



MEDICINAL VALUES AND PHARMALOGICAL ACTIVITIES OF *VITEXNIGUNDO LINN*

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ABSTRACT

Key Words

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Herbal medicines are a types of alternative medicine that originates from plant and plants extracts. One of such plant is *Vitex negundo* also known as five -leaved chaste tree or Nirgundi belongs to Verbenaceae family. it is distributed throughout the India. Almost all parts of the plant used in traditional medicine. Phytochemical analysis of leaf extract shows the presence of alkaloids, Flavonoids, Phenols, Saphonins, Tannins, & Essential oils. And enormous Pharmalological activities like Anti-inflammatory, Antibacterial, Anti-HIV, Nephroprotective, Anti-oxidant activity, Wound healing activity. Synthesis of silver nanoparticles, Inhibiting melanin production, Drug potential activity, CNS depressant activity, Insecticidal & Pesticidal activity, Enzyme inhibitory Activity, Effect on reproduction potential. The medicinal values taxonomical Description, Distribution and History. Here in we present a review of all such data related to *Vitex negundo*.

INTRODUCTION

Vitex negundo Linn, belonging to family Verbenaceae, commonly known as five leaved chaste tree [1]. which is a large family of herb, shrubs and trees comprising of about 75 genera and nearly 2500 species. *V. negundo Linn* [2]. Some common names are in Hindi -Nirgundi and in Sanskrit as Sindhuvara. It commonly bears tri- or

Pentafoliate leaves on quadrangular branches, which give rise to bluish-purple colored flowers in branched tomentose [3]. Flowers occur throughout the year [4]. Nirgundi is already in clinical use in several traditional systems of medicine including Ayurveda, Unani and Siddha for management of Pain, Headache, Inflammation, Leucoderma,

Enlargement of the Spleen, Rheumatoid arthritis, Gonorrhoea, Bronchitis, Fever, Cold and Cough [5]. The extracts from its leaves and roots are the most important in the field of medicine and drug. The leaves of *V.negundo* have been reported to possess Pesticidal, Antifungal properties [6]. The leaves are aromatic, tonic and vermifuge. A decoction of Nirgundi leaves is given with the addition of long pepper in catarrhal fever with heaviness of head and dullness of hearing. A pillow stuffed with the leaves of Nirgundi is placed under the head for relief of headache. The juice of leaf is said to have the property of removing foetide discharges and worms from ulcer [7]. The leaves of *Vitex negundo* Linn are Antibacterial, Laxative, Antioxidant, Anticonvulsant, Hypoglycemic, and Anti-inflammatory properties [8]. Dried leaves when smoked are said to relieve catarrh and headache. Its oil is used as bathing oil, for rubbing on the head and in cervical lymphadenitis. It has been used in bloating of stomach, entrails and bowels. One of the ancient uses of *V. negundo* documented in Ayurveda is to provide mental peace[9]. This herb is utilized to treat female disorders especially disorders that are linked with female reproductive system and to decrease sexual desire. Moreover, it is also used as Antipyretic Anti-androgenic and for Analgesic activities [10]. Phytochemical analysis of *V. negundo* leaves revealed the presence of Alkaloids, Flavonoids, Glucoside, Iridoid glycosides and essential oil with some other constituent such as Vitamin C, Carotene, Glucononital, Benzoic acid, β - sitosterol and C-glycoside. These phytoconstituents are accountable for its different biological actions [11].

History: The Sanskrit word for *V. negundo* – Nirgundi literally means that which protects the body from the diseases. People in ancient India identified two varieties of Nirgundi. One bearing white flowers (swethapusphi) called Sindhuvar, and other having blue flowers (Pusphanilika) designated as nirgundi in Sanskrit. The Amarakosha (500-800CE) lists various names assigned to nirgundi as Sindhuk, Sindhuvara, Indhasurasa, Nirgundi, Indranika, & Sindhuar. The ancient treatise Varahamihira's *Brhat Samitha* (c.500CE) identifies two names as Sindhuvara and

