

Leaf Epidermal Features of *Canarium schwenfurthii* and *Dacryodes edulis* (Burseraceae).

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ABSTRACT: The leaf epidermal features of *Canarium schwenfurthii* and *Dacryodes edulis* investigated shared distinct features that can be used for taxonomic decision. The epidermal cell type of the upper leaf epidermis of *Canarium schwenfurthii* is tubular while that of *Dacryodes edulis* is multicellular. The number of epidermal cell type in the upper leaf epidermis of *Canarium schwenfurthii* ranged from 121-144 while that of *Dacryodes edulis* ranged from 266-280. The study showed that there is absence of trichomes, subsidiary cells, and stomata in the upper leaf epidermis of the two taxa investigated. The leaf epidermal features showed that the lower leaf epidermis of both taxa is characterized by anomocytic type of stomata. Trichomes are present in the lower epidermis of *Dacryodes edulis* and absent in the lower leaf epidermis of *Canarium schwenfurthii*. Subsidiary cells are present in the lower leaf epidermis of both taxa. The epidermal cell type is tubular in the lower leaf epidermis of *Canarium schwenfurthii* and multicellular in the lower leaf epidermis of *Dacryodes edulis*. These distinctions in the leaf epidermis of the two taxa showed that leaf possess useful epidermal features that could play a vital role in classifying, characterizing, grouping and delimitation of taxa and hence act as a useful tool in systematic botany.

KEY WORDS: Leaf, Epidermal features, *Canarium schwenfurthii*, *Dacryodes edulis*, *Burseraceae*.

INTRODUCTION

Burseraceae is a family of dicotyledonous plants in the order *Sapindales*. Members of the family are characterized by an ovary of two to five cells, prominent as in ducts in the bark, wood and intrastaminal disk. *Canarium schwenfurthii* belongs to the family *Burseraceae* and genera *Canarium*. It can be called African *Canarium*, bush candle or African olive because of its black oily fruit (Chudnoff, 1984). The hard pericarp gives it a high archaeological visibility which had been discovered from a number of forest sites in West Central Africa. The trees reaches a height of 45-72 meters with a straight cylindrical bole up to 90 feet, trunk diameters 4 to 5 feet over a slight buttress. The heartwood is light pinkish brown or light pinkish yellow; sapwood is whitish or straw coloured, wide and not clearly differentiated.

The heartwood of *Canarium schwenfurthii* is not resistant to decay and is vulnerable to termite attack. Sapwood is liable to attack by powder post beetles. The fruit can be eaten raw or boiled and its other uses include plywood, decorative veneers, parquetry, joinery, furniture components and food.

Dacryodes edulis is a fruit tree, native to Africa. It is an evergreen tree attaining a height of 18-40m in the forest but not exceeding 12m in plantations. It has relatively short trunk and a deep-sense crown. Its name was derived from the greek word "darkroun" meaning tear and "edulis" meaning edible. The bark is pale grey and rough with droplets of resin. The leaves are compound with 5-8 pairs of leaflets. The upper surface of the leaf is glossy. The flowers are yellow and about 5mm across. The flesh of the fruit is dark blue or violet. The tree flowers typically between January and April and bears fruit between May and October (Kapseu and Tchiegang, 1996).

The preferential habit of *Dacryodes edulis* is a shady, humid tropical forest. However, it adapts well to variations in soil type, humidity, temperature, and day length. Oil from the fruit of *Dacryodes edulis* according to Kapseu and Tchiegang (1996) is a rich source of amino acids and triglycerides. Fruits significantly differed in mass,

length, thickness of pulp and mass of kernel but contained similar amounts of oil.

