

## ***Nirgundi (Vitex negundo) – Nature’s Gift to Mankind***

**SC Ahuja<sup>1</sup>, Siddharth Ahuja<sup>2</sup>, and Uma Ahuja<sup>3</sup>**

1. Rice Research Station, Kaul 136 021, Kaithal, Haryana, India
2. Department of Pharmacology, Vardhman Mahavir Medical College, Safdarjung, New Delhi, India
3. College of Agriculture, CCS Haryana Agricultural University, Kaul 136 021, Haryana, India (email: ua5419@yahoo.co.uk)

### **Abstract**

*Vitex negundo (nirgundi, in Sanskrit and Hindi) is a deciduous shrub naturalized in many parts of the world. Some consider it to have originated in India and the Philippines. There is no reference to nirgundi in the Vedas, while several references occur in post-Vedic works. In India, the plant has multifarious uses: basketry, dyeing, fuel, food, stored-grain protectant, field pesticide, growth promoter, manure, as medicine for poultry, livestock, and humans. It is used in all systems of treatment – Ayurveda, Unani, Siddha, Homeopathy, and Allopathy. It is commonly used in folk medicine in India, Bangladesh, China, Philippines, Sri Lanka, and Japan. True to its meaning in Sanskrit (that which keeps the body free from all diseases), it is used to treat a plethora of ailments, ranging from headache to migraine, from skin affections to wounds, and swelling, asthmatic pains, male and female sexual and reproductive problems. Referred to as sindhuvara in Ayurveda, nirgundi has been used as medicine since ancient times. It is taken in a variety of ways, both internally and externally. The whole plant, leaves, leaf oil, roots, fruits, and seeds are administered in the treatment of specific diseases. However, in Ayurveda, the leaves, roots, and bark are the most important parts. The present paper deals with the distribution and history of nirgundi, and its uses in rituals, religious rites, as an insecticide and as medicine. The paper also presents a scientific validation of its traditional agricultural uses as storage, field, and household insecticide, as well as pharmacological evidences on its use in folk medicine and Ayurveda.*

The word *Vitex* is derived from the Latin ‘vicio’ (meaning to tie or bind) because of the flexible nature of its stems and twigs. Of the 270 known species of the genus, about 18 are in cultivation and are referred to as ‘chaste tree’, or simply *Vitex*. The genus was established by Linnaeus in 1753 with four species: *Vitex agnus-castus*, *V. negundo*, *V. pinnata*, and *V. trifolia* in the family

Verbenaceae. Later on, *Vitex* along with several other genera was transferred from Verbenaceae to Lamiaceae in the 1990s on the basis of phylogenetic studies of DNA sequences (Chantaranothai, 2011).

Chaste tree species are native to the warm regions of the Old World. *Vitex agnus-castus* grows naturally from the

Mediterranean Sea eastward to central Asia. The leaves are composed of five to seven radiating leaflets. *Vitex negundo*, the five-leaved chaste tree is more cold hardy than the *Agnus* species. *Vitex* occurs in Kenya, Tanzania, Mozambique, Madagascar (in Africa), and in Afghanistan, Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Taiwan and Vietnam (in Asia) (<http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?41831>). It is also found in similar habitats along the seashore throughout Mauritius, Japan and southward through Malaya to tropical Australia and Polynesia.

*Vitex trifolia* is native to southeastern Asia and Melanesia (Meena *et al.*, 2010). *Vitex trifolia*, the three-leaved chaste tree, also called the Indian privet or Indian wild-pepper has similar properties of *V. negundo*. *Vitex trifolia* occurs in India along the seashore, known in Hindi as ‘*pani-ki-sanbhalu*’ and ‘*sufed-sanbhalu*’ and ‘*Lagunding-dagat*’ in the Philippines (Kulkarni, 2011).

Some consider *Vitex negundo* being native to India and the Philippines (Orwa *et al.*, 2009) and this fact can be corroborated on the basis of availability of a name in almost all the local dialects and languages in the Philippines and India (Table 1). In India, the prevailing *Vitex* species include *V. negundo*, *V. glabrata*, *V. leucoxydon*, *V. penduncularis*, *V. pinnata*, and *V. trifolia* (Kulkarni, 2011). Wild *nirgundi* (*V. negundo*) plants are found almost everywhere though mostly on wastelands from the seashore to an altitude of about 1,500 m in the outer Himalayas. It thrives in humid places or along water

courses in wastelands and mixed open forests. It often grows gregariously and is abundant on sandy soils (Chowdhury *et al.*, 2009).

Three varieties of *V. negundo* L. are currently recognized: (1) *Vitex negundo* L. var. *cannabifolia* (Siebold & Zucc.) Hand.-Mazz. is prevalent in China (including Hong Kong), India, Nepal, and Thailand; (2) *Vitex negundo* L. var. *incisa* (Lam.) C.B. Clarke occurs in China, India, Indonesia, and the Philippines; and (3) *Vitex negundo* L. var. *negundo* is found in China, Japan, Taiwan and in the Nallamala Hills (India). One may visit the website <<http://florida.plantatlas.usf.edu/Plant.aspx?id=1485#synonym>> for synonymy.

### Habitat and cultivation

*Vitex negundo* is a much-branched shrub up to 5 m tall or sometimes a small, slender tree with thin, gray bark. Leaves are palmately compound, 3–5 foliate; leaflets are lanceolate; margins are entire or crenate; terminal leaflets are 5–10 cm × 1–3 cm; lateral leaflets are smaller; all nearly glabrous above, whitish tomentose beneath and aromatic when crushed (Fig. 1). Flowers are bluish-purple, small, in peduncled cymes, forming large, terminal, often compound, pyramidal panicles. In central India, flowering occurs between June and December and fruiting from September to February. The fruit is a succulent drupe, black when ripe, 5–6 mm in diameter. Seeds are 5–6 mm in diameter. The mature seeds sown in nursery beds normally germinate within 2–3 weeks. Four- to six-month-old seedlings are used for transplanting in the

**Table 1. Names of *Vitex negundo* in/among various languages/tribes.**

Language/ region/tribe	Name	Language/ region/tribe	Name
English	Chinese chaste tree, five-leaved chaste tree, Indian privet	Kannada	<i>Lakkingida, lakkigida, nakkilu, nekki, nekka, nakkigida, lakki, karillalaki</i> (Dharwad), <i>bilenekki</i> (Mysore), <i>nochi, sinduka, sinduvara</i>
Sanskrit	<i>Nirgundi, sindhuvara, indrasursa, indranika, sinduka, nisinda, shephali, indrani, nirgundika, renuka, sindhuvaram, sinduya, sugandhika, surasa, vrikshaha, nirgunda, shveta sephalika, suvaha, nirgundi, nilika (kali newri), nilapushpi, nilanirgundi, shvetasurasa, bhootveshi</i> (white-flowered <i>newri</i> ), <i>svetapuspa</i>	Kumaon	<i>Sindwar, kharwar, shiwali, simali</i> ; fruit = <i>filfil = bari</i>
Assamese	<i>Pasutia, aggla-chita, pochatia, aslok</i>	Marathi	<i>Nirgundi, nisind, nigudi, ligur</i> (Konkan), <i>samhalu</i> (Amravati), <i>lingur, nirgunda, nirgur, lingur</i>
Bengali	<i>Nisinda, samalu, nirgundi, sinduari, beguna, nishinda, nishinde</i>	Malayalam	<i>Vellanocchi, vennocchi, indrani, karinocchi, nocchi, vennochi, velnochchi</i>
Mumbai	<i>Katri, lingur, nargunda, nirgundi, nirgur, nisinda, shiwari</i>	Manipuri	<i>Urik shibi</i>
Gujarati	<i>Nagoda, nagaol, nirgari</i>	Oriya	<i>Beyguna, begundia, nirgundi, laguni</i> (Malkangiri), <i>begna, beguniya</i>
Himachal Pradesh	<i>Bana</i> (Parvati valley)	Punjabi	<i>Banna, marwan, moraun, morann, sanoke, swanjan, shawar, bankahu, marwa, mawa, maura, mora, biuna, binna, torbanna, shwari, maura, torban, wana</i> ; root and leaves = <i>amalu</i> ; fruits = <i>filfil = bari</i>
Hindi	<i>Bheudi, mewri, nengar, ningori, nigandi, nirgandi, nirgundi, nirgunda, nisinda, panikisambhalu, sambhal, sambhalu, sanbhalu, samhalu, sanghalu, saubhalu, sawbhalu, shambalu, shriwari, newri, sanbhalu, shawalu, shiwali, shivari, shiwari, sinuar, sinduar, sindhuca, sinduari, siwain, bannah, bana, banna, siwali, wana, banha, banana, veeru dhayad, nirgud, negad, veeru, kali-nirgundi, tarvan, shimalu, shinduca, shiwari, sinduari, khanni</i> (Rajasthan)	Telugu	<i>Vaavili, vaavilu, tellavavaati, tellavavilli, vaavilu, chirvaavili, mella-vavili, vavalipadu, veyala, vavilli, nalla vavili, vavilipadu</i>
		Tamil	<i>Vellai-nochi, nirkkundi, venmochi, notchi, nirnochi, sirunochi, nirrukundi, vennochi, villai-noch-chi, nochchi, nir-nochi, nochi</i>
		Urdu	<i>Sambhalu, tukhm sambhalu</i>
		Uttar Pradesh	<i>Somi</i> (Jaunsar Bawar hills), <i>mala</i> (Moradabad)

