

Study of Leaf Architecture of *Commiphora Wightii* Arnott (Burseraceae) as One of the Pharmacognostic Tools.

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ABSTRACT

Of the several leaf surface characters, leaf architecture has drawn relatively less attention when compared to the epidermal studies which are in the limelight especially after the initiation of SEM studies. In the last decade, with the publication of Hickey's work on the dicotyledons (1973, 1979) a new thought was provided to this field. A perusal of the past literature revealed that there are no specific reports on the leaf architectural features of the *Commiphora wightii* Arnott belonging to the family Burseraceae. Leaf architecture act as a pharmacognostic tool for identifying the adulterant because adulteration and misidentification of medicinal plants can cause serious health problems to consumers and legal problems for the pharmaceutical industries. Therefore, the present investigation has been carried out to provide a detailed account of the same besides its evaluation for taxonomic purpose which showed apical orientation, simple leaf organization, lamina and base is asymmetrical, coriaceous texture without any gland. Type of venation is pinnate craspedodromous and semicraspedromous, higher vein order of the leaf is 5⁰.

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Introduction

Sufficient interest seems to have been revived during the past two decades on the role of internal organization of the individual organs of plants. Herbal medicines are available as single or poly herbal preparations. Because of consumption of these herbal preparations by a large masses of developed as well as developing countries, use of plant materials as a raw materials for the pharmaceutical industries and as it represent a substantial proportion of the world drug market, there is need to control and assure the quality of such preparations through systematic scientific studies. The quality of herbal drugs is the sum of all factors which contribute directly or indirectly to the safety, effectiveness and acceptability of the product.

Adulteration and misidentification of medicinal plants can cause serious health problems to consumers and legal problems for the pharmaceuticals industries. Adulterant resembles the genuine drugs with respect to its morphological appearance and characteristics. However, it is devoid of the active constituents which are present in genuine drug. With this backdrop, it becomes extremely important to make an effort towards standardization of the material to be used as medicine. The process of standardization can be achieved by stepwise pharmacognostic studies. Because the importance of micromorphological features (anatomical biomarkers) for the taxonomic consideration of angiosperms is now well established (Ramayya, 1972; Tomlinson, 1979; Ogundipe and Akinrinlade, 1998 and Parveen *et al.*, 2000). Micromorphological parameters of different plant parts have been used as aids in the taxonomical recognition of species (Kathiresan *et al.*, 2011).

A perusal of the past literature revealed that there are no specific reports on the leaf architectural features of the *Commiphora wightii* Arnott belonging to the family Burseraceae. Therefore, the present investigation has been carried out to provide a detailed account of the same besides

its evaluation for taxonomic purpose and identifying the adulterant. *Commiphora wightii* is a medicinal plant found from northern Africa to central Asia used to treat rheumatism, obesity and atherosclerosis.

Review of Literature:

The first summary of the systematically more useful anatomical characters with an evaluation of their importance was provided by Fritsch (1903). Metcalfe and Chalk (1950, 1967 and 1983) have enumerated a large number of anatomical characters of diagnostic value for different families. Leaves occupy a prominent position in this regard and their various features such as venation, stomata and trichomes were found useful in solving taxonomic and phylogenetic issues. The utility of foliar epidermal features in distinguishing taxonomic groups was clearly established (Stace, 1965, 1984; Rao and Raju, 1985, 1988; Mohan, 1994; Bhatia, 1984; Jones, 1986 and Manohari, 2004). The taxonomic relevance of the foliar epidermal characters of angiosperms has been well documented (Parveen *et al.*, 2000; Yasmin *et al.*, 2009; Celka *et al.*, 2006 and Zou *et al.*, 2008). The leaf epidermal cells are of significant taxonomic importance.

The leaf architecture study is found to be useful for taxonomic purpose. Ettinghauen (1854a, 1854b, 1856, 1857, 1858a, 1858b, 1861, 1869 and 1872) pioneered the leaf architecture studies. Kerner and Oliver (1895) had worked out systems of classification based on foliar venation. Later, Foster (1950a, 1950b, 1952) had worked on foliar venation. Levin (1929) firstly took vein islet areas as criteria for classification. Hall and Melville (1951, 1954) proposed vein termination number as a technique for testing the purity of fragments of particular leaf type for pharmacognostical properties. Gupta (1961a and 1961b) made further contribution in use of absolute vein islet number. Meyerhoff (1952) and Klucking (1962) worked on venation of angiosperm leaves.

