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Comparative systematic leaf and petiole anatomical studies of the genus *Stachytarpheta* found in Awka Nigeria

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Abstract

Investigations on the anatomical features of the leaf and petiole of three species of *Stachytarpheta* (*S. angustifolia*, *S. cayannensis* and *S. jamaicensis*) that were common in Awka, South East Nigeria was made with the aid of a light microscope. Anatomical significant features were found in the leaf and petiole. The leaves and petioles were dorsiventral. The epidermis was conspicuous but one cell thick. The epidermal cells in the leaves were not of uniform size in both surfaces. Chlorenchyma was present as a very narrow portion of the leaves and petiole tissue while the palisade layer was one to three cells thick. These features however, could not proffer any taxonomic relevance to the delimitation of any of the species in this genus.

Keywords: *Stachytarpheta*, *Jamaicensis*, *Cayannensis*, *Angustifolia*, Anatomical, Leaf, Petiole.

1. Introduction

Verbenaceae is predominantly a tropical family exhibiting a wide range of growth habit and inhabiting diverse habitats^[1]. The family has about 98 genera and 3,000 species^[2]. They are low shrubs, herbs or trees. Flowers are in spikes. The genus *Stachytarpheta* Vahl, belongs to the family Verbenaceae and is represented in West Africa and Nigeria by three species namely: *Stachytarpheta cayannensis* Rich. Vahl; *S. angustifolia* Mill. Vahl and *S. jamaicensis* L. Vahl^[3]. They are economic plants and may be grown as ornamentals^[4]. Members of family Verbenaceae are popular in traditional medicine. Moreover, all the *Stachytarpheta* species have been used ethnomedically as anti-diabetic, abortifacient, emmenagogue, sedative, antihypertensive, anti-asthmatic and anti-fever^[5].

Stachytarpheta is an erect and branched half-woody plant, with stem slightly angled. The leaves are elliptic to oblong-ovate and 2 to 10cm long. The leaf tips are pointed with toothed margins. The leaf base is decurrent on the petiole. The spikes are terminal, rather slender, 10-30cm long, 3-4mm thick, green and continuous. The calyx is small, oblique and 4-toothed. The corolla is deep-blue or blue-purple, 1cm long. The fruit is enclosed in the calyx and oppressed to and somewhat sunk in the rachis which is smooth, oblong and about 4mm long^[2].

Plant anatomy has been found to be very essential in plant taxonomy. The purpose is to develop a system of classifying plants in a way that all the differences and similarities are set out in ordered manner^[6]. In spite of the fact that vegetative and floral characters are markedly modified in relation to the habitat and pollination mechanisms, the preceding observations and the summaries of character variation indicated that the taxonomic application of the diversity of epidermal morphology in plants cannot be over emphasized. The decision to choice epidermal characters to carryout studies in plants was informed by earlier declaration that these characters represented genetic variations and have been used to solve taxonomic problems in certain plant groups by Taxonomists^[7, 8, 9, 10, 11, 12, 13]. The leaf epidermal features observed in all the fourteen species of Cucurbitaceae were enough taxonomic characters which could be implored to support hitherto external morphological characters used to classify plants in this family. In addition, based on epidermal features, some members of the family Cucurbitaceae can readily be distinguished from one another.

Leaf epidermis and the leaf cross-sectional anatomy provide extensive taxonomic data and the literature on this subject is now vast. A number of research workers have recognized and reported unmistakably taxonomic importance of epidermal characteristics such as the shape

and size of the epidermal cells. These variations in the epidermis on the other hand, have been attributed to the functional multiplicity of the dermal tissue. The variation in the epidermal anatomy has also been studied in family Boraginaceae.

