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VITEX NEGUNDO: MEDICINAL VALUES, BIOLOGICAL ACTIVITIES, AND PHYTOPHARMACOLOGICAL ACTIONS

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ABSTRACT

Vitex negundo is another Indian herb with extensive historical uses for numerous ailments. A member of the Verbenaceae family, the small tree Vitex negundo has thin, gray bark. The herb is abundant and has pharmacological effects against a variety of ailments in conventional medicine. Numerous secondary metabolites, including alkaloids, phenols, flavonoids, glycosidic iridoids, tannins, and terpenes, are present in all parts of the plant, but especially in the leaves. The plant is said to have a variety of therapeutic uses due to its abundance of phytochemicals, including antibacterial, anti-inflammatory, astringent, bronchodilator, CNS depressant, emmenagogue detoxifying, diuretic, anticancer, and hepatoprotective properties. In addition, it has larvicidal, insecticidal, and repellent uses. Leaf extract is used as an anthelmintic, nerve tonic, and sedative. It became known as the chaste berry tree. Widely cultivated in the Americas, Europe, Asia, and the West Indies, this plant is found in Indo-Malesia. It can be found in most parts of India as well as the outer Himalayas. The plant has the potential to be an effective biocontrol agent and is included in several commercially available herbal supplements. The use of methods such as cell and tissue culture would allow rapid propagation and maintenance of plant species and, from a phytochemical perspective, would provide scope for improving the number and quality of bioactive secondary metabolites naturally produced by plants.

Keywords: *Vitex negundo*, Traditional uses, medicinal Values, anti-inflammatory.

INTRODUCTION

Medicinal plants have been a significant source of therapeutic compounds to treat human diseases since ancient times. Natural medicine has regained popularity over the past decade, largely due to the widespread notion that it is healthier than manufactured medicines. Due to the growing worldwide interest in the use of medicinal plants, medicinal plant-based companies have multiplied in recent years. The evaluation of plant products based on their therapeutic and medicinal properties provides a framework for the development of novel drug molecules from diverse plant sources. The Vitex negundo is an important plant. This plant belongs to the verbena family and is also known as five-leaved chasteberry and Nir gundi in Hindi (English).

Vitex negundo L. is a large, fragmentary shrub. Herbal remedies are a category of complementary medicine treatments made from real plants or plant extracts. A wide range of natural resources such as plant leaves, bark, berries, flowers and roots are used to produce herbal treatments.

TAXONOMIC /SCIENTIFIC CLASSIFICATION

Kingdom- plantae - plants

Sub kingdom – Tracheobionta -vascular plants

Super Division – Spermatophyta – Seed plant

Division -Magnoliophyta – flowering plant

Class – Magnoliopsida – Dicotyledons

Sub Class – Asteridea

Order – Lamilales

Family – Verbenaceae

Genus – Vitex Linn

Species -Vitex negundo Linn. (Chaste tree)

VERNACULAR NAMES

Telugu: Vaavili

Tamil: Nirkundi

Hindi: Shivari, Nirgundi

Punjab: Shwari

English: five leaved chaste tree

Punjabi: Sambhalu, Banna

Sanskrit: Nirgundi

Five – leaved chaste tree **Stem with leaves**

VITEX NEGUNDO: FLOWERS WITH BUDS

MICROSCOPICAL CHARACTERS

STOMATA

Many are on the lower side and none in the top epidermis. Almost all are normocytic.

TRICHOMES

Both are simple, covering glandular on both surfaces, but the lower surface has a lot of covering. It is a 1-3celled uniseriate with a sharply pointed apex and a protruding base. The mesophyll is made up of three rows of palisade cells.

VASCULAR BUNDLES are shielded by the parenchymatous sheath on both sides.

MID RIB

Tissue that is Collenchyma Tous beneath the upper and lower epidermis. The shape of the xylem is crescent.

PERIMEDULLARY

Phloem patches are embedded in the parenchyma tissue. Isolated clusters of lignified pericyclic fibers make up Pericycle.

