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FOLIAR EPIDERMAL CHARACTER IN THE GENUS *Brachystegia* Benth

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ABSTRACT: The study reports on the structure of trichomes, epidermal cells and stomata. The trichomes are nonglandular, unicellular pointed or bent and long or short. The epidermal cells are variously shaped and stomata are paracytic and amphistomatic.

Key Words: Trichomes; Epidermal characters; Stomata; *Brachystegia*.

INTRODUCTION

Brachystegia Benth (Caesalpinaceae) is a genus term which is represented in Nigeria by three (3) species: *B. eurycoma* Harms, *B. kennedyi* Hoyle and *B. nigerica* Hoyle & A.P.D. Jones. Members of the genus occur in the moist forest of the tropical regions in Africa (Willis, 1980). In Nigeria, the genus is of considerable economic importance because of the suitability of the wood for building, construction work and medicinal uses, for example, the plant is used as an anti-helminthic (Burkill, 1995).

The cultivar and epidermal morphology has received treatment from taxonomists in order to facilitate phylogenetic considerations and assessing generic affinities. Apart from phylogenic, taxonomic and diagnostic significance, the cuticular character are of immense value in the identification of crude drugs in pharmacognostic studies of medicinally foliar parts. The literature on the cuticular morphology of angiosperm by contributors such as Metcalfe & Chalk (1979), Cutler (1979), Wilkinson (1979), Stace (1984), Olowokudejo (1993) and Ogundipe (1992) among others have shown that characters derived from the epidermis could aid in taxonomic identification and classification because of their high structural diversity.

The present study which deals with the foliar epidermal character is an attempt to give detail information about some species of *Brachystegia*.

MATERIALS AND METHODS

The foliar material was either collected from plants growing locally or procured from dried herbarium specimens from Forestry Research Institute of Nigeria, Ibadan (FRI), Obafemi Awolowo University, Ile-Ife (IFE), and University of Ibadan (UIH). The following species were studied: *B. nigerica*, *B. eurycoma*, and *B. kennedyi*.

The herbarium leaf materials were first revived by boiling in water to which detergent has been added for 15 to 20 minutes and soaked in water for about 10 hours to allow the leaf to expand properly. The leaf material for study was placed with upper surface facing down on a glass plate and flooded with domestic bleach. The lower surface of the materials was then scraped with razor blade until the upper epidermis is

reached (Cutler, 1978). The material was then washed in distilled water and transferred to 10% aqueous solution of safranin o, washed in water and mounted in glycerine. The process was repeated from the lower surface too by scrapping off the upper surface. from each sample 10 - 2- peelings were examined.

Drawing were made using a Wild M12 with camera lucida attachment. Fifty cells and stomata were selected randomly from all specimens of each species and measured.

OBSERVATIONS AND DISCUSSION

Tables 1 and 2, and Figs 1 and 2 are summary of the range of variation in epidermal characteristics of seen by light microscopy.

EPIDERMAL CELL COMPLEX - The abaxial and adaxial cells are isodiametric, irregular or plogonal (Fig 1A, B, C, D, E, F) with straight adaxial anticlinal cell walls in *B. eurycoma* and *B. nigerica* (Fig 1A, E) but arcuate to curved in *B. kennedyi* *Fig 1C) while on the abaxial epidermis, the anticlinal cell walls are straight to arcuate in *B. eurycoma* (Fig 1B), they are curved to undulate in *B. kennedyi* and *B. nigerica* (Fig 1D,F).

The average size of the cells varied from 10.00 (19.25 ± 4.04) 27.50 x 18.00 (23.25 ± 3.00) 33.50 µm on the adaxial epidermis of *B. eurycoma* to 22.50 (36.0016.32) 50.00 µm x 29.45 (41.50 ± 5.45) 65.00 µm on the adaxial epidermis of *B. kennedyi*, while on the abaxial epidermis the cell sizes varied from 12.50 (19.63 ± 3.97) 27.50 x 14.35 (21.50 ± 2.50) 32.10 µm in *B. eurycoma* to 25.00 (35.38 ± 7.04) 52.50 x 34.80 (40.57 ± 5.00) 62.50µm in *B. kennedyi*. the average number of epidermis cells per sq.mm. varied from 406 on the adaxial depidermis of *B. kennedyi* to 1108 in *B. eurycoma* and 394 to 930 on the abaxial epidermis of *B. kennedyi* and *B. eurycoma* respectively.

