

Foliar epidermal studies in some clerodendrum species (Verbenaceae)

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SUMMARY

The five species of *Clerodendrum* have been investigated for epidermal structure. The walls of the epidermal cells are sinuous. The abaxial epidermis shows more sinuous nature in same species. The cuticular striations are noted in *C. inerme* on lower epidermis. The leaves are hypostomatic but in *C. philippinum* is amphistomatic. The stomata are present on both the surfaces. However, the stomatal number is less on the adaxial surface. The stomata are mostly anomocytic. Anisocytic, diacytic and tetracytic types also occur. The diacytic stomata are dominant in *C. serratum*. Both glandular trichomes are sessile and occur in the form of scales. In *C. aculeatum*, variation is seen in the structure of scales.

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Key words : Verbenaceae, *Clerodendrum* sp., Foliar epidermis

The genus *Clerodendrum*, belonging to the tribe Vitaceae of family verbenaceae. Anatomical features play an increasingly important role in the formulation of natural phenetic groups (Davis and Heywood, 1963). Epidermal and stomatal parameters are widely employed as taxonomic evidence (Wilkinson, 1979, Vaikos, 1987, Kannbiran and Ramassamy, 1988, Yashodhara and Shanmukha. Rao, 1994). The structure of leaf including epidermis on different genera of the family have been worked out on structure and ontogeny of stomata on vegetative and floral organs, Shah and Mathew (1982) have been worked on Trichomes in some species of *Clerodendrum*. Rao *et al.* (1988) worked on Trichomes, distributional patterns and their significance in *Clerodendrum*. Rao and Ramayya (1985) have been worked on taxonomic significance of laminar stomatal distribution in *Clerodendrum*. This paper presents a detailed account of epidermis in five species of *Clerodendrum*.

MATERIALS AND METHODS

The plant material of *Clerodendrum aculeatum*, *C. inerme* (L) Gaertn, *C. philippinum* Schuer (L) *C. serratum* (L) Moon, *C. splendens* G. Don. were collected from Botanical garden of Dr. B.A.M.U., Aurangabad and Gatala and preserved in 70% alcohol. The peels for epidermal studies were taken from fresh and preserved material and also from herbarium specimens. The chemical methods were used for the separation of peels. Diluted nitric acid and chromic acid (5-10%) used in different proportions gave best results. The peels were stained in safranin (1%) or aniline blue and mounted in glycerine and made semipermanent by rings with rubber solution. Figures were drawn using camera lucida.

RESULTS AND DISCUSSION

The epidermal characters like size, shape, cell walls, cuticular striations, stomatal type, size and variations in the trichomes were examined in the five species of *Clerodendrum*. The epidermal cells on both the surfaces in the intercostal zones of the leaves generally polygonal, uneven shaped with straight, undulated or wavy walls. They were polygonal or uneven shaped with straight walls on both the surfaces in *C. inerme* (Fig. 3, 4). In *C. aculeatum* the cell walls of adaxial epidermis are straight of abaxial ones are wavy (Fig. 1). They may be wavy or sinuous on both the surfaces in remaining species. The cell walls of abaxial epidermis are more sinuous in *C. philippinum* and *C. splendens* (Fig. 6, 10). The epidermal

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1. *Clerodendrum aculeatum*: 1. adaxial epidermis, 2. abaxial epidermis; 11-12 non- glandular trichome; 19, scale; 29,30 glandular trichomes.
2. *Clerodendrum inerme*: 3 adaxial epidermis, 4 abaxial epidermis; 13,14 non- glandular trichomes; 20 scale; 31, 32 glandular trichomes.
3. *Clerodendrum philippinum*: 5 adaxial epidermis, 6 abaxial epidermis; 15,16,17 non- glandular trichomes; 21, 22,23 scales; 33, 34 glandular trichomes.
4. *Clerodendrum serratum*: 7 adaxial epidermis, 8 abaxial epidermis; 18 non- glandular trichomes; 24 scales; 35 glandular trichomes.
5. *Clerodendrum splendens*: 9 adaxial epidermis, 10 abaxial epidermis; 25,26,27 scales; 36,37 glandular trichomes

cells on the veins are generally elongated

The cuticular on the leaf is smooth or may show a pattern of striations. These are observed on the lower epidermis in *C. inerme* (Fig. 4).

