



# Phytochemical And Physiological Evaluation Of Vitex Negundo

<sup>1</sup>Miss. Shendage A.S , <sup>2</sup>Mr. Bhanwase M.S, <sup>3</sup>Mr. Borade K.D, <sup>4</sup>Miss. Awhad J.A, <sup>5</sup>Miss. Kadam K.B

<sup>1</sup>Assistance Professor, <sup>2</sup>Student, <sup>3</sup>Student, <sup>4</sup>Student, <sup>5</sup>Student

B. Pharmacy,

College of Pharmacy, Paniv, Malshiras, Solapur,

Maharashtra, India, 413113

## ABSTRACT: -

Vitex negundo is a well-known medicinal plant used in Indian traditional medicine. It's also known as Five-Leaved Chaste. Tree pepper or Monk's pepper. It is known as punjgusht, Nirgundu, and other names in India. Saphali or sambhalu? Extracts of Vitex negundo have been utilized in Unani medicine uses it as an anti-inflammatory, expectorant, and tonic. Sedative, antispasmodic, anticonvulsant, rejuvinate, antiarthritic Antipyretic, anthelmintic, and antifungal. In Unani, the seeds are referred as are suggested for reducing premature ejaculation as well as Improve male lidibo. Vitex negundo alleviates muscular and joint pain. The Indian Ayurvedic and Unani Pharmacopoeia has reported the use of the leaf, seed, and root in the treatment of excessive oedema, skin problems, pruritus, helminthiasis, vaginal discharge Rheumatism and puerperal fever are both symptoms of pregnancy. Vitex negundo is also a component of many herbal preparations. Chryso-splenol D, a compound found in the Five-Leaved Chaste Tree, has antihistamine and muscle relaxant properties.

**KEYWORD** – vitex nirgundo, nirgudi plant mosquito repellent

## I. Introduction: -

Since ancient times, medicinal plants have been a significant source of compounds used to treat human illness. The last ten years have seen a resurgence of interest in natural medications. mostly due to the widespread perception that green Medications are more healthful than manufactured goods. These days, there has been a significant rise in therapeutic plant-based industries as a result of the growing interest in using worldwide medicinal plants that are expanding at a yearly rate of 7–15%. Despite significant advancements in the contemporary medicine, the creation of novel medications from Natural products are still seen to be significant. 1 Conventional therapies founded on the principles of herbal medicine is time validated and extensively embraced across diverse cultural and socioeconomic divisions Nevertheless, there are currently relatively few specific recommendations available for the investigation of herbal substances, and only a small percentage of this enormous potential therapeutic repertoire has been explored. has undergone scientific screening. Thus, there's a genuine necessity

for the validation of these agents based on scientific data. 2. The assessment of plant items based on their potential medical and therapeutic qualities provide a framework for the investigation of novel medicinal compounds derived from various plant sources. As seen from the countless plants have been studied for ages now, The Vitex negundo is a crucial one. This Verbenaceae plant the family is referred to as Nirgundi in Hindi, and five English: leafed chaste tree. Sambhalu, or Vitex negundo L., is a fragrant, big shrub or small, thin tree, about three metre tall with four-pointed branches

## II. HABITAT AND AGRICULTURE -

A densely branching shrub growing to a height of 5 metres, or occasionally a short, slender tree with thin, grey bark. The terminal leaflet is 5-10 cm 1-3 cm, while the lateral leaflets are smaller. The leaves are palmately compound, 3-5 foliate, lanceolate, with whole or crenate edges; the terminal leaflet is nearly globous above, whitish tomentose beneath, and scented when crushed. Small, bluish-purple flowers with peduncles grow in cymes to produce enormous, terminal, frequently complex, pyramidal panicles. Flowering and fruiting take place in central India between June and December and September and February, respectively. The fruit is a juicy drupe that is 5–6 mm in diameter and becomes black when ripe. Seeds have a diameter of 5–6 mm.