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Systems of leaf architecture have been presented by Ettinhausen (1961) and Madler and Straus (1971). Hickey (1971 and 1973) provided leaf architectural classification in an elaborate manner for dicotyledons. Hickey and Wolfe (1975) provided first systematic summary of dicot leaf architectural features and they demonstrated that a number of lower order leaf architectural features, including leaf organization, configuration of first three vein orders and characteristics of leaf margin are significant systematic indicators within dicotyledons. Ingole and Patil (2004) studied the leaf architecture of 18 species of Verbenaceae of Amravati.

Material and Methods:

For the present study, the leaves of *C.wightii* were collected from RDIK and NKD College, Badnera, Maharashtra, India. To study the leaf architecture, the mature leaves from both fresh and herbariums were cleared by treating them with 5% aqueous sodium hydroxide which was repeatedly replaced by fresh solution until leaf material got cleared followed by treatment with 2% acetic acid after washing thoroughly with distilled water.

The lamina after washing with distilled water stained with aqueous safranin and mounted in glycerin or dehydrated. Major venation patterns were studied under lens both dissecting and compound. For minor venation pattern and details of leaf architecture, compound microscopic observations were made. Terminology of Hickey (1973, 1979) was followed for describing leaf architecture.

Result and Observation:

Morphology:

Habit- medium size shrub 5-6 m height; stem- woody, papery aromatic, rough, with much side branches, aromatic; leaves- simple, alternate, few pinnately compound, with serrate margin, somewhat mucronate apex and decurrent base, aromatic with astringent to sour taste; inflorescence- solitary axillary; flower- small, dioecious; fruit- drupe.

Leaf Architecture:

The basic axis of orientation in the leaf is apical. The leaf organization is simple. With respect to shape and size, the length of whole lamina is 5-6cm and width is 3-3.5cm. The lamina is slightly asymmetrical; base is asymmetrical; form is ovate; apex is mucronate and base is decurrent. The margin is serrate and apical angle is obtuse, teeth irregularly spaced; tooth's basal part is straight, apical part is acuminate. Leaf texture is coriaceous. The glands are absent on the lamina and very shortly petiolated.

Type of venation is pinnate craspedodromous and semicraspedodromous. Primary vein (1^0) is stout; its course is straight and unbranched. Secondary veins (2^0) are present. The angle of divergence is acute, moderate and nearly uniform. Secondary veins are moderate. Its course is curved uniformly; loop forming branches are joining super adjacent secondary at an acute angle. Inter secondary veins are absent. Intermarginal vein is absent. Tertiary veins (3^0) are present; angle of on exmedial side is RR (Right-Right). The pattern is random reticulate. The percurrents are absent. Higher order venation forming reticulum in which vein orders are distinct. Quarternary (4^0) veins are thin, their course is orthogonal. Higher vein order of the leaf is 5^0 . The marginal ultimate venation is incomplete. Veinlets branched twice. Areoles are imperfectly developed; arrangement is random and shapes are quadrangular- polygonal.

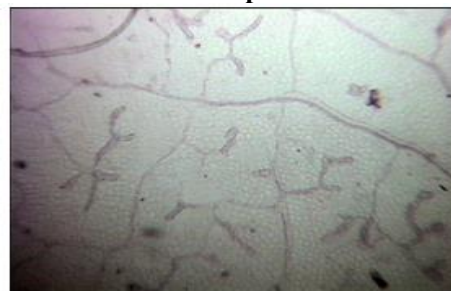
Elements in tooth architecture non-glandular, apical termination simple, course of the principal vein central, accessory veins incomplete.



Morphology of *C.wightii*



Cleared whole leaf showing major venation pattern



Cleared whole leaf showing minor venation pattern



Cleared whole leaf showing marginal venation pattern

Discussion and Conclusion:

Plant materials are used throughout the world as home remedies, over the counter drug products and raw materials for the pharmaceutical industry and represent a substantial proportion of the world drug market. It is therefore important to establish their quality. Anatomical biomarkers of different plant parts have been used as aids in the taxonomical recognition of species. The initial step in quality control of medicinal plants is ensuring the authenticity of the desired species for the intended use. It can be conducted via a variety of techniques namely macro and microscopic identification to determine definitively the proper species of plant material while it is still in its non-extracted form. Hence the present work was undertaken with a view to lay down standards which could be useful to detect the authenticity of this medicinally useful plant. Study of the leaf architecture of *C. wightii* can be useful to substantiate and authenticate drug with the cheapest and the fastest rate.

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