



VITEX NEGUNDO: AN OVERVIEW

Asha Jyothi.V* and Tejaswi Namani

Sarojini Naidu Vanita Pharmacy Maha Vidyalaya, Hyderabad, India.

*Corresponding Author Email: ashajyothivadlapudi@gmail.com

ABSTRACT

Vitex negundo is quite popular folkore medicine and a house hold name in Telangana, India for its usage after pregnancy in women. Vitex is a highly studied phytomedicine in Ayurveda for its medicinal properties. A lot of literature supports its benefits. Vitex negundo is famous for its anti-inflammatory, analgesic and antipyretic properties. In the present review its pharmacognostic, phytochemical and pharmacological profiles are elaborated and compiled for the reader's benefit.

Key words:

Vitex negundo, Vitex

INTRODUCTION

It is proven that medicinal plants have immense potential in treating many diseases. There are many varieties of such plants which are widely distributed and possess many pharmacological activities.^[1] A large proportion of world population still depends on traditional herbal medicine, especially in developing countries.^[40] Vitex negundo or Chinese chaste tree is one such tree credited with diverse therapeutic applications, including anti-inflammatory, analgesic, antimicrobial, and antioxidant properties.^[2] In India, people consider it as “Sarvaroganivari” which translates as an agent which cures all diseases.^[3] It is also believed to have a vital role in treating disorders associated with female reproductive system. “De Materia medica” contains all the information and importance of this plant.^[4] This plant is native to Eastern and Southern Africa and Asia and also found throughout the Indian subcontinent as well. It has different names in different localities. The plant's wide distribution, adaptability, and rich phytochemical profile make it a valuable resource for both traditional healing and scientific research. Vitex negundo is considered as a gift to mankind.

HISTORY

Medicinal plants are backbone of the herbal medicine. Use of herbal plants or traditional medicine are result of

experience and superstitions of many generations.^[32] In Sanskrit, it is known as Nirgundi which means “protects body from all diseases”, it also mentioned in samhithas. In ancient times, based on the color of flower people classified it into two types: “sindhuvar” (white flower bearing) and “nirgundi” (blue flowers). This plant is mentioned in various books such as Varahamihira's Brhat Samhita (c. 500 CE), Brahma Vaivarta Purana, Kautilya's Arthashastra (321–296 BCE), and Ayurvedic classics such as Kalpasthana, Susruta Samhita (400 BCE).^[5]

According to Ayurveda, it is proven to produce post digestive effect also termed as vipaka. In ancient times monks used to chew this to suppress their sexual desire hence it is also called as Monk's berry. It was also used to treat hot flashes due to reduced progesterone production during menopause.^[4] *Vitex negundo* was historically valued for its flexible stems, which were used in basketry, and its leaves, which served as natural insect repellents. It also played a role in religious rituals, symbolizing purification and protection. It was also used to control ovulatory cycles and menopause.^[6] Vitex negundo gets its common name – chaste tree – from the historical use of the plant in ancient Greece. Ancient Romans considered the seeds of *V. agnus-castus* useful for securing chastity. Vitex has been used throughout history to reduce sex drive.^[5]

Figure 1: Image of *Vitex negundo*.**TAXONOMICAL CLASSIFICATION**

Vitex negundo is a very popular medicinal plant whose taxonomical classification is given below. [3], [7]

Taxonomic rank	Scientific name	Common name
Kingdom	Plantae	Plants
Subkingdom	Tracheobionta	Vascular plants
Super division	Spermatophyte	Seed plants
Division	Magnoliophyta	Flowering plants
Class	Magnoliopsida	Dicotyledons
Subclass	Asteridae	-
Order	Lamiales	
Family	Verbenaceae	Verbena family
Genus	<i>Vitex</i> linn.	
Species	<i>Negundo</i> Linn.	Chaste tree

Table 1: Taxonomical classification of *Vitex negundo*.**GEOGRAPHICAL DISTRIBUTION**