Within two to three weeks, mature seeds placed in nursery beds typically germinate. For transplantation in the field, seedlings aged four to six months are employed. It is easily cloned from shoot cuttings. Strong, deep roots and numerous suckers are characteristics of Vitex negundo. Root suckers that are produced by it can also be used for planting. Sindhu Vara (V. negundo) can be cultivated from both seeds and stalks, according to Vishva Vallabha (1577 CE) <sup>1</sup>

### III. History

Nirgudi, the Sanskrit name for *V. negundo*, literally translates to "that which protects the body from diseases." One of the herbs mentioned in every Ayurvedic Samhita is this one. According to Balkishan (2008), people in ancient India distinguished between two varieties of nirgudi: one with white blossoms (shwetapushpi), known as sindhuvar, and the other with blue flowers (pushpanilika), known as nirgundi in Sanskrit.

Numerous names given to newri are listed in the Amarakosha (500–800 CE), including sinduk, sindhuvara, indrasursa, nirgundi, indranika, and sinduar. Two names are identified as sindhuvara (XXIX 9, LIII 103, and LIII.14) and sindhuka in the ancient work Varahamihira's *Brhat Samhita* (about 500 CE). It has four names in the Puranas: sindhuvara (MP), sindhuvaraka [Agni], and nirgundi [Matsya Purana (MP)].

It was known as nirgundi, sephali (ka), and sinduvara in the agricultural book Surapala's *Vrikshayurveda* (Sadhale, 1996). The Vedas include no mention to sindhuvara (white-flowered negundo). While numerous allusions can be found in post-Vedic works like the epic *Mahabharata* (3000 BCE), Kautilya's *Arthashastra* (321-296 BCE), and Ayurvedic classics like *Kalpasthana*, *Susruta Samhita* (400 BCE), *Astangahridaya* (700 CE), *Vaidyamanorama* (800–1000 CE), *Vrindamadhava* (9th century CE), *Bangasena*,

These two variants are also identified and mentioned in classical Sanskrit literature, including Banbhatta's *Harsacharita* and *Kadambari*, *Ritu Savambhara* by Kalidasa, and Banerji's *Ritu Savambhara* (Banerji, 1968). In the *Charaka Samhita* (about 700 BCE), the blue form of nirgundi/ka is most likely mentioned for the first time. It is clear that mentions of sindhuvara precede mentions of nirgundi in traditional Sanskrit literature.

Different names:

- Botanical Name: *Vitex negundo*
- Sanskrit: Nirgundi, Sindhuvara, Neelamanjari
- Indrasurasa, Bhoothakeshi, Neelika
- Hindi: Samhalu, Saubhalu, Nirgundi
- English: Five-leaved chaste tree
- Bengali: Nirgundi, Nishinda
- Gujarati: Nagod
- Kannada: Bile-nekki
- Malayalam: Indrani
- Telugu: Nallavalli, Vavilli, Tellavavilli
- Tamil: Nirkunnchi, Nallanoch

### IV. BOTANICAL SUMMARY

*Vitex negundo*, sometimes referred to as nirgundi, is a member of the Verbenaceae family. The plant is a fragrant, deciduous shrub that can be found growing up to 1500 metres high in wastelands and mixed open forests throughout India. Additionally, it can be found in Madagascar, China, Eastern Africa, Afghanistan, Pakistan, Sri Lanka, Thailand, and Malaysia. It is grown as a hedge plant in India. The tree reaches a height of 2-4 metres and has thin grey bars and quadrangular branches.



### Nirgudi leaves

## V. THE PHYTOCHEMICAL ASPECTS

Comprising 120 distinct chemicals, the primary categories into which they can be categorised include phenolic compounds, protein contents, lignans, flavonoids, terpenoids, iridoids, and steroids (Roy et al., 2013; Neha et al., 2021). Viridiflorol,  $\beta$ -caryophyllene, caryophyllene oxide, camphene, camphor, carene, benzaldehyde, 1,8-cineole, sapienene, bornyl acetate,  $\delta$ -elemene, terpinen-4-ol,  $\delta$ -terpinene, 1-octen-3-ol, and globules are the chemical components of the volatile oil recovered from *V. negundo* leaves (Singh et al., 1999). Formic acid, n-heptane, p-cymene,  $\beta$ -caryophyllene, trans- $\alpha$ -bergamotene, valencene,  $\alpha$ -selinene,  $\beta$ -selinene, germacren-4-ol, caryophyllene epoxide, (E)-nerolidol, and P-(1,1-dimethylethyle) toluene are among the chemical components of the volatile oil recovered from *V. negundo* flowers (Khokra et al., 20).

