



Review Article

PHARMACOLOGICAL PROPERTIES OF *NIRGUNDI*: A REVIEW

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ABSTRACT

Owing to wide range of medicinal properties, *Nirgundi* is very useful herb. It is used for its medicinal values for thousands of years by the people all over the globe. The folklore healers use the plant for various ailments. As per Ayurvedic system of medicine, its *Rasa* is *Katu*, *Tikta* and *Kashaya* and it pacifies *Vata* and *Shleshma*. Its property is *Laghu* and *Veerya* is *Sheetoshna* and is used in the treatment of various disorders like *Pleeha rog*, *Gulma*, *Krimi*, *Kushtha*, *Vrana*, *Visha* and *Aruchi*. Available ancient and modern contemporary literature has been studied thoroughly while preparing this article so as to put all the available knowledge about the herb at one place. Various properties possessed by the plant have been evaluated in different studies, and results or observations of few of such prominent studies have been presented here to enrich the knowledge. Review of the available literature showed that it possesses various pharmacological activities like cardiogenic, anti-inflammatory, analgesic, anti-histaminic, anti-cancerous, anxiolytic, anti-asthmatic, hepatoprotective etc. All these properties have been authenticated by various experimental and clinical studies. So keeping in view the huge potential of the plant, further research is suggested to extract maximum benefits for the benefit of the society.

KEYWORDS: *Nirgundi*, *Vitex negundo*, Ayurveda, *Sindhuvaa*.

INTRODUCTION

Nirgundi is a Sanskrit word, which means it protects the body from infections. The botanical name of *Nirgundi* is *Vitex negundo* and it belongs to the family Verbenaceae^[1]. This herb finds place in all the *Samhitas* of Ayurveda. Bhavapraksh has described two varieties of *Nirgundi*. One is *Sindhuvaa* and the second is *Suvaha*^[2].

Vitex negundo Linn. is an aromatic shrub which may grow into a small tree. It is woody and it thrives well in humid places or along the water courses in wastelands. It is also found to grow well in mixed open forests. It is reported to occur in Afghanistan, India, Pakistan, Sri Lanka, Thailand, Malaysia, Eastern Africa and Madagascar. The plant usually bears tri-foliolate or penta-foliolate leaves on the branches which are quadrangular and which give rise to bluish-purple flowers in branched tomentose cymes. The plant is grown as crops on commercial scale in parts of Asia, Europe, North America and the West Indies^[3]. The plant grows all over India, and is commonly cultivated as a hedge plant. The fruits of the plant are ovoid or obovoid, four sided drupes, black when ripe^[1].

The world is gradually turning to herbal formulations which are known to be effective against a large number of diseases and ailments along with the added benefit that they are not known to cause any notable derogatory effects^[4]. This makes the exploration and use of the wisdom of the herbs against the diseases the need of the hour. To fulfill this need of the ailing humanity, it becomes necessary to explore the ages old indigenous wisdom in the field of health i.e., Ayurveda. All the classic texts of Ayurveda explain the properties and medicinal uses of numerous herbs. *Vitex negundo*, the *Nirgundi* finds its place in almost all classical Ayurvedic texts.

Ayurvedic Properties and Uses

Its *Rasa* is *Katu*, *Tikta* and *Kashaya*^[5] and it pacifies *Vata* and *Shleshma*^[6]. Its property is *Laghu* and *Veerya* is *Shhetoshna*^[7].

According to the description available in Ayurvedic texts, *Nirgundi* possesses *Kirimighna* and *Vishghna* properties^[8]. Flowers of the plant pacify *Pitta*^[9]. *Sushrut* has classified *Nirgundi* in the group *Sursaadi Gana*, the herbs of which pacifies *Kapha*, are wormicidal, helpful in *Pratishyaaya*, *Aruchi*, *Kaasa*,

and are *Vranashodhan*^[10]. It is helpful in the treatment of *Krimi*, *Kushtha* and *Ruja*, and alleviates *Pleeha rog*, *Gulma* and *Aruchi*^[11]. It is intellect promoting, good for eyes, carminative, good for hair health, and is antitoxic^[12].