Vitex negundo originates from tropical regions in Eastern and Southern Africa, as well as Asia.^[4] This plant flourishes in moist environments, particularly near water sources, in open forests and uncultivated lands. It is widely distributed across multiple regions, including Afghanistan, Pakistan, India, Sri Lanka, Thailand, Malaysia, parts of Africa, Madagascar, the Americas, Europe, China, and the West Indies.^[3]

VERNACULAR NAMES / SYNONYMS

Assamese: Posoti ya

Bengali: Nirgundi; Nishinda; Samalu

English: Five-leaved chaste tree; Horseshoe vitex; Chinese chaste tree

Gujarati: Nagoda; Shamalic

Hindi: Mewri; Nirgundi; Nisinda; Sambhalu; Sawbhalu

Kannada: Bili nekki

Telugu: Sindhuvara; Vavili; Nalla-vavili; Tella-vavili

Malayalam: Karinochi

Tamil: Chinduvaram; Nirnochchi; Nochchi; Notchi

Chinese: Huáng jīng ^{[1] [5]}

PHARMACOGNOSY

Many plants like *vitex negundo* with medicinal value are well studied for their macroscopic and microscopic characters. [3], [4], [8], [9]

Macroscopical characters:

PLANT PART	DESCRIPTION
Plant structure	Woody, erect shrub of height 2-5 meter
Branches	Quadrangular
Fruits	globose to broadly egg-shaped, 3-6 mm long.
Bark	bark is thin and greyish-brown or greyish-white, with a yellow blaze.
Flowers	arranged in loose, terminal or axillary panicles. bluish-purple in colour. Hermaphroditic
Leaves	leaves are palmately compound. Each leaf typically has 3-5 leaflets.

Table 2: Macroscopical characters of *vitex negundo*.

MICROSCOPY

The microscopic features of various plant parts like leaf, stem and powder are given below. ^[7]

Leaf microscopy

Epidermis	A single layer of cells, with unicellular, bi-cellular, and multicellular trichomes (hairs).
Hypodermis	1-3 layers of cells, interrupted by palisade layers.
Palisade Mesophyll:	4-8 layers of cells containing chlorophyll.
Vascular Bundles	Enclosed by a bundle sheath, traversing the mesophyll.
Stomata	Primarily on the ventral (lower) surface, often covered by trichomes.

Table 3: leaf microscopy of vitex negundo**Stem microscopy**

Pith	wide, parenchymatous region.
Hypodermis	Chlorenchymatous, containing chlorophyll.
Rays	Multiseriate

Table 4: Stem microscopy of vitex negundo.**Powder microscopy ^[1]**

•	Fragments of various trichomes.
•	Palisade tissue with hypodermis.
•	Upper and lower epidermis.
•	Xylem vessels with pitted wall