2. Materials and Method

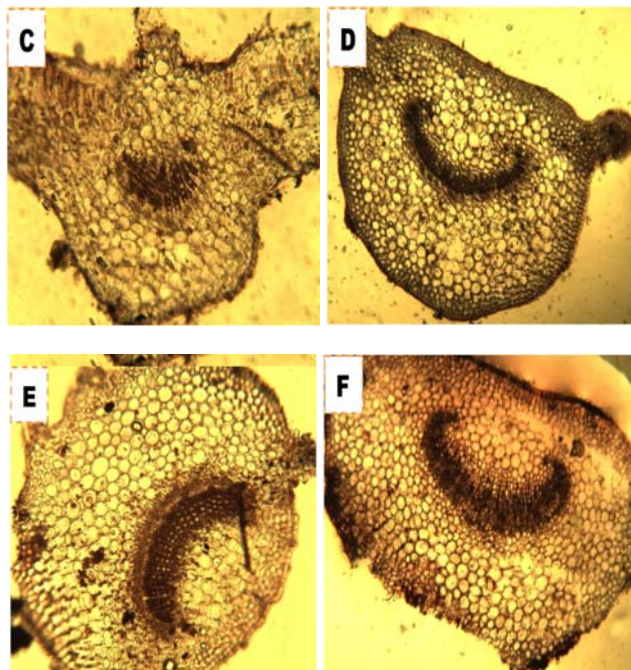
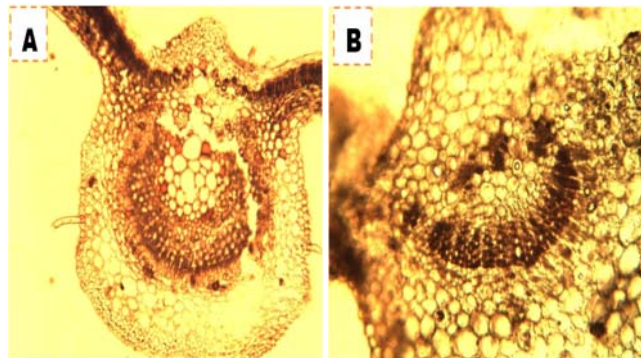
Anatomy follows the methods of [14, 15, 1, 16] with some modification. The leaf petiole and midrib sample was freely sectioned using a razor blade and the thin slices obtained were kept in water before transferring onto a glass slide where a few drops of 99% ethyl alcohol was added for tissue hardening and then 2 drops of Safranin solutions. Excess stain was washed off with water before a drop of glycerine was added. Slides were covered with cover slips and then ringed with nail lacquer to prevent dehydration. Slides were observed with an Olympus microscope and photographs were taken with a digitized camera (Nikon).

3. Result and Discussion

The foliar epidermis is a significant taxonomic character from the biosystematic point of view and the taxonomic studies of a number of families of leaf epidermis [17, 18]. Also, the rigorous and critical anatomical study of fewer morphological characters in the context of molecular phylogenies is fruitful to integrate the strength of morphological data with those of sequence data [19].

In the figure above, the leaves and petiole was dorsiventral. The epidermis was conspicuous but one cell thick. The epidermal cells in the leaves were not of uniform size in both surfaces. The chlorenchyma was present as a very narrow portion of the leaves and petiole tissue while the palisade layer was one to three cells thick. These features however, could not proffer any taxonomic relevance to the delimitation of any of the species in this genus. Hence, studies by [20] delimited *Althaea* and *Alcea*, the two closely related genera in the family Malvaceae using anatomical sizes of the epidermal cells. But in this study however, the cell size of the epidermal cells is of little or no taxonomic significance and may not be too helpful in delimiting the three species of *Stachytarpheta* species.

Now-a-days virtually every anatomical aspect of plants has been studied by Taxonomists and the quality of information accumulated is enormous. Particularly valuable taxonomic evidence has been obtained from the study of pollen, wood, leaf, epidermis, cuticle, trichomes and stomata. Some of these anatomical features are so diagnostic that they are now commonly used in routine identification, rather than being confined to a use in problems of phylogeny or classification or in the identification of fragments of plants.



A. T/S of leaf of *S. jamaicensis* $\times 100$
 B. T/S of leaf of *S. cayannensis* $\times 100$
 C. T/S of leaf of *S. angustifolia* $\times 100$
 D. T/S of petiole of *S. cayannensis* $\times 40$
 E. T/S of petiole of *S. jamaicensis* $\times 40$
 F. T/S of petiole of *S. angustifolia* $\times 40$

Fig 1: Photomicrograph of Leaf and Petiole of *Stachytarpheta* Species

4. Conclusion

Plant anatomy has been found to be very essential in plant taxonomy. Hence, the purpose is to develop a system of classifying plants in a way that all the differences and similarities are set out in ordered manner at a glance. Therefore, leaf epidermis and the leaf cross-sectional anatomy provide extensive taxonomic data and the literature on this subject is now vast. Thus, from the affinity of the petiole and leaf anatomical characters observed between the three species of *Stachytarpheta*, there is obvious evidence that correlates and supports the relationship existing between these species.

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