Sindhuka. In the Puranas, it is referred to by four names: nirgundi [Matsyapurana (MP)], nirgundika, sindhuvara (MP), & Sindhuvaraka [Agnipurana, MP, Brahma Vaivarta Purana (BVP)]. The agricultural treatise Surapala's *Vrikshayurveda* referred to is as nirgundi. Scephali (ka) and Sindhuvara. There is no reference to Sindhuvara in the Vedas. While the several references occur in post-Vedic works such as the epic Mahabaratha (3000BCE), Kautilya's *Arthashastra* (321-296BCE), and Aruyvedic classics such as Kalpasthana, Susrutha Samith (400BCE), Astangahridaya (700CE), Vidyamanorama (800-1000CE), Vrndamadhava (9th Century CE), Bangasena, Chakradatta (1055CE), Rasaratnasamuccaya (1300CE) Yogaratnakara (Sanrarasa, 1400CE), Bhavaprakasha (1500CE). The classical Sanskrit literature such as Kalidasa's *Ritu Savambhara* and Bhanabatta's *Harshacharitha* and Kadambari also identify the refer to these two varieties. Probably the earliest reference on the blue variety of nirgundi/ka occurs in the *Charaka samhita* (c.700BCE). It is evident that reference to sindhuvara appear earlier in classical Sanskrit literature than references to nirgundi [12]. In the ancient times this drug was known because of its property to reduce sexual desire and it is recorded that Roman wives whose husbands were abroad with the legions spread the aromatic leaves on their couches for this purpose. The name Monk's berry or Monk's pepper is given to this drug because in ancient times monks were used to chew the berries of nirgundi to reduce their sexual desire. Stem of the plant was found to be beneficial because of its actions upon pituitary gland, specially its effect on production of luteinizing hormone and its reducing effect on prolactin secretion which in turn may benefit some infertile women as well as women with breast tenderness associated with premenstrual syndrome. Plant may also be used to reduce hot flashes due to reduced progesterone production during menopause. It may also be used to regulate ovulatory cycles. In early times the oil obtained from plant leaves was used to treat intense pain due to gout, rheumatism and sciatica and general body ache[13].

Taxonomical Description: *Vitex negundo* is an erect shrub or small tree growing from 2 to 8 m (6.6 to 26 ft) in height. The bark is reddish-brown. Its leaves are digitate, with five lanceolate leaflets, sometimes three. Each leaflet is around 4 to 10 cm (1.6 to 3.9 in) in length, with the central leaflet being the largest and possessing a stalk. The leaf edges are toothed or serrated and the bottom surface is covered in hair. The numerous flowers are borne in panicles 10 to 20 cm (3.9 to 7.9 in) in length. Each is around 6 to 7 cm (2.4 to 2.8 in) long and is white to blue in color. The petals are of different lengths, with the middle lower lobe being the longest. Both the corolla and calyx are covered in dense hairs [16]. The fruit is succulent, black when ripe, rounded and about 4 mm in diameter [17].

Distribution: *Vitex negundo* (Verbenaceae), a large aromatic shrub up to 45 meters in height is found throughout the greater part of India growing up to an altitude of 1500 m in the outer Himalayas [18]. It thrives in humid places or along water courses in wastelands and mixed open forests [19]. It is also abundantly found in all parts of Maharashtra, Sub-Himalayan tract, Plains of North India to the Peninsular India. Globally distributed in countries like Tropical Eastern and Southern Africa and Asia. It also found in Afghanistan, Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Japan, Korea, Kenya, Madagascar, Malaysia, Mozambique, Myanmar, Nepal, Pakistan, the Philippines, Sri Lanka, Taiwan, Tanzania, Thailand and Vietnam [20].

Chemical constituents: Leaves contain an Alkaloid nisindine, Flavonoids like flavones, Luteolin-7-glucoside, an essential oil and other constituent like Vitamin C, Carotene, Gluco-nonital, Benzoic acid β -sitosterol, Benzoic acid and Phthalic acid, Anti-inflammatory diterpene, Flavonoids, Artemetin and Triterpenoids. Fatty acid, β sitosterol, Vanillic acid, P-hydrobenzoic acid and Luteolin have been isolated from bark. Stem bark yields Leucoanthocyanidines [21]. Viridiflorol, Sabinene, Casticin, Negundin A, Negundin B, Vitrofolal A, various Terpenes, Flavanone and acids have been isolated from the leaves and roots of *V. negundo* Further phytochemical investigation will provide information about the bioactive constituents

present in *V. negundo* responsible for its therapeutic activity [22].

