of Senna including S. alata (L.) Roxb.; S. hirsuta (L.) H. S. Irwin & Barneby, S. occidentalis Link., S. obtusifolia (L.) H. S. Irwin & Barneby and S. spectabilis (DC.) H. S. Irwin & Barneby have been described by Hutchinson and Dalziel (1968) and Akobundu and Agyakwa (1987). The stems are either cylindrical or ribbed and woody and therefore can support themselves. The leaves are petiolate and vary in shape depending on the species.

epidermal cells of the leaf of C. afer are hexagonal and their leaves amphistomatic.

Some Cassia species have now been changed to Sena species (Lowe and Soladoye, 1990). Taxonomic studies on wide geographic basis may show that a particular taxon in one country is in fact the same as another name. Such studies may indicate that a particular genus should be split into more separate genera, as Cassia has been divided into Cassia, Senna and Chamaecrista.

This recent separation of Senna species from Cassia species shows that there is need to ascertain the taxonomic characters which are unique to this new genus. As a new taxon, information about it is incomplete; thus it is an attempt to fill in the gap in our present knowledge that the present work was carried out.

Materials and Methods

Mature and fresh leaves of the five Senna species (S. hirsuta, S. obtusifolia, S. alata, S. occidentalis and S. spectabilis) were collected (Inamdar, 1968) from different parts of southern Nigeria. Samplings were made by using fresh leaves from plants in their natural conditions. These do not undergo any form of deterioration since the leaves were succulent. These materials were used for the epidermal studies following the method of Cutler (1978) with slight modifications. Epidermal peels were stained with 1% ethanol safranin and temporarily mounted in aqueous glycerine solution. The slides were studied under a light microscope and photomicrographs of epidermal cells including stomata and trichomes taken using a Carlzeiss Jenaval microscope fitted with MF AKS 24 × 36 automatic camera. Stomatal index was also calculated. For the terminology used in this study see Metcalfe and Chalk (1950).

Observations

The cuticular characters were very important in all the Senna species investigated and were summarized in Table 1. The epidermal cells of these Senna species were varied in shape and were either irregular or sinuous, slightly sinuous and coarsely sinuous. The epidermal cells ranged from pentagonal, hexagonal to polygonal.

Paracytic stomata were observed in all the species but Senna alata and S. spectabilis; the latter two species have both paracytic and anisocytic stomata in the upper epidermis but only paracytic stomata in the lower epidermis (Fig. 1–9). Two major types of hairs were observed in this genus: unicellular and multicellular trichomes (Fig. 10–12). S. hirsuta had both unicellular and multicellular trichomes while S. alata, S. occidentalis, S. obtusifolia and S. spectabilis possesses unicellular trichomes only.

The stomatal distribution in both the upper and lower epidermis was also observed to be significant. Thus the stomatal index varied from 47.1
% in *Senna spectabilis* to 98.2 % in *S. alata*. Of great importance to note was the close range of the stomatal indices in both the upper and lower epidermis in all the taxa studied.

**Discussion**

Metcalfe and Chalk (1950) had earlier described the aspects of mature epidermis in a number of mature plants including *Senna*. The epidermal characteristics of the five species studied showed that the epidermal cell wall patterns were straight, slightly sinuous, or coarsely sinuous. The degree of sinuosity according to Esau (1965) is caused by the degree of force exerted on the stomata in their course of development.

In the presently investigated taxa, the leaves were observed to be amphistomatic. The stomatal indices were higher on the lower epidermis compared to the upper surfaces. These species also showed the existence of variable stomatal types: paracytic and anisocytic. This did not agree with Metcalfe and Chalk’s (1950) reports which indicated that the stomatal types of all the species were paracytic. Paracytic stomata were observed in all the five species studied; in addition, *Senna alata* and *S. spectabilis* showed anisocytic stomatal type.

Most of the species studied had high stomatal index and this had earlier been reported by Gill and Karatela (1985) and Gill *et al.* (1983) in Asclepiadaceae and Leguminosae. All the five species investigated had
FIGS. 5–8. 5 and 6. Lower and upper epidermis of *Senna hirsuta*. Stomata are paracytic and the epidermal cells are sinuous in both surfaces (× 125 and × 200, respectively). 7 and 8. Lower epidermis in *S. alata* and *S. spectabilis* respectively. Both paracytic and anisocytic stomata are present and the epidermal cells are polygonal (× 200).

TABLE 1. Cuticular characteristics of the *Senna* species studied

<table>
<thead>
<tr>
<th>Character</th>
<th><em>S. alata</em></th>
<th><em>S. occidentalis</em></th>
<th><em>S. obtusifolia</em></th>
<th><em>S. hirsuta</em></th>
<th><em>S. spectabilis</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stomatal index (%)</td>
<td>Upper = 87.3</td>
<td>58.1</td>
<td>72.6</td>
<td>61.1</td>
<td>47.1</td>
</tr>
<tr>
<td></td>
<td>Lower = 98.2</td>
<td>66.1</td>
<td>92.5</td>
<td>68.4</td>
<td>50.1</td>
</tr>
<tr>
<td>Stomatal type</td>
<td>Paracytic</td>
<td>Paracytic</td>
<td>Paracytic</td>
<td>Paracytic</td>
<td>Paracytic</td>
</tr>
<tr>
<td></td>
<td>&amp; anisocytic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shape of epidermal cells</td>
<td>Mostly hexagonal</td>
<td>Varied, hexagonal to polygonal</td>
<td>Mostly polygonal</td>
<td>Polygonal</td>
<td>Polygonal &amp; sinuous</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichome</td>
<td>Unicellular</td>
<td>Unicellular</td>
<td>Unicellular</td>
<td>Unicellular</td>
<td>Unicellular</td>
</tr>
<tr>
<td>Rows of cells per trichome</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

trichomes on the abaxial surfaces of the leaf but the cell architecture however differed. Thus they were unicellular in all the species except in *S. hirsuta* where they were both unicellular and multicellular (Figs. 11 and 12). Similarly in all the species there was one row of cell per trichome except in *S. hirsuta* which had up to three rows. This observation was in line with that of earlier authors that had vividly emphasized the taxonomic im-

The possession of paracytic and anisocytic stomata brought to light the phylogenetic relationship of these Senna species. Inspite of this, S. hirsuta and S. alata exhibited cuticular attributes that could be used in separating them from the other taxa investigated. Though the recent separation of some of these Senna species from Cassia is still being questioned by some authors, the epidermal features seemed to support such move. Despite this support, more investigations in other lines of taxonomic reasonings could be initiated such as phytochemistry and cytology in these taxa. This will go a long way in clearing the confusions in the taxonomy of these Senna species.

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摘　要

エデオガ, H. O.・P. I. オサウェ：ナイジェリア産 Senna （＝カワラケツメイ属）(マメ科
ジャケツイバラ亜科) 数種の表皮系の比較研究

ナイジェリア産 Senna （＝カワラケツメイ属）(マメ科ジャケツイバラ亜科) の5種の表皮
系について、光学顕微鏡により比較研究を行った。毛や気孔の形態の違いに基づいて、それ
らの分類学的意義を議論した。Senna hirsuta は単細胞の毛と多細胞の毛をもつ点で他の種
と区別されることが明らかにされ、同時に Senna 属がこれら二つの毛をもつことが初めて記
録された。

(ナイジェリア，エド州立大学，植物学研究室)