

## ***Vitex negundo*: - A Chinese Chaste Tree**

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### **ABSTRACT**

*Vitex negundo* (Nirgundi) is one of the widely studied and used medicinal plants amongst those mentioned in ancient books. The name “Chinese Chaste tree” is derived from one of its therapeutic activity, which depresses the sexual desire. The long list of thesaurus is result of its wide distribution throughout the world. It’s important constituents are Vitexin, Nishindaside and Negundoside. A number of experts have worked on this plant for its different therapeutic uses such as: antiandrogenic, anti-inflammatory, analgesic, hepatoprotective, anxiolytic and mosquito repellent potential etc.

**Key Words**-Chaste tree, Negundoside, Nishindaside, Nirgundi, Vitexin

### **1. INTRODUCTION**

The medicinal plants with time tested healing properties are now in vogue. An urgent need is therefore being felt for their proper identification and utility. The older literature reveals that the study of plants was not that exhaustive, in fact, the study of larger magnitude was not necessary. Today the scenario has changed with quality consciousness, ethical considerations, legal requirements and commercial benefits. Under such conditions it is apparent that archival knowledge should be revived and reaffirmed. The information available in literature is compiled and made available to those concerned.

Plant *Vitex negundo*, popularly known as Nirgundi belongs to family *Verbenaceae*. It is a well known plant because of its two main properties i.e. its use in female disorders specially disorders linked with

female reproductive system and decreasing sexual desire. This plant is widely found in Mediterranean countries as well as central Asia. In past two main herbalists Pliny and Dioscorides have done great work on it and they mentioned its use as antipyretic and its property to stimulate perspiration, urination and many more. The usefulness of this plant is mentioned in *De Materia Medica* and also reported from time to time by many workers in terms of its anti-inflammatory, antiandrogenic/antifertility and analgesic activities.<sup>[1-12]</sup>

#### **1.1 Plant History**

In Sanskrit word Nirgundi can be used for plant or any substance, which protects the body from the diseases, and it is the

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herb, which is mentioned in Ayurveda with a number of uses. Charaka has categorized Nirgundi as Krmighna-anthelmintic and Visaghna-Antitoxin (Charaka Samhita). In Ayurveda Nirgundi is described as a plant with pungent, bitter and astringent taste (Rasa), pungent in post-digestive effect (Vipaka) and has hot potency (Virya). It is also mentioned that it alleviates vatta and kapha dosas, but it stimulates or increases the pitta dosa. Its antipyretic, anti-inflammatory and anti-arthritis properties are also mentioned.

In the ancient times this drug was known because of its property to reduce sexual desire and it is recorded that Roman wives whose husbands were abroad with the legions spread the aromatic leaves on their couches for this purpose. The name Monk's berry or Monk's pepper is given to this drug because in ancient times monks were used to chew the berries of nirgundi to reduce their sexual desire. Stem of the plant was found to be beneficial because of its actions upon pituitary gland, specially its effect on production of luteinizing hormone and its reducing effect on prolactin secretion which in turn may benefit some infertile women as well as women with breast tenderness associated with premenstrual syndrome. Plant may also be used to reduce hot flashes due to reduced progesterone production during menopause. It may also be used to regulate ovulatory cycles. In early times the oil obtained from plant leaves was used to treat intense pain due to gout, rheumatism and sciatica and general body ache. [1-5, 9-10, 12]

## 1.2 Distribution of Plant

*Vitex negundo* is found in Eastern Africa, Madagascar to Iran, Burma, Pakistan, Sri Lanka, China, Taiwan, Japan, Afghanistan, India, Philippines, Thailand, throughout Malaysian region, east to the palace Islands, Caroline island and the Moriana islands. It is also widely cultivated in Europe, North America and West Indies. In India it is found at the altitude of 1500 m in outer region of Himalayas and some districts of Himachal Pradesh. [1-4, 11-12]

## 1.3 Plant Characteristics

Nirgundi is a tree of length of 8m or a spreading shrub with thin, gray and slightly rough bark. Branchlets are four angled, densely white tomentose, 3 to 5 foliate opposite leaves, terminal leaflets quite long. Leaves are minutely hairy on dorsal side, densely pubescent ventrally, shallow, blunt toothed margin, long leaf stalks. Flowers are bluish-white to bluish-purple, paniculate raceme. Berry is black and is of pea size. Fruits are four valved, capsulated and rounded like egg shaped. [1, 4, 9, 13-20]