Medicinal uses: Roots, Barks, Leaves and Fruits are highly medicinal. Roots are one of the ingredients of the drug Dasmula arista; used in Colitics, Dysentery, Diarrhea, Flatulence, Fever, Vomiting and Colic.

Roots and barks: Used for relieving intermittent fever, thirst and body pain.

Leaves: used for treating Opthslmis, Deafness, indigestion, piles and Jaundice, leaf Juices are used in curing Catarrhal and fever. Tender fruits are bitter Astringent, Antilaxatives. Digestion, Promote digestion and strength, as well as overcome Diarrhea & Dysentery.

Ripe fruits: nutritious, cooling used in treating indigestion and improve vision [24].

Pharmalogical Activities

Antibacterial Activity: Essential oils and successive ethyl acetate and ethanol extracts of *Vitex negundo* Linn. showed antibacterial activity against *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli* and *Pseudomonas aeruginosa* bacterial strains. Main constituents identified in leaves oil were d-guaiene, Carryophyllene epoxide and Ethylhexadecenoat; In flowers oil α -selinene, germacren-4ol, carryophyllene epoxide and (E) -nerolidol while fruit oil showed β -selinene, α - cedrene, germacrene D and hexadecanoic acid as the main constituents which help for antibacterial activity [26].

Anti-inflammatory and analgesic Activity: Anti-inflammatory and pain suppressing activities of fresh leaves of *vitex negundo* are attributed to Prostaglandin synthesis inhibition. Antihistamine, Membrane Stabilizing and Antioxidant activities [27].

Antioxidant activity: *Vitex negundo* exhibited a potent scavenging activity for (2, 2'-azino-bis 3-ethylbenzothiazoline-6-sulfuric acid) ABTS radicalcations in a concentration dependent manner, showing a direct role in trapping free radicals. The polar fractions of *Vitex negundo* possess potent antioxidant properties.

The extracts also possess the ability to combat oxidative stress by reducing lipid peroxidation owing to the presence of flavones, Vitamin C and Carotene. Leaf extracts of *Vitex negundo* were determined to possess Anti-oxidant potential. The extracts were found to be useful in decreasing levels of superoxide dismutase; catalase and glutathione peroxidase in Freund's adjuvant induced arthritic rats. The antioxidant and therapeutic potential of *Vitex negundo* flavonoids in modulating solenoid-induced cataract and found it to be effective [28].

Antifungal Activity: Bioactivity guided fractionation of ethanolic extract of leaves of *Vitex negundo* resulted in the isolation of new Flavonine Glycoside along with five known compounds. All the isolated compounds were evaluated for their antimicrobial activities the new flavone glycoside and compounds 5 were found to have significant antifungal activity against Trichophyton Mentagrophytes and Cryptococcus neuroformans at mice 6.25mg/ml [29].

CNS Depressant Activity: A methanolic extract of the leaves of *Vitex negundo* was found to significantly potentiate the sleeping time induced by pentobarbitener sodium diazepam chlorpromazine in mice [29].

Enzyme Inhibitory Activity: Root extracts of *Vitex negundo* showed inhibitory activity against enzymes such as Lipoxygenase Butyryl-cholinesterase, α -chymotrypsin, Xanthine-oxidase, Tyrosinase. HIV type-1 reverse transcriptase inhibitory activity of the aqueous extract of the aerial parts of *Vitex negundo* has also been reported [30].

Nephroprotective Activity

The methanolic extracts of bark were tested for Nephroprotective activity against kidney damage which was induced chemically by oral administration of paracetamol in male wistar rats. The kidney damage was studied based on the assessment of biochemical parameters such as serum glutamate pyruvate transaminase (SGPT), serum glutamate oxaloacetate transaminase (SGOT), alkaline phosphate (ALT), bilirubin, total protein and

enzymatic antioxidant SOD, CAT, GSSH, GPx, Px, Non-enzymatic antioxidants (GSH) and it was concluded that the methanolic extracts of Nirgundi bark shows a significant reduction in biochemical parameters has Nephroprotective activity [31].