HEALTH BENEFITS OF VITEX NEGUNDO

Every individual part of the plant has different use. Leaves of the plant possess anti-inflammatory and analgesic properties. They are helpful in removing worms and foetid discharge from wounds. Leaves also possess anti-histaminic, hepatoprotective and CNS depressant properties. Leaves of *Vitex negundo* are also used for their snake venom neutralizing properties^[13]. Flowers of the plant are used in liver ailments and in diarrhoea. Flowers of the plant are also used for their febrifuge and astringent properties. Fruits of the plant possess vermifuge and emmenagogue properties. They also act as nervine tonics. Seeds of *Vitex negundo* possess antitoxin properties. Oil of the seeds is used in scrofulous sores and to the sinus. Roots of the plant are diuretic, expectorant and febrifuge and are also used as tonic. Whole plant possesses analgesic, anti-gastalgic, anti-parasitic and anti-flatulant activities. It is also used for its emmenagogue and galactagogue properties^[14].

Pharmacological Properties of Nirgundi

Cardiotonic Activity

Cardiotonic activity of the aqueous extract of *Vitex negundo* leaves was proven by significant increase in the height of contraction even at the lower doses. The extract showed wide therapeutic index as it produced therapeutic effect in the dose range of 0.25mg to 2mg without producing cardiac arrest, while digoxin showed cardiac arrest at dose 0.2mg. In view of the above findings, extract of the *Vitex negundo* can be safe and potent alternative to digoxin in management of congestive heart failure^[15].

Anti cancer Activity

In studies to assess the histomorphological effects of *Vitex negundo* extracts in rats, it was observed that even by toxic doses, the stomach tissues remained unaffected^[16]. The study observed that there were changes in lung, liver and heart tissues, which were dose dependent. COLO-320 tumour cells were used to affirm the cytotoxic effects of leaf extracts of *Vitex negundo*^[17]. The chloroform extract of the leaves of *Vitex negundo* was found to be toxic to the human cancer cell line panel^[18] but was non cytotoxic on genitourinary and mammary cells of mice^[19].

Antiasthmatic Activity

Ethanollic extract and various fractions like petroleum ether, aqueous leaves of *Vitex negundo*

were evaluated for antiasthmatic activity by various experimental models like mast cell degranulation by compound 48/80, passive cutaneous anaphylaxis, and egg-albumin induced asthma. Dexamethasone was used as a reference standard. Ethanolic extract, and aqueous of leaves of *Vitex negundo* were found to be effective in various experimental models of asthma. Stabilization of mast cells, inhibitory effects on immediate hypersensitivity reactions and antieosinophilic activity appeared to be involved in its mode of action^[20]. In another study it was concluded that aqueous subfraction of leaves of *Vitex negundo* possesses antieosinophilic activity. It reduced bronchial hyper responsiveness and bronchial inflammation^[21]. *Vitex negundo* seems to be a promising plant for treatment of bronchial asthma because of its reported immunomodulatory and anti-inflammatory activity^[22]. In another study it was concluded that AE, EAF, and AF of *Vitex negundo* leaves were effective in various experimental models of asthma. The probable modes of action were the antieosinophylic activity, stabilization of mast cells and inhibitory effects on immediate hypersensitivity reactions^[23].

Anxiolytic Properties

In the studies conducted to evaluate the anxiolytic effects of leaves of *Vitex negundo*, this property of the extract was found to be similar to that of Diazepam in the mice subjected to elevated plus maze test. These findings were in accord with the traditional use of ethanolic extract of *Vitex negundo* and establish that it could be useful in primary medical care^[24].