continued

Table 1. *continued*

Language/ region/tribe	Name	Language/ region/tribe	Name
Uttarakhand (Garhwal)	<i>Sambhaalu</i>	Bangladesh	<i>Sarsa, samalu, chasta, nirgundi</i>
Kuruku	<i>Nirgudi</i>	China	<i>Bugingiab</i>
Kol	<i>Ehuri, sindwar, hobaro, sinduari</i>	Guam	<i>Laoundi, lagundi</i>
Lodha	<i>Bengunia-bo</i>	Javanese	<i>Katumpa empah</i>
Gond	<i>Nirgiri</i>	Malay	<i>Lenggundi, legundi, lagundi, lemuning, muning, demundi, lemuni</i>
Oraon	<i>Sinduhi</i>	Myanmar	<i>Kiyow-bhan-bin, kiyuban-bin</i>
Santhal	<i>Bengunia, luguni, sindwar</i> (Chhota Nagpur), <i>sinduari</i> (Bihar)	Nepal	<i>Gadaki, simali</i>
Asurs Bihar	<i>Sinduar</i>	Pakistan	<i>Marvandaey</i> (Buner), <i>nirgud</i> (Margallah hills), <i>kalgari</i> (Siran valley)
Arabic	<i>Aslaq, aslag, fanangasht, zukhamsatilouraq, zuhamsate-asabea</i>	Persian	<i>Sisban, panj-angasht, banj-angasht, panjngust</i> (Fazan Khist)
Philippines	<i>Lagundi</i> (Ibn., Tag., Bik., P. Bis.), <i>dabtan</i> (If.), <i>dangla</i> (Ilk.), <i>kamalan</i> (Tag.), <i>liñgei</i> (Bon.), <i>limo-limo</i> (Ilk.), <i>sagarai</i> (Bag.), <i>turagay</i> (Bis.), <i>agno-casto</i> (Span.)	Pusthtu	<i>Marwandai, mehrwan, warwande</i>
		Sri Lanka	<i>Nilnikka, nika, sadu-nikka</i>
		Vietnam	<i>Ngutrao</i>

Figure 1. *Nirgundi (Vitex negundo)*: (left) plant in flowering stage; and (right) inflorescence.



field. It can be reproduced readily from shoot cuttings. *Vitex negundo* roots are strong and deep and suckers profusely. It produces root suckers which can also be utilized as planting material. Vishvavallabha (1577 CE) points out that *sindhuvara* (*V. negundo*) can be grown both from seeds and stalks (Sadhale, 2004).

## History

The Sanskrit word for *V. negundo* – *nirgundi* – literally means ‘that which protects the body from diseases’. It is one of the herbs mentioned in all of the Ayurvedic *Samhitas*. People in ancient India identified two varieties of *nirgundi*, one bearing white flowers (*shwetapushpi*), called *sindhuvar*, and the other having blue flowers (*pushpanilika*) designated as *nirgundi* in Sanskrit (Balkishan, 2008). The *Amarakosha* (500–800 CE) lists various names assigned to *newri* as *sinduk*, *sindhuvara*, *indrasursa*, *nirgundi*, *indranika*, and *sinduar*. The ancient treatise Varahamihira’s *Brhat Samhita* (c. 500 CE) identifies two names as *sindhuvara* (XXIX 9, LIII 103, and LIII.14) and *sindhuka* (Sharma, 1979). In the Puranas, it is referred to by four names: *nirgundi* [*Matsya Purana* (MP)], *nirgundika*, *sindhuvara* (MP), and *sindhuvaraka* [*Agni Purana*, MP, *Brahma Vaivarta Purana*, (BvP)] (Sensarma, 1989). The agricultural treatise Surapala’s *Vrikshayurveda* referred to it as *nirgundi*, *sephali (ka)*, and *sindhuvara* (Sadhale, 1996).

There is no reference to *sindhuvara* (white-flowered *negundo*) in the Vedas. While several references occur in post-Vedic works such as the epic Mahabharata (3000

BCE), Kautilya’s *Arthashastra* (321–296 BCE), and Ayurvedic classics such as *Kalpasthana*, *Susruta Samhita* (400 BCE), *Astangahridaya* (700 CE), *Vaidyamanorama* (800–1000 CE), *Vrindamadhava* (9<sup>th</sup> century CE), *Bangasena*, *Chakradatta* (1055 CE), *Rasaratnasamuccaya* (1300 CE), *Yogaratanakara* (Santarasa, 1400 CE), *Bhavaprakasha* (1550 CE) (Mehendale, 2007; Sensarma, 1998). The classical Sanskrit literature such as Kalidasa’s *Ritu Savambhara* (Banerji, 1968), and Banhatta’s *Harsacharita* and *Kadambari* also identify and refer to these two varieties (Sharma, 1979). Probably the earliest reference on the blue variety of *nirgundi/ka* occurs in the *Charaka Samhita* (c. 700 BCE). It is evident that references to *sindhuvara* appear earlier in classical Sanskrit literature than references to *nirgundi*.

## Sacred status and uses in rituals

In India, *nirgundi* is considered a sacred plant and is thought to have originated from the abdomen of *Ganadhipa* (an appellation of Lord Shiva and also his son, Ganesha) and is used in worship (MP) and in religious rites (Sensarma, 1989). *Sindhuvaraka* is also considered to have originated from the temple of Ganesha (Gupta, 1991). The leaves are offered to Lord Shiva and Gouri on *Nitya Somavara Vrata* (Bennet *et al.*, 1992).

Among the Puranas, MP and BvP (1600 CE) refer to *nirgundi* as a forest tree of medicinal value and mention its use in religious rites, while the *Vamana Purana* considers it to be a holy plant (Sensarma, 1998). Kashyapiyakraishisukti recommends

the preservation of seeds of *sindhuvara* and others among trees.