## VI. CHEMICAL CONSTITUENTS

A number of anti-inflammatory compounds have also been extracted from the seeds, such as the flavonoid artemin, the triterpenoids 3 $\beta$ -acetoxyolean-12-en-27-oic acid, 2 $\alpha$ , 3 $\alpha$ dihydroxyoleana-5,12-dien-28-oic acid, and 2 $\alpha$ ,3 $\beta$ diacetoxy-18-hydroxyoleana-5,12-dien-28-oic acid (m.p. 205–260); and the lignan, which is identified as 6-hydroxy-4-(4-hydroxy-3-methoxyphenyl)- 3-hydroxymethyl-7methoxy-3,4-dihydro-2-naphthaldehyde (C<sub>20</sub>H<sub>20</sub>O<sub>6</sub>, m.p.

Bark has been used to separate fatty acids, beta-sterol, vanillic acid, p-hydroxybenzoic acid, and luteolin (Hussain, 1992) [17]. Leucoanthocyanidins are produced by stem bark (Hussain, 1992 [17]; Chopra et al., 1956). In [9] The medicinal properties of chaste berries have not been thoroughly studied. Preliminary research does, however, indicate the existence of substances that can regulate the production of female hormones. It is believed to contain a substance that resembles progesterone. Agnuside, eurostoside, and aucubin are the monoterpenes that make up the chemical components. The flavonoids vitexin, chryso-splenol, and casticin are also present in chasteberries. According to research on animals, extracts from *Agnus castus* can both block and promote the release of the hormone known as follicle stimulating hormone (FSH) and lumièrenizing hormone (LH).

According to a different study, chasteberry extracts can both suppress and increase the release of the hormone known as follicle-stimulating hormone (FSH) and lumièrenizing hormone (LH). Another laboratory investigation that indicates the volatile oil has a progesterone-like effect has validated this hormonal effect. Therefore, the actions of vitex on the pituitary gland, specifically on the generation of luteinizing hormone, are the source of its benefits. This helps control a woman's menstrual cycle and raises progesterone production. Additionally, vitex regulates prolactin output. Reducing high prolactin levels could help women who are infertile.

## VII. THERAPEUTIC AVAILABILITY TRADITIONAL

Folk medicine employ this plant species to cure a wide range of illnesses, some of which have been proven effective in experiments. Nirgundi's bark, leaves, fruit, roots, and flowers are all utilised both internally and externally for therapeutic purposes. Anti-nociceptive, anti-inflammatory, anti-tumours, anti-oxidant, anti-androgenic, anti-osteoporotic, anti-cataract, hepatoprotective, anti-hyperglycaemic, insecticidal, and antimicrobial activity were among the many bioactivities shown by all the compounds extracted from all the plants. The entire plant is used to treat viral and chronic illnesses. It has been used to treat chronic bronchitis in traditional Chinese medicine. A steam bath with nirgundi decoction is used to treat sciatica, arthritis, and joint discomfort. When smoked, the dried leaves are supposed to provide headache relief. Nirgundi leaf decoction works well as a gargle for sore throats and stomatitis. For the treatment of uterine irritation and epididymo-orchitis, the decoction of its leaves made in a tub is beneficial. Leaves with apoptotic and antiproliferative properties have been found to contain caricin (Chan et al., 2018). *V. negundo*'s fresh leaves may offer



anti-inflammatory and pain-suppressive properties. Controlled by antihistamine (anti-itching), antioxidant, membrane stabilising, and PG synthesis inhibition (Dharmasiri et al., 2003). By inhibiting lipid peroxidation, improving intracellular calcium homeostasis, and inhibiting Ca (2+)-dependent proteases, leaf extract of *V. negundo* protects human liver cells against CYP2E1-dependent CCl<sub>4</sub> toxicity (Tasduq et al., 2008). Roots are used to treat leprosy, inflammations, respiratory issues, flatulence, and joint pain. Roots have diuretic, febrifuge, bechic, tonic, and anodyne properties. Flowers are used to treat heart problems, fever, diarrhoea, cholera, and haemorrhages.



