

## FOLIAR EPIDERMIS, STOMATOGENESIS AND TAXONOMY IN *COUROUPITA GUIANENSIS* AUBULET. (LECYTHIDACEAE)

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The present study deals with foliar epidermis, stomatogenesis and taxonomy in *Couroupita guianensis* Aubulet. The non-costal cells are slightly sinuous and deeply sinuous with thin walls in the abaxial and adaxial surfaces, respectively. Leaves are hypostomatic with three stomatal types viz. tetra-, anomo- and actinocytic. Of these tetracytic ones are dominant, anomo- and actinocytic types of stomata are of earlier origin and are of perigenous (aperigenous) in origin. Tetracytic type is of later origin and derived from meristemoids with one cutting face (unilabrate). In transection the guard cells are vertically placed to the entire length of subsidiary cells. The cuticle is thin, lamellar with small outer ledges over stomata. Unicellular non-glandular conical hairs are frequently seen in young leaves. The above distinctive nature of foliar epidermal features and stomatogenesis substantiate the erection Lecythidaceae as a separate family.

**Keywords:** *Couroupita guianensis*; Foliar epidermis; Lecythidaceae; Stomatogenesis; Taxonomy.

### Introduction

*Couroupita guianensis* Aubulet. (Cannon-ball tree) is a large-sized tree belonging to the family Lecythidaceae<sup>1</sup>. It is well known for their large, cauline showy flowers borne on trunks. Matcalfe and Chalk<sup>2</sup> reported the leaf structure of other members of this family. However, no study was made on the leaf epidermis of this species. Therefore, the present study was taken up.

### Material and Methods

Leaves of different ages were collected from the trees growing in Pondicherry Botanical garden and fixed in FAA. Epidermal peels were obtained from fresh as well as fixed materials mechanically. In addition young and mature leaves were cleared in 10% NaOH and saturated chloral hydrate solutions successively. Peels and cleared leaf bits were stained in aqueous safranin (1%) and mounted in 50% glycerine and sealed with DPX.

### Observations

Upper surface (Fig.1.A-E): The costal cells of both surfaces are axially elongated, rectangular to rhomboidal with straight or slightly undulated thin walls bearing unicellular non-glandular conical hairs infrequently. The cells in the large veins exhibit prismatic calcium oxalate crystals. The non-costal cells of abaxial side are slightly sinuous and those on the adaxial epidermis are deeply sinuous with thin walls and are of various shapes.

Unicellular, non-glandular conical, (rarely

uniseriate, 2-3 celled) hairs are frequently seen in young leaves. Stomata are confined to abaxial epidermis only. (Fig.1.B) They are elliptical, medium sized, irregularly distributed, multidirectional and occurring in large stomatiferous regions. Of the three types of stomata tetracytic ones are more frequent; anomocytic types less frequent and actinocytic type rare (Table 1).

Table 1. Stomatal features of *Couroupita guianensis*.

Leaf	-	Hypostomatic
Stomatal Frequency	-	142 ± 11/mm <sup>2</sup>
Tetracytic	-	64%
Anomocytic	-	36%
Actinocytic	-	rare
Stomatal size (L x B)	-	22 x 14µm ± 0.35 ± 0.28
Meristemoid	-	Unilabrate
Ontogeny	-	Mesoperigenous

In transection (Fig.1.I) abaxial epidermis is 1-layered with small, iso-to anisodiametric, squarish and rectangular cells. The guard cells are oval vertically embedded in the subsidiary cells. Cuticle is thin, lamellar forming inconspicuous outer ledges over guard cells. Adaxial epidermis is 1-layered, cells are large, mostly barrel shaped and deeper than abaxial surface. The cuticle

