PHARMACOLOGICAL AND THERAPEUTIC POTENTIAL OF VITEX NEGUNDO (NIRGUNDI): A REVIEW

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Abstract- Vitex negundo is a woody plant mainly found in Indian subcontinent and its neighbouring countries. Almost all the sections of the plant possess an immense amount of phytochemical secondary metabolites that impart a matchless variety of medicinal uses of the plant. Vitex negundo is a constituent of a number of commercially available herbal formulations and has also shown an efficient bio-control instrument. The implementation of biotechnologically advanced procedures would provide resources of rapid proliferation and from the point of view of phytochemistry; it furnishes the opportunities for augmentation of the quality and quantity of the biologically potent secondary metabolites occurring in the plant. In this paper, the already reported medicinal uses and pharmacological activities of the plant have been reviewed.

Keywords: Vitex negundo, Analgesic, Anti-Inflammatory, Antioxidant, Antifungal
I. INTRODUCTION

Medicinal plants have been a major source of therapeutic agents since ancient times to cure human disease. The revival of interest in natural drugs started in last decade mainly because of the widespread belief that green medicine is healthier than synthetic products. Now-a-days, there is manifold increase in medicinal plant based industries due to the increase in the interest of use of medicinal plants throughout the world which are growing at a rate of 7-15% annually. Despite the major advances in the modern medicine, the development of new drugs from natural products is still considered important.\textsuperscript{1} Traditional therapeutics based on herbal medicinal principles is time tested and widely accepted across various cultural and socioeconomic strata. However, there is lack of precise guidelines to study the herbal compounds and till date a very meagre portion of this tremendous potential drug-repertoire has been scientifically screened. Hence, there is a real need for scientific evidence based validation of these agents.\textsuperscript{2}

The evaluation of plant products on the basis of medicinal and therapeutic properties forms a platform for the discovery of newer drug molecules from different plant sources. From the innumerable plants being researched since time immemorial, \textit{Vitex negundo} is important one. This plant of Verbenaceae family is commonly known as Nirgundi and five leaved chaste tree.

\textbf{Botanical Description}

\textit{Vitex negundo} is commonly known as the five-leaved chaste tree (Fig.1, 2 and 3). It is a large shrub or sometimes a small slender tree having thin grey bark, quadrangular branchlets, whitish with a fine tomentum. Leaves are 3-5 foliate, leaflets are lancoelate, acute, the terminal leaflet with a petiole is 1-1.3 cm long, the lateral leaflets are smaller with a very short petiole and all are nearly glabrous which are covered with a fine white tomentum beneath, having acute base.\textsuperscript{3,4,5} Flowers are in pedunculate branched tomentose cymes that are opposite along the quadrangular tomentose rachis of a large terminal often compound pyramidal panicle (axillary peduncles in the upper axils are sometimes present. Ovary is glaborous having its stigma forked. Drupe is less than 6 mm diameter turns black when ripe.\textsuperscript{6,7,8}

\textbf{Ecology and distribution}

\textit{V. negundo} is native to India and Philippines and occurs as exotic species in United Kingdom. The species is also cultivated in Europe, Asia and West Indies. It is a water loving plant and found abundantly along river banks, in humid conditions and in open wastelands. Nirgundi is one
of the commonly used hedge plant which is planted along roads and between fields. It grows best up to an altitude of 2000 m, requires a mean annual rainfall of 600 to 2000 mm and can tolerate alkaline and saline soils.\textsuperscript{7}

\textit{V. negundo} also used as a food crop and a source of timber,\textsuperscript{9} this review deals with the bioactive components, medicinal importance and other related attributes of the plant.

\begin{figure}[h]
\centering
\includegraphics[width=0.4\textwidth]{stem_with_leaves.png}
\includegraphics[width=0.4\textwidth]{flowers_with_buds.png}
\caption{\textit{Vitex negundo} - Stem with leaves \hspace{1cm} \textit{Vitex negundo} - Flowers with Buds}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{five_leaved_chaste_tree.png}
\caption{\textit{Vitex negundo} - Five-leaved Chaste tree}
\end{figure}

\textbf{Phytochemical Constituents}

Higher plants are warehouses of assorted bioactive constituents or phytochemicals which find ample use in the pharmaceutical industry. Namdeo\textsuperscript{10} states that about a quarter of all prescribed pharmaceuticals in advanced countries contain compounds that are directly or indirectly, derived from plants. Phytochemicals or secondary metabolites usually occur in complex mixtures that differ among plant organs and stages of development.\textsuperscript{11,12}