Flowers are used as an astringent for liver problems, diarrhoea, and fever. The lignans in the dried fruits, such as vitexdoin F (1), a phenylindene-type lignan, and vitexdoins G, H, and I (2-4), phenyl-naphthalene-type lignans, have anti-inflammatory and anti-osteoporotic properties (Telang et al., 1999; Tandon and Gupta, 2006; Zheng et al., 2014). The bark of the fruits is used to treat toothaches. It has been discovered that niggundi oil is beneficial for sloughing off wounds and ulcers, sinuses, scrofulous sores, premature hair greying, and scalp infections. It treats bronchial asthma and acts as an antipyretic when taken internally. It treats issues with the urine. It eradicates bacteria and worms and has antihelmintic properties. As a potent bio-control agent against pests and diseases of domesticated plants, *V. negundo* has demonstrated potential. Leaf extracts have the ability to suppress, dissuade, or kill pathogens and other living things. It is said that the leaves have antibacterial, antifungal, and pesticidal qualities. To keep pulses safe from insects, leaf extract is utilised as a grain preservation ingredient. The antibacterial capabilities of volatile oil stem from the presence of monoterpene components that cause damage to membranes. Triterpenoids with a pesticidal activity include betulinic acid and ursolic acid Vishwanathan and Basavara

#### Nirgudi Flower

### VIII. PHARMACOLOGICALS ACTIONS

#### 1) Pain-Relieving Action

Using various solvents discovered that several leaf and root extracts had analgesic effect when administered intraperitoneally. Using the hot plate, tail flick, and formalin tests, M.G. Dharmasiri et al. (2003) assessed the analgesic efficacy of an aqueous extract of fresh *Vitex negundo* leaves in female Wistar rats. Aspirin (100 mg/kg) was the usual medication used in hot plate and tail flick procedures.

#### 2) Anti-arthritic and Anti-inflammatory Properties

Different plant parts, particularly leaves, fruits, roots, and seeds, have been shown in experimental studies using a variety of animal models to have anti-inflammatory and anti-arthritic. A.S. Chawla et al. (1992) used Ibuprofen as a standard medication to study the anti-inflammatory properties of a chloroform extract of *Vitex negundo* seeds in male Sprague-Dawley rats that had paw oedema caused by carrageenan. A.S. Chawla et al. (1991), U.K. Rao et al. (1977), M.B. Ahmad et al. (1989), and E. Niagara et al. (2004) reported the anti-inflammatory properties of *Vitex negundo*'s bark, seeds, seed oil, and essential oil. Jana, U., & investigated the potential anti-inflammatory effects of *Vitex negundo*, *Zingiber officinal*, and *Tinospora cordifolia* in albino rats. M.G. 65. Using carrageenan- and formaldehyde-induced rat paw oedema as a model, Dharmasiri et al. (2003) examined the anti-inflammatory properties of an aqueous extract derived from *Vitex negundo* leaves in male Wistar rats. Indomethacin was used as the reference. Significant suppression of the early stages of carrageenan-induced rat paw oedema was observed in an inversely dose-dependent manner. 65 Using carrageenan-induced rat paw oedema and cotton pellet granuloma models, R.K. Gupta et al. (2006) showed anti-inflammatory efficacy from the ethanolic extract of *Vitex negundo* leaves in albino rats (of either sex). Phenylbutazone (10-100 mg) and ibuprofen (10-200 mg) were used as standards. The 67 According to Pradeep Singh et al. (2009), an ethanolic extract of roots has anti-inflammatory properties.

### 3) Inhibition of Hyperpigmentation

Using a Spectra Max 340 microplate reader, A. Malik et al. (2006) examined the lignans' capacity to inhibit tyrosinase after they were separated from the methanolic extract of *Vitex negundo* roots.44 Immuno-stimulant Activity: Using human polymorph nuclear cells in the oxyburst phagocytic assay, D.D. Singh et al. (2005) showed immunostimulatory activity from *Vitex negundo* extracts.38 The immunostimulatory potential of two iridoid glucosides from *Vitex negundo* leaves was described by. Suri et al.

### 4) The Hepatoprotective Effect

The hepatoprotective properties of *Vitex negundo*'s negundoside and agundoside were studied by Prabhakar et al. Both substances were combined with one or more hepatic disease-prevention and -treatment pharmacological additives.47, 46 Venkatachalam Kambham The sequence is CNS Function: The CNS activity and anticonvulsant properties of petroleum ether and methanolic extracts of *Vitex negundo* were assessed in mice by M. Gupta et al. (1997 & 1999).75,74 The anti-androgenic property *Vitex negundo* seeds were the source of many flavonoids with antiandrogenic action, as revealed by S.K. Bhargava (1984, 1986) & R.P. Samy et al. (1998). The flavonoids 5, 7, 3'-trihydroxy and 6, 8, 4'-trihydroxy flavones exhibit both estrogenic characteristics and anti-implantation activity. From 76 to 80 Activity Inhibition by Enzymes Negundin B and Vitrofolal F, two lignans, have been shown to have anti-lipoxygenase and anti-butyrylcholinesterase potential by A. Haq et al.

