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Anatomical studies of the medicinally important plant *Bauhinia pupurea* Linn

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Abstract
The plant *Bauhinia purpurea* Linn. is popular in India, bark was reported as antimycobacterial, antimalarial, antifungal, cytotoxic and anti-inflammatory activities. The leaves were reported to possess antinociceptive, anti-inflammatory and antipyretic properties, while the stem was found to have anti-diabetic and adrenergic properties, *Bauhinia* statins, isolated from leaves and bark was reported to inhibit human cancer cell. Standardization is essential measure for quality, purity and sample identification. Macro morphology along with the microscopy is one of the simplest and cheapest methods to start with for establishing the correct identity of the source materials. In the present study the leaf architecture, types of stomata and anatomy of the leaf of *Bauhinia pururea* was undertaken. Actinodromous perfect basal type of venation and paracytic type of stoamta along with uniseriate trichomes were found.

Keywords: *Bauhinia purpurea,* actinodromous, paracytic, uniseriate

Introduction
Bauhinia purpurea is belongs to family Leguminosae and sub family Caesalpinae [1].

Vernacular names: Kachanar, Sanskrit- Kovidara, Hindi- Khairwal, Bengali- Devakanchan, Tamil- Mandari, English- Butterfly [1].

Occurrence & Distribution: It is found in the lower slopes of the Himalayas; also distributed in Asssam, Khasi hills & the western Peninsula; occasionally cultivated in gardens for its large coloured flowers.

Fig 1: *Bauhinia purpurea* flowers

Description: A moderate sized ornamental evergreen tree. Bark brown, 1.3cm thick. Wood moderately soft, greyish- brown. Leaves rigidly sub-coriaceous, 2 lobed, not deeply cleft. Flowers pink, appearing with leaves in terminal panicles. Calyx –limb irregularly 3-5 cleft. 3 or 4 fertile stamens are present. Pods long, narrow, flat, dehiscent. Seeds 12-15 [1].

Chemical Constituents: Leaves contain quercetine, quercetrin, rutin & apigennin. Flowers contain astragalin, isoquercitin & glycosides of pelargonidum. seeds yield approximately 16% fat, 27% protein, 15% carbohydrates & 15% oil, with linoleic (49%), palmitic (18.5%), tearic (18%) & oleic (11%) acids, besides the chalcones, butein & 3, 4 dehydroxy chalcone & DOPA (2%) [2].

Uses: Traditionally *Bauhinia purpurea* is intended to be used for the treatment of numerous activity namely diarrhea, ulcers, enlarge cervical glands, goiter, scrofulous tumors etc.

Bauhinia purpurea contains various types of phytochemicals like polyphenols and flavonoids which area responsible for anti-inflammatory and anti-arthritis activity [3]. The constituents of a various medicinal plants may fluctuate while changing in atmosphere and time of collection. Because the plant extracts are used all seasons, it was intended to study changes of chemical constituents if any found while changing season and reason [4]. *B. purpurea* contains major class of secondary metabolites are glycosides, flavonoids, saponins, triterpenoids, phenolic compounds and phytosterols which are useful against cancer [5].

Materials and Methods

The plant material i.e. leaves of *Bauhinia purpurea* for the present work was collected from Dahanu, Dist- Palghar, India and authenticated.

For study of leaf venation and types of stomata standard methods were used [6-8].

The microphotographs showing different anatomical features were taken by using Cosina Camera in Mithibai College.

Observations and Results

a) Leaf Architecture

Leaf organization is simple. With respect to leaf shape and size, the length of the whole leaf is 13.2 mm and the width is 12.6 mm. The lamina is symmetrical; base is asymmetrical; form is oblong; apex is emarginate and base is lobate. The margin is entire. The leaf texture is coriaceous. There are no glands and the petiole is normal.

The type of venation is actinodromous perfect basal. Primary vein (1^0) is stout; its course is straight. Secondary veins (2^0) are present; angle of divergence is acute moderate. The relative thickness of secondary veins is moderate; its course is curved abruptly and unbranched. Intersecondary veins are composite. Intramarginal vein is absent. Tertiary veins (3^0) are present; angle of origin exmedial to admedial side is RR/OR/AR; the pattern is orthogonal reticulate. The higher order venation forming a reticulum in which vein orders are distinct. Quarternary veins (4^0) are thin; its course is orthogonal. The highest vein order of leaf is 4^0. The marginal ultimate venation is looped. Areoles are well developed formed by trachea; arrangement is random and shapes quadrangular, pentagonal and polygonal. Veinlets are simple, linear, curved and once branched.

