Anatomical Studies on Vitex Leucoxylon and Vitex Negundo (Verbenaceae)

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ABSTRACT

Plants have served as a source of medicine to man for several decades now and still remain a source for vast potent bioactive molecules for the treatment of ailments. The anatomical and physiological features of plants may provide valuable characters and character states in assessing homology and elucidating phylogenetic relationships among plants. Anatomical features of vegetative as well as reproductive organs have been studied and the results of such research have found application in systematics, particularly for resolving controversial taxonomic problems. Vitex species possesses numerous biological activities proved by many experimental studies. One of the ancient uses of Vitex negundo Linn. documented in ayurveda is to provide mental peace. The leaf extract of Vitex negundo are generally used as preservation in storage of grain to protect the pulses against insects. Vitex leucoxylon Linn. is used as folkloric medicine in India for the treatment of cancer. The stem of Vitex negundo consists of wide parenchymatous pith, Chlorenchymatous hypodermis and TLS showing the multiserrate rays. Vitex leucoxylon TLS shows biseriate and uniseriate rays with intervessel pits.

Keywords: anti-inflammatory, antimicrobial effects, febrifuge, folkloric medicine.

INTRODUCTION

Medicinal plants contain secondary metabolites that are bioactive and these bioactive substances are responsible for their medicinal properties. The medicinal plants with time tested healing properties serve as health care entities. An urgent need is therefore essential for their proper identification and utility. In this regard, the knowledge of plant internal structure has essential role to solve several common and everyday problems such as identification of unknowns, food contaminants and forensic complications. Most of the species of the genus Vitex are used therapeutically in ancient Indian systems of medicine especially, Ayurveda and Siddha. Vitex leucoxylon is a large deciduous tree with spreading head and trunk. It is an endemic tree found in peninsular India and Sri Lanka. The leaves of vitex are used in traditional medicine for relieving headache, fever and catarrh [1] and are also used for medicinal baths in fever and anaemia. [2] The major compound compound such as vitexin which is a flavanoid is mainly responsible for the
anti-cancer activity. These dietary constituents mostly act as anti-oxidants and may prevent from DNA damage. [3] The roots and bark are astringent and the roots are reported to be used as a febrifuge. [4] Vitex negundo Linn. is a woody, aromatic shrub growing to a small tree. The extract from fresh leaves exhibit analgesic and antihistaminic properties [5] and its aqueous and ethanolic extract from leaf show significant hypoglycaemic activity in alloxan induced diabetic rats. [6] It has also been reported that the extract has mosquito repellent effects, antiparasitic [7] and antimicrobial effects. [8-9] Besides it is reported that the species shows HIV type1 reverse transcriptase inhibitory activity especially the water extract of the aerial parts of Vitex negundo. [10] Leaves possess antiulcerogenic, antiparasitic, hepatoprotective potentials, anti-inflammatory and antifungal activities. [11-12]

MATERIALS AND METHODS

Leaf, stem and petiole of the Vitex leucoxylon and Vitex negundo were collected from the Rapinat Herbarium-Botanical garden, St. Joseph’s College, Tiruchirappalli and the plant specimen was botanically identified and authenticated by comparing the herbarium specimen (Fig.1 & Fig.2). Few fully matured leaves, petioles and stems were preserved in fixative solution FAA (Formalin-5ml + Acetic acid-5ml + 70% Ethyl alcohol-90ml) for more than 48 hours. The preserved specimens were cut into thin transverse section using sharp blade. The free hand sections were stained with safranine, Aniline blue, Eosin Y as per standard methodology. The selected diagnostic characters of the transverse section were photographed under suitable magnification using camera. The transverse sections of the stems, petioles and fresh leaves through the midrib were also cleared, mounted and observed under fluorescent microscope.

RESULTS AND DISCUSSION

The stem of Vitex negundo consists of wide parenchymatous pith, Chlorenchymatous hypodermis, TLS showing the multiseriate rays. The leaf contains the single epidermal layer with thick cuticle, hypodermis with intercellular spaces. Petiole possesses crescent shaped vascular bundle, single layered epidermal layer with hairs, hypodermal layer with intercellular spaces. In Vitex leucoxylon also there is wide parenchymatous pith, metaxylem outside, protoxylem inside and TLS showing biseriate and uniseriate rays with intervessel
pits. Leaf consists of single layered epidermal layer with thick cuticle, and sclerenchymatous bundle sheath present. Petiole displays three lobed vascular bundle, xylem intermixed with phloem (Table-1 & Fig-3, Fig-4).