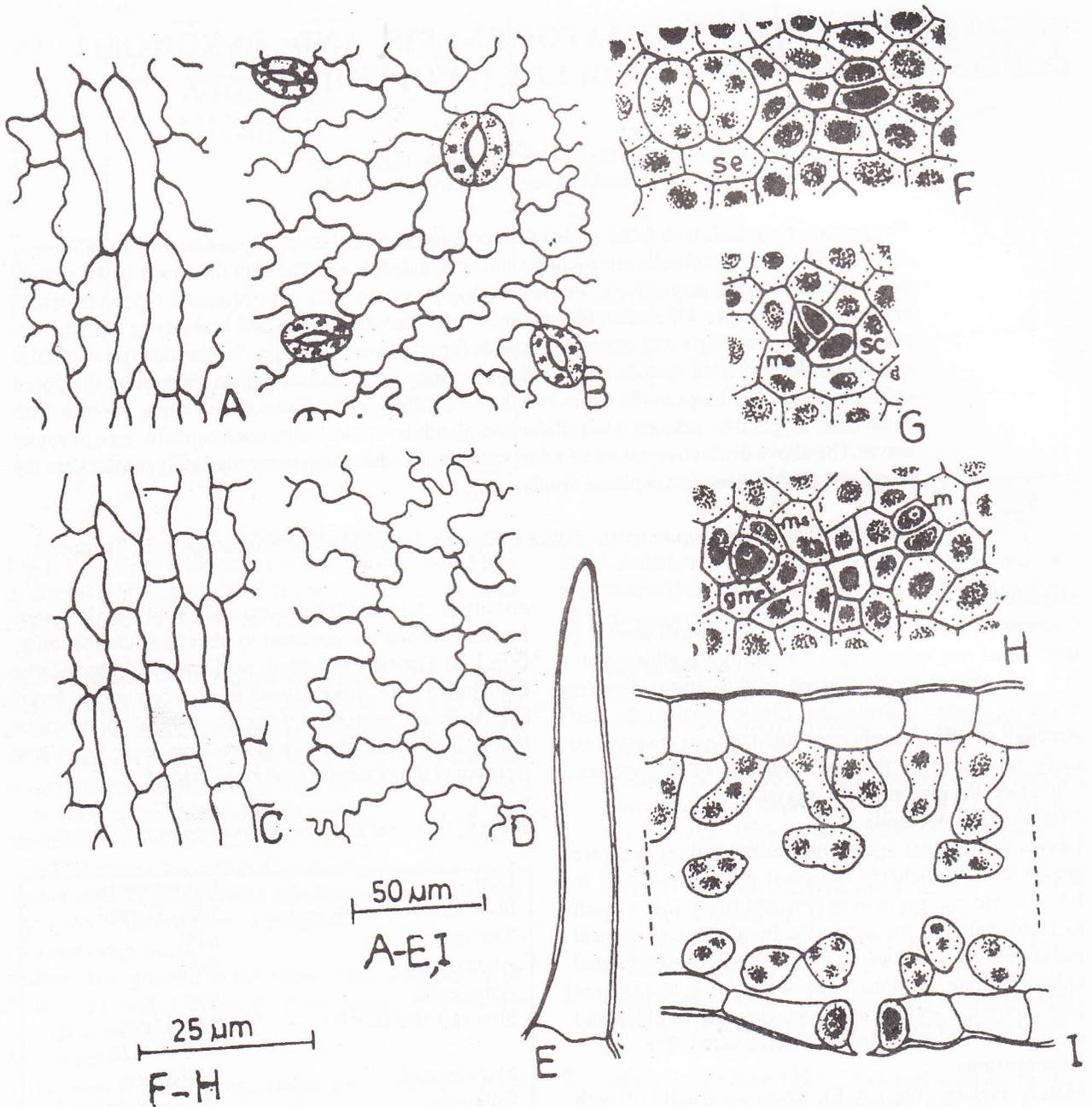


Fig.1.

*Stomatogenesis* (Fig.1.F-H) - Stomata originate in two stages. In the young leaves anomo- and actinocytic stomata are of earlier origin, differentiate directly from the meristamoids concomitant with differentiation of non-glandular hairs. Protodermal cells (more than 5) around the guard cells enlarge and form anomo-perigenous and rarely actino-perigenous stomata due to radial enlargement of protodermal cells (Fig.1F). The stomata of later origin are derived from meristamoids which are cut off by the

protodermal cells; (Fig.1.F,H). The meristamoid is small unilabrate (one cutting face) and puts a daughter wall beyond the common wall of abutting cells to produce one mesogenous subsidiary cell and guard cell mother cell (gmc); (Fig.1.G). Hence, the gmc divides parallel to the previous division, to give rise to two guard cells. In addition to the single mesogenous subsidiary cell three protodermal subsidiaries (perigenous) encircle the guard cells resulting in tetra-mesoperigenous stomata.

and lamellar.

#### Discussion

Bentham and Hooker<sup>3</sup> treated the family Lecythydaceae as a tribe Lecythydeae under the family Myrtaceae. Accordingly the tribe Lecythydeae consists of three subtribes viz., Barringtonieae, Eulecythydeae and Napoleoneae. Later, these sub tribes were elevated to the level of families and named them as Barringtoniaceae, Lecythydaceae and Napoleonaceae, respectively<sup>4-6</sup>.

The foliar epidermis and stomatogenesis are reported for the first time in this family. The costal cells are distinct over mid-rib as well as lateral veins. The non-costal cells are slightly sinuous in the abaxial and deeply sinuous in the adaxial surfaces respectively. The leaves are hypostomatic with predominant tetracytic stomata. Actinocytic stomata with a circle of radiating cells are encountered in this taxon rarely<sup>2</sup>. The stomata develop in two distinct stages separated by time viz., stomata of earlier origin and stomata of later origin<sup>7</sup>. The stomata of earlier origin are anomocytic (rarely actinocytic) derived from alabrate meristamoids during the very early stage of leaf development as in the case of other members of Myrtales<sup>8</sup>. Stomata of later origin are meso-perigenous. (unilabrate) with one mesogenous subsidiary cell on one side and three perigenous subsidiaries (neighbouring cells) on the remaining sides<sup>9,10</sup>. Besides vegetative and floral characters, the features of epidermis and stomatogenesis in this taxon are distinct from its closely related genera such as *Barringtonia*, *Careya* (Barringtoniaceae). Epidermal morphology and stomatal ontogenetic studies in the later two genera brought out hypoamphistomatic condition, non-costal cells with slightly arched walls and aniso- and tetra meso perigenous stomata from dolabrate meristamoids. In transection the guard cells vertically placed either at the level of lower periclinal wall of subsidiary cells (*Barringtonia*) or vertically placed and centrally embedded in the the subsidiary cells (*Careya*)

and cuticle thick and minutely serrate with prominent outer and inner cuticular ledges over guard cells, in *Barringtonia* and *Careya*<sup>8</sup>. Hence, hypostomatic leaves, deeply sinuous, thin epidermal walls, unilabrate tetramesoperigenous stomata, guard cells vertically placed to the entire length of subsidiary cells, and cuticle thin lamellar with minute outer ledges only over guard cells, substantiate erection of Lecythydaceae and Barringtoniaceae as distinct families.

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