Wound healing Activity

Munamad ibraham et.al reported that an improved rate of wound contraction and reduction in healing time in animals treated with ointment containing *V.negundo* leaf extracts in both incision and excision wounds . 25%Agnuside (Group III) was found to be the most effective and quickest when compared to the ethanolic extract (Group II) tried in both types of wounds. The wound healing rate was significantly greater than that of the control and almost nearer to that of the standard drug, Soframycin [32].

Inhibit Melanin Production

Huey-Chun Huang et.al (2012) was first report concerning the inhibitory effect of the essential oil isolated from the leaves of *V. negundo* Linn on melanin production. They also analyzed the chemical composition and antioxidant capacities of the essential oil. The study concludes that *V. negundo* Linn essential oil shows antioxidant potential while simultaneously inhibiting melanin synthesis in B16F10 melanoma cells. The results indicated that *V. negundo* essential oil decreased melanin production and this may be attributed to its inhibitory action upon the signaling pathway regulating tyrosinase activity and/or depletion of cellular oxidative stress. The essential oil can thereby serve as a natural antioxidant which could also inhibit melanin production. Also essential oils extracted from leaves of *V.negundo* Linn could be added to the cosmetic formulation of skin-whitening products [33].

Synthesis of nanoparticles

Nano-silver particles with an average size of 18.2 ± 8.9 nm and spherical shapes were synthesized using methanolic extract of *Vitexnegundo* leaf. It plays an important role in the reduction and stabilization of silver to silver nanoparticles [34].



Fig 1: *Vitexnegundo* leaves and Inflorescence.

Vernacular names

Table.1: Regional names of *Vitex negundo* Linn

Languages	Names
Telugu	Vaavili.
Tamil	Nirkundi, Nirgundi.
Hindi	Shivari, Nirgundi.
Malayalam	Vellanocchi, Indranee, karunacci.
Kannada	Nikkilu, Lakkigida, Nekka, Nakkigida.
Punjab	Shwari.
Assam	Aslok.
Bengal	Nirgundi, Nishinda.
English	Five Leaved Chastre Tree.
Guajarati	Nagod.
Marathi	Nirgundi.
Punjabi	Sambhali, Banna.
Sanskrit	Nirgundi.

Source:(Vadana Barathi et.al,2017) [14].

Taxonomic Classification

Table. 2: Classification of *Vitex negundo* Linn

Kingdom	Plantae	Plants
Sub Kingdom	Tracheobionta	Vascular plants
Super Division	Spermatophyta	Seed plant
Division	Magnoliophyta	Flowering Plant
Class	Magnoliopsida	Dicotyledons
Sub Class	Asteridea	
Order	Lamiales	
Family	Verbenaceae	
Genus	Vitex Linn	
Species	Vitex nigundo Linn	Chaste Tree

Source:(Mohammed Abu Bin Nayeem et al ,2017) [15].

Table 3: Phytochemical Analysis of Ethanol, Methanol, and Acetone Extract of Nirgundi leaves.

Where (+)= Present & (-) =Absent

Phytochemical content	Solvent system	Plant extract
Phenolic compound	Ethanol	+ve
	Methanol	+ve
	Acetone	+ve
Alkaloids	Ethanol	+ve
	Methanol	+ve
	Acetone	+ve
Tannins	Ethanol	+ve
	Methanol	+ve
	Acetone	+ve
Flavonoids	Ethanol	+ve
	Methanol	+ve
	Acetone	+ve
Proteins	Ethanol	-ve
	Methanol	-ve
	Acetone	-ve
Saphonins	Ethanol	+ve
	Methanol	+ve
	Acetone	+ve

Source: (kauntal pal et.al, 2018 & Kruti dave et.al, 2017) [23&16].



Five Leaved Chaste Tree.

Table 4: some common, Ethno medicinally important species of genus Vitex.