GEOGRAPHICAL DISTRIBUTION

The *Vitex negundo* can be found in china, the Philippines, tropical Africa, and India. The plant is also found in Burmo, Southern India, and Bengal. It is widespread in waste areas around villages, along riverbanks, in damp areas, and in deciduous forests. It is grown as a hedge plant in India. The tree has thin, grey bark, quadrangular branches, and a height range of 2-4 meters.

It is widespread in drier regions of India, from the coastal strip to the subtropical Western Himalayas and the Andaman Islands.

Karnataka and Tamilnadu are where it is prevalent (both wild and cultivated).

DESCRIPTION

A woody, fragrant deciduous shrub that can become a small tree is *Vitex negundo*. Other names for *Vitex negundo* include monk's pepper and the five -leaved chaste tree. Its most prominent characteristic is a group of five pointed leaves that resemble a palm. The leaves contain five palmately arranged leaflets that are lanceolate, sharp, glabrous, hairy beneath, pointed at both ends and 4-10cm long. The lateral leaflets have small petioles, whereas the terminal leaflet has a long petiole. Flowers are borne on axillary or terminal panicles up to 30cm long and are bluish purple in colour. The fruit has four spherical, 4mm – diameter seeds that are spongy, globose, and black when ripe.

FLOWERING / FRUITING

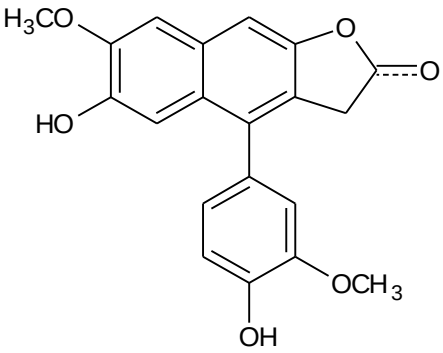
March -April and June – September

PARTS USED

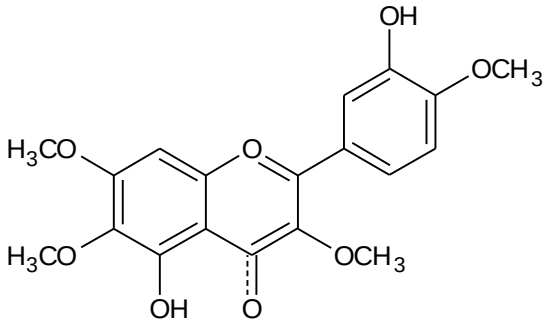
Whole plant

CHEMICAL CONSTITUENTS

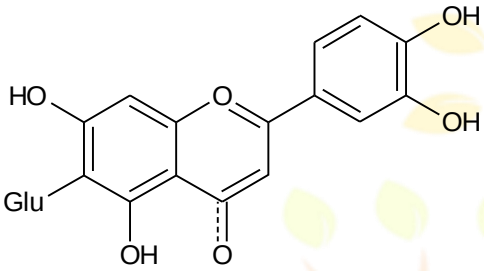
120 different chemicals extracted from V. Negundo can be broadly categorized as phenolic compounds, proteins, flavonoids, lignans, terpenoids, irridoids and steroids. Viridifloral, caryophyllene, caryophyllene oxide, camphene, camphor, carene, benzaldehyde, 1-8-cineole, sabinene and bornyl acetate are the chemical components of volatile oil. Volatile oil isolated from leaves of V.negundo. There is 0.05% of the essential oil produced by fresh leaves. Two new iridoid glycosides - nihindaside and negundoside - have been identified in addition to an alkaloid from air-dried leaves. Flavone glycosides are produced by bark. Vanitine and a variety of unknown alkaloids have been reported to be produced by seeds. Hydrocarbons, benzoic acid, phthalic acid, anti-inflammatory diterpenes, flavonoids, and artemisin are all found in seeds. The chemical components of Vitex negundo are the monoterpenes agnuside, eurostoside and aucubin. The herb also contains the flavonoids casticin, chrysoplenol and vitexin. Chrysoplenol D has antihistamine and muscle relaxant properties and is a compound found in Vitex negundo. In vitro and animal studies have shown that chemicals isolated from the plant have potential anti-inflammatory (Damayanti, 1996) and analgesic effects; Chemicals or secondary metabolites usually occur in complex mixtures that differ according to plant organs and developmental stages. Knowledge of the secondary plant substances is very important in order to be able to examine the actual effectiveness of the plant in medicine. The different phytochemical constituents have been reported from different parts of Vitex negundo. Leaves contain hydroxy-3,6,7-pentamethoxyflavone; hydroxybenzoylmusaenoside acid; trimethoxyflavanone; viridiflorol; b-caryophyllene, sabinene; 4-terpineol; gamma terpinene; caryophyllene oxide; 1-octen-3-ol; globulol ; betulinic acid ; ursolic acid; n -hentriacontanol; p-hydroxybenzoic acid protocatechuic acid; oleanolic acid; flavonoids. The seed contains 3beta-acetoxyolean-12-en-27-oic acid; 3 alpha-diacetoxyoleana-5,12-diene-28-acid vitedoin-A; Vitedoin-B; a phenylnaphthalene-type lignan alkaloid, vitedoamine-A; five other lignan derivatives. The roots contain vitexin and isovitexin (Srinivas, 2001); Negundin-A; negundin-B(+)-lyoniresinol; vitrofolal-E and vitrofolal-F; acetyloleanolic acid; sitosterol; 3-Formyl-4,5-dimethyl-8-oxo-5H-6,7-dihydronapthlo(2,3-b)furan.