The leaf is mostly hypostomatic in all the species examined but *C. philippinum* (Fig. 5, 6) it is amphistomatic, the stomata are present on both surfaces. They are more on the lower surfaces. The stomata are

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generally circular, oval or elliptical in outline and are anomocytic. In addition anisocytic, tetracytic and diacytic type are also observed. The diacytic type is dominant in *C. serratum* (Fig. 8).

Leaves of all the species of *Clerodendrum* develop trichomes on the adaxial and abaxial surfaces and often on the intercostal zones and rarely on veins. The trichomes are of various types unicellular hairs composed of basal

cell, rarely two or many basal cells and distal thick walled cell. The distal cell is long, narrow or broad, sometimes short in *C. aculeatum* (Fig. 11).

Bicellular hairs, it consists of a basal cell, rarely two basal cells, which are thin or thick walled and a two celled body. The body cells are generally thick walled, distal short or long and tapering in *C. aculeatum*, *C. inerme*, *C. philippinum* (Fig. 11, 12, 13, 16).

Uniseriate multicellular type, basal cell and sometime two basal cells or even more basal cells and an upper body, which consists of three to many cells. Terminal cell is tapering in *C. inerme*, *C. philippinum*, *C. serratum* (Fig. 14, 15, 17, 18).

The scales are attached to the epidermis at the single point and secretory. They are sessile or peltate. The scales are variable in size, shape and structure. The peltate head is circular, oval, irregular or wavy, sometimes lobed in top view. These are 1-4 celled, 4-8 celled or many celled often enveloped by a cuticular vesicle, sometime very prominent and walls thin. Generally scales are more frequent on the leaves, they are more on the leaf abaxial than the adaxial. They occur in *C. aculeatum*, *C. inerme*, *C. philippinum*, *C. serratum*, *C. splendens*. (Fig. 19, 20, 21, 22, 23, 24, 25, 26, 27).

The glandular hairs may be one celled, two celled or multicelled. They may be stalked or sessile. The stalk may be of varying length and head usually consists of one to many cells. Some trichomes do not show differentiation into stalk and head. The details are given below.

Unicellular type : with a basal cell, the body of glandular cell in small or large, the shape is variable. It is thin walled in *C. aculeatum*, *C. inerme* (Fig. 30, 32).

Bicellular type : The trichomes, *C. aculeatum*, *C. inerme*, *C. philippinum*, *C. serratum*, *C. splendens* (Fig. 28, 31, 33, 37)

Multicellular type : It is three to many celled, in

these types trichome is differentiated into a basal cell and body. The stalk is one celled and the head is vertically partitioned in *C. splendens* (Fig. 36). The body many celled. *C. aculeatum*, *C. philippinum*, *C. serratum* (Fig. 29, 34, 35).

The epidermis in the investigated species reveals structural diversity. Although the anticlinal walls are straight in *C. aculeatum*, *C. inerme* and sinuous in all species. The bearing of cuticular striations is of interest as observed on the abaxial surface only in *C. inerme*. (Metcalf and Chalk, 1979; Bangar, 2002;) The leaves are mostly hypostomatic. But in *C. philippinum* these are amphistomatic. The stomata are anomocytic in most of the plants. Diacytic and dominant in *C. serratum*. Anomocytic and anisocytic stomata have been recorded in the verbenaceae.

Glandular and non-glandular trichomes and also scales are of various types. Unicellular hairs are common in *C. aculeatum* and *C. splendens*. The uniseriate multicellular type occur in *C. inerme*, *C. philippinum* and *C. serratum*.

Multicellular trichomes occur in *C. aculeatum*, *C. philippinum*, *C. serratum*. The multicellular glandular trichomes are of different size of shape. Scales of various size and shape, either sessile or peltate occur in various plants studied.

The present investigation on trichomes reveals varied structure and different types of trichomes and confirm the earlier observations made in the *Clerodendrum* species (Yashodhare and Shanmukha Rao, 2002) Variations in the epidermis like striations, stomata and trichomes may provide valuable features in the segregation of the species.

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