The main use of *Dacryodes edulis* is its fruit, which can be eaten raw, cooked, boiled or roasted. Cooked flesh of the fruit has a texture similar to butter. The wood of *Dacryodes* is elastic grayish white to pinkish. The wood has general use for tool handles and occasionally for mortars and is suitable for carpentry. The resin is sometimes burnt for lighting or used as glue. The tree is used as an ornament. The plant is known to improve soil quality and contributes greatly in traditional medicines (Kapseu and Tchiegang, 1996). According to the authors knowledge, there is clearly absence of leaf epidermal characters especially in *Canarium schwenfurthii* and *Dacryodes edulis* necessary for delimitation of the two taxa hence the justification for this study.

The objective of this research work is to comparatively study the leaf epidermal features of the two taxa so as to use the outcome to establish interspecific relationships and differences between the two taxa and to re-evaluate the reliability of these characters as aid in biosystematics studies.

MATERIALS AND METHODS

These studies were made on matured living leaf materials of *Canarium schwenfurthii* and *Dacryodes edulis* collected from different L.G.A. of Imo, Ebonyi and Anambra States of Nigeria. The leaves were washed in tap water. The study was carried out in the Plant Science and Biotechnology Laboratory of Imo State University Owerri in December, 2008.

Epidermal Studies

The leaves were immersed in a bowl of water to facilitate peeling. Peeling was done by a sharp razor blade from the upper and lower surfaces of the leaves. The epidermal peels were mounted on slides and observed under a Leitz Wetzler Orthogolus microscope fitted with vivitar-v-335 camera.

RESULTS

Table 1: Upper Leaf Epidermis of *Canarium schwenfurthii* and *Dacryodes edulis*

Characters	<i>Canarium schwenfurthii</i>	<i>Dacryodes edulis</i>
Stomatal type	None	None
No. of Stomata	None	None
Subsidiary cells	None	None
Epidermal cell type	Unicellular	Multicellular
No. of Epidermal cells	122-144	266-280
Trichomes	None	None

Table 2: Lower Leaf Epidermis of *Canarium schwenfurthii* and *Dacryodes edulis*

Characters	<i>Canarium schwenfurthii</i>	<i>Dacryodes edulis</i>
Stomatal type	Anomocytic	Anomocytic
No. of Stomata	60	65
Subsidiary cells	Present	Present
Epidermal cell type	Unicellular	Multicellular
No. of Epidermal cells	275-300	480-500
Trichomes	Absent	Present

The leaf epidermal features of the upper epidermal surfaces of the two taxa are highly different from those in the lower epidermal surfaces. (Tables 1 & 2).

In the upper leaf epidermal surfaces (Table 1), both taxa showed total absence of stomata, subsidiary cells and trichomes. The number of epidermal cells ranged between 121-144 in the upper leaf epidermis of *Canarium schwenfurthii* and 266-280 in the upper leaf epidermis of *Dacryodes edulis*. The epidermal cell type is unicellular in *Canarium schwenfurthii* and multicellular in *Dacryodes edulis*.

In the lower epidermal surface (Table 2), both taxa are characterized by anomocytic type of stomata while trichomes are absent in the lower leaf epidermis of *Canarium schwenfurthii* and present in the lower leaf epidermis of *Dacryodes edulis*. Subsidiary cells are present in both taxa while the epidermal cell type of the lower leaf epidermis of *Canarium schwenfurthii* is unicellular but multicellular in *Dacryodes edulis*. The number of stomata is 60 in the lower leaf epidermis of *Canarium schwenfurthii* and 65 in that of *Dacryodes edulis* while the number of epidermal cells ranged between 275-300 in *Canarium schwenfurthii* and 480-500 in *Dacryodes edulis*. (Fig 1 a & b and Fig 2 a & b).

DISCUSSION

The results of the epidermal studies of the leaves showed some characteristics that could be used for taxonomic decision. In the two taxa studied, there is presence of stomata only at the lower epidermal surface of both taxa which means that both taxa are hypostomatic that is possessing stomata only at the lower epidermal surfaces. This is attributed as ecological adaptation to avoid loss of excess water through the stomata at the upper leaf surfaces. (Mbagwu, 2004; Mbagwu *et al*, 2007, Nwachukwu and Mbagwu, 2007).