Anti-inflammatory Effects

A study conducted to evaluate the anti-inflammatory effect of leaf oil of *Vitex Negundo* showed that oil of *Vitex negundo* prevented carrageen induced inflammation via COX-2 inhibition, this indicates that *Vitex negundo* leaf oil possesses potent anti-inflammatory property and acts via the inhibition of COX-2 receptor without interfering COX-1 inhibition^[25].

Anti-oxidant Activity

Plant of the *Vitex negundo* is a source of many natural antioxidants^[26]. A phytochemical which is very strong antioxidant, named as Vitedoin A^[27], is present in the plant and is reported to have more antioxidant activity than L-cystine and Vit E. A study conducted to validate the antioxidant potential of leaf extract of *Vitex negundo* showed that it reduced the levels of catalase, superoxide dismutase and glutathione peroxidase in Freund's adjuvant induced arthritic-rat^[28]. It is also reported that due to presence of Vit C, flavonones and carotene present in it, extracts of *Vitex negundo* reduce the lipid

peroxidation and thus are capable to combat the oxidative stress^[29]. Another study suggested that anti-inflammatory effect of the plant could be due to the prevention of oxidative damage to the tissue^[30]. Owing to the presence of flavonoids and polyphenols in the extract of *Vitex negundo*, it also exhibits scavenging activity towards the 1,1-Diphenyl-2-picrylhydrazyl (DPPH) radicals^[26].

Hepatoprotective Activity

Negundoside and Agundoside present in the extracts of *Vitex negundo* have been reported to improve the liver the functions and reduce the markers like Serum Bilirubin, Alanine Aminotransferase, Alkaline Phosphates, Aspartate, Aminotransferase and Total Protein (TP) levels in liver damage. Extracts of leaves of *Vitex negundo* possess hepatoprotective activity against liver damage induced by d-galactosamine^[31], carbon tetrachloride and commonly used antitubercular drugs^[32]. In another study, hepatic cell protective effect of ethanolic extract of *Vitex negundo* leaves against the injury induced by paracetamol in rats at the dose of 300 mg/kg/body weight was authenticated^[33].

Antibacterial Activity

In a study to evaluate the antibacterial effects, *Vitex negundo* exhibited significant activity against *E. coli*, *K. aerogenes*, *P. vulgaris* and *P. aerogenes* at all dosages. Extract of leaves of *V. negundo* showed activity against all bacteria at all dosages. A standard disc containing chloramphenicol antibiotic drug (30 mg/disc) was used as a positive control^[34]. Prominent activity was observed against *Bacillus subtilis*. Significant inhibition was demonstrated by the methanol extract of *Vitex negundo* against *Bacillus cereus*, *Pseudomonas aeruginosa* and *Salmonella typhi*. Most prominent inhibitory activity was demonstrated by Pet-ether and carbon tetrachloride fractions against *Bacillus subtilis*, *Bacillus megaterium*, *Salmonella typhi* and *Vibrio mimicus*, and this activity was quiet prominent in comparison to the standard antibiotic kanamycin. The pet-ether fraction and the methanol extract showed profound activity against *Candida albicans* and *Aspergillus niger* respectively^[35]. Another study revealed significant activities of the *Vitex negundo* extracts against Methicillin resistant *Staphylococcus aureus*^[36].

CNS Activity

In a study conducted to evaluate the CNS activity of petroleum-ether extract of *Vitex negundo*, it was observed that petroleum-ether extract of *Vitex negundo* exhibited hypnotic and analgesic activity in a dose dependent manner, whereas the anticonvulsant activity was observed at high dose^[37].

Embryo Protective Effect

In an experimental study that was conducted to study the hepatoprotective effect of herbal drug on Adriamycin induced toxicity in the developing chick embryos, it was observed that pre-treatment with leaf extract of *Vitex negundo* significantly reduced the adverse effects of Adriamycin by restoring the peroxidant/ antioxidant balance and biochemical parameters in developing chick embryos^[38].