Table 5: Powder microscopy of vitex negundo.**PHYTOCHEMICAL CONSTITUENTS**

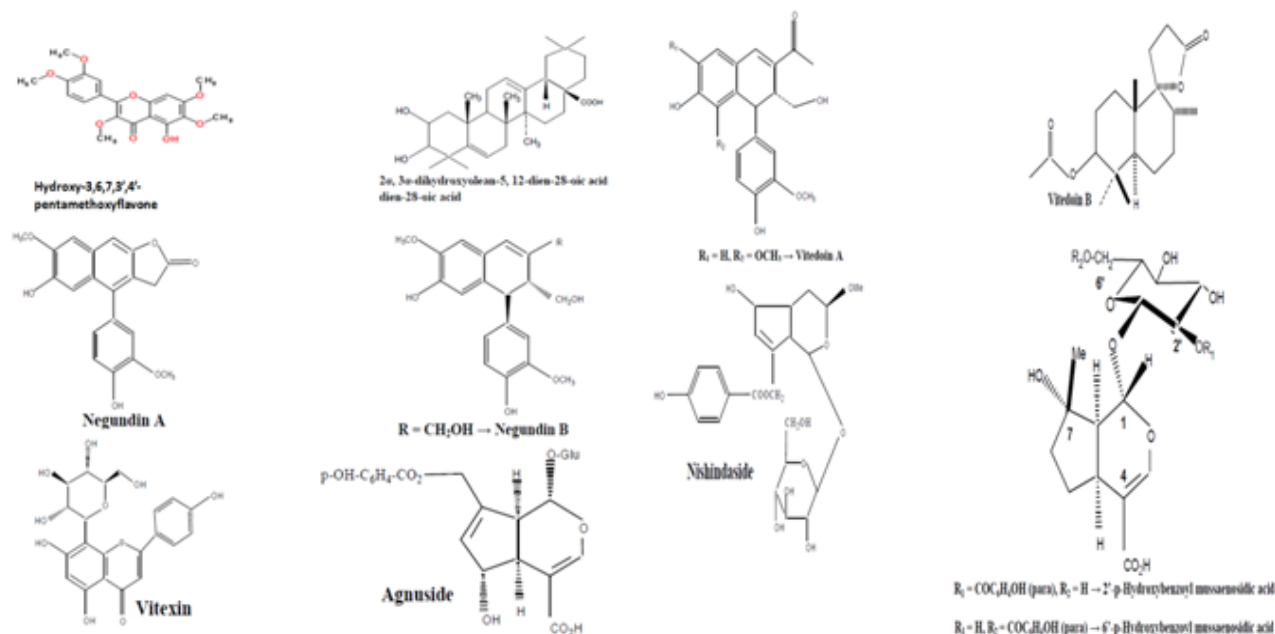
The various phytochemical constituents of vitex negundo are described below:

PLANT PART	PHYTOCHEMICAL CONSTITUENTS	REFERENCE
Leaves	Viridiferol, beta caryophyllene, sabiene-4-terpineol, globulol, 6'-p-hydroxybenzoyl musaenosidic acid, alpha copaene, beta caryophyllene, camphene, stearic acid, behenic acid, beta elemene, flavonoids, 1-octen-3-ol.	Fauziya Basri et al 2014. ^[2] Yogendra Singh et al 2020. ^[3] S. Vishwanathan et al 2010. ^[10]
Seeds	2alpha,3 alpha -dihydroxyoleana-5,12-dien-28 oic acid, vitedoin A, vitedoamine A, vitedoin B, s n- tritriacontane, n- hentriacontanol, nhentricontane, n-nonacosane, beta sitosterol, 5,7,3'-trihydroxy 6,8,4'-trimethoxy, 6-hydroxy-4-(4-hydroxy - 3-methoxy phenyl)-3-hydroxymethyl-7-methoxy-3,4-napthaldehyde	Yogendra Singh et al 2020. ^[3]
Stem and bark	Rhamnoside, vitexin, cafeate, beta amyrin, epifriedelinol, cycloheptasiloxane, tetradecamethyl nona methyl, phenyl cyclopentasiloxane, cyclooctasiloxane.	Fauziya Basri et al 2014. ^[2] Yogendra Singh et al 2020. ^[3]
Roots	Vitexin, isovitexin, negudin-A, negudin-B, diasyringaresinol, lyoniresinol, vitrofolal-E, vitrofolal-F, acetyloleanolic acid, sitosterol, 2beta,3alpha -diacetoxyoleana-5, 2alpha 3alpha-dihydroxyoleana-5.	Fauziya Basri et al 2014. ^[2] PL. Ladda et al 2012. ^[7] S. Vishwanathan et al 2010. ^[10]
Essential oil of fresh leaves, flowers and dried fruits	Guaia-3,7-dienecaryophyllene epoxide, alpha selinene, (E)-nerolidol, beta selinene, alpha cedrene, hexadecenoic acid, p-cymene and valencene.	Yogendra Singh et al 2020. ^[3] S. Vishwanathan et al 2010. ^[10]
Flavonoids	5,3'-dihydroxy-6,7,4'-trimethoxyflavone, 3'5'-dihydroxy-3,4',6,7-tetramethoxyflavone (leave)	B. Neha. et al 2021. ^[24] Banerji A et al 1969. ^[25] Achari B. et al 1984. ^[26]

Triterpenoids	Betulinic acid [3 β -hydroxylup-20-(29)-en28-oic acid (leaves) Acetyl oleanolic acid (flower)	B. Neha. et al 2021. ^[24]
----------------------	--	--------------------------------------

Table No 6: Phytochemical constituents of vitex negundo.