Name	Uses	Distribution
Vitex agnus-castus	Premenstrual syndrome (PMS) treat pain, swelling, inflammation, headaches, rheumatism, and sexual dysfunction	Mediterranean and western Asia. It is now cultivated all over the world, including the southern part of the United States
Vitex trifolia L	Fungicidal, bactericidal, cytotoxic and insecticidal	India and Mexico
Vitex rehmannii Guerke	Treat hysteric fits	Zulu, Africa
Vitex wilmsii Guerke	Bark infusions are taken as purifying emetics by adults when a kraal member is dying. treat hysteric fits	Zulu
Vitex negundo var. cannabifolia (Sieb. et Zucc.) Hand.-Mazz.	Diarrhea, stomachache, asthma, detoxification	Guangdong southeast coast of China, Hong Kong
Vitex rehmannii	Enema for stomachache	Zulu Africa
Vitex rotundifolia	Upper respiratory infection	Korea

Source: (Bonsad et al. 2009) [25].

Insecticidal and Pesticidal Activity

Vitex plants possess promising potent repelling activity against mosquitoes and other bloodsucking insects. The leaf extracts did not cause any Uneasiness or Skin irritation to the human volunteers. Leaf extract of *Vitex negundo* use to control of vector mosquitoes. Plants can provide safer alternatives for modern deadly poisonous synthetic chemicals [35].

Drug potentiating ability

Administration of *Vitex negundo* Linn extracts potentiated the effect of commonly used Anti-inflammatory drugs such as Ibuprofen and Phenylbutazone analgesics such as Meperidine, Aspirin, Morphine and Pethidine; sedative-hypnotic drugs like Pentobarbitone, Diazepam and

Chlorpromazine; Anti-convulsive agents such Diphenylhydantoin and Valporic acid [36].

Effect on reproductive potential

The flavonoid rich fraction of seeds of *Vitex negundo* caused disruption of the latter stages of spermatogenesis in dogs and interfered with male reproductive function in rats. ethanolic extracts of *Vitex negundo* showed Estrogen-like activity and propounded its use in hormone replacement therapy [37].

Other Activities

The aqueous extract of the plant is reported for its laxative effect. Anti-histaminic activity of the plant against histamine release from mast cells has also been validated ∴. Methanolic root extracts of *Vitex negundo* showed antagonization of the lethal activity induced by venom of *Vipera russelli* and

Naja kauthia [38]. Leaves of this plant have been shown antiulcerogenic antiparasitic antimicrobial properties [39]. An ethanolic extract was tested for anthelmintic activity against the Indian earthworm *Pheritima posthuma* [40].

DISCUSSION

Herbal medicines are in great demand in the developed as well as developing countries for primary healthcare because of their wide biological and medicinal activities, higher safety margins and lesser costs [41]. Medicinal plants contribute nearly 25% of the prescribed drug in the world market. In recent years screening of such plants for biological activities has resulted in the development of therapeutics used in the treatment of cancer, AIDS and others [42]. Traditionally *Vitex negundo* having the folk claims like useful in treatment of Rheumatism, Insecticidal, Antimicrobial, Anticancer properties [43]. Several plant constituents like Flavonoids, Quinonoid, Xanthene, Polyphenols and Terpenoids possessed protein binding and enzyme inhibiting properties [44]. Almost all parts of the plant are used in preparing herbal medicines. The plant is known to possess Anti-inflammatory, Anti fungal, Anti – oxidant, Anti-hyperpigmentation, Hepatoprotective, Antihistaminic, Analgesic 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 [45]. *Vitex negundo* contains many polyphenolic compounds, Terpenoids, Glycosidiciridoids and Alkaloids. Since polyphenolic compounds have high antioxidant potential [46].

CONCLUSION

Medicinal plants, which are backbone of traditional medicine. The value of medicinal plants as potential sources of new compound of therapeutics value and as sources of lead compound in the drug development *Vitex negundo* Linn is having multiple uses which help in the treatment of various ailments. In Ayurveda and Unani systems of medicine. This herb is used in pharmaceutical industry for its various

properties. The plant shows presence of many chemical constituents, which are responsible of the various activities of the plant such as, Antibacterial activity, Anti-inflammatory, Anti-oxidant activity, Anti-fungal, Enzyme inhibitory, Nephroprotective, wound healing activity, Inhibiting melanin production, Insecticidal, Synthesis of silver nanoparticles, Drug potential activity. Effects on reproductive potential etc. were reported in this literature.

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