

FOLIAR EPIDERMAL FEATURES AND STOMATOGENESIS IN *ENTADA SCANDENS* BENTH. (MIMOSACEAE)

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The present study brings out the epidermal morphology and stomatal ontogeny in *Entada scandens* Benth. (Mimosaceae). The costal cells are differentiated on both surfaces over mid-rib and lateral veins. The non-costal cells with thin walls are sinuous and slightly sinuous to arched on the abaxial and adaxial surfaces respectively. Only unicellular, non-glandular conical hairs are found confined to mid-rib and margins of leaf-lets. Leaf-lets are hypostomatic. Of the four types of stomata viz. para-, aniso-, tetra-, and anomocytic, the tetracytic ones are predominant. The stomatal development is mesogenous or meso-perigenous type from dolabrate meristemoids.

Keywords : *Entada*; Epidermal features; Stomatogenesis.

Introduction

Epidermal morphology of the family Mimosaceae have been studied by different workers¹⁻⁵. However, the epidermal features of this species *Entada scandens* Benth. has not been studied so far. Moreover, stomatal development is altogether lacking not only in the present taxon but also in the entire family Mimosaceae. Therefore, the present study has been taken up to bring out the epidermal features and stomatal development in this species.

Material and Methods

Leaves of different ages of *Entada scandens* Benth. were collected from TBGRI, Palode, Thiruvananthapuram, Kerala 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%). They were mounted in 50% glycerine and sealed with DPX.

Observation

Mature surface : The costal cells over mid-rib and lateral veins are axially elongated narrow, longer than broad, rectangular to fusiform on both surfaces; walls thin and straight (Figs. 1 A, D). The non-costal cells in the abaxial region are irregular, longer than broad, truncate, rhomboidal. Walls thin, sinuous, mostly 'U' shaped or 'V' shaped (rare). The non-costal cells of adaxial region are rectangular, trapezoidal, slightly elongated, often possess oil globules. Walls thin and slightly sinuous to arched (Figs. 1B,E). Unicellular, non glandular conical hairs are confined only to the mid-ribs and margins of the leaf-lets (Fig. 1C). The stomata are oval or ellipsoidal, irregularly oriented in all directions. Of the four types of stomata viz. para-, aniso-, tetra-, and anomocytic observed, the tetracytic ones appear to be predominant (Table I). Stomata

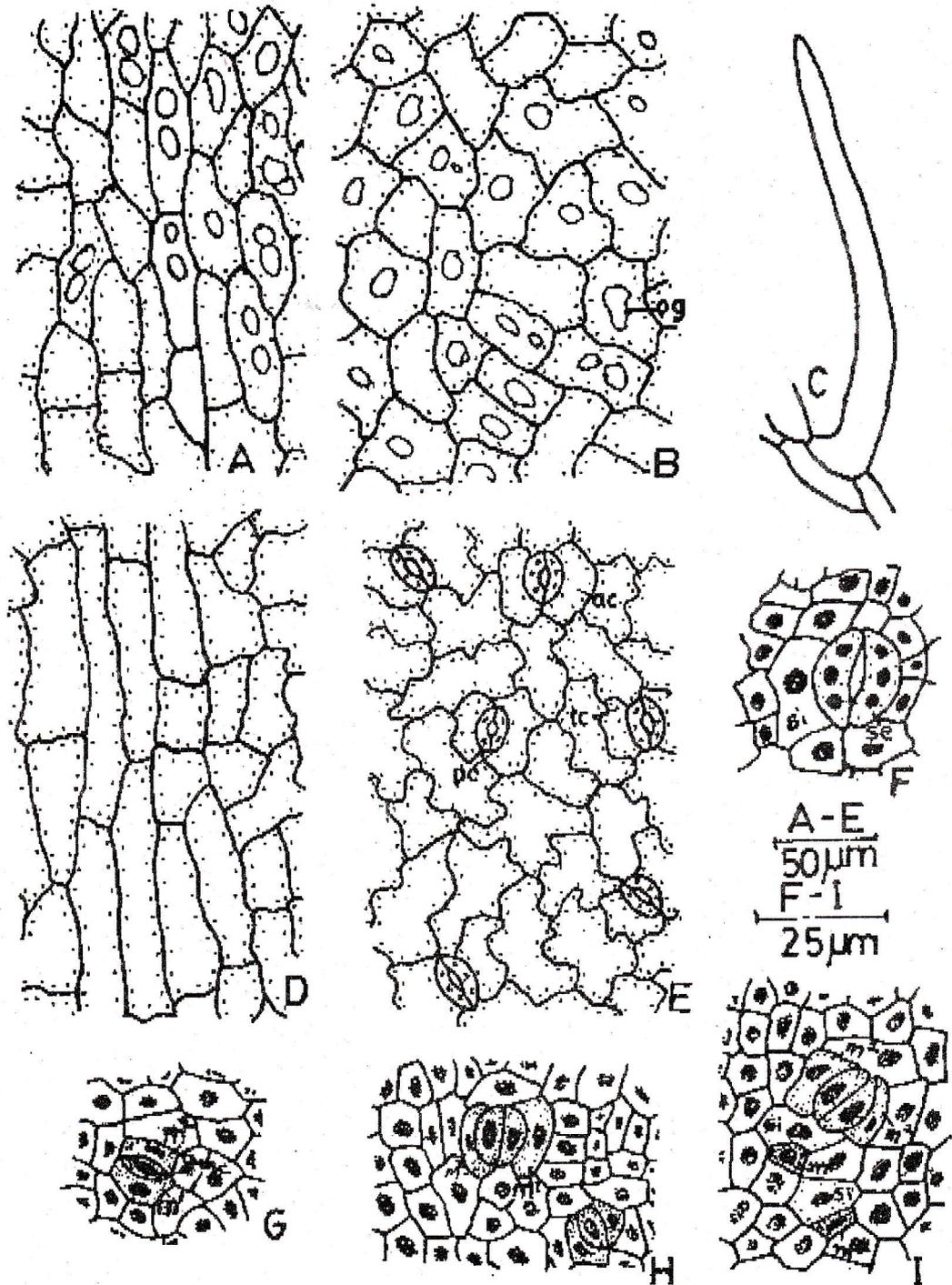
are absent in the adaxial surface (Fig. 1B).