### 5 Activities to Repel Mosquitoes

P.K. Amancharla et al. (1999) investigated the ability of an aqueous extract of *Vitex negundo* leaves to repel mosquitoes. The aforementioned activity was evaluated for a novel compound called "rotundial."

### 6) Activity of Anticonvulsants

While none of the root extracts have demonstrated protection against maximum electroshock (MES) seizures, the leaf extracts of petroleum and butanol have. While methanolic leaf extract demonstrated considerable protection against Strychnine and Leptazole in used convulsions (Gupta et al, 1999), petroleum root extract could only offer protection against Leptazole in used convulsions (Ravisankar et al, 1985, 1986)83–88.75.

### 7) Antioxidant Function

According to studies conducted by G. Zheng et al. (1999), G. Zheng and Z. Luo (1999), and M. Onu et al. (2004), vitedoxin A, vitedoxin B, and other lignans derived from *Vitex negundo* seeds have antioxidant activity. 35, 71, 70 Vitexin is a novel chemical whose antioxidant action was described by V. Tendon & R.K. Gupta in 2005. 72 O.P. Tiwari & Y.B. Tripathi (2007) used a variety of invitro systems, including 2, 2'-azino-bis(3-ethyl benzothiazoline-6-sulfuric acid (ABTS), lipid peroxides (LPO), superoxide, hydroxyl radical scavenging, and iron chelation, to assess the antioxidant properties of various fractions of *Vitex negundo*. Using the completed radical monocation ABTS test, the total antioxidant capacity was ascertained. Using egg yolk homogenates as lipid-rich media, LPO was evaluated in terms of thiobarbituric acid reactive compounds.

### 8) Insecticidal and Pesticidal Activities:

The plant products of *V. negundo* have been reported to exhibit insecticidal activity against mosquito larvae, house flies, and tobacco leaf-eating larvae; leaf oil of the plant is demonstrated to have a repellent action against stored product pests (Deshmukh et al, 1982; Prakash & Mathur, 1985; Hebbalkar et al, 1992). TOXICITY: A preliminary acute toxicity study of ethanolic leaf extract in albino rats conducted by oral route showed it to be practically nontoxic, with an LD50 dose of 7.5 g/kg/wt. The stomach did not exhibit any histomorphology changes in any of the doses of the extract studied; however, dose-dependent histomorphology changes were noted in the specimens of the liver, heart, and lung.

## IX. Pharmacological proof

### 1) Acting as an analgesic and anti-inflammatory

*Vitex negundo* extracts have been shown to have anti-inflammatory qualities in both acute and sub-acute inflammation by Yunos et al. (2005) and Jana et al. (1999). The antioxidant, antihistamine, membrane-stabilizing, prostaglandin synthesis inhibition, and anti-inflammatory and pain-suppressive properties of fresh Panjghust (*Vitex negundo*) leaves have been linked (Telang, 1999). (Dharmasiri, 2003).

### How it affects oxidative stress

It was shown that Panjghust (*Vitex negundo*) leaf extracts has antioxidant potential (Tiwari, 2007). In Freund's adjuvant-induced arthritic rats, the extracts were helpful in lowering levels of glutathione peroxidase, superoxide dismutase, and catalase (Devi, 2007). Because the extracts contain flavones, vitamin C, and carotene, they can help prevent oxidative stress by lowering lipid peroxidation (Vishal, 2005). Panjghust (*vitex negundo*) flavonoids have been shown by Rooban et al. to have antioxidant and therapeutic potential in the modulation of solenoid-induced cataract.

### The inhibitory effect of enzymes

The root preparations of *Vitex negundo*, also known as Panjghust, shown inhibitory efficacy against several enzymes, including tyrosinase (Azhar, 2006),  $\alpha$ -chymotrypsin (Lodhi, 2008), lipoxygenase and butyryl-cholinesterase (Azhar, 2004). The aqueous extract



of Panjghust's aerial parts (*vitex negundo*) was shown to have HIV type 1 reverse transcriptase inhibitory action by Woradulayapini et al. (2005).