Structure of some phytochemical constituents of vitex negundo ^[2]:



PHARMACOLOGY

The various pharmacological activities of *Vitex negundo* are described below:

ANTIMICROBIAL ACTIVITY:

Action against - *Escherichia coli*, *Klebsiella aerogenes*, *Proteus vulgaris* and *Pseudomonas aerogenes* (Bacteria).^[2]

ANTI INFLAMMATORY AND ANALGESIC ACTIVITY:

It is the property of a substance or treatment that reduces inflammation. Anti-Inflammatory activity of *vitex negundo* was proved by performing clinical trials on rat.^[2] This activity has been attributed to prostaglandin synthesis inhibition, antihistamine and antioxidant activities of the plant.^[11] It is also found that dose of *vitex negundo* will potentiates the activity of phenylbutazone and ibuprofen in carrageenan induced hind paw oedema which is useful in adjuvant therapy. Its effect is also found in protein synthesis inhibition.^[7]

ANXIOLYTIC ACTIVITY:

Different parts of stems, roots, leaves of *vitex negundo* was found to be credited with anxiolytic activity by different solvents. Ethanolic extract of *vitex negundo* shows anxiolytic activity.^[3]

ANTINOCICEPTIVE ACTIVITY:

It was studied by using ethanolic leaf extract of *vitex negundo*. Tail flick test in rats and acetic acid induced writhing in mice were employed. Interaction with naloxone hydrochloride was also studied in tail flick method for its mechanism of central analgesic action.^[7]

EFFECT ON OXIDATIVE STRESS:

Antioxidant effect was studied by using leaf extracts. It is also found to be decreasing levels of superoxide dismutase, catalase.^[10] The extracts also possess the ability to combat oxidative stress by reducing lipid peroxidation owing to the presence of flavones, vitamin C and carotene.^[7]

SNAKE VENOM NEUTRALISATION ACTIVITY:

The methanolic leaf extracts of *vitex negundo* was found to be credited with snake venom neutralisation activity. *Vipera russellii* venom-induced haemorrhage, coagulant, defibrinogenating and inflammatory activity were significantly neutralized by both plant extracts.^[7]

ANTIPIRETIC ACTIVITY:

Leaf extracts of *Vitex negundo* Linn by using yeast induced pyrexia model in Wistar Albino rats. Petroleum ether and ethanolic extracts possess this activity. Administration through oral route is observed to be most

effective.^{[3] [12]} According to the study, the antipyretic effect may be due to flavonoids, which lower lipid peroxidation.^[6]

ANTITUMOR ACTIVITY:

Ethanol extracts of leave is found to be antitumor activity. This study increased the assess the the tumor volume, tumor cellcount.^{[12] [3]} The U-937 cell line was used to test the ethanolic *Vitex negundo* extract's anticancer properties.^[6]

CARDIOPROTECTIVE ACTIVITY:

Cardioprotective activity was highly studied by using the ethanol extract of vitex leaves. Flavonoids and flavanones were found to be responsible for this impact.^{[6] [14]}

ANTIFUNGAL ACTIVITY:

The effect was observed against some fungal species like *Curvularia lunata*, *Alternaria alternata*, *Cryptococcus neoformans*, *Trichophyton mentagrophytes*, *Candida albicans*, and *Aspergillus niger*.^{[6] [15]}

Complete summary of the various pharmacological activities is mentioned in the table 8.

