

STUDIES ON LEAF VENATION IN SELECTED CLIMBERS

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Received : 25.06.2017; **Accepted** : 13.08.2017**ABSTRACT**

In this paper studies on leaf venation characterized for four species of climbers namely, *Clitoria ternatea* Linn, *Daemia extensa* R. Br., *Aristolochia bracteata* Retz, and *Gloriosa superba* Linn. To morphotype leaves, these were sorted out on the basis of serrated versus entire margins, primary and secondary vein patterns, etc. With some exceptions, these characters are usually stable within morphotypes. The leaf size and shape are the least reliable characters in identifying leaves. After the leaves are sorted into these broad categories, one can further divide them by looking at higher order venation patterns and tooth type. This paper illustrated with line drawings of prepared stained leaves, provides a framework of the leaves. This study will be very useful to a broad range of people who work with plants.

Figure : 1

References :17

Table : 01

KEY WORDS: *Aristolochia*, Climbers, *Clitoria*, *Daemia*, *Gloriosa*, Leaf venation.**Introduction**

The climbers are one of the specialized group of Angiosperms consisting of about ca. 302 genera and ca. 1582 species placed under ca. 52 families¹¹. The group is well represented in temperate, tropical and sub-tropical regions of the world. The group is well circumscribed showing significant evolutionary tendencies in the twining pattern leaf type, carpel type and morphology, zygomorphy and reduction in floral parts. However, the literature available indicate that most of the studies in climbers are carried out for the beautification of gardens. Very scanty and meager work is available on the anatomy particularly leaf architecture of the climbing plants^{6,7,14}. The plants selected for the present leaf architectural study are *Clitoria ternatea* Linn. (Leguminosae- Fabaceae), *Daemia extensa* R. Br. (Asclepiadaceae), *Aristolochia bracteata* Retz. (Aristolochiaceae) and *Gloriosa superba* Linn. (Liliaceae). These plants have constant familial position in different systems of classification of flowering plants^{1,2,5,12,17}.

The plants selected for present study, have great reputation in medicine. In addition, it shows great diversity in foliage production, twining pattern, morphology, reproduction and beautification. Due

to all these considerations, the studies carried on to know the architecture of leaf in selected climber species.

Materials and Methods

The present work is based on the material collected from different places (Table 1) of Ahmednagar and identified by available literature^{4,11}. For architecture of leaf venation, leaves were treated with aqueous solution of potassium hydroxide and hydrogen peroxide in equal proportion with 2-5 ml ammonium hydroxide at 37°-40°C temperature in an oven till the pigments get bleached out. Then they were washed thoroughly with tap water to remove alkali and dehydrated through alcohol and xylene grades and stained with safranin and mounted in Canada balsum. For architecture of leaf venation studies, drawings were made with the help of Leitz's camera lucida at the stage level (Plate I).

Observations

The foliage of the plants is principally accountable for photosynthesis. The leaves of the climbers especially show very highly diverse and intricate patterns of leaf venation. *The venation design* is an obligatory tool for describing, comparing and classifying the leaves. For the

present studies, leaf venation characterized for four species of climbers (Table 1). To morphotype leaves, these were sorted out on the basis of serrated versus entire margins, primary and secondary vein patterns, etc. With some exceptions, these characters are usually stable within morphotypes. The leaf size and shape are the least reliable characters in identifying leaves. This paper illustrated with line drawings of prepared stained leaves, provides a framework of the leaves. The *leaf venation* allows for the description and identification of plants, offering useful assistance in the case of certain plants, whose flowering cycles can be brief and irregular, and whose fruits and flowers may be difficult to access.

Literature available on the leaf venation has been employed for solving various problems of taxonomy. Though many of the modern descriptive and ontogenetic accounts of the foliar venation are available but very little precise information is available on the system of main veins, fine veinlets and vein ending in the leaves of the different taxa. As concerned histological account of study of architecture, it has been playing important role in taxonomic study and identifications of family and genera^{3,9,10,13,15}. In angiosperms, cotyledons, floral organs, mature and developing leaves show range of venation pattern. Studies revealed that the open dichotomous venation of the Ranalian genera *Kingdonia* and *Circaester* are primitive within angiosperms, which might be an adaptive feature, as in *Utricularia*^{8,16}. It was recorded that number of vein islets in *Barasma*, *Cassia*, *Digitalis* and *Erytroxylon* varies within narrow limits and number for the different species is sufficiently constant, which can be used as a valuable specific taxonomic character¹³.