\section*{II. MEDICINAL IMPORTANCE}

Herbal medicine, rather than merely curing a particular disease, aims at returning the body back to its natural state of health.\textsuperscript{13} The phytochemical components of medicinal plants often act
individually, additively or synergistically in improvement of health. After having analyzed the various chemical components present in different parts of *Vitex negundo*, it is imperative that focus shifts to the medicinal applications of the plant. Myriad medicinal properties have been ascribed to *Vitex negundo* and the plant has also been extensively used in treatment of a plethora of ailments. These properties have been categorized under three heads – traditional medicine, folk medicine and pharmacological evidence.

**Traditional Medicine**

Traditional medicine mainly comprises of Indian Ayurveda, Arabic Unani medicine and traditional Chinese medicine. In Asia and Latin America, populations continue to use traditional medicine as a result of historical circumstances and cultural beliefs. Traditional medicine accounts for around 40% of all health care delivered in China. Up to 80% of the population in Africa uses traditional medicine to help meet their health care needs.

**Ayurveda**

The plant finds mention in the verses of the *Charaka Samhita* which is unarguably the most ancient and authoritative textbook of Indian Ayurveda. *Vitex negundo* has been designated as an anthelminthic and is prescribed as a vermifuge in the exposition on the *Charaka Samhita* by Sharma. Other Ayurvedic uses of *Vitex negundo* are described by Tirtha. People sleep on pillows stuffed with *Vitex negundo* leaves to dispel catarrh and headache and smoke the leaves for relief. Crushed leaf poultice is applied to cure headaches, neck gland sores, tubercular neck swellings and sinusitis. Essential oil of the leaves is also effective in treatment of venereal diseases and other syphilitic skin disorders. A leaf decoction with *Piper nigrum* is used in catarrhal fever with heaviness of head and dull hearing. A tincture of the root-bark provides relief from irritability of bladder and rheumatism. Jadhav and Bhutani report the Ayurvedic use of *Vitex negundo* in dysmenorrhea. Patkar refers to the formulations described in *Anubhoga Vaidya Bhaga*, a compendium of formulations in cosmetology, in outlining the use of *Vitex negundo* leaves in a notable rejuvenation treatment known as *Kayakalpa*.

**Chinese medicine**

The Chinese Pharmacopoeia prescribes the fruit of *Vitex negundo* in the treatment of reddened, painful, and puffy eyes; headache and arthritic joints.
Folk Medicine

Folklore systems of medicine continue to serve a large segment of population, especially those in rural and tribal areas, regardless of the advent of modern medicine. The entries regarding the multifarious applications of *Vitex negundo* in folk medicine have been grouped regionally to emphasize the ethnobotanical diversity and ubiquity of the plant; and the details have been laid out in Table 1.

**Table 1 Uses of *Vitex negundo* in folk medicine outside India**

<table>
<thead>
<tr>
<th>S.NO</th>
<th>COUNTRY</th>
<th>LOCAL NAME</th>
<th>USED IN THE TREATMENT OF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Bangladesh</td>
<td>Chittagong</td>
<td>Weakness, Headache, Vomiting, Malaria, Black fever&lt;sup&gt;22&lt;/sup&gt;</td>
</tr>
<tr>
<td>2.</td>
<td>China</td>
<td>Buging’iab</td>
<td>Common cold, Flu and Cough&lt;sup&gt;23&lt;/sup&gt;</td>
</tr>
<tr>
<td>3.</td>
<td>Nepal</td>
<td>Simali, Marvandaey</td>
<td>Sinusitis, Whooping cough&lt;sup&gt;24&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Chest-pain, Backache&lt;sup&gt;25&lt;/sup&gt;</td>
</tr>
<tr>
<td>4.</td>
<td>Pakistan</td>
<td>Nirgud, Kalgari</td>
<td>Used as anti-allergenic agent&lt;sup&gt;26&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
III. PHARMACOLOGICAL EVIDENCE

Demands of the scientific community have necessitated experimental evidence to further underline the medicinal importance of *Vitex negundo* as described above. Taking cue from these traditional and folk systems of medicine, scientific studies have been designed and conducted in order to pharmacologically validate these claims. Anti-inflammatory, antinociceptive, CNS depressant, antifungal, enzyme inhibition, snake venomous, cytotoxic, hepatoprotective, hypoglycemic and immunomodulatory effects were reported from the leaves of *Vitex negundo* Linn.