*Vitex negundo* gets its common name – chaste tree – from the historical use of the plant in ancient Greece. Ancient Romans, medieval monks and priestesses considered the seeds of *V. agnus-castus* useful for securing chastity. *Vitex* has been used throughout history to reduce sex drive. In addition, *Vitex* was used as a herbal supplement which had various effects upon the reproductive systems of both men and women. Athenian women would place leaf clippings from the chaste tree in their beds during the feasts of Ceres in order to remain pure and virtuous. The whole plant is used during puberty rituals (<http://thewesternghats.in/biodiv/species/show/32833>).

### Varied uses of *Vitex negundo*

*Vitex negundo* is put to numerous and varied types of uses. It is used as a hedge, ornamental plant, growth promoter in agriculture, manure, pesticide, medicine, food, food protectant, household pesticide, in reclamation of wasteland and erosion, basketry, witchcraft, totems, water divination, and in the preparation of grain storage structures. It is considered sacred

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and is required in various rituals, but its medicinal uses surpass all types of uses.

Young shoots are employed in basketry (Ambasta, 1986), stems as firewood, and the plant ash is used as an alkali in dyeing. Its wood is used in building and as fuel and branches for wattle work. The leaf juice is used for soaking metallic powders before converting them into pills (Watt, 1892; Jain *et al.*, 2000). Herbal shoes prepared from *nirgundi* wood are reported to be effective in the treatment of rheumatism, and the practice is popular in parts of Chhattisgarh ([http://www.ayurvedaconsultants.com/herb\\_consult.aspx?commonName=NIRGUNDI](http://www.ayurvedaconsultants.com/herb_consult.aspx?commonName=NIRGUNDI)). Another interesting fact has been its use for punishment in China (Da Ming, 2004). *Tendu (Diospyros melanoxylon)* and *nirgundi* are believed to have magical potency and branches of these trees are used by Oroan tribes to avert the evil eye, repel evil spirits and other evil influences from standing crops (Gupta, 1991). In ancient times, *V. negundo* was used as totem plant during war. Soldiers about to occupy a fort wore the *ulingai* creeper (*Cardiospermum halicacabum*) while the occupied army was required to wear the flowers of *nocci (V. negundo)* (Swamy, 1973). This explains as to why *Brahma Vaivarta Purana (BvP)* considers *sindhuvara* as a bad omen for any army camp (Sensarma, 1998). Since ancient times, the presence of *Vitex trifolia* along with an ant-hill was considered as an indicator of the presence of water in the area. The ancient Sanskrit texts *Upavana-Vinoda* (1300 CE), *Sarangdhara Padhiti (nirgundi, nirgunda)*, *Lokopakara* (1025 CE), *Vrikshayurveda*, and *Vishvavallabha* (1577 CE) state the presence of *nirgundi (V. trifolia, sindhuvara)* with

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an anthill as an indicator of the presence of tasteful water towards the South (Sadhale, 1996; Ayangarya, 2006). *Vitex negundo* is used as a hedge as no animal grazes on it. Its roots are strong and deep and suckers profusely. It is used as a contour hedge in sandy arid areas for soil retention and moisture conservation. The shrub can be used for forestation, especially for reclamation of forestlands which are affected by floods. It has been found suitable for shelterbelts and windbreaks. Some forms of *V. negundo* are used as ornamental plants. In ancient times its inflorescence was used as an ornament. There are references that Parvati, the consort of Lord Shiva used ornaments made of its white pearl flowers. The Mahabharata mentions *sindhuvara* trees full of golden flowers looking like the lance (*tomara*) of the God of Love (Karmakar, 1951; Pandey, 1996).

Flowers of *sindhuvara* (*sweta nirgundi* – white form) were used as vegetables having the property of cooling (*sita*) and the power of destroying bile (*pittanasana*) (Sharma, 1979). The Lokopakara points out that the boiled shoots of *nirgundi* with turmeric powder, roots of tree cotton and fresh lime make *sambar* very delicious (Ayangarya, 2006). The fruits of *V. leucoxydon* are eaten

by the Oraons of Dhabuleshwar (Saxena *et al.*, 1991). Seeds are boiled and eaten in the Philippines. Fresh leaves are credited with the power of destroying the smell of ‘high meat’ [decomposed meat] or tainted meat or fish when boiled with it (Watt, 1892).

### Household pesticide

Dry *V. negundo* leaves are traditionally placed with stored woolen garments since the leaves repel wool-destroying insects and worms. Dry leaves are used for storing cotton and warm clothes in Hazaribagh. Leaves are burnt in a fire during the rainy season to keep mosquitoes away from animals and human beings; the smoke repels mosquitoes and insects (Ghosh, 2000; Guleria and Vasisth, 2009). The Lodha tribe uses dry leaf powder for repelling bedbugs (Pal and Jain, 1998). Dry leaf powder alone or mixed with *dhoop* smoke repels mosquitoes (Tarafdar, 1983; <http://www.indianetzone.com/48/shivari.htm>).

### Agricultural uses

#### Growth promoter

Ancient treatises mention the promotion of growth of newly planted trees by fumigation and smearing with *unmatta* (*Datura metel*), *vatarika* (*Allium sativum*), *mallika* (*Jasminum sambac*), *sindhuvara*, *tila* (sesame), *masha* (black gram), *yava* (*Hordeum vulgare*), clarified butter, and honey mixed in milk (Sadhale, 1996; Sadhale, 2004). Nowadays, in Tamil Nadu, a mixture of the extract of *V. negundo* (*nochi*) leaves and neem cake is sprayed to control the shedding of flowers and premature fall

of pods in field bean (Sundaramari and Ranganathan, 2003).

### Manure

Green leaves of many non-nitrogen-fixing plants and *V. negundo* are used for leaf manure (Watt, 1892; Pereira, 1993). Twigs and leaves of *nochi* along with leaves of *Calotropis gigantea*, *Cassia auriculata*, *Gliricidia maculata*, and *Tephrosia purpurea* are used in manuring in some parts of Tamil Nadu (Ayyavu, 1995).

### Traditional use in plant disease and pest control

*Vitex negundo* has been used in the management of plant diseases to control wind disorders of trees since ancient times. Vishvavallabha (written by Chakrapani Mishra who worked under the patronage of Maharana Pratap around 1577 CE) refers to fumigation with a mixture of *nirgundika*, *guggul* (*Commiphora wightii*), and oil cake at the root to obtain favorable results in the treatment of wind diseases. Vishvavallabha also mentions that a frostbitten tree can produce plenty of shoots if treated with cow dung ash, and by sprinkling a decoction of *nirgundika* (Sadhale, 2004).

### Insect pest control

The Vishvavallabha refers to fumigation of trees to draw out insects from within the trees. A mixture of cow's horn, *bhallataka* (*Semecarpus anacardium*), *nimbu*, *musta* (*Cyperus rotundus*), *vacha* (*Acorus calamus*), *vidanga* (*Embelia ribes*), *ativisha* (*Aconitum heterophyllum*),

*karanja* (*Pongamia pinnata*), *sarja* (*Vateria indica*), *sidhharthaka* (*Brassica alba*), and *sindhuvara* (*Vitex*) was used for this purpose (Sadhale, 2004).

In Chhattisgarh, in the olden days, it was common practice to burn dried leaves of *nirgundi* in rice fields, in order to repel harmful insects ([http://botanical.com/site/column\\_poudhia/115\\_nirgundi.html](http://botanical.com/site/column_poudhia/115_nirgundi.html)). The Oraons of Hazaribagh sweep paddy fields with brooms made of *nirgundi* branches which are presumed to act as an insecticide (Tarafdar and Raichaudhuri, 1991). This practice of sweeping rice plants with branches of *nirgundi* is also prevalent in the Mandi district of Himachal Pradesh (Lal and Verma, 2006). Brandishing *Vitex* sticks over a paddy plant during the *Kangli Bihu* festival in Assam (associated with the autumnal equinox) is not a mere ritual but points towards the importance of *Vitex* in insect pest control (Ahuja *et al.*, 2000). *Vitex* is also used as an insect repellent in Fiji (Singh, 1986 quoted in Prakash, 2004).