MEDICINAL VALUE

Medicinal value is described below:

ACCORDING TO THE PLANT PARTS

Plant part	Medicinal importance
Seed	Condiment ^[7]
Fruit	Treatment of angina,cold,cough, vermifuge, weakness. ^[18] Treating indigestion. ^[1]
Stem	Treatment of burns and scalds ^[7]
Root	treatment of colds and rheumatic ailments, tonic, febrifuge, increases hair length.
Bark	odontalgia, erminois and ophthalmopathy ^[19]
Flower	Vermifuge, febrifuge, cool astringent, carminative. ^[7]
Leaves	Antibacterial, antitumor, astringent, treatment of swelling of joints. ^{[16] [17]}

Table 7: Medicinal value of plant parts.

MEDICINAL VALUE IN TRADITIONAL MEDICINE

Ayurveda	It is mentioned in charka samhitha. mainly used as headache and smoke relief. ^[10] Increases digestion, gonorrhea, enhances sexual power, treatment of common weakness, hemorrhage. ^[5]
Unani	Removal of swellings, used in spermatorrhoea. ^{[5] [20]}
Chinese medicine	treatment of reddened, painful, and puffy eyes; headache and arthritic joints. ^{[10] [21]}
Folk medicine	Used in treatment of several diseases occurring in tribal and rural areas. Diseases like joint pain, jaundice, rheumatitis, used as expectorant etc. ^[10]

Table 8: Medicinal value in traditional medicine.

MISCELLANEOUS

TOXICITY

Acute toxicity studies: *Vitex negundo* dosage was about 40 g of dried leaves/day, equivalent to approximately 0.8 g/kg of a person weighing 50 kg. It is studied by trials on Swiss mice. ^[22] Preliminary acute toxicity study of ethanolic leaf extract in albino rats by oral route.

The stomach showed no histomorphology changes in any of the doses. ^[1] A study concluded that a combined extract of *Vitex negundo* and related species did not lead to mortality or adverse effects in mice, even at high doses. ^[23]

ALLERGY

Chinese chaste tree or *vitex negundo* contains flavonoids, saponins which can provoke immune response in sensitive people. symptoms may include skin rashes, irritation, redness, respiratory discomfort. Produces hallucinations.

DRUG INTERACTIONS

There is very limited information regarding drug interactions of *vitex negundo*, however it is advised to visit healthcare professional before taking it.

MARKET VALUE

The market price of vitex negundo varies depending on dried plant parts (Rs. 25-110/kg) or extracts price ranging from (Rs. 40 – 550/kg).

Nirgundi leaves can cost upto Rs.45/kilogram to Rs.10,000/kilogram.

The cost of entire plant will be ranging from Rs.260-Rs.299.

The price of various vitex negundo are as follows:

Nirgundi extracts: Rs.800-1200/kg.

Vitex negundo: Rs.20/kg.

Nirgundi seeds: Rs.60/kg.

Medicine grade black leaves: Rs.10,000/kg.