## 1.4 Chemical Constituents

Fresh leaves yield 0.05 percent essential oils. Air-dried leaves yield alkaloid and two new iridoids-glycosides viz – nishindaside and negundoside. Bark yields flavone glycosides. Seeds have been reported to yield certain vitamins and a mixture of unidentified alkaloids. 5 $\beta$ -hydro-8,11,13-abietatrien-6 $\alpha$ -ol, lanostan-8,25-dien-3 $\beta$ -ol, artemetin, vitexicarpin,  $\beta$ -sitosterol, stigmasterol, vitexin, isovitexin, casticin, agnuside,

aucubin, luteolin 7-glucoside,  $\alpha$ -D-glucoside, orientin, nomoorientin, 5-hydroxy-3,6,7,3',4'-pentamethoxy flavone, n-tritriacontane, n-hentriacontane, n-pentatriacontane, n-nonacosane,  $\gamma$ -hydroxybenzoic acid, 5-oxyisophthalic acid, p-hydroxybenzoic acid, glucose, vanillic acid, luteolin, methyl ether of leucodelphenidin, leucocyanidin-7-O-rhamnoglucoside, glycine, alanine, valine, leucine, 6-C-glycosyl-5-O-rhamnopyranosyltrimethoxywogonin, acerosin-5-O-glucoside monoacetate, 5-hydroxy-3,6,7,3',4'-pentamethoxy-5-O-glucopyranosyl rhamnoside, vitexin caffeate, 4'-O-Me myricetin-3-O-[4''-O- $\beta$ -D galactosyl]- $\beta$ -D-galactopyranoside,  $\alpha$ -pinene,  $\delta^3$ -carene, limonene, camphene,  $\beta$ -phellandrene, 17-methyl heptenone, p-cymene, linalool, 4-terpineol,  $\alpha$ -terpineol, citral, caryophyllene oxide, geraniol, caryophyllene, terpenyl acetate, geranyl acetate, benzaldehyde, cinnamaldehyde, sabinene,  $\beta$ -pinene, 1,8-cineole,  $\gamma$ -terpinene, 4-(terpinen-4-ol),  $\beta$ -elemene, 2'-p-hydroxy benzoyl mussaenosidic acid, furanoeremophilane, acetyl oleanolic acid, 6'-p-hydroxy benzoyl mussaenosidic acid, nishindaside, negundoside, 5,3'-dihydroxy -7,8,4'-trimethoxy flavone, 5,3'-dihydroxy -6,7,4'-trimethoxy flavone, 5-hydroxy-3,6,7,3',4'-pentamethoxy flavone, 3,5-dihydroxy-3,4,6,7-tetramethoxy flavonol, 5,7,3'-trihydroxy flavone, 6,8,4'-trimethoxy flavone, 4,4'-dimethoxy-trans-stilbene, 5,6,7,8,3',4',5' -heptamethoxy flavone, 5-hydroxy-

6,7,8,3',4'-pentamethoxy-(5-O-desmethyl nobiletin) flavone, 5-hydroxy-6,7,8,4'-tetramethoxy flavone, 5-hydroxy-7,3',4',5'-tetramethoxy flavone, isoorientin, neral, bornyl acetate,  $\alpha$ -guaiene,  $\beta$ -guaiene,  $\alpha$ -elemene,  $\beta$ -farnesene, caryophyllene epoxide, nerolidol, caryophyllenol F, farnesol,  $\beta$ -eudesmol,  $\beta$ -bisabolol, cedrol, 3 $\beta$ -acetoxyolean-12-en-27-oic acid, 6-hydroxy-4-(4-hydroxy-3-methoxyphenyl)-3-hydroxymethyl-7-methoxy-3,4-dihydro-2-naphthaldehyde, spathulenol, globulol, viridifloral, bis-(1,1-dimethyl)methyl phenol, abieta-7,13-diene,  $\beta$ -eudesmol, lagundinin, betulinic acid, ursolic acid, rotundial, vitexilactone, epifriedelinol. Five compounds were isolated from methanolic extract of roots of *Vitex negundo* Linn and purified by crystallization and preparative TLC, these were then identified as 2 $\beta$ , 3  $\alpha$ -diacetoxyoleana-5, 12-dien-28-oic acid, 2 $\alpha$ , 3 $\alpha$ - dihydroxyoleana-5, 12-dien-28-oic acid, 2 $\alpha$ , 3  $\beta$ -diacetoxy-18-hydroxyoleana-5, 12-dien-28-oic acid, vitexin and isovitexin. Roots also contains oleanolic acid. Structures of some important chemical constituents are given in Figure 1-12. [1, 3, 5, 9-33]

A new phenyldihydronaphthalene-type lignan, vitedoin A, a new phenylnaphthalene-type lignan alkaloid, vitedoamine A, and a new trinorlabdane-type diterpene, vitedoin B, were isolated from the seeds of *Vitex negundo* along with five known lignan derivatives. Their chemical structures were determined mainly on the basis of NMR and MS

data. Compounds showed stronger antioxidative activity than  $\alpha$ -tocopherol using the ferric thiocyanate method. [34-35]

### 1.5 Therapeutic Uses

The therapeutic uses of *Vitex negundo* are given in Table-1 and Some Important Chemical Compounds found in the Vitex genus and its pharmacodynamic properties given in Table- 2.

### 2 Ayurvedic Preparations Containing *Vitex negundo*

Liv. 52, Pilex, V-Gel, Himcolin Gel, Rumalaya Gel, Acne-n-Pimple Cream and Muscle & Joint Rub, Nirgundi Kalka, Nirgundi Ghrita, Nirgundi Kwatha, Varnyasodhna Taila, Visagarbha Taila etc.