Table 1. Stomatal features of *Entada scandens*.

Leaf-lets	-	Hypostomatic
Tetracytic	-	50%
Anisocytic	-	34%
Paracytic	-	12%
Anomocytic	-	4%
Stomata (l X b)	-	19.6 16.2 μm
stomatal index	-	12
Meristemoid	-	Dolabrate

Stomatogenesis : Stomata develop in two stages. A few large mature stomata of earlier origin (Fig. 1F) are observed among the differentiating stomata of later origin in the young epidermis. They are surrounded by 5-7 neighbouring cells and are of anomocytic type. Most of the stomata develop at later stage. Irrespective of earlier or later origin, a protodermal cell divides unequally to form a small dense meristemoid with a large nucleus and a large vacuolated sister cells. In the case of stomata of earlier origin meristemoid enlarges and divides equally to produce two guard cells. Hence, they are of anomoperigenous type (aperigenous). In the case of stomata of later origin the meristemoid cuts off two subsidiaries and a guard cell mother cell (gmc) by two unequal divisions (Figs. 1G, I). Three adult stomatal types viz. para-, aniso-, and tetracytic types result depending upon the intersection of the second wall of mesogenous subsidiary cell with the first one.

- i) Para-mesogenous type develops when the second wall intersects the first one at both the poles (Fig. 1 G).
- ii) Aniso-mesoperigenous type is derived when the second wall intersects the first one at only one pole (Fig. 1H).
- iii) Tetra-mesoperigenous stoma is formed when the second wall lies parallel in the first one without intersecting



Figs. 1. A-I Foliar epidermal features and stomatal development in *Entada scandens* Benth. A-E mature leaf surface; A, B- adaxial surface; A- costal region, B- non-costal, C- unicellular conical hair; D, E- abaxial surface, D- costal region, E- non-costal region; F-I stages of stomatal development; F- stoma of earlier origin, G- paramesogenous type, H- aniso- and tetramesoperigenous types, I- meristamoid and tetramesoperigenous stomatal type.

(ac-anisocytic stoma, gmc - guard cell mother cell, m-meristamoid, m¹-first mesogenous subsidiary cell, m²- second mesogenous subsidiary cell, og - oil globule, pc-paracytic stoma, se- stoma of earlier origin, si-sister cell, tc- tetracytic stoma).

the former (Figs. 1H, I).

Discussion

Entada, which includes 30 species are chiefly distributed in the tropical America and Africa. Of these *Entada scandens* Benth. is the only species in this genus represented in India^{6,7}. It is an immense climber, with slender terete woody branches; leaves long petioled, the rachis usually ending in a tendril. Leelavathi *et al.*³, reported various types of costal cell arrangements, orientation and distribution in the leaves of Leguminosae (both the adaxial and abaxial surfaces). It is evident from their study that the costal cells are not differentiated in most of the species of Mimosoideae in adaxial surface. It is interesting to note that the present study on *Entada scandens* shows differentiated costal cells on both surfaces, a feature was observed in one species of Mimosoideae out of 21 species studied by them. The walls of non-costal cell are sinuous in abaxial side and slightly sinuous to arched in the adaxial side. Though unicellular and multicellular hairs have been reported in Mimosoideae^{1,8}, present study could not confirm the occurrence of multicellular hairs in this taxon presently studied.

Solereder⁸ reported hypostomatic condition in most of the species and amphistomatic in some members of Mimosoideae. Ghosh and Roy⁵, of the 10 species studied, recorded amphistomatic condition in all the species except *Samania saman*. In the present study the leaf-lets with hypostomatic condition is reported. Stomata with two subsidiary cells which are placed parallel to the pore (paracytic) is characteristic of Mimosoideae⁸ and this was further confirmed by Ghosh and Roy⁵. However, the present study reports that four types of stomata viz. para-, aniso-, tetra-, and anomocytic types and the tetracytic ones appear to be dominant type (Table 1).

The stomatal development have not been studied so far in any of the taxon of Mimosoideae. The present study confirms the development of stomata in two stages. The stomata of earlier origin, which are a few in number, are developed from alabrate meristemoid and are always aperigenous and the resultant adult stomata are of anomocytic type⁹. The stomata of later origin are the more frequently seen stomata, which are developed from dolabrate meristemoids which undergo two successive

divisions to produce two mesogenous subsidiary cells before becoming differentiated into guard cell mother cells (gmc). Based on the nature of cutting of wall of the second mesogenous subsidiary cell, the stomatal development may be of para-mesogenous, aniso-mesoperigenous or tetra-mesoperigenous which result in the formation of adult stomata of paracytic, anisocytic or tetracytic types respectively¹⁰. The paracytic ones have two mesogenous subsidiary cells lying parallel to the pore covering the guard cells at both poles, the anisocytic one have two mesogenous subsidiary cells and one neighbouring cells of perigenous origin and tetracytic ones have two mesogenous subsidiary cells lying parallel to guard cells exposing the poles to two neighbouring cells one at each pole.

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