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A study of the vasculatures of the mid-vein of some Nigerian Cucurbits

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ABSTRACT: A study of the vasculatures of the mid-vein of some members of Nigerian Cucurbitaceae was undertaken. Ten species representing eight genera were studied and there is a considerable variation in the number and pattern of arrangement of the vascular bundles recorded in all the genera.

The transactions of the mid-vein of the Cucurbit leaves are provided with three to seven bicollateral vascular bundles. The vasculature recorded in Cucurbits differs from what obtained in other group of plants with digitate/palmate leaves where the mid-veins are usually provided with a single vascular bundle of different sizes and shapes.

The taxonomic significance of the nature of the vasculature and the distribution of the vascular tissues in the mid-vein of the Cucurbits is discussed.

Key words: Plant taxonomy; Vasculature; Mid-vein; Cucurbitaceae; Bicollateral.

Introduction

The Cucurbitaceae consists up to 130 genera and 900 species (Jeffery, 1980). In West Africa, the family is represented by 24 genera and 60 species (Gill, 1988), out of which 20 genera and 48 species have been reported in Nigeria (Hutchinson and Dalziel, 1954).

The family is most abundantly represented within the tropics, especially in tropical Africa and neotropics. It is characterised by prostrate or scandent habit, tendril bearing herbaceous stems and unisexual flowers with inferior ovary. The leaves are usually dorsiventral, more rarely isobilateral, alternate exstipulate and often digitately lobed. The occurrence of bicollateral vascular bundles in the stem and leaves is often a diagnostic character (Metcalfe and Chalk, 1950).

Cucurbitaceae is an important family in Nigeria. members of the family of considerable economic importance as vessels/receptacles, forage crops ornamentals and food items. The dried fibrous material of the fruit of *Luffa cylindrical* (smooth loofah) after the removal of the rind is of immense value as sponge and dishcloth in cleaning kitchen utensils. Various species of the family are also known to be in common use in African traditional medicine for treatment of various ailments.

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A review of literature reveals that the anatomy of the family Cucurbitaceae has not been extensively studied. Metcalfe and Chalk (1950) in the general study of the family, gave a scanty description of the anatomy of the Cucurbits.

This study was designed to examine the nature of vasculature in the Cucurbitaceous leaves and assess their taxonomic potential. A comparison of the vasculature of the Cucurbits with some digitate/palmate leaves was also carried out to ascertain whether the vasculature of the Cucurbit leaves conforms with what obtains in other groups of plants having digitate/palmate leaves.

Materials and Methods

The fresh leaf materials used for this study were collected in the field. The leaf materials were preserved in formol-acetic acid-alcohol (F.A.A.). The representative specimens of the Cucurbits studied include:

Luffa aegyptiaca

Trichosanthes anguina L.

Citrullus lunatus (Thum) Mans

Telfalria occidentalis Hook

Cucumeropsis mannii Naud.

Lagenaria breviflora (Benth.). G. Roberty

Lagenaria siceraria Molina

Cucurbita pepo L.

Momordica charantia L.

Momordica foetida L.

The simple palmate/digitate leaf specimens studied along with the Cucurbit leaves are those of *Manihot esculentus* Linn. (Euphorbiaceae) and *Carica papaya* Linn (Caricaceae).

For a report of the internal organisations, the transverse sections of the Lamina were made from the portion taken from the middle area of the leaf. The sections were stained with phloroglucinol and HCl and counter stained with Akian blue and examined. The drawings of some of the preparations were made using a wild M20 microscope with camera Lucida attachment.

Results and Discussion

Transverse Section of Lamina

Outline: The leaves are dorsiventral.

Epidermis: The epidermal cells are rectangular and some slightly idodiametric.

Mesophyll: The mesophyll is clearly differentiated into palisade and spongy parenchyma. The palisade mesophyll is a layer with dense population of chloroplasts in the cells. The spongy tissues are not very loose but with small intercellular air spaces.

Transections of the Mid-Vein

In the transactions of the mid-vein, there are few layers of collenchymatous tissue at the periphery of the epidermis and more deposited at the angles. The ground cortex of the mid-vein is made of parenchymatous cells which are polygonal in shape. The vascular tissues are bicollateral and there is a considerable variation in the number and pattern of arrangement of the vascular tissues.