S.NO	PLANT PART	ACTIVITY	EXTRACT	MODEL	STANDARD DRUG	DOSE	PARAMETERS	MECHANISM	STATS P VALUE	AUTHOR AND YEAR
1.	Leaves	Anti-inflammation	Aqueous extract	Carrageenan induced paw model Formaldehyde paw oedema model	Indomethacin and formaldehyde	5mg/kg, 1ml of 2%	EC50:2g/kg	Membrane stabilizing, inhibition of prostaglandin synthesis, Antihistamine, antioxidant activities.	P<0.05	M.G. Dharmasiri et.al., 2003. ^[11]
2.	Leaves	Analgesic	Water (fresh)	Hot plate and tail flick method	Aspirin, Naloxone	100mg/kg, 5g/kg	4.1g/kg	Inhibition of cox-2, reduction in prostaglandin synthesis.	P<0.05	M.G. Dharmasiri et.al., 2003. ^[11] P.S. Mishra et al. 2014. ^[27]
3	Leaves	Anti histamine	Butanol extract	Histamine induced bronchospasm	Chlorpheniramine	0.67mg/kg	-	Blocking of histamine receptors.	P<0.01	M.G. Dharmasiri et.al., 2003. ^[11]
4	Leaves	Anti convulsant	Petroleum and butanol leaf extracts	Maximal electroshock seizure test	Phenytoin	250mg/kg	-	Enhance Gaba activity, ion channel regulation.	P<0.01	Vishal.R.et al. 2005. ^[28]
5	Leaves	Anti nociceptive activity.	Ethanol extract.	Tail flicking and acetic acid induced writhing method.	Meperidine hydrochloride, aspirin.	40mg/kg, 50mg/kg.	-	-	P<0.01	R.K. Gupta et al. 2005. ^[28]
6	Root	Antioxidant activity.	Methanol extract.		Diclofenac sodium.	100mg/kg.	%inhibition in oedema at 3hr:69.08%(extract).	Lipid peroxidation inhibition, radical scavenging, prostaglandin synthesis inhibition.	P<0.05	Kulkarni.et al., 2008. ^[29]
7.	Bark	Antioxidant	Methanolic	In vitro	Not specified	50-250µg/mL	DPPH radical scavenging activity.	Significant antioxidant activity in a concentration-dependent manner.	Not specified	Sarvan Kumar.et al ,2011. ^[31]

8.	Root	Antibacterial	Methanolic extract	-	200-3200	-	Inhibition zone-9.9-22.6mm, MIC:200-3200µg/ml, MBC:200-6400µg/ml.	Bactericidal activity against enteric pathogens, protection in mouse cholera model.	P<0.0001	Kannathasan et al, 2013. ^[33]
9.	Leaves	Hepatoprotective	Ethanolic extract.	Thioacetamide-induced liver fibrosis.	Silymarin	100,300mg/kg	Liver enzymes, Histopathology	Antioxidant, Antifibrotic	Significant	Kadir et al,2013. ^[34]
10.	Bark	Nephroprotective	Methanolic	Paracetamol induced nephrotoxicity in rats	Silymarin	200&400mg/kg(oral)	Serum enzymes bilirubin, total protein.	Significant reduction in biochemical parameters; protective effect against kidney damage.	Not specified	Sarvan Kumar et al ,2015. ^[39]
11.	Root	Anti Microbial	Methanolic extract	Bacterial culture	ciprofloxacin	20µg/mL	Zone of inhibition.	Disruption of bacterial membrane.	Not specified.	Suganthi et al, 2016. ^[35]
12.	Leaves	Antiproliferative	Methanolic	PA1 human ovarian cancer cell lines.	Not specified	Not specified	Cell viability assays.	Induction of apoptosis in cancer cells.	P<0.005	Koirala et al, 2020. ^[36]
13.	Flower	Anti-inflammation	Ethanolic	Carrageenan induced paw model.	Not specified	200-400mg/kg	Paw edema model.	Inhibition of inflammatory mediators.	Significant.	Maniar et al, 2024. ^[37]
14.	Leaves	Antitumor	Methanolic	HCT116 colon cancer cell line assays.	Not specified	54µg/ml.	Cell cycle analysis, Apoptosis markers.	Induction of G2/M cell cycle arrest and apoptosis.	Significant.	Gouthami Kuruvall, et al,2024. ^[38]

Table 8: Summary of pharmacology activities of *Vitex negundo*.