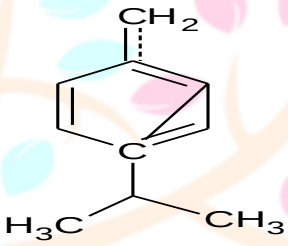
1. Negundin A



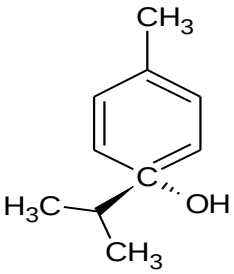
2. Casticin



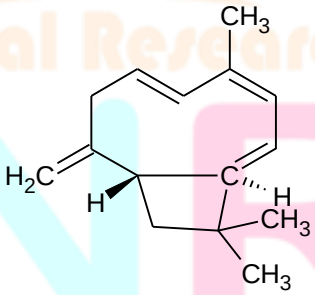
3. Isoorientin



4. Sabinene



5. Terpinen-4-Ol



6. Caryophyllene

MEDICINAL IMPORTANCE

Herbal medicine seeks to restore the body to a healthy, natural state while ideally curing a specific ailment. The secondary plant substances of medicinal plants often have a health-promoting effect alone, in combination with other substances or in a synergistic way. After analyzing the numerous chemical components found in its various servings, the focus must be turned to the medicinal use of Vitex negundo. The herb Vitex negundo has been used extensively to treat a variety of therapeutic properties.

TRADITIONAL MEDICINE

Traditional medicine mainly includes Indian Ayurveda, Arabic Unani medicine and traditional Chinese medicine. Due to historical events and cultural beliefs, people in Asia and Latin America still practice traditional medicine. In China, traditional medicine accounts for about 40% of all healthcare services. In Africa, traditional medicine is used by up to 80% of the population to help them with their medical needs.

AYURVEDA

The herb is mentioned in the verses of the Charka Samhita, undoubtedly the oldest and most reliable book on Indian Ayurveda. According to Sharma's account of the Charka Samhita, Vitex negundo is both an anthelmintic and a vermifuge. Tirtha describes other Ayurvedic uses for vitex negundo. To relieve catarrh and headaches, people stuff pillows with Vitex Negundo leaves while sleeping or smoking the leaves. Headaches, cervical ulcers, tuberculous throat swelling and sinusitis are all treated with crushed leaves.

The treatment of venereal diseases and other syphilitic skin diseases with the essential oil of the leaves is also successful. In describing the use of Vitex Negundo leaves along with those of Azadirachta Indica, Eclipta Alba, and Sphaeranthus Indicus in the well-known rejuvenation process known as Kayakalpa, Patkar refers to the formulations found in Anubhoga Vaidya Bhaga, a compilation of formulations in the Cosmetics are described.

UNANI MEDICINE

The use of vitex negundo, also known as nisinda in Unani medicine, is described by khare. The seeds are taken internally with sugar cane vinegar to reduce swelling. When administered in combination with dry Zingiber officinale, milk, and other ingredients, powdered seeds are used to treat spermatorrhea and act as an aphrodisiac.