In addition to direct brandishing with fresh twigs, certain preparations are made for control of various pests of paddy. In Himachal Pradesh, a mixture of cow urine, *Vitex* leaves, and *hing* or asafetida (*Ferula assafoetida*) is used to control pests in wheat and paddy fields (Lal and Verma, 2006). The tribals of Tamil Nadu spray the crop with *Vitex* leaf extract and buttermilk, or *Adhatoda* leaf extract plus cow dung to control leaf folder (Narayanamy, 2006; Ahuja and Ahuja, 2008). *Vitex* leaf extract and buttermilk is included in the tribal package for control of rice leaf folder, brinjal leaf beetle, tomato fruit



borer, groundnut cutworm, and storage pests such as the rice weevil. The spray has been reported effective and superior over other treatments against stem borer (Narayanasamy, 2006). Presently, farmers in Tamil Nadu use green leaf extract with cow urine for pest control. They use leaves of neem, *pongam* (*Pongamia*), *nochi*, *erukku*, and *tulsi* which is locally called *poochi viratti* (Karthikeyan *et al.*, 2006). In Tamil Nadu, leaf extracts of *nochi* and other plant products are used to control many types of insects in tomato and cumin, and rice tungro virus (Sundaramari and Ranganathan, 2003). Pod borer of pulses in Karnataka is reported to be controlled by a spray of indigenously developed pesticide with *V. negundo* and other plant parts in cattle urine (Singh, 1986 quoted in Prakash, 2004).

Various herbal sprays are reported to be effective against eriophyid mites, one of the most serious pests of coconut: custard apple leaves (*Annona squamosa*), turmeric rhizome, *Clerodendrum inermi*, *Aloe vera*, *V. negundo*, and *Azadirachta indica* kernel (in equal amounts) (Chellamuthu, 2000), or by application of *Aloe vera*, *V. negundo*, and neem cake around the trunk of the tree followed by cow dung slurry (Samyappan, 2000), or through herbal extract of *Tephrosia purpurea*, *V. negundo*, *Lantana camara*, *Annona squamosa*, *Vinca rosea*, *Pongamia*

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*pinnata*, turmeric, *Azadirachta indica*, garlic, and *Cassia auriculata* (herbal extract was named as Phytolan) (Lois, 2001).

### Grain storage structures

Since generations, the natives of Chhattisgarh are using the *nirgundi* herb to prepare earthen pots to store grains for long periods (Oudhia, 2010). Similarly, the Mahadeokolis of Maharashtra use wood of *nigudi* to prepare *kothala* for the grain storage barrel (Kulkarni and Kumbojkar, 2003).

### In grain storage

*Vitex negundo* is traditionally used by farmers as a storage insecticide and a common insecticide. *Nirgundi* leaves, wet or dried, are used in grain storage in Bengal, Gujarat, Chhattisgarh, and Tamil Nadu. Farmers and tribals use a handful (4–10 percent) of *V. negundo* leaves alone and along with leaves of neem, *karanj* (*Pongamia pinnata*), or turmeric powder for the storage of rice and black gram (Tarafdar, 1983; Ahmed and Koppel, 1986; Garorkar, 1996; Naskar, 1998; Pal and Jain, 1998; Golob *et al.*, 1999; Sundaramari and Ranganathan, 2003; Ahuja *et al.*, 2007; 2010).

Various reports confirm that *Vitex* admixed with freshly harvested paddy, maize, or mung bean reduces damage by natural infestations of *Callosobruchus chinensis*, *Sitophilus zeamais*, and *Rhyzopertha dominica* (Dakshinamurthy, 1988; Morallo-Rejesus *et al.*, 1990). The fresh leaves mixed with paddy at 2% w/w in gunny

bags with rice and stored in drum bins protect the grains from insect attack for nine months (Prakash *et al.*, 1987). The plant products mixed with grains reduced the pest infestation in the following order: *Azadirachta indica* > *V. negundo* > *Adhatoda vasica* > *Clerodendrum infortunatum* > *Acorus calamus* (Abraham *et al.*, 1972).

### Scientific validation of traditional uses in agriculture

Traditional use of *V. negundo* leaves by tribals has been scientifically validated and reported as effective. Dry leaf powder, aqueous and alcoholic extracts repelled such coleopteran pests as *Callosobruchus chinensis*, *Rhyzopertha dominica*, *Sitophilus oryzae*, *Sitophilus zeamais*, and *Latheticus oryzae* under natural and controlled conditions. Infestation of *Sitotroga cerealella* was also reduced significantly with dried leaf powder admixed with stored paddy grains. Leaf essential oil combined with citronella oil showed repellency to *Sitotroga cerealella* (Prakash and Rao, 1996). Exposure to a combination of citronella and *lagundi* (*nirgundi*) oil (1:1) in a fumigation flask caused knockdown of adult *Sitotroga cerealella* (Krishnarajah *et al.*, 1985).

**Vishvavallabha also mentions that a frostbitten tree can produce plenty of shoots if treated with cow dung ash, and by sprinkling a decoction of nirgundika.**

***In Chhattisgarh, in the olden days, it was common practice to burn dried leaves of nirgundi in rice fields, in order to repel harmful insects.***

Leaf and branch extracts showed repellency to field insects and pests of paddy (Litsinger *et al.*, 1978) and antifeedant activity to hairy caterpillar *Euproctis fraterna* and cotton armyworm *Spodoptera litura* on castor leaves (Prakash and Rao, 1996). Its petroleum leaf extract resulted in malformed pupae of the rice leaf folder (*Cnaphalocrosis medinalis*) under controlled conditions. The acetone extract of *V. negundo* possesses insecticidal, ovicidal, growth inhibition, and morphogenetic effects against various life stages of a noxious lepidopteron insect-pest *Spilarctia obliqua* (Prajapati *et al.*, 2003). Petroleum ether leaf extracts showed larvicidal activity against larval stages of *Culex tritaeniorhynchus* in the laboratory. *Vitex* showed larvicidal activity against the mosquito species *Culex quinquefasciatus* and *Anopheles stephensi*, and acts as a deterrent to the mosquito *Aedes aegypti* (Meena *et al.*, 2010). The oil obtained from a steam distillate of leaves exhibited mosquito repellent activity. Researchers found that the protection period against mosquito bites ranged between 1 and 3 hours (Hebbalkar *et al.*, 1992).

A survey of literature on chemicals extracted from leaves show various alkaloids and glycosides. It was observed that *p*-hydroxybenzoic acid is responsible for germicidal activity (Perry, 1980). Viticosterone-*E*, iridoides, and ecdysones

isolated from *Vitex* sp. are juveno-mimetic against insects. Z-heptatriacontanone from the leaf extract of the Indian privet inhibits the oviposition of stored-grain boring insects such as *S. cerealella*, *R. dominica*, and *S. oryzae* (Prakash *et al.*, 1990; Prakash and Rao, 1996).

### Ayurvedic determinants of a pesticide

*Nirgundi* is pungent, bitter, and astringent in taste, pungent in the post-digestive effect and has hot potency. It alleviates *vata* and *kapha doshas*, but aggravates the *pitta dosha*. It possesses light and dry attributes. A plant product, to be effective as an insecticide, must possess some specific Ayurvedic properties. It has been known that the plants with pungent (*katu*), bitter (*teekta*), astringent (*kasaya*) taste; *katu* in *vipaka* (transformed taste), *ushna* (hot) in *veerya*; penetrating (*teeksna*) quality; hot (*ushna*) potency are antagonistic to the *kapha dosha* and possess insecticidal and anti-worm properties (Vijayalakshmi and Sundar, 1994). Later, Ahuja *et al.* (2007) identified that the important requisite for a pesticide would be possessing *rooksha* (dryness) and *snigdha* (soothing) *guna* (quality), in addition to being *katu*, *kasaya*, or *teeksna* in taste (*rasa*), and hot (*veerya*)

***Vitex negundo is traditionally used by farmers as a storage insecticide and a common insecticide. Nirgundi leaves, wet or dried, are used in grain storage in Bengal, Gujarat, Chhattisgarh, and Tamil Nadu.***

and highlighted the following combinations of *guna* in plants possessing insecticidal and antimicrobial activity: LD, LDP, LDPM, and LSo (L = light/*laghu*; D = dry/*rooksha*; P = penetrating/*teeksna*; M = mobile/*sara*; and So = soothing/*snigdha*).