REFERENCES:

1. Kambham Venkateswarlu, Vitex negundo: Medicinal Values, Biological Activities, Toxicity Studies and Phytopharmacological Actions, Int. J. Pharm. Phytopharmacol. Res. 2012, 2(2): 126-133.
2. Fauziya Basri, H.P. Sharma, A Review of Ethnomedicinal Plant-Vitex negundo Linn, International Journal of Advanced Research (2014), Volume 2, Issue 3, 882-894.
3. Yogendra Singh and Pankaj Mishra, Morphology, Phytochemistry and Pharmacological Activity of Vitex negundo: An Overview. Journal of Drug Delivery & Therapeutics. 2020; 10(3-s):280-285.
4. Arora Vimal, Vitex negundo: - A Chinese Chaste Tree, IJPI 2011, Volume 1, Issue 5.
5. SC Ahuja, Siddharth Ahuja, and Uma Ahuja, Nirgundi (Vitex negundo) – Nature's Gift to Mankind, Asian Agri-History, 2015, Vol. 19, No. 1, (5–32).
6. Tejas Tembare, Gauri Patil, Introduction, plant history, pharmacological and biological activities of vitex negundo: A review, International Journal of Research in Pharmacy and Pharmaceutical Sciences, 2023, Volume 8, Issue 2, Page No. 119-125.
7. PL. Ladda and CS. Magdum, Vitex negundo Linn: Ethnobotany, Phytochemistry and Pharmacology- A Review. IJAPBC, 2012, Vol. 1(1).
8. Uzma Bano, THERAPEUTIC USES OF VITEX NIGUNDO, World Journal of Pharmaceutical Research, 2015, Volume 4, Issue 12, 589-606.
9. Pradeep Singh, Phytopharmacological Review of Vitex negundo. Pharmacology online 2: 13551385.
10. S. Vishwanathan, 2010. A Review on Vitex negundo L. – A Medicinally Important, EJBS 2010, 3 (1): 30-42.
11. M.G. Dharmasiri, Anti-inflammatory and analgesic activities of mature fresh leaves of Vitex negundo, Journal of Ethnopharmacology, 2003, 87, 199–206.
12. Chitra V, Sharma SN and Kayande N. Evaluation of Anticancer Activity of Vitex negundo in Experimental Animals: An in-vitro and in-vivo Study. International Journal of Pharmtech Research, 2009; 1(4):1485-1489.
13. Miskin N, Manjunath KP, Bhandarkar A, Girish B and Manjunatha SK. Antipyretic activity of Vitex negundo Linn Leaves extracts. Rajiv Gandhi University of health sciences journal of pharmaceutical sciences, 2012; 2(2):78-81.
14. Maruthi Prasad E, Ramgopal Mopuri, Md Shahidul Islam, Lakshmi Devi Kodidhela. Cardioprotective effect of Vitex negundo on isoproterenol-induced myocardial necrosis in Wistar rats: A dual approach study. Biomedicine & Pharmacotherapy, 2017;85:601-610.
15. Guleria V, Vasisth A. Ethnobotanical uses of wild medicinal plants by Guddi and Gujjar tribes of Himachal Pradesh. Leaflets, 2009;13:1158-1167.
16. Chaturvedi GN, Singh RH, Indian journal of Medical Research. 1965; 53: 71.
17. Hansal R, Leuckert C, Rimpler H, Schaaf KD, Phytochemistry. 1965; 4: 19.
18. Sirait LM, Rimpler H, Experientia. 1962; 18: 72.
19. AJILA RAJ S, An Overview on Vitex Negundo, International Journal of Humanities Social Science and Management (IJHSSM) Volume 1, Issue 1, pp: 50-55.
20. Khare CP. 2004. Encyclopedia of Indian Medicinal Plants. Springer, Berlin, Germany. 523 pp.
21. Liu, C., Tseng, A. and Yang, Chinese herbal medicine: Modern applications of traditional formulas, CRC Press, 2005.
22. Tu T.T. Nguyen, Acute and Sub-Chronic Toxicity Studies of Aqueous Ethanol Leaf Extract of Vitex negundo in Experimental Animals, Tropical Journal of Natural Product Research, Trop J Nat Prod Res, January 2024; 8(1):5806-5810.
23. K. Phani, Toxicity Studies of Combined Extracts of Vitex Leucoxydon, Vitex Negundo and Vitex Trifolia, January – March 2014 JCPS Volume 7 Issue 1.
24. B. Neha, Phyto-pharmacological and Biological Aspects of Vitex negundo Medicinal Plant - A Review, Journal of Pharmaceutical Research International 2021,33(29A): 17-32; Article no. JPRI.67848.
25. Banerji A, Chadha MS, Malshet VG. 'Isolation 5-hydroxy-3,6,7,3',4' pentamethoxyflavone from Vitex negundo', Phytochemistry. 1969;8:511-512.
26. Achari B, Chowdhuri US, Dutta PK, Pakrashi SC. 'Two isomeric flavones from Vitex negundo, Phytochemistry. 1984; 23:703-704.
27. P. S. Mishra, S. Vyas, R. P. Agrawal, P. Phadnis and A. Tiwari, Analgesic and Anti-Inflammatory Activities of Vitex Negundo (Leaves) Extract, International Journal of Pharmacognosy, 301-306.
28. R. K. Gupta and V. R. Tandon, antinociceptive activity of vitex-negundo linn leaf extract, Ind. J Physio Pharmacol 2005; 49 (2): 163–170.
29. R. R. KULKARNI, Antioxidant and Antiinflammatory Activity of Vitex negundo Indian Journal of Pharmaceutical Science, November - December 2008.
30. Siti Latifah Abd Kadir, Potential anti-dengue medicinal plants: a review, Journal of natural medicine, 2013, 67, pages 677–689.
31. Guguloth sarvankumar, Vivekanandan Lalitha, Singaravel Sengottuvellu, sheik haja sharif and Thangavel Sivakumar, Nephroprotective activity of vitex negundo Linn Bark Against Chemical Induced Toxicity in experimental Rats, PHARMANEST- An International Journal of Advances in Pharmaceutical Sciences, 2011, Vol.2 (5 – 6).
32. V. Asha Jyothi, Tamarindus Indica: A Potent Medicinal Herb, International Journal of Pharmaceutical Research and Biomedical Analysis, 2025, 14(2), 01-06.
33. Kannathasan K, Senthilkumar A, Venkateswarlu V. In vitro antibacterial potential of some Vitex species against human pathogenic bacteria. Asian Pac J Trop Med. 2011 Aug;4(8):645-8.
34. Siti Latifah Abd Kadir, Harisun Yaakob, Razauden, Mohamed Zulkifli, Potential anti-dengue medicinal plants: a review, Journal of natural medicine, 2013, 67, 677–689,