CHINESE MEDICINE

The Fruit of *Vitex negundo* is recommended by the Chinese Pharmacopoeia for treating red, painful, and swollen eyes, headaches, and arthritic joints.

FOLK MEDICINE

- Despite the development of modern medicine, the folklore medicine system continues to provide care for a significant portion of the population, especially in rural and tribal areas.
- Used in treatment of: A pack of crushed leaves is used in treatment.
- In Bangladesh, India and Malaysia, leaves are soaked and pillows filled with leaves are used for ailments such as weakness, headache, vomiting, malaria, black fever flu and cough.
- Nepal uses crushed leaf poultices and leaf essential oil to treat whooping cough and sinusitis. Used as a toothbrush for Buner, Pakistan, back pain and chest pain.
- Eye diseases; toothache; Rheumatism; Srilankan use it as a tonic, carminative and vermifuge.

- In India, bronchitis and asthma are treated with root decoctions.
- Flowers are used in India and Pakistan to treat diarrhea and gastrointestinal diseases.

SPECIAL CHARACTERS

Branches contain conspicuous auxiliary spines and leaflets feature many small lucky dots. There are many stamens in the fragrant white flowers. Fruits look similar to crab apples. The delicate stems and leaves are quite fragile.

MEDICINAL USES

- **FRUITS, BARK, LEAVES, AND ROOTS** are all extremely medicinal. The medicine Dasmula Arista, used for colitis, dysentery, diarrhea, flatulence, fever, vomiting, and colic, has roots as one of its constituents.
- **ROOTS AND BARKS:** Used to treat sporadic fever, thirst, and body aches.
- **LEAF JUICES** are used to treat catarrh and fever as well as deafness, indigestion, piles, and jaundice.
- **TENDER FRUITS** are astringent, bitter, and anticipative. They also aid in digestion.
- **RIPE FRUITS:** Fruits that are ripe are nutritious, calming, and used to alleviate indigestion and enhance vision. Its therapeutic properties include alternative, anodyne, antiarthritic, antiparasitic, appetizing, fragrant, astringent, cardiac demulcent, expectorant, febrifuge, and nervine tonic. It has been said to have healing properties for conditions like rheumatoid arthritis, tonsillitis, sciatica, splenic enlargements, and asthma. Grain storage facilities are shielded by dried leaves, and insects are repelled by their smoke.

PHARMACOLOGICAL EVIDENCE

It is estimated that 14-28% of higher plant species have medicinal uses, and research into ethnomedicine uses of plants has led to the discovery of 74% of the pharmacologically active plant components metabolites, covering all its parts from roots to fruits, a variety of give for medical purposes.

ANTI- INFLAMMATORY AND ANALGESIC ACTIVITY

The anti-inflammatory and analgesic properties of Vitex negundo fresh leaves are attributed to inhibition of prostaglandin synthesis, antihistamine, membrane stabilization and antioxidant activities established these properties in acute and subacute inflammation.

ENZYME -INHIBITORY ACTIVITY

Alpha-chymotrypsin, tyrosinase, butyrylcholinesterase and lipoxygenase were all inhibited by Vitex negundo root extract. The HIV type 1 reverse transcriptase inhibitory activity of Vitex negundos aerial parts aqueous extract was reported by Woradulayapinij et al. The plant has inhibitory effects on a variety of enzymes. The methanolic extract of Vitex negundo roots contained lignins that were tyrosinase inhibitory.

ANTIMICROBIAL ACTIVITY

- The antimicrobial properties of plant extracts are enhanced by antioxidant components.

- It has been suggested that the plant's antimicrobial activity is mainly due to the presence of essential oils, flavonoids, terpenoids, alkaloids, tannins, saponins and other natural polyphenolic compounds or free hydroxyl groups in the extracts.
- The presence of flavonoids, terpenoids and tannins in Vitex negundo has been demonstrated in various studies.
- In addition to its antibacterial properties, it has also been found to have larvicidal, repellent and pesticidal effects.
- Significantly, it is considered a good pesticide because it only needs to be used in very small amounts and is particularly safe for mammals.