*Vitex* is *katu* and *teekta* in taste, *katu* in *vipaka* (transformed taste), *ushna* in *veerya*, *laghu* and *rooksha* (dry) in *guna*, thus it possesses most of the inherent qualities or decisive features of an insecticidal plant. On basis of these inherent properties [*rooksha* (dry) in *guna*], *Vitex* may be considered to possess antimicrobial activity also. A survey of literature reveals that *Vitex* possesses insecticidal, anti-worm and antimicrobial properties as predicted on the basis of Ayurvedic properties (Ahuja *et al.*, 2007).

### Veterinary uses

The *Handbook of Agriculture* published by the Indian Council of Agricultural Research lists the use of *Vitex negundo* as one of the plants used in indigenous practices for the treatment of mastitis, and diarrhea diseases of animals (ICAR, 2006). *Suvaha* (*nirgundi*) is used in the treatment of elephants, as referred in Manasollasa (Sadhale and Nene, 2004). *Nirgundi* cures indigestion, brings down temperature, and is particularly recommended in typhoid. The Lokopakara refers to the cure of fever of cows with a decoction of *nirgundi* and neem leaves. Ground leaves of *nirgundi*, *Leucas aspera*, bottle gourd, *madar*, mustard, betel pepper, and lime, made into a gruel after stirring along with sesame oil and administered orally cures ninety-six types of cattle diseases. In the Medak district

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of Telangana (formerly Andhra Pradesh), farmers occasionally feed the animal with a handful of *Vitex negundo* leaves, 50 g of dry ground coconut, three *Musa paradisiaca* (banana) fruits, and one kilogram of *Trigonella foenum-graecum* (fenugreek) leaves to check foot and mouth disease (Khan, 2006). In Gujarat, to check diarrhea, farmers feed the animal with 200–250 g leaves of *nagod* (*nirgundi*) with normal feeds for two to three days (Bhimsen, 1995). *Vitex negundo* leaves, amaranth, rock salt, immature *bael* (*Aegle marmelos*) fruit, buds of the banyan tree, roots of *Datura metel*, Indian lotus rhizomes, and whole plant of Indian spinach ground in a stone mortar and applied to the belly of a cow relieves swelling.

A paste of *Vitex negundo* leaves with various other ingredients cures all digestive diseases of horses (Ayangarya, 2006). In the Moradabad district of Uttar Pradesh, *nirgundi* is used as refrigerant for cattle (Ali, 1999). In the Siran valley, Pakistan, it is used as medicine for buffaloes in colic (Shah and Khan, 2006). In Haryana, villagers use leaves for cure of swelling and washing

septic wounds of cattle and also given internally for digestive purposes. Tribals use a leaf decoction for washing septic wounds of cattle (Pal and Jain, 1998). The Oraon and Korwa tribes of Raigarh, Madhya Pradesh, use the leaf juice mixed with seeds of *Trachyspermum ammi* (*ajwain*) to treat stomach trouble in cattle and conjunctivitis (Maheswari *et al.*, 1991).

In poultry birds, lice infestation occurs mainly during the *kharif* (rainy) season. The irritation caused by the biting of the lice makes the bird peck itself all over its body and this causes detachment of the feathers. To control lice, leaves of *nagod* (*V. negundo*) are heaped in the poultry farm. It is believed that the smell of the *nagod* leaves repels lice (Patel, 1994).

### Medicinal importance

In India, *nirgundi* is used in Ayurveda, folk, Siddha, Tibetan, and Unani systems of medicine (Udayan and Indirabalachandran, 2009; Vishwanathan and Basavaraju, 2010). It is interesting that it is also dispensed in homeopathy and allopathic systems of medicine. Myriad medicinal properties have been ascribed to *Vitex* and the plant has also been extensively used in the treatment of a plethora of ailments.

### Use in Ayurveda

In Ayurveda, *sindhuvara* has been used as medicine since ancient times. *Nirgundi* is used in a variety of ways, both internally and externally. The plant finds mention in the verses of the *Charaka Samhita* which is beyond all doubt the most ancient and

authoritative textbook of Indian Ayurveda. *Vitex* has been designated as an anthelmintic and is prescribed as a vermifuge. *Vitex* has been used in postnatal care as it brings the uterus to its original size and reduces swelling. It is also useful in the first stage of gonorrhoea, increases digestion, useful in sciatica, slip disc, and swelling of muscles, increases sexual power and cures the weakness of penis, reduces common weakness, makes one free from diseases, increases age, reduces cough, fever, swelling of lungs and spleen, heals wounds, and is also useful in eye diseases (Balkishan, 2008). The plant is reported to have expectorant, carminative, digestive, anodyne, antiseptic, alterant, antipyretic, diuretic and emmenagogue, depurative, rejuvenating, ophthalmic, vulnerary, and tonic properties. The *Madanapahala Nighantu* states specifically that *nirgundi* is a promoter of memory. Patkar (2008) refers to the formulations described in *Anubhoga Vaidya Bhaga*, a compendium of formulations in cosmetology, in outlining the use of *Vitex* leaves along with those of *Azadirachta indica*, *Eclipta alba*, *Sphaeranthus indicus*, and *Carum copticum* (syn. *Trachyspermum ammi*) in a notable rejuvenation treatment known as *Kayakalpa*.

***The Handbook of Agriculture published by the Indian Council of Agricultural Research lists the use of *Vitex negundo* as one of the plants used in indigenous practices for the treatment of mastitis, and diarrhea diseases of animals.***

The whole plant, leaves, root, fruits, and seeds are used in the cure of specific diseases. However, leaves, roots, and barks are the most important in the field of Ayurvedic medicine. Leaf oil is also used in the treatment of a number of diseases (Chandramu *et al.*, 2003). The flowers are somewhat different from the rest of the plant and have a cooling energy, used in *pitta*-specific disorders such as liver complaints, fever, bleeding diarrhea, and hemorrhage (Warrier *et al.*, 1995). The flowers are useful in treating diarrhea, cholera, fever, hemorrhages, hepatopathy, and cardiac disorders.

*Sindhuvara*, the white-flowered variety, is used in treating fevers, rat and snake poisoning, and intrinsic hemorrhage (Sharma, 1996). *Nirgundi*, the blue-flowered variety, has been used to cure cough and asthma, guinea worm, *gandmala* (cervical adenitis), sinus, epilepsy, consumption, fetid ear, *vatavyadhi*, and puerperal disorders.

*Sindhuvara* leaves are used in treating headache, brain diseases, mouth sores, sore throat, swelling of throat, fever, bloating, and stomachache. People sleep on pillows stuffed with *sindhuvara* leaves to dispel catarrh and headache, and smoke the leaves for relief. Crushed leaves are applied to cure headaches, neck-gland sores, tubercular neck swellings, and sinusitis. Leaf powder is useful for curing the liver and gall bladder after a malarial attack. Leaf paste is applied on the navel, waist, and vagina for easy delivery (Tirtha, 1998).