The detail studies and observations on the architecture of leaf venation of the following climbers are as follows:

1. *Clitoria ternatea* Linn. : The leaf is alternate, imparipinnately compound and stipulate. Leaflets are 5-7, opposite, with large terminal leaflet; symmetrical. Apex is mucronate, base obtuse, margin entire, sub-coriaceous. Venation type is pinnate, camptodromous, reticulodromous. Primary vein is moderate and straight. Secondary veins are acute, moderate and alternate, lowest pairs are more acute than pairs above. Tertiary veins are right angled on both sides, alternate, oblique to primary veins, percurrent forked. Marginal ultimate venation is recurved to form loops. Areoles are imperfect of variable size, randomly arranged, shape is tri- or quadrangular or pentagonal. Veinlets are branched twice or single.

2. *Daemia extensa* R. Br.: The leaves are simple, opposite-decussate, ovate, thin, softly pubescent, petiolate, petiole 2-3 cm long; lamina entire 4-6x 2.2-4 cm, acuminate, ciliate. Base cordate and forming sinus. Venation type is pinnate, camptodromous, reticulodromous, primary vein is single and massive. Secondary veins are arising from a single point from primary vein. These are narrow and wide, upper more acute than lower, relatively thick, branched forming loop, by joining super-adjacent secondary veins at acute angle. Inter-secondary veins are simple. Tertiary veins are acute, reticulate orthogonal, arranged oblique to mid-vein and are predominantly alternate. Higher order venation is thin and randomly oriented. Marginal ultimate venation is looped. Areoles are imperfect of variable size and are oriented. Shape of areole is triangular or pentagonal but mostly quadrangular. Veinlets are branched once or twice

TABLE-1 : Names of selected climbers:

Sr. No.	Name of the climber	Family	Status*
1	<i>Clitoria ternatea</i> Linn.	Leguminosae- Fabaceae	W/C/O
2	<i>Daemia extensa</i> R. Br.	Asclepiadaceae	W
3	<i>Aristolochia bracteata</i> Retz.	Aristolochiaceae	W
4	<i>Gloriosa superba</i> Linn.	Liliaceae	W/O