ANTI- OXIDANT ACTIVITY

- Anti-oxidants are compounds that can neutralize free radicals and stop them from damaging cells and creating health issues like cancer, aging, heart disease, and stomach issues, among others.
- Natural antioxidants can be found in the plant *Vitex negundo* (Rabeya et.al. 2013). The phenolic components found in plant extracts, such as flavonoids, phenolic acid, tannins, and diterpenes, are primarily responsible for the antioxidant effects of those chemicals. They are suitable for both human and animal consumption.
- Particularly flavonoids have been demonstrated to possess strong antioxidant and free radical scavenging properties.
- This plant also contains a variety of terpenoids, glycosidic iridoids, alkaloids, and polyphenolic chemicals. According to research by Tiwari and Tripathi, all fractions of Vitex negundo have significant, dose dependent scavenging ability for ABTS radical cation. Moreover, Vitex negundo extracts show DPPH radical scavenging activity. Vitex negundo's presence of polyphenols and flavonols may be responsible for the trait.

ANTI - CANCER ACTIVITY

Investigations on the histomorphology impacts of Vitex negundo extracts in rats revealed that, despite hazardous levels, stomach tissue remain unchanged, however dose- dependent alterations were seen in the heart, liver, and lung tissues. Using COLO-320 tumour cells, the cytotoxic effect of Vitex negundo leaf extracts was investigated and confirmed.

HEPATOPROTECTIVE ACTIVITY

The hepatoprotective properties of negundoside and agundoside from Vitex negundo were reported by A. Prabhakar et al. Both substances have been used in conjunction with one or more pharmacological additives to prevent and treat liver diseases. Vitex negundo leaf extract has been shown to have hepatoprotective properties against liver damage caused by d-galactosamine, routinely prescribed tuberculosis medications, and carbon tetrachloride.

DRUG POTENTIATING ABILITY

Administration of *Vitex negundo* extracts is reported to enhance 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 as diphenyl dantoin and valporic acid.

ANTICONVULSANT ACTIVITY

While no root extract has demonstrated protection against the most severe electroshock seizures, petroleum and butanol leaf extracts have. Only leptazole -induced convulsions were prevented by petroleum root extract, although Strychnine and leptazole- induced convulsions were significantly prevented by methanolic leaf extract.

INSECTICIDAL AND PESTICIDAL ACTIVITIES

There are many claims that the plant products of *V. negundo* have insecticidal activity against pests that live on stored goods, mosquito larvae, house flies, and tobacco leaf – eating larvae. There is evidence that the plant's leaf oil acts as a pest repellant when applied to stored goods.

ANXIOLYTIC ACTIVITY

Using an elevated plus maze model, investigated the anxiolytic Activity of *Vitex negundo*'s various parts, including its leaves, stems, and roots. They used a variety of solvents, including petroleum ether, chloroform ethanol, and an aqueous extract. Just the roots outperformed the other sections in terms of anti- anxiety activity. As compared to diazepam, extract of the roots in chloroform and ethanol demonstrated the most anti- anxiety effects.

NEPHROPROTECTIVE ACTIVITY

The nephroprotective efficacy of methanolic extracts of Vitex negundo leaf extract on nephrotoxicity produced by cisplatin in male albino rats. This study showed that compared to the cisplatin-treated rats, the Vitex negundo methanol extract-treated group also had elevated levels of Hb, RBC, WBC, PCV, and MCV. According to the study results, Vitex negundo protected the rats from the harmful effects of cisplatin.

Using a single oral dose of paracetamol, the nephroprotective efficacy of methanolic extracts of Vitex negundo bark against clinically induced kidney damage in male Wistar rats was investigated. The study assessed biochemical markers including total protein, bilirubin, alkaline phosphatase, serum glutamic-pyruvic transaminase, and serum glutamic-oxaloacetic transaminase. Compared to paracetamol-induced kidney damage, the study found a significant reduction in biochemical markers and enzymatic and non-enzymatic antioxidants. The result showed that the kidney was protected from paracetamol-induced toxicity by the methanolic extract of Vitex negundo bark.