Taken internally, the fresh leaf juice (*svarasa*) is used in treating a variety of digestive disorders, from dyspepsia to



parasites, and helps to resolve *kapha* and *vata* fevers, catarrh, cough, and bronchitis. The leaf juice also is useful in treating skin conditions such as eczema and psoriasis, and in inflammatory joint disorders such as arthritis and gout. Applied externally, the *svarasa* is used in the treatment of otitis media, joint inflammation, wounds, snake and insect bites, ulcers, bruises, sprains, and orchitis, to relieve both pain as well as inflammation. The juice is also used in bacterial and parasitic skin conditions. The juice of the leaves is said to have the property of removing fetid discharges and worms from ulcers. The freshly dried leaves can be made into a strong infusion and used in much the same way as the fresh juice, and specifically, are smoked in the treatment of *kapha* conditions such as headache and catarrh (Nadkarni, 1994).

*Nirgundi* is used as a mouthwash in the treatment of periodontal disease and to relieve tooth pain. A leaf decoction with *Piper nigrum* is used in the treatment of catarrhal fever with heaviness of head and dull hearing. Leaf oil is used to treat painful lips, fetid ear, *gandmala* (cervical adenitis), fever, venereal diseases and other syphilitic skin disorders.

The fruit has nervine, cephalic, and emmenagogue properties. The fruits are prescribed to relieve watery eyes, headache, and catarrh; when dried they are considered vermifuge (Ambasta, 1986).

*Vitex* seeds are used in regulating the menstrual cycle. They are also considered useful in treating eye diseases (*anjan*). The seeds are considered cooling and are used to

treat skin diseases and leprosy (<http://www.indianetzone.com/48/shivari.htm>).

The roots are considered as tonic, febrifugal, expectorant, anodyne and having diuretic properties, and are used to treat dyspepsia, colic, rheumatism, and boils. Kautilya's Arthashastra refers to its use in *madanadosha* (sexual aberration or torments of passion) and recommends the patient to drink milk with the astringent substance obtained from the roots of any one of *sragalavinna* (*Uraria lagopoides*), *madan* (*Xeromphis spinosa*), *varana* (*Crateva magna*), *sindhuvara* (*Vitex negundo*), and *varanavalli* (plantain) as inebriation of the person can be removed (Sensarma, 1998). A tincture of the root-bark provides relief from irritability of bladder and rheumatism. It is used in dysmenorrhea (Jadhav and Bhutani, 2005). The powdered root is prescribed as a demulcent for dysentery; it is also used to treat piles (Ambasta, 1986). The root-bark is mentioned in the treatment of rheumatism, hemorrhoids, and irritable bladder, used in much the same way as the leaf (Nadkarni, 1994).

### Commercial products

The oil prepared with the juice of the leaves is very popular for relieving pains. In the Chennai region of Tamil Nadu, *taludaali ilai* (*prasaarini*) is used for similar purposes externally and is very effective in relieving pains of acute rheumatism. The pharmacological potential of *Vitex* has been exploited effectively in formulating commercial products by traditional and modern companies dealing in Ayurvedic medicines.

Ayurvedic preparations containing *Vitex negundo* are:

Vatagajankusa Rasa, Mahavata Vidhvansana Rasa, Ykrtptihara, Lauha, Dasamula Taila, Trivikrama Rasa, Nirgundi Taila, Visa, Tinduka Taila Nirgundi Kalka, Nirgundi Ghrita, Nirgundi Kvatha, Ngagrodhadi Churana, Varnyasodhna Taila, Visagarbha Taila and Rasnadi Kavath, etc. (Anonymous, 2001).

Branded Indian products include Liv. 52, Pilex, V-Gel, Himcolin Gel, Rumalaya Gel, Acne-n-Pimple Cream, and Muscle & Joint Rub.

#### Unani medicine

*Vitex*, commonly known as *nisinda* in Unani medicine, finds use in many applications (Khare, 2004). The seeds are administered internally with sugarcane vinegar for removal of swellings. Powdered seeds are used in spermatorrhea and serve as an aphrodisiac when dispensed along with dry ginger (*Zingiber officinale*) and milk.

#### As folk medicine in India

The *Vitex* plant is used as a folk medicine in Bangladesh, India, China, Indo-China, Indonesia, Nepal, Pakistan, the Philippines, and Sri Lanka (Perry, 1980; Vishwanathan and Basavaraju, 2010). Various tribes in India use the leaves, juice of leaves, boiled leaf water, dry leaf powder, leaf extract, oil, flowers, stem, roots, and fruits of *V. negundo* to treat various afflictions (Table 2). Tarafdar (1983) has listed 33 uses of *V. negundo* by tribals of Hazaribagh,

Bihar. It is used as folk medicine in diseases such as asthma, jaundice, urticaria, abscesses, carbuncles, eczema, and liver disorders in Assam; wounds and body ache in Himachal Pradesh; toothache, febrile catarrh, rheumatic afflictions, and migraine in Karnataka; rheumatism, encephalitis, joint pain and as expectorant in Maharashtra; jaundice in Odisha; as an antidote to snakebite, respiratory disorders, fever, sinus problem, and headache in Tamil Nadu; and in eye pain and 48 other ailments in Uttar Pradesh (Vishwanathan and Basavaraju, 2010). In the Dharward district of Karnataka, leaves are used in the treatment of impotency, crack foot, bone fracture, and paralysis (Hegde and Hebbar, 2009).

The leaf juice is used to clean infected ulcers. The leaves are also used as a mosquito repellent. Its leaves are also tied around (tying is called '*dava*') the area of the body having internal injury. The ointment made from leaf juice is applied as a hair tonic. Mixed with residual coconut oil after frying fish it is applied to the head to treat baldness and dandruff. Patients cured of typhoid fever are made to take a bath in water boiled with leaves on the first and second days, for the purpose of antiseptic treatment and to bring body heat down. About 100–150 ml juice is given orally on an empty stomach for 15 days as a remedy for pile diseases (Tarafdar, 1986, 1987). In Andhra Pradesh, water boiled with five leaves is used for bathing during the post-maternity period and to cure rheumatism and arthritis (Raju, 1985). The preparation of fresh leaves of *nirgundi*, along with *jatiphal* (*Myristica fragrans*), *lajwanti*

**Table 2. Folk medicinal uses of *Vitex negundo* among various tribes of India.**

Plant part used	Usage	Tribe/Area
Leaves	Swelling	Nagas, Santhals, Kols of Uttar Pradesh, Eastern Rajasthan
	Rheumatism	Asuras of Bihar, Eastern Rajasthan, Santhals, Kols of Uttar Pradesh, Eastern Rajasthan, Chhattisgarh
	Sterilizer	Khasis and Garo of Meghalaya
	Headache	Purulia, Kondhs of Orissa, Dhanau Forest of Maharashtra, Garhwal, Delhi, Totos of Bengal
	Dropsy	Asuras of Bihar, Santhals
	Paralysis	Nayadis of Kerala
	Eye inflammation, dropsy and anasarca, madness, hemiplegia, epilepsy, postnatal complaints, scabies, sores, syphilis, rinderpest	Santhals
	Fever	Chota Nagpur, Dhanau Forest of Maharashtra, Totos of Bengal
	Blisters, boils, piles, wounds	Bhoxas of Uttar Pradesh
	Itches	Garhwal
	Diarrhea	Chanderpur (Maharashtra)
	Cold	Kols of Uttar Pradesh
	Cold and cough	Tribes of Purulia
	Fresh leaf juice	Carbuncle
Aqueous paste	Boils	Chhattisgarh
	Postnatal care	Chhattisgarh
	Good growth of baby hairs	Santhals
	Relieves bodyache	Tribes of Bihar and northeastern Madhya Pradesh, Parvati valley, Himachal Pradesh, Garhwal
Leaf oil	Rheumatism, gout, sciatica	Tribes of Chhattisgarh
	Bodyache from heavy work, migraine, toothache, earache, skin troubles	Oudhia of Orissa