Table-1: comparative anatomical profile of Vitex negundo and Vitex leucoxylon

<table>
<thead>
<tr>
<th>Part</th>
<th>Vitex negundo</th>
<th>Vitex leucoxylon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stem</td>
<td>Wide parenchymatous pith and metaxylem outside with protoxylem inside;</td>
<td>Wide parenchymatous pith and metaxylem outside with protoxylem inside; TLS</td>
</tr>
<tr>
<td></td>
<td>Chlorenchymatous hypodermis present; presence of epidermal hairs, TLS with</td>
<td>showing biseriate and uniseriate rays with intervessel pits</td>
</tr>
<tr>
<td></td>
<td>multiseriate rays</td>
<td></td>
</tr>
<tr>
<td>Leaf</td>
<td>Xylem is intermixed with phloem. There is one layer of epidermal cells with</td>
<td>Sclerenchymatous bundle sheath present. There is a single layer of epidermal</td>
</tr>
<tr>
<td></td>
<td>thick cuticle and epidermal hair; hypodermis consists of parenchyma cells</td>
<td>cells with thick cuticle</td>
</tr>
<tr>
<td></td>
<td>with intercellular spaces</td>
<td></td>
</tr>
<tr>
<td>Petiole</td>
<td>Consists of crescent shaped vascular bundle, metaxylem inside and</td>
<td>Exhibiting the vascular bundle in three lobes, single epidermal layer with</td>
</tr>
<tr>
<td></td>
<td>protoxylem outside, single layered epidermis with epidermal hairs;</td>
<td>epidermal hairs, parenchymatous hypodermal layer; xylem intermixed with</td>
</tr>
<tr>
<td></td>
<td>hypodermal parenchymatous cells with intercellular space</td>
<td>phloem</td>
</tr>
</tbody>
</table>

Fig.3. Vitex negundo: A. Stem (4x); B. Enlarged section of stem showing the parenchymatous pith, vascular bundles, chlorenchymatous hypodermis, single epidermal layer with hairs; C. Leaf (4x), D. Enlarged view of leaf showing the vascular bundle, parenchymatous endodermis and unilocular trichomes; E&F. Petiole (10x) and 20x indicating xylem, phloem and hypodermis; G.TLS showing the formation of biseriate rays; H. RLS showing medullary rays.

Fig.4. Vitex leucoxylon: A. Stem(4x) B. Enlarged view of stem showing the central wide parenchymatous pith, vascular bundle, single layered epidermis; C. Petiole(4x), D. enlarged view of petiole exhibiting the vascular bundle arranged in three lobes, parenchymatous pith, outer single layered epidermis with hairs; E. Leaf(10x), F. Enlarged view of leaf displaying xylem, phloem, endodermis and epidermis; G.TLS showing biseriate and uniseriate rays with intervessel pits, H. RLS showing medullary rays.

In the present study an attempt has been made to establish an evaluation of morphological and microscopical features which are helpful in identification of the authentic plant sample and marketed sample. The comparative anatomical studies of these plants are really helpful for the correct identification of the plants and also a great contribution in the field of Plant anatomy. This study has also formulated pharmacopoeial standards for these medicinal plants. The microphotographs on different magnifications which were carried out in the present study reveal specific identification features of each plant.

**CONCLUSION**

Plant anatomy plays an important role in the understanding of plant biology.
realistic interpretation of morphology, physiology, and phylogeny must be based on a thorough knowledge of the structure of cells and tissues. Pharmacognostical analysis of stem, leaf, petiole and peduncle of the selected medicinal plants provides substantial information for the proper identification, authentication and scientific evaluation. It is to be noted that the transverse sections and longitudinal sections of the plant parts show unique characters and they play an important role in the proper identification of species. From the above discussion it may be concluded that Vitex species are used for its various properties by several of pharmaceutical companies.

REFERENCES

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