STOMATA COMPLEX - Leaves are amphistomatic. Stomata type is paracytic in all species (Fig 1B,D,F). Frequency of stomata ranges from as high as 62-96 per mm sq. in *B. eurycoma* to 34-60 per mm. sq. in *B. kennedyi* on the abaxial epidermides. However, stomata are more on abaxial epidermis when compared to the adaxial epidermis. Stomata are usually absent in the costal zone. The ratio of stomata length to width varied adaxially from 1.26 in *B. nigerica* to 1.43 in *B. kennedyi* and abaxially from 1.45 in *B. kennedyi* to 1.54 in *B. nigerica*. The ratio of stomatal length to width was found to be a useful diagnostic features among other features for distinguishing species. Aso the stomata index ranges adaxially from 0.09 in *B. nigerica*.

TRICHOME COMPLEX -The morphology of trichomes including their form and size is characteristics of the different species and hence of great diagnostic interest. Only non-glandular trichomes are present in the species of *Brachystegia*.

Trichomes are unicellular very short and straight, long and straight or long and curved on the adaxial and epidermides of *B. nigerica* (Fig 2A-E). In *B. Kennedyi* trichomes are restricted to the midrib of the abaxial epidermis and are unicellular, straight or curved (Fig 2F,G). Trichomes are absent in *B. eurycoma*.

SECTIONAL VIEW OF EPIDERMIS - Cross section of the leaves of *Brachystegia* have been examined to study the form of stomata, epidermal cells and cuticle in sectional view. Stomata are sunken in *B. nigerica* and *B. eurycoma* but slightly raised in *B. kennedyi*. Cuticle in this species is thin and smooth over the epidermal cells of the intercostal zones. The trichome base is superficial in *B. kennedyi* but sunken in *B. nigerica*.

CRYSTALS - Crystals have been of considerable taxonomic importance (Franceschi and Horner, 1980). In this study crystals sand are present only in *B. nigerica*.

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TABLE 1: EPIDERMAL CELL CHARACTERS OF BRACHYSTEGIA SPECIES IN NIGERIA.

Taxa	Leaf Surface	Epidermal cell shape	Anticlinal cell wall pattern	Epidermal cell width(NM)	Epidermal cell length(mm)	NO of Epidermal cell per sq.mm	Epidermal cell wall thickness (mm)
<u>B. eurycoma</u>	adaxial	Isodiametric/Polygonal	Straight	10.00 (19.25 ± 4.04) 27.50	14.00 (23.29 ± 3.00) 33.50	1108	3.75 - 5.00 (4.58 ± 0.56)
	Abaxial	Isodiametric/Polygonal	Straight	12.50 (19.63 ± 3.97) 27.50	14.35 (21.50 ± 2.50) 32.10	930	2.50 - 3.75 (2.79 ± 0.57)
<u>B. kennedy</u>	Adaxial	Isodiametric/Irregular	Curved	22.50 (36.00 ± 6.32) 50.00	29.45 (41.50 ± 5.45) 65.00	406	2.50 - 3.75 (2.99 ± 0.52)
	Abaxial	Irregular	Curved/undulate	25.00 (35.38 ± 7.04) 52.50	34.80 (40.57 ± 5.00) 62.50	394	2.25 - 2.75 (2.50 ± 0.16)
<u>B. nigerica</u>	Adaxial	Isodiametric/Polygonal	Curved/Straight	20.00 (25.13 ± 3.30) 32.50	30.00 (35.10 ± 3.50) 41.50	968	2.50 - 5.00 (4.14 ± 0.79)
	Abaxial	Irregular/Polymal	Curved/Straight	15.00 (22.00 ± 4.00) 30.00	21.00 (25.00 ± 3.00) 40.00	897	2.25 - 2.75 (2.46 ± 0.16)