Fig 2: Entire leaf

Fig 3: Leaf Base

Fig 4: Areole 10X x 10X

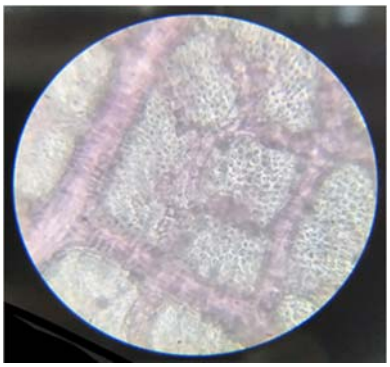

Fig 5: Areole 10X x 40X

b) Stomata

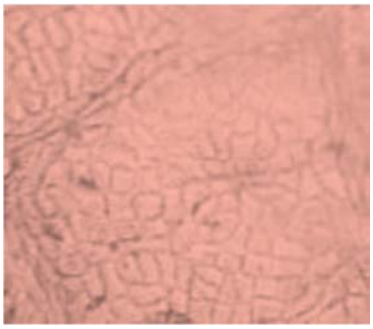

Fig 6: 10 x10X U E

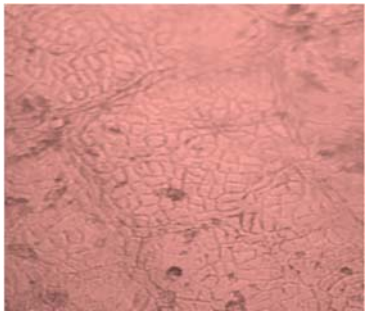

Fig 7: 10 x10X LE

The upper epidermis as well as lower epidermis are regular, thin walled and single layered.

Upper epidermis: The leaves are hypostomatic. Stomata are absent on upper epidermis. Epidermal cells are polygonal and irregular in shape.

Lower epidermis: Stomata are paracytic type. The guard cells are elongated and kidney shaped. The epidermal cells are polygonal and irregular in shape. The stomata are present only in the lower epidermis.

c) Trichomes: The epidermal layers also show presence of unicellular trichomes.

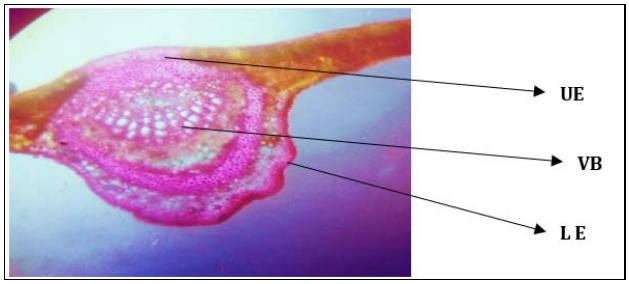

Fig 8: Section of leaf: 10 x10X

d) Microscopy: Section of leaf

The leaves are hypostomatic. Lamina is a isobilateral in nature. The upper and lower epidermii are regular, thin walled and single layered. The stomata are present only in the lower epidermis. The epidermal layers also show presence of unicellular trichomes.

Midrib:- It has upper epidermis which is multilayered; it shows upper palisade cells, arranged in single layer, elongated & compact; spongy parenchyma are thin walled, loosely arranged & embedded with xylem vessels; endodermal layer showed single layered cells surrounding the vascular bundles; lower epidermis is similar to upper epidermis; conical & unicellular trichomes covered with thick wall. In between the epidermal layers is present the region of chlorophyll containing cells called mesophyll. It is not differentiated into palisade and spongy parenchyma.

Summary

The type of venation is actinodromous perfect basal. Primary vein (1^0) is stout; its course is straight. Secondary veins (2^0) are present; angle of divergence is acute moderate. Tertiary veins (3^0) are present; angle of origin exmedial to admedial side is RR/OR/AR. The highest vein order of leaf is 4^0. Areoles are well developed. Veinlets are simple, linear, curved and once branched.

The leaves are isobilateral. Stomata are absent on the upper surface and on the lower surface the stomata are of paracytic type.

Discussion

Anatomy is very essential to validate and understand the many aspects of plant biology. Systematic study of leaf architecture in 7 genera and 10 species of the Convolvulaceae has been studied [14]. Leaf architecture in the Asteraceae was also carried out [15]. Leaf architectural aspect of 24 taxa of *Ficus* L. has been reported [16]. Studies leaf architecture pattern in some members of Cucurbitaceae [17], leaf architecture of some species of *Litsaea* Lamk. of family Lauraceae [18].

The epidermal characters of plants in systematic studies in distinguishing certain groups of plants have been used. The different type of stomata have been reported on the same surface of an organ in diverse angiospermic families [19-22]. Stomatal studies of *Philodendron* [23], of *Dieffenbachia* and *Colocasia* of family Araceae [24] have already been studied. Role of anatomy in the study of stomata in ten members of the family Arecaceae [25], study of stomata in some species of *Alocasia* & *Syngonium* of family Araceae Juss. have also been reported [26].

The structure and development of trichomes and glands have been studied in several angiosperm families [27-29]. Trichomes in some species of *Litsaea* [30], and evaluation of *Carica papaya* L. leaves with reference to sexual dimorphism has already been reported [31].

Conclusion

Anatomy is the first step towards ensuring quality of plant material, the authentication of plant material. According to WHO the macroscopic and microscopic description of a medicinal plant is the first step towards establishing its identity and purity, which should be carried out before tests are undertaken [32].

Abbreviations Used: LE- Lower epidermis, UE- Upper epidermis, VB- Vascular bundle

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