35. N. Suganthi, S. Dubey, Phytochemical constituents and pharmacological activities of *Vitex negundo*, Journal of Chemical and Pharmaceutical Research, 2016, 8(2):800-807.
36. Niranjana Koirala, Chiran Dhakal, *Vitex negundo* Linn.: phytochemical composition, nutritional analysis, and antioxidant and antimicrobial activity, Cell Mol Biol (Noisy-le-grand), 2020 Jun 25;66(4):1-7.
37. Yasmeen. A. Maniyar, Dasari Sriraj, Peripheral and central analgesic activity evaluation of ethanolic extract of *Vitex Negundo* flowers in experimental animals, International Journal of Basic & Clinical Pharmacology, November 2017 | Vol 6 | Issue 11.
38. Gouthami Kuruvalli, Lavanya. L, *Vitex negundo* L. leaf extract suppresses the cell cycle and promotes apoptosis in colon cancer cells, Indian Journal of Biochemistry and Biophysics (IJBB), 2024, Vol.61 No.5.
39. Artha Nari Saravanakumar, Biosynthesis of silver nanoparticles using *Cassia Tora* leaf extract and its antioxidant and antibacterial activities, Journal of Industrial and Engineering chemistry, 2015, Volume 28, pages 277-281.
40. Asha Jyothi.V, A review on *Datura*, International Journal of Pharmacy and Biological Sciences-IJPBSTM (2024) 14 (2): 107-112.

***Corresponding author Email address:**

ashajyothivadlapudi@gmail.com