*continued*

Table 2. *continued*

Plant part used	Usage	Tribe/Area
Root	Decoction in treating joint pains, spermatorrhea	Rajgarh, Madhya Pradesh, Oraon, Korwa
	Paralysis, rheumatism	Asuras of Bihar
	Tonic, expectorant	Sagar (Madhya Pradesh)
Root-bark decoction	Catarrh fever with heaviness and dullness of hearing	Santhals
Roots with fruits	Diuretic	Garhwal
Stem	Bone fracture	Asuras of Bihar
	Abortifacient	Khed (Maharashtra), Lodhas
Flowers	Pneumonia	Folks of Rajouri
	Dysentery, skin diseases, eczema, leprosy, syphilis	Tribes of Garhwal
Seeds	Gout	Tribes of Eastern Rajasthan

(*Mimosa pudica*), *satawari* (*Asparagus gonocladus*), seeds of *magji* (*Cucumis melo*), fruits of *silajit* (*Styrax officinalis*), evaporated to dryness with cow milk, mixed with sugar (twice the weight) and 1 kg of ghee taken orally is a strong sterilizer (Lal and Lata, 1980).

The dried leaves are considered a tonic by the Lodhas; the leaves are sometimes smoked for relief from headache and

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asthma. Leaf paste along with a paste of pepper is used to treat orchitis, and the leaf decoction for washing pox wounds to avoid scars (Tarafdar, 1983; Pal and Jain, 1998;). Among tribal women in the Udaipur district, Rajasthan, the powdered young roots are taken with milk to restore fertility. The juice obtained from the stem is taken orally with honey to relieve indigestion among the tribal inhabitants of northern Odisha. A leaf decoction of *Vitex negundo* with *Andrographis paniculata* and/or *Hyoscyamus niger* is used to cure cough, gout, and cold; the leaves are also used for fumigating houses to get rid of mosquitoes in Arunachal Pradesh (Srivastava and Choudhary, 2008).

The Lodhas wear a 4-cm long piece of stem on a white thread as a cure for one-sided headache. Tribal women wear a piece of

stem of *Loranthus* spp. (about 3 cm long) parasitizing on this plant as a magical agent for contraceptive purposes (Pal and Jain, 1998). In the Surguja district, Chhattisgarh, a decoction of the stem-bark is reportedly used to treat paralysis and tuberculosis. The decoction with pepper or *swarasam* is used by some as a specific in treating malaria. It is also used in the treatment of colic, dyspepsia, rheumatism, and worms. The crushed mass is tied to the head to treat heaviness of the head and fevers of the complicated or nervous type (<http://www.indianetzone.com/48/shivari.htm>). The Bengali community in Chhattisgarh believes that the presence of this shrub saves their home from ghosts. In acute and chronic rheumatism, they use *nishindi* in many ways. The most attractive and common use is wooden shoes. The use of bark powder of *nishindi* for the treatment of sciatica is also popular in this region (Oudhia, 2010).

#### **Folk medicine in Asian countries**

The Chinese Pharmacopoeia prescribes the fruit in the treatment of reddened, painful, and puffy eyes, and of headache and arthritic joints (Liu *et al.*, 2005). It is also used in common cold, flu, and cough (Au *et al.*, 2008).

In Nepal, *simali* is used in treating sinusitis and whooping cough. In Pakistan, people use it as an anti-allergenic agent, and to treat gum and skin diseases. In Sri Lanka, it is used to treat eye diseases, toothache, rheumatism and also as a tonic, carminative, and vermifuge.

In the Philippines, the leaves, bark, roots, and seeds are used for medicinal purposes by

Filipino traditional healers as an antiseptic. Oil prepared with the juice of plant parts can be rubbed onto the sinuses and to scrofulous sores of the neck. It cures of sloughing wounds and ulcers. According to some authors, febrile, catarrhal, and rheumatic affections can be treated using different preparations of plant plants. A tincture of the root-bark is recommended in cases of rheumatism. The powdered root is prescribed for hemorrhoids as a demulcent, and also for dysentery. It is also used in cancer in the Philippines. In Indo-China, a decoction of the root is prescribed for intermittent fevers.

#### **Pharmacological evidences**

The antioxidant power of the plant extracts basically depends on the composition of the extracts, hydrophobic or hydrophilic nature of the antioxidants, type of solvent used for the extraction process, method of extraction, temperature and conditions of the test. Fifteen species of *Vitex* have been explored in various studies for their phytochemical and medicinal values and it was reported that different species differ in their chemical composition resulting in different medicinal properties. Different plant parts differ in chemical compositions. Methanol, ethanol, hexane, and petroleum ether extract yield different components. Phytochemical studies on *Vitex negundo* identified several types of compounds, such as volatile oils, lignans, polyphenolic compounds, glycosidic irridoids, flavonoids, terpenes (triterpenes, diterpenes, and sesquiterpenes), alkaloids, and steroids. The phytochemical analysis, medicinal uses, and pharmacological studies on *Vitex negundo*



have been reviewed and well documented (Tandon, 2005; Padmalatha *et al.*, 2009; Meena *et al.*, 2010; Vishwanathan and Basavaraju, 2010; Singh *et al.*, 2011).

Ethanol and methanol extracts of the leaves are found to be active inhibiting agents against both gram-positive and gram-negative bacteria. On the other hand, petroleum ether and chloroform extracts had better antibacterial activity against all gram-positive bacteria (Panda *et al.*, 2009). Methanol extract (28.2%) was found to be more effective than hexane extract (16.7%) as measured by DPPH radical scavenging assay (Zargar *et al.*, 2011). The EtOH extract of the powdered dry aerial parts of *V. negundo* var. *cannabifolia* was reported to yield four phenolics – salviaplebeiaside,  $\gamma$ -tocopherol, chrysosplenol-D, isovitexin – along with *a*-tocoquinone and  $\beta$ -sitosterol, which had inhibition activities on four spoilage microorganisms *Escherichia coli*, *Bacillus subtilis*, *Micrococcus tetragenus*, and *Pseudomonas fluorescens* (Ling *et al.*, 2010). Most of the bacterial pathogens such as *Salmonella paratyphi*, *Klebsiella pneumoniae*, *Vibrio cholera*, *Streptococcus mutans*, and *E. coli* were found to be susceptible in ethanol leaf extracts of *Vitex negundo* (Merlin Rose and Cathrine, 2011). Methanolic leaf extract contains negundoside, agnuside, and vitegnoside which show antibacterial activity (Samy *et al.*, 1998), antioxidant activity (Munasinghe *et al.*, 2001), anti-fungal activity (Sathiamoorthy *et al.*, 2007), cardioprotectant (Ono *et al.*, 2004), cleaning heavy metals Fe, Al, Zn, Pb, Ni, Cr, and As (Liu *et al.*, 2005), anticonvulsant (Tandon and Gupta, 2005), anti-hyperglycemic

activity (Villasenor and Lamadrid, 2006), analgesic (Gupta *et al.*, 1999; Telang *et al.*, 1999), and hepatoprotective activity (Mahalakshmi *et al.*, 2010). Leaf and root extracts have also shown activity against rheumatism, poliomyelitis, and have diuretic, antifilarial, antimalarial, and antiandrogenic/antifertility properties (Tandon, 2005).