*W= wild, C= cultivated, O=ornamental

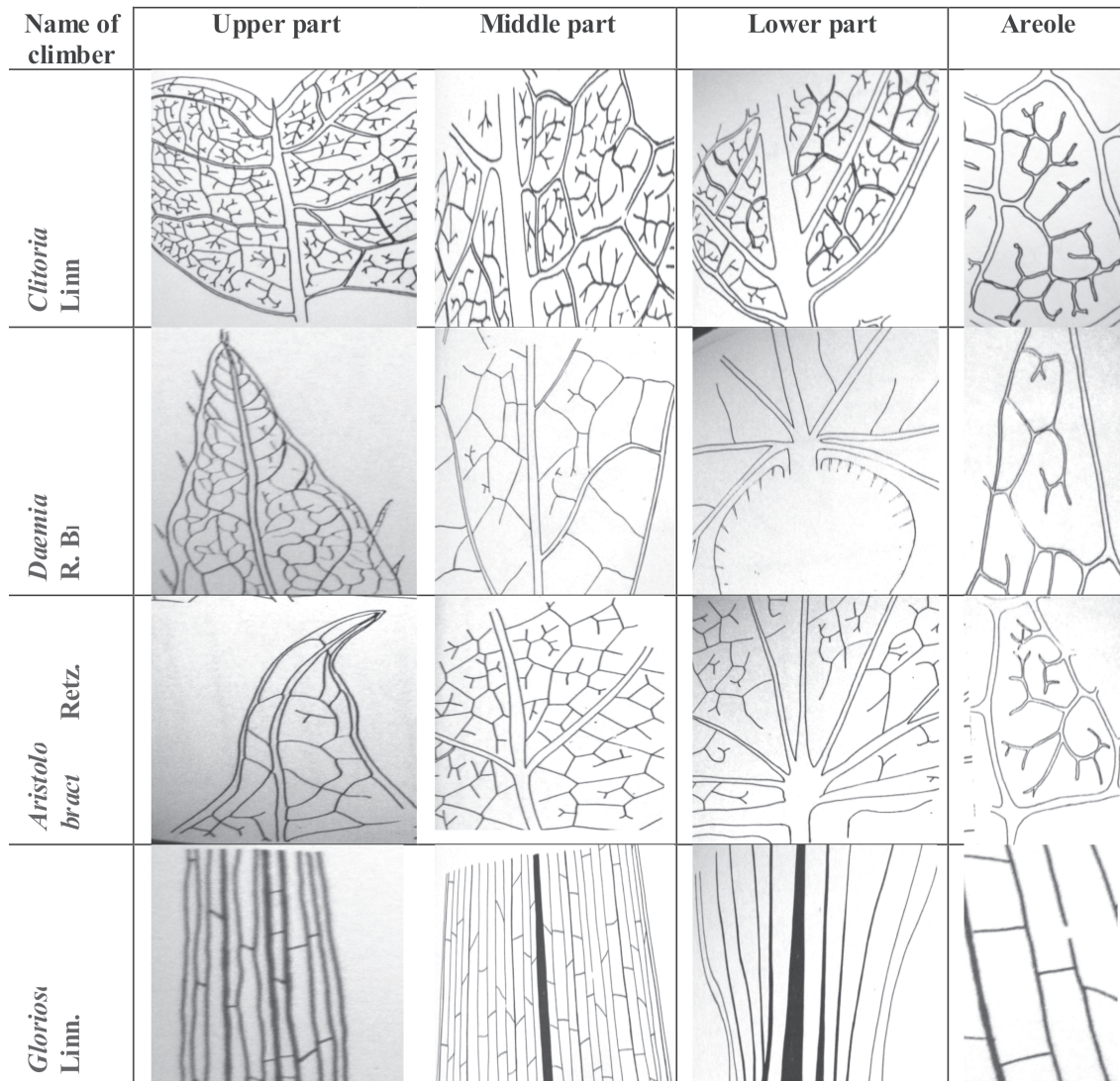


Fig. 1 : Leaf venation characters of the four species

or none.

3. *Aristolochia bracteata* Retz. : The leaf is simple, cordate, 3.5- 5.5x 3-5 cm in size. Lamina is symmetrical, base cordate, apex obtuse sometimes acute, margin undulate, petiole grooved. Venation type is pinnate, camptodromous, reticulodromous. Primary vein is moderate and markedly curved. Secondary veins are acute, narrow, moderate, branched forming loops by joining super adjacent secondary veins at acute angle, upper more obtuse than lower and are fine. Inter-secondary veins are simple. Tertiary veins are

reticulate, anastomosing with other tertiary veins or with secondary veins, randomly or orthogonally reticulate, arranged alternately. Marginal ultimate venation is fimbriate. Areoles are imperfect, arranged randomly. Shape of areole is usually, quadrangular, sometimes pentagonal or irregular. Veinlets are branched once or twice or none.

4. *Gloriosa superba* Linn.: Leaves are simple, alternate or opposite or in whorls of 3; nearly sessile, ovate-lanceolate, acuminate, tip ending in a coiled tendril like spiral, base cordate, margin entire, lamina is 8-17 x 1.8-8.4 cm in size, glabrous.

Midrib is single with secondaries and tertiaries running parallel to long axis. Venation is parallelodromous, convergent. Midvein is single, very short, straight but at tip gets coiled. Secondary veins are two on either side of midrib. Tertiary veins are 2-4 in between secondary veins. Connection of commissures to longitudinal veins is from primary to secondary, secondary to secondary, secondary to tertiary, and tertiary to tertiary. Commissures are well developed, medium, thin and simple but sometimes branched forming Y-shaped and some incomplete configuration of an anomalous form. Commissures are oblique or in right angle forming loops. Areoles are usually quadrangular or rectangular.

Results and Conclusions

Leaf venation pattern studied in all above species is either pinnate, camptodromous and reticulodromous (*Clitoria ternatea* Linn, *Daemia extensa* R. Br., *Aristolochia bracteata* Retz,) or parallelodromous, convergent (*Gloriosa superba* Linn.). Marginal ultimate venation is looped (*D. extensa* R. Br.) or recurved to form loop (*C. ternatea* Linn.) or fimbriate (*A. bracteata* Retz.). Areoles are imperfect and of variable size and are oriented (*D. extensa* R. Br.) or randomly arranged (*C. ternatea*

Linn.). Shape of areole is tri- to pentangular, mostly quadrangular in *D. extensa* R. Br. and *A. bracteata* Retz. Veinlets are branched, ones/ twice/none (*A. bracteata* Retz.) or ones/ twice/thrice (*C. ternatea* Linn.) or ones/ thrice/none (*D. extensa* R. Br.). In *Gloriosa superba* Linn. midvein is single, stout, straight but tip is coiled. Connections of commissures to longitudinal veins are from primary to secondary, secondary to secondary, secondary to tertiary or tertiary to tertiary. Commissures sometimes branched forming Y-shape and some are incomplete, oblique or in right angle forming loops. Areoles are usually quadrangular or rectangular.

Thus it is concluded that, leaves in climbers are symmetrical, simple except pinnate in *C. ternatea* Linn., having camptodromous and reticulodromous venations except *G. superba* Linn. having parallelodromous and convergent. Areoles are imperfect to perfect, oriented or randomly arranged, with triangular to pentangular shape, veinlets in areoles are simple unbranched or branched. In *G. superba* Linn. commissures are present and are branched forming Y-shaped or in right angle forming rectangular or quadrangular shape. Thus there is a great variation in climbers regarding venation patterns in leaves.

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