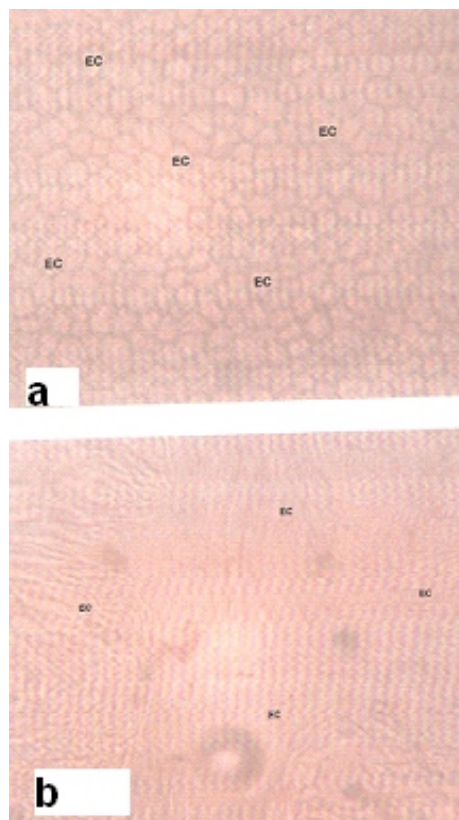


Fig 1: (a & b)
A= Upper leaf epidermis of *Dacryodes edulis*
B= Upper leaf epidermis of *Canarium schwenfurthii*

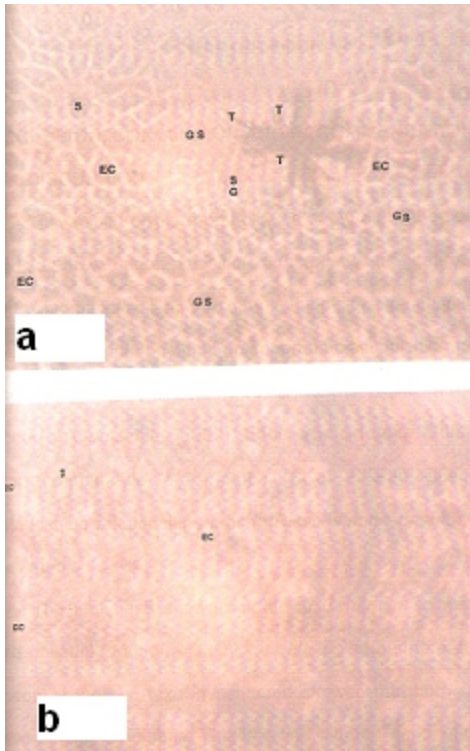


Fig 2: (a & b)

A= Lower leaf epidermis of *Dacryodes edulis*.

B= Lower leaf epidermis of *Canarium schwenfurtherii*

Both taxa are also characterized by anomocytic type of stomata, which is a distinguishing character that could be used in distinguishing *Canarium schwenfurtherii* and *Dacryodes edulis* from other species in the family *Burseraceae*. According to Stace (1965), stomatal size may vary in the same organ but this may not prevent it from being used as an important taxonomic character in delimiting different species of a genus. The type of epidermal cells found in the two taxa which include unicellular in *Canarium schwenfurtherii* and multicellular in *Dacryodes edulis* and also anomocytic stomata found at the lower epidermal surfaces of both taxa are great taxonomic tools in biosystematics.

In both taxa, stomata are present only to the lower epidermis. This is in agreement with Metcalf and Chalk (1950) and 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 some dicotyledonous plants and Mbagwu and Edeoga (2006) also noticed the same in *Vigna* species. The observations made in the leaf epidermal features of the two investigated taxa are important especially as they help to establish interspecific relationships among the two investigated taxa. For example the differences in the leaf epidermal features showed strong interspecific relationships and thus suggest reasons for the

two taxa to belong to different genera.

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