Drug Potentiating Ability

In various studies conducted to study the effects of *Vitex negundo* extracts on various diseases and systems, it was observed that administration of extracts of *Vitex negundo* enhanced the effects of various commonly used anti-inflammatory drugs, such as ibuprofen and phenylbutazone^[39]; analgesics like meperidine, aspirin^[40]; morphine and pethidine; sedative-hypnotic drugs, such as pentobarbitone, diazepam^[41] and chlorpromazine^[42]; anti-convulsive agents like diphenylhydantoin and valporic acid^[43].

Effect on Reproductive Potential

A study observed that a disruption was caused by flavonoid rich extract of *Vitex negundo* seeds in the later stages of spermatogenesis in the dogs^[44]. It also interfered with the reproductive function in the male rats^[45]. Estrogen like activity exhibited by ethanolic extract of the plant may enable its use in hormone replacement therapy^[46]. Owing to the above findings, the traditional claim of plant having aphrodisiac property is contradicted^[47].

Antiproliferative Properties

It was observed in a study conducted to assess the antiproliferative properties and PASS (predicted activity of antioxidant) on hepatoma cells in humans that the *Vitex negundo* extract significantly enhanced antioxidant activity and proposed a tumour preventive action against HepG2 cell lines. This action was dose and time dependent and there was lower toxicity towards WRL68 cells. In addition to this, on morphological analysis using AO/EB staining, it was revealed that the inhibition of the growth and proliferation was through proteolytic cleavage of caspase-3 protein and intrinsic apoptosis pathway^[48].

Mast Cell Stabilizing Activity

In a study to evaluate Mast cell stabilising activity of various subfractions of leaves of *Vitex negundo*, it was found NaOH fraction of Ethyl acetate fraction of *Vitex negundo* leaves displayed mast cell stabilising activity. It was thought to be useful as anti-asthmatic, anti-inflammatory, and anti-allergic agent^[49].

Insecticidal and Pesticidal Activities

The products prepared from the plants of *Vitex negundo* have been reported to possess insecticidal action against the stored product pests, larvae of house flies, mosquitoes and tobacco leaf eating larva. Repellent action was demonstrated by leaf oil of *Vitex negundo* against stored product pests [50].

Miticidal Activity

Methanolic extract of *Vitex negundo* was evaluated for its miticidal effects on skin of camel, buffalo, goat, dog and human affected with scabies. It was observed that the topical application of 10%, 20% and 30% concentration of the extract produced a mortality of the *Sarcoptes scabiei* mites at a rate of 70%, 80% and 90% respectively. These findings were helpful to conclude that the extract of *Vitex negundo* could be used as an effective bio-medicine for the management of the human and animal skin scabies [51].

Antipyretic Property

Antipyretic effect of the leaf extract of *Vitex negundo* in yeast provoked elevation of body temperature was significant and was comparable to the antipyretic action of Paracetamol. Therefore it can be concluded that *Vitex negundo* has antipyretic action. These findings support the ethnopharmacological use of *Vitex negundo* as antipyretic [52].

CONCLUSION

Nirgundi, the *Vitex negundo*, is a very important herb which has been used for ages due to its medicinal values. Its use in preventing and curing various diseases ranging from mild pains to severe cardiac disorders and cancer makes it a hope for the future trends in medicine. *Vitex negundo* finds its place in almost all the systems of medicines including Ayurveda, allopathy, homoeopathy, Chinese medicine and even the folklore healing methods. It is used to treat day to day diseases like cough and cold. Owing to the high levels of therapeutic effects and negligible adverse effects of the herbs described in Ayurveda and elsewhere, the whole world is looking with hope towards these systems. The main cause remains the ever increasing reporting of adverse effects and continuously decreasing efficacy of allopathic drugs, especially the antibiotics. *Vitex negundo* possesses a wide variety of bioactive molecules and nutrients, and it has a wide range of pharmacological properties and thus can be hope for the future in the preventive and curative medicine. Therefore further research is required to authenticate and establish these pharmacological actions of *Vitex negundo* so that the ailing humanity is benefitted to the maximum.

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