**Anti-Inflammatory Activity**

The sub-effective dose of *Vitex negundo* potentiated anti-inflammatory activity of phenlbutazone and ibuprofen significantly in carrageenin induced hind paw edema and cotton pellet granuloma models. The potentiation of anti-inflammatory activities of phenlbutazone and ibuprofen by *Vitex negundo* indicates that it may be useful as an adjuvant therapy along with standard anti-inflammatory drugs. Yunos et al. and Jana et al. established anti-inflammatory properties of *Vitex negundo* extracts in acute and sub-acute inflammation which are attributed to prostaglandin synthesis inhibition.²⁹,³⁰

**Antinociceptive Activity**

Tail flick test in rats and acetic acid induced writhing in mice were employed to study the antinociceptive activity of ethanolic leaf extract of *Vitex negundo* (100, 250 and 500mg/kg). The effect was compared with meperidine (40 mg/kg) in tail flick method and aspirin (50 mg/kg, p.o) in writhing test as a standard control respectively. An interaction with naloxone hydrochloride was also studied in tail flick method for its mechanism of central analgesic action. It showed significant analgesic activity in dose dependent manner in both the experimental models. It suggested that *Vitex negundo* possesses both central and peripheral analgesic activity. The central analgesic action does not seem to be mediated through opioid receptors. It may prove to be a useful adjuvant therapy along with standard analgesic drug.³¹

**CNS Depressant Activity**

The methanolic extract of leaves of *Vitex negundo* was found to significantly potentiate the sleeping time induced by pentobarbitone sodium, diazepam and chlorpromazine in mice.³²
Antifungal Activity
Bioactivity guided fractionation of ethanolic extract of leaves of *Vitex negundo* resulted in the isolation of new flavone glycoside. The new flavone glycoside was found to have significant antifungal activity against *Trichophyton mentagrophytes* and *Cryptococcus neoformans* at MIC 6.25 µg/ml.  

Enzyme-Inhibitory Activity
Root extracts of *Vitex negundo* showed inhibitory activity against enzymes such as lipoxygenase and butyrylcholinesterase, α-chymotrypsin, xanthine-oxidase and tyrosinase. It also reported the HIV type 1 reverse transcriptase inhibitory activity of the water extract of the aerial parts of *Vitex negundo* Linn.  

Snake Venom Neutralization Activity
The methanolic root extracts of *Vitex negundo* and *Emblica officinalis* showed anti-snake venom activity. The plant *Vitex negundo* extracts significantly antagonized the *Vipera russellii* and *Naja kaouthia* venom induced lethal activity both in *in vitro* and *in vivo* studies. *Vipera russellii* venom-induced hemorrhage, coagulant, defibrinogenating and inflammatory activity were significantly neutralized by both plant extracts. No precipitating bands were observed between the plant extract and snake venom.  

Hypoglycemic Activity
Villasenor and Lamadrid have provided an account of the anti-hyperglycemic activity of *Vitex negundo* leaf extracts.  

Contraindications
*Vitex negundo* Linn should be used with caution with the concurrent use of psychotropic drugs, including analgesics, sedatives, antidepressants, anticonvulsants and antipsychotics. *Vitex negundo* is quite similar botanically to the better studied *Vitex agnus castus*, and thus may have a similar range of contraindications, including the concurrent use of progesterogenic drugs and hormone replacement therapies.  

IV. CONCLUSION
A popular quote of the Western Himalayas says that a man cannot die of disease in a region where *Vitex negundo* is found, obviously, if he knows appropriate usage of the plants. Even in the Indian traditional community, *Vitex negundo* is uttered as “sarvaroganivarini”, the remedy for all diseases. Almost all parts of the plant are use in preparing herbal medicines. The plant is
known to possess antimicrobial, anti-inflammatory, antihyperpigmentation, hepatoprotective and related activities. Scientifically explored exhaustive reports of the plant, their medicinal properties and active chemical constituents have a role in the management of various human ailments. This review attempts to encompass the available literature on *Vitex negundo* with respect to its traditional uses, chemical constituents and summary of its various pharmacological activities.

**REFERENCES**