TABLE 2: EPIDERMAL FEATURES OF BRACHYSTEGIA SPECIES IN NIGERIA

Taxa	Leaf Surface	Stomatal Frequency	Stomatal Length (Nm)	Stomatal Width (Nm)	Stomatal Length Stomatal Width	Stomatal Index %	Trichome
<u>B. Curvcoma</u>	Adaxial	1	17.50 - 22.50 (19.38 ± 1.75)	10.00 - 20.00 (14.06 ± 2.46)	1.38+	0.09	Absent
	Adaxial	83	15.00 - 20.00 (16.88 ± 1.56)	10.00 - 12.50 (11.38 ± 1.24)	1.48	8.16	Absent
<u>B. Kennedy</u>	Adaxial	3	17.50 - 25.00 (21.75 ± 2.25)	12.50 - 17.50 (15.25 ± 1.56)	1.43+	0.70	Absent
	Adaxial	48	17.50 - 22.50 (19.06 ± 1.42)	10.00 - 17.50 (13.13 ± 1.92)	1.45	10.76	Present
<u>B. Nigerica</u>	Adaxial	1	17.50 - 22.50 (20.63 ± 2.07)	12.50 - 17.50 (16.25 ± 2.17)	1.26+	0.02	Present
	Adaxial	67	12.50 - 17.50 (15.44 ± 1.44)	7.50 - 12.50 (10.00 ± 1.94)	1.54	6.89	Present