### Impact on the capacity to procreate

According to Bhargava (1989) and Das (2004), the flavonoid-rich fraction of Panjghust (*vitex negundo*) seeds disrupted the later stages of spermatogenesis in dogs and interfered with male reproductive function in rats. It is important to highlight, nonetheless, that these results stand in stark contrast to the custom of using Panjghust (*vitex negundo*) as an aphrodisiac (Khare, 2004). Hu et al. (2007) suggested using Panjghust (*Vitex negundo*) in hormone replacement therapy after finding that its ethanolic extracts exhibited oestrogen-like action.

## X. EFFECTS OF CYTOTOXICITY AND HISTOMORPHOLOGY

When Tandon and Gupta (2004) examined the histomorphology effects of Panjghust (*vitex negundo*) extracts in rats, they discovered that whereas the heart, liver, and lung tissues showed dose-dependent alterations, the stomach tissue remained unchanged even at toxic dosages. Using COLO-320 cancer cells, the cytotoxic activity of Panjghust (*vitex negundo*) leaf extracts was investigated and confirmed (Smit, 1995). While Yunos et al. (2005) observed that Panjghust (*vitex negundo*) extracts were noncytotoxic on mouse mammary and Genito-urinary cells, Diaz et al. (2003) found that the chloroform extracts of Panjghust (*vitex negundo*) leaves were toxic to a human cancer cell line panel.

### Potential of drugs

The administration of extracts from Panjghust (*Vitex negundo*) increased the effects of analgesics (e.g., meperidine, aspirin, morphine, and pethidine), sedative-hypnotics (e.g., pentobarbitone, diazepam, and chlorpromazine; Gupta, 1999), anticonvulsive agents (e.g., diphenylhydantoin, and valproic acid) and common anti-inflammatory medications (Tandon, 2006). Panjghust (*vitex negundo*) extracts have also been investigated for a variety of additional systemic effects in addition to the ones listed above.

Panjghust (*vitex negundo*) leaf extracts have been shown to have hepato-protective efficacy against liver damage caused by dgalactosamine (Yang, 1987), carbon tetrachloride (Tasduq, 2008; Raj, 2008), and routinely used tubercular medicines (Tandon, 2008). Extracts from the leaves of Panjghust (*Vitex negundo*) have been shown to have anti-hyperglycaemic properties by Villasenor and Lamadrid (2006). Adnaik et al. (2008) observed that Panjghust (*vitex negundo*) leaf extracts had laxative effects on rats. The fatal action induced by the venom of *Vipera russellii* and *Naja kaouthia* was shown to be antagonistic by methanolic root extracts of Panjghust (*vitex negundo*) (Alam, 2003). Panjghust (*vitex negundo*) extracts have been shown to have an immunomodulatory impact (Ravisankar and Shukla, 2007).

## XI. CONCLUSION

Several experimental studies have demonstrated the wide range of biological activity exhibited by *V. negundo*. It stands for a category of herbal medication has a very solid theoretical foundation for application. So, this plant has a lot of potential for use in medication development by pharmaceutical sectors, but prior to suggesting it for therapeutic use in these circumstances, research must be done trials and demonstrate its practicality in medicine. Medicinal herbs, the foundation of conventional Over the past few decades, medicine has been the focus of extremely thorough pharmacological research; the importance of medicinal Potential sources of novel chemicals from plants medicinal worth and as sources of primary chemicals in the medication research As a result, screening medicinal plants for bioactive chemicals becomes necessary in order to provide a foundation for additional pharmacological research. Considering the comprehensive after reviewing the existing literature, it is clear that the The significance of Nirgundi in conventional medicine is quite important. Nearly every portion of the plant is used when making natural remedies. The herb is recognised for contain hepatoprotective, anticancer, antibacterial, antifeedant, anti-inflammatory, and antihyperpigmentation properties. analgesic, antihistaminic, and associated actions. Scientifically studied in-depth accounts of the plant, their therapeutic characteristics and chemical components that are active play a part in the control of a range of human illnesses. This analysis aims to cover all of the material on *Vitex* that is currently available. *Negundo* in relation to its customary use, chemical components and an overview of its many pharmacological activity.

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