In the leaf of *Luffa aegyptiaca* and *Cucumeropsis mannii*, four vascular tissues were recorded in their mid-vein. The vascular tissues are arranged in form of a cross. In *Citrullus lunatus* (Fig. 1a) and *Cucurbita pepo*, a ring of vascular tissues are recorded with each provided with seven and five vascular tissues respectively. Three vascular tissues were recorded in species of *Momordica charantia* (Fig. 1c), *Momordica foetida, Lagenaria breviflora* and *Lagenaria siceraria*. The vascular tissues are arranged in these species with a large bundle in the middle with two smaller ones around it. *Telfairia occidentalis* (Fig. 2b) and *Trichosanthes anguina* are each provided with five vascular bundles. Metcalfe and Chalk (1950) reported an occurrence of varying number of vascular bundle and pattern of arrangement in *Lagenaria, Luffa, Momordica, Trichosanthes, Citrullus* and *Cucurbita*. results of this study did not only corroborate that but also present these features in other members of Cucurbitacea family not reported by Metcalfe and Chalk (1950).

The 10 species representing 8 genera of the family Cucurbitaceae examined in the study can be arranged in four (4) groups on the basis of the distribution of the vascular bundles in the mid-veins.

Table 1: The distribution of the vascular bundles in the groups.

Group 1 (with 3 Vascular bundles)	Group 2 (with 4 vascular bundles)	Group 3 (with 6 Vascular bundles)	Group 4 (with 7 Vascular bundles).
Momordica charantia	*Luffa aegyptiaca*	*Trichosanthes anguina*	*Citrullus lunatus*
Momordica foetida	*Cucumeropsis mannii*	*Cucurbita pepo*	
Lagenaria siceraria		*Telfairia occidentalis*	
Lagenaria breviflora			

Results of this study show that there is constancy in the number and structure of the vascular bundles of all the examined species affinity among members of each group and could be of immense phylogenetic significance, since the variation in the number of vascular bundles may be used in arranging the genera within the family in a phylogenetic sequence assuming for this purpose that reduction in the number of vascular bundles is an advanced character.

It is also noteworthy that the evidence obtained in this study supports the Jeffrey's (1964) re-classification of 3 species of *lagenaria* formerly recognised as belonging to the genus *Adenopus*. The number of vascular tissues (3) recorded in the mid-vein of the leaves of *Adenopus breviflorus* (now recognised as *Lagenaria breviflora*) corresponds with what was recorded for *lagenaria siceraria* (formerly the only species for *Lagenaria*).

The vasculature recorded in the mid-cein of the Cucurbit leaves showed a unique feature which could be of immense diagnostic taxonomic value especially when compared with what is observable in some other simple digitate/palmate leaves. Leaves of most dicotyledons have one main vascular bundle in the mid-rib and a network of progressively smaller veins, forming a reticulate venation system as observed in *Manihot esculentus* (Fig. 1b) where a crescent – like vascular bundle was recorded. In the Cucurbits leaf however, the mid-vein is provided with more than one vascular bundle ranging between three and seven and different to what obtains in most dicots.

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References

Author, J.E. and Mac Daniels, L.H. (1972). An introduction to plant. Anatomy, 2nd edition. Tata Mc Graw-Hill Publishing.

Cutler, E.G. (1971). Plant Anatomy: Experiment and Interpretation, Part 2. Organs. Williams Clowes and Sons Ltd., London, p. 166 – 174.

Esau, K. (1977). Anatomy of seed plants. 2nd edition. Wiley,. New York.

Gill, L.S. (1988). Taxonomy of flowering plants. African. FEB Publishers Limited, p. 166 – 181.

Hutchinson and Dalziel (1963). Flora of West Tropical Africa, vol. 2. crown Agents for Overseas Governments and Administrations. Millband, London, SW 1, p. 204 – 216.

Jeffrey, C. (1964). key to the cucurbitaceae of West Tropical Africa, with a guide to localities of rare and little known species. West African Journal of Science Association 9: 79 – 97.

Jeffrey, C. (1980). A review of the Cucurbitacea. Botanical Journal of the Linneans Society, 81: 233 – 247.

Jeffrey, C. (1982). An introduction of plant taxonomy, 2nd edition. University Press, Cambridge, 154pp.

Metcalfe, C.R. and Chalk, L. (1950). Anatomy of the Dicots, vol. 1, Clarendon Press, p. 684 – 690.

Okoli, B.E. and Onofeghara, F.A. (1984). Distribution and morphology of extra flora nectarines in some Cucurbitaceae. Botanical Journal of the Linnean Society, vol. 89; 2: 153 – 164.

Olorode, O. (1984). taxonomy of flowering plants. Longman Group Ltd., 158pp.