ANTI – SNAKE VENOM ACTIVITY

The anti-snake venom activity of hydroethanolic extracts from Vitex negundo leaves has been observed. According to the study, Vitex negundos blue leaf extract has stronger antioxidant and snake venom-neutralizing effects.

This plant extract effectively repelled the venom of Russellii and Najakaouthia vipers. The results proved that plant extracts have potent snake venom-neutralizing abilities and warrant further investigation.

ANTIPYRETIC ACTIVITY

Used a yeast-induced pyrexia model in Wistar albino mice to study the antipyretic efficacy of Vitex negundo Linn leaf extracts. According to the results, oral administration of Vitex negundo leaf extracts in petroleum ether and methanol significantly reduced the temperature that yeast can cause.

Both the petroleum ether extract and the methanolic extract showed significant antipyretic efficacy. The antipyretic efficacy of an alcoholic extract of Vitex negundo was evaluated in PGE-1-induced pyrexia in albino rats. Vitex negundos ethanolic leaf extract was found to show a more pronounced antipyretic effect when tested on albino rats using pyrexia and hyperpyrexia models.

THERAPEUTIC INDICATION

The leaves have splitting (muhalil) properties and are used for rheumatic joint swelling and sprains. The juice of the leaves is used to treat foul-smelling discharge. They show anti-inflammatory, antibacterial and antifungal activity. Because of its anti-inflammatory, antibacterial, and antifungal properties, the plant is useful in treating wounds and skin infections. Vitex negundo relieves muscle and joint pain.

- The herb is effective in treating vaginal discharge.
- Seeds soaked in vinegar are used as hot fomentation in case of flatulence.
- It cures cough.
- It is beneficial in leprosy, asthma and rectal prolapse.
- Oral use of powdered seeds helpful in reducing pain during menses.
- Powdered seeds are used orally in case of poor lactation.
- Powdered dry fruit is used orally to reduce backache and headache.
- Juice of green leaves dropped into eyes to improve the vision.

CULTIVATION PRACTICES

Both scion cuttings and seeds can be used to easily cultivate the plant. It prefers a light, loamy soil that drains well. Vitex negundo can be grown in warm temperate to tropical areas and thrives at altitudes of around 2,000 meters above sea level. The mature seeds sown in nursery beds usually germinate within 2-3 weeks. Seedlings four to six months old are used for transplanting in the field. It can be easily propagated from shoot cuttings. Strong and deep, Vitex Negundo roots are runners that can also be used as planting material. Vishvavallabha (AD 1577) indicates that Vitex negundo can be grown from both seeds and stems.

RECOMMENDED DOSAGE

Almost all of its components including the leaves, roots, bark, fruits, flowers and seeds are used as medicines and can be prepared as powders, decoctions, juices, oils, tinctures, sugar/water/honey/paste and dried extracts. Juice (10–

20 mL), decoction (50–100 mL), leaf powder (1.5–3 g), and dry leaf extract (300–600 mg) are recommended adult dosages.

CONCLUSION

Several experimental studies have shown that vitex negundo has a variety of biological functions. One of the most important plants with multiple uses in the conventional medical system is Vitex negundo. It represents a group of herbal drugs with a fairly solid theoretical basis. So, the pharmaceutical industry is very promising to develop this plant into a drug, but before it is recommended for use in these conditions, clinical trials must be conducted to demonstrate its effectiveness. The basis of traditional medicine, medicinal plants, have been the focus of extensive pharmacological research in recent decades.

FUTURE ASPECTS

These studies have explored the value of medicinal plants as potential sources of novel therapeutic compounds and as sources of lead compounds for drug development. Therefore, the screening of medicinal plants for bioactive chemicals becomes necessary as a basis for further pharmacological research. The relevance of Nirgundi in the traditional medicine system is of paramount importance, as is evident from a careful reading of the existing literature. Almost all parts of the plant are used to make herbal medicines. Anti-cancer, anti-bacterial, anti-eating, anti-inflammatory, anti-hyperpigmentation, hepatoprotective, antihistaminic, analgesic, and other related effects are known to be present in the plant. According to indipth, scientific reports on the plant, its therapeutic properties and chemical components play a role in the treatment of a number of human diseases.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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