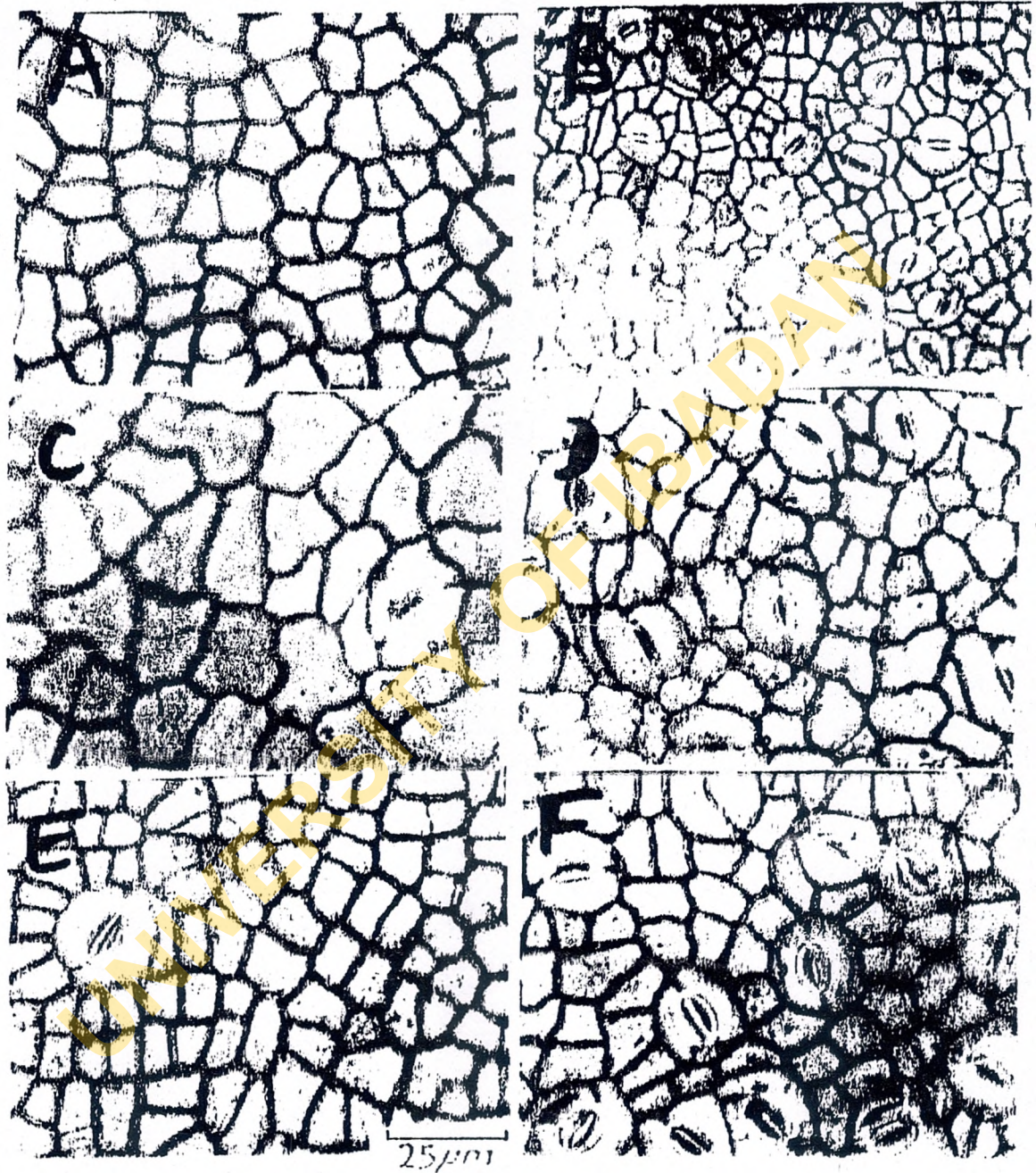


Fig. 1: Light micrographs of leaf epidermis of *Brachystegia* species. A, B: *B. eurycoma*, abaxial and adaxial epidermides respectively. C, D: *B. kenedyi*, abaxial and adaxial epidermides. E, F: *B. nigerica*.

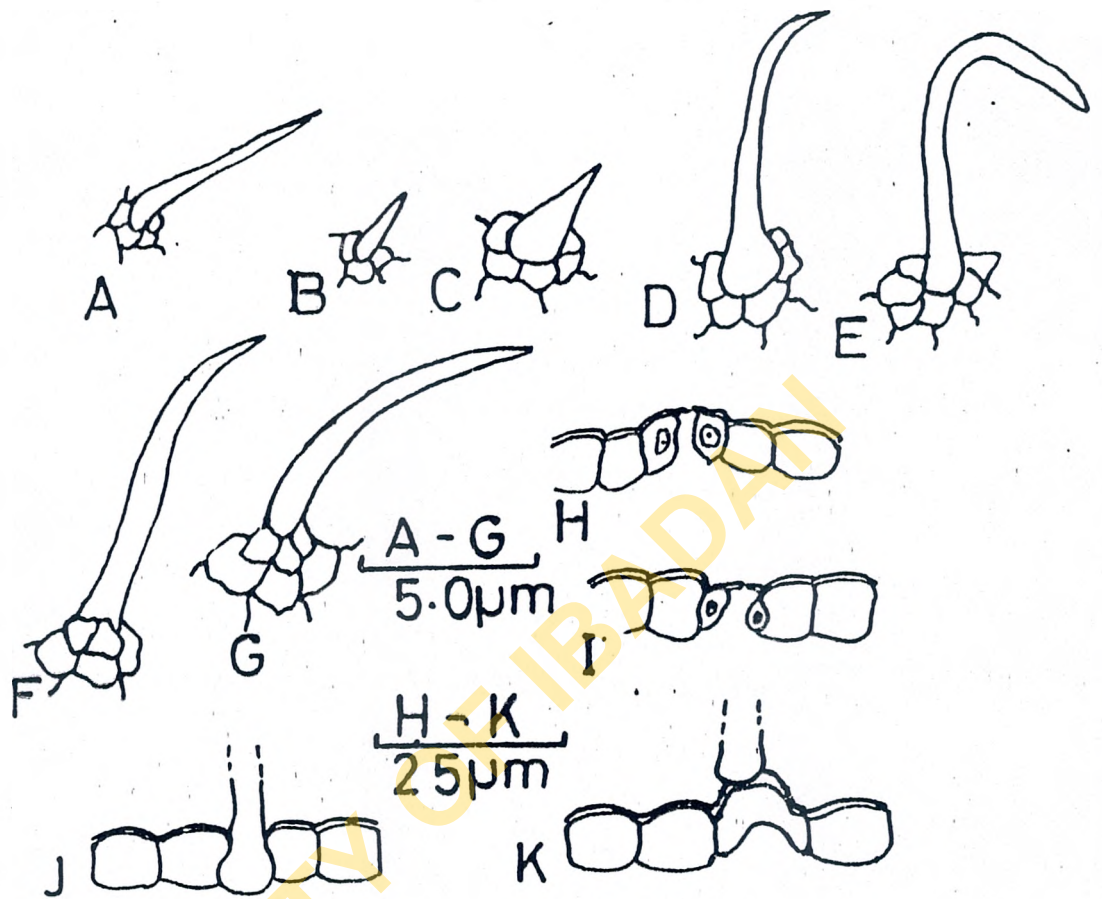


Fig.2. Trichome type in the species of Brachystegia: A-G H. A portion of the lower epidermis in a transection of leaf B. kennedyi, showing raised stomata and outer ledges. I. B. nigerica showing sunken stomata and outer ledges on the adaxial portion in a transection. J. B. nigerica A portion of the transection showing sunken trichome base. K. B. kennedyi A portion of the transection showing superficial base of trichome.

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