The anti-inflammatory, analgesic, and antihistamine properties of *Vitex negundo* claimed in Ayurvedic medicine have been reported by orally treating rats with leaf extracts. The antihistamine activity could produce the anti-itching effect claimed in the Ayurveda system (Dharmasiri *et al.*, 2003). The analgesic effect is due to prostaglandin inhibition and reduction of oxidative stress and is not mediated through opioid receptors (Tandon and Gupta, 2004). Anti-inflammatory and pain suppressing activities of fresh leaves are attributed to prostaglandin synthesis inhibition (Telang *et al.*, 1999), antihistamine, and membrane stabilizing and antioxidant activities (Dharmasiri *et al.*, 2003). Prostaglandin synthesis inhibition may be expected to cause gastric damage but no histomorphological changes were seen even in toxic doses in stomach while dose-dependent changes were observed in the heart, liver, and lung tissues (Tandon and Gupta, 2004). The chloroform extracts of leaves were toxic to a human cancer cell line panel (Diaz *et al.*, 2003) whereas non-cytotoxic was observed on mammary and genito-urinary cells of mice (Yunos *et al.*, 2005).

Methanolic extract potentiated analgesia induced by morphine and pethidine,

and demonstrated significant protection against strychnine and leptazole-induced convulsions (Gupta *et al.*, 1999). Studies conducted in India have confirmed the potentiating effect of anti-inflammatory activities of drugs phenylbutazone and ibuprofen by *Vitex*, indicating its usefulness as an adjuvant therapy along with standard anti-inflammatory drugs (Tandon and Gupta, 2006). It also potentiated the anticonvulsant action of diphenylhydantoin and valporic acid, thus it may be useful as an adjuvant therapy along with standard anticonvulsants and can possibly be used to lower the requirement of diphenylhydantoin and valporic acid. Leaf extracts possess hepatoprotective activity against liver damage induced by D-galactosamine, commonly used tubercular drugs carbon tetrachloride and ibuprofen (Maurya *et al.*, 2004). In addition, laxative activity of the leaf extracts was exhibited in rats (Adnaik *et al.*, 2008). The leaf extract showed anti-cancerous and antibacterial activity. It is taken as a remedy for bulging of the abdomen due to fat.

The essential oil from leaves of *Vitex negundo* when tested against pathogenic microorganisms *Staphylococcus aureus*, *E. coli*, *K. pneumoniae*, *B. subtilis*, *Micrococcus luteus*, and *Candida albicans* exhibited good antimicrobial activity against all the clinical isolates when compared with standard drugs ciprofloxacin and chloramphenicol (Singh *et al.*, 2011).

The flavonoid-rich fraction of seeds caused disruption of the latter stages of spermatogenesis in dogs (Bhargava, 1989) and interfered with the male reproductive function in rats (Das *et al.*, 2004). It must

however be noted that these findings are in sharp contrast with the traditional use as aphrodisiac. Khare (2004) determined that ethanolic extracts showed estrogen-like activity and propounded its use in hormone replacement therapy. The methanolic root extract possessed potent snake venom-neutralizing (*Viper russellii* and *Naja kaouthia*) capacity (Alam and Gomes, 2003).

### Contraindications

*Vitex negundo* is quite similar botanically to the better studied *V. agnus-castus*, and thus may have a similar range of contraindications, including the concurrent use of progestogenic drugs and hormone-replacement therapies. *Vitex* promotes production of progesterone in the second half of the cycle. Also known as a contraceptive, it should not be taken before ovulation, as it may delay or prevent ovulation. The juice of the leaves is dangerous to young people as it brings down sexual emotions. Experimental data on animals and human studies have reported that phytochemicals of *Vitex* exhibit hormonal activities and may affect the pharmacological effects of hormonal medications. Reports indicate that *Vitex* affects endocrinal activity and may alter effects of medications and possibly doses needed for treatment ([www.ovarian-cysts-pcos.com/vitex.html](http://www.ovarian-cysts-pcos.com/vitex.html)). *Vitex* may decrease the effect/effectiveness of oral contraceptives or female hormone replacement therapy. People with hormone dependent conditions as endometriosis, fibroids or cancers of the breast, uterus, and prostate should not take it and it is not recommended during pregnancy. Small doses may increase milk

production in females and high doses may decrease it. Dopaminergic effects of *Vitex* may be partly responsible for its prolactin-inhibiting actions and variable degree of binding occurs between crude extracts and diterpene fractions of *Vitex*. People with schizophrenia or where dopamine levels are affected should use *Vitex* under supervision of health professionals (Padmalatha *et al.*, 2009).

## Discussion

The very name of the *Vitex* plant in Sanskrit describes its medicinal importance. “*Nirgudati shareeram rakshati roghhyah tasmad nirgudi*”: *that which protects the body from diseases is known as nirgudi*. Uniyal *et al.* (2006) reiterates a popular local quote of the Bhangalis in the Western Himalayan region of India which translates as – “A man cannot die of disease in an area where *Vitex negundo*, *Adhatoda vasica*, and *Acorus calamus* are found [provided that he knows how to use them].”

Most of the species of *Vitex* have been revered for their effectiveness in treating many ailments, especially female reproductive imbalance, colic, flatulence, and digestive problems. Important uses of *Vitex* as insecticide and medicinal purposes elevated it as a sacred plant and found it a place in rituals, worships, etc. The ritualistic use of a plant in any ritual concerned with a life stage may be considered as an indication of its possible use in the life process. Maybe, our ancestors wanted to indicate or highlight the relation of the plant and its importance in cures. *Vitex* is used in puberty rituals and our folklore knowledge indicates its

important role in both male and female sexual systems.

All parts of the plant, from root to fruit, possess a multitude of phytochemical secondary metabolites that impart an unprecedented variety of medicinal uses to the plant. It is interesting to note that a single plant species finds use for treatment of a wide spectrum of health disorders in traditional and folk medicine, some of which have been experimentally validated. Thus, the *Vitex* plant holds great promise as a commonly available medicinal plant, and it is indeed no surprise that the plant is referred to in the Indian traditional circles as ‘*sarvaroganivarini*’ – the remedy for all diseases.

*Lagundi (nirgundi)* is one of a few herbs recently registered with the Bureau of Foods and Drugs (BFAD) of the Philippines as medicine, as it has been proven to be an effective analgesic and antitussive (prepared as a pleasant-tasting cough syrup). It has therefore been considered as a replacement for dextromethorphan in the public health system for cough and asthma ([http://www.philhealth.gov.ph/partners/providers/pdf/PNDFvolved7\\_2008.pdf](http://www.philhealth.gov.ph/partners/providers/pdf/PNDFvolved7_2008.pdf); [http://justmejojo.wordpress.com/2011/03/02/10-herbal\\_medicines-approved-by-doh/](http://justmejojo.wordpress.com/2011/03/02/10-herbal_medicines-approved-by-doh/)).

Although many Ayurvedic medicines using *Vitex negundo* are available in India and a considerable amount of literature is available on various aspects of the plant – traditional to biochemical and ethnobotanical to pharmacological – yet allopathic formulations using *Vitex* like

the one available in the Philippines is awaited in India. Its role in the sexual system needs thorough investigations. Pandey *et al.* (2008) concluded by saying that “considerable amount of literature is available on various aspects of the plant – traditional to biochemical and ethno-botanical to pharmacological; however there are many gaps which need to be filled by concurrent researchers in different disciplines.” It represents a class of herbal drugs with strong traditional and experimental base. Clinical trials are needed to prove its clinical utility (Tandon, 2005). The young generation is not aware of its medicinal uses for both humans and animals and depends heavily on antibiotics which have played havoc with the immune system. There is an urgent need to educate the young generation to identify the plant and to conserve it. Pharmaceutical companies need to help in the conservation looking at their medicinal importance (Padmalatha *et al.*, 2009). The lessons learnt from the traditional wisdom of the older generations combined with the modern scientific approach can provide the key to many of the unresolved issues of present-day medicine and open new vistas for the biotechnology industry (Vishwanathan and Basavaraju, 2010).

*All parts of the plant, from root to fruit, possess a multitude of phytochemical secondary metabolites that impart an unprecedented variety of medicinal uses to the plant.*

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