### 3 Conclusion

From the above discussion it may concluded that *Vitex negundo* is an herb of great deal and it is used for its various properties by a number of pharmaceutical companies and general people. Still a lot of scope is there for research on this drug to explore it further for the well being of humans. The long list of uses of the drug suggests that each and every part of the herb can be used in different ailments, which in turn reflects the importance of this herb. A number of pharmaceutical preparations, containing *Vitex negundo* makes it clear that this herb is contributing a lot not only in the field of

Ayurveda but also in or modern system of medicine. So this drug can still be explored a lot for the pharmaceutical purposes.

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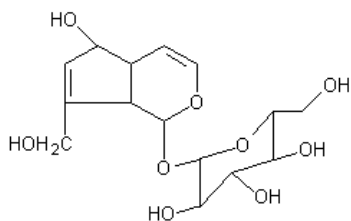


**Table 1: Therapeutic Uses of *Vitex negundo*** [1, 4, 8-11, 13-20, 25, 29-30, 34-69]

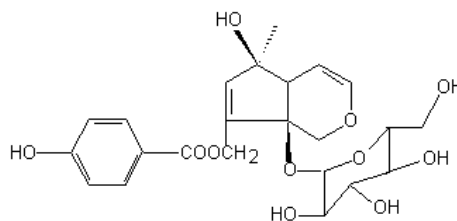
| Plant Part                 | Uses  |
|----------------------------|---|
| Powdered Roots             | Antirheumatic, Hemorrhoid, Demulcent, Worms problem, Skin problems, Dyspepsia and Colic.  |
| Tincture from Roots & Bark | Antirheumatic and Irritable bladder.  |
| Roots and Leaves           | Bitter tonic, expectorant, diuretic and anodyne.  |
| Leaves                     | As poultice in aromatic bath and filled in pillow to relieve headache and catarrh. Crushed leaves as plaster on spleen and in swelling. Leaves decoction is used as febrifuge for wounds and ulcers. Juices from leaves relieve sore throat, cough and discharges worms from the wounds. Ethanolic extract of leaves have significant antifungal activity against <i>Trichophyton mentagrophytes</i> .  |
| Flowers                    | In Cholera, Diarrhoea, Liver disorders and as Cardiac tonic.  |
| Seeds                      | Boiled seeds or its water extract used internally to prevent spreading of toxins from poisonous bites of animals.   |
| Whole plant                | Galactagogue, Emenagogue, Antigastalgic, Antiflatulant, Antiparasitic and Analgesic.  |
| Other uses                 | Suppresses sex desire, Increases chastity (sexual morality), Remedy for premenstrual syndrome and menstrual difficulties. Used in endometriosis and fibrocystic breast diseases. Promotes hair growth, used in the eye diseases, leucoderma, bronchitis, asthma, painful teething in children. Oil from fresh leaves is used for about seventy common and complicated diseases. Also used in oxidative stress, antibacterial activity, anxiolytic activity, CNS activity, antioxidant, antiinflammatory activity, laxative action, Snake venom neutralization, antiepileptic activity, and gastric carcinoma. |

**Table 2: Some Important Chemical Compounds found in the Vitex genus and its Pharmacological properties** <sup>[62-69]</sup>

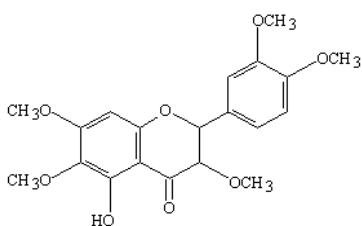
| S. N | Species, Part and Chemical Constituents   | Source   | Activity   | Ref.  |
|------|---|--|--|-------|
| 1.   | <p><b>Vitex negundo Linn</b></p> <p><u>Leaves</u></p> <p>a. 5-hydroxy-3, 6, 7 trimethoxy (3,4dimtoxypheny) 4Hchrome-4-on.</p> <p>b. 5, 7-dihydroxy-2-(3, 4 dihydroxyphenyl)-4H-chromen-4-one.</p> <p>c. Agnuside</p> <p><u>Bark</u></p> <p>a. p-Hydroxybenzoic acid</p> <p>b. <math>\beta</math>-sitosterol</p> <p><u>Seeds</u></p> <p>a. vitedoamine A</p> <p><u>Roots</u></p> <p>a. lignans (agnucastoid A, B,C and aucubin, agnuside, mussaenosidic.</p> | <p>Ethanolic extract</p> <p>Methanolic extract</p> <p>Methanolic and hexane extracts</p> <p>Acetoacetate fraction</p> <p>Methanolic Extract of the flowering stems</p>           | <p>Antifungal</p> <p>Tyrosinase inhibitory, Antimicrobial activity and Cytotoxic activity</p>                          | 48-50 |
| 2.   | <p><b>Vitex agnus-castus</b></p> <p>a. 1, 8-cineole, sabinene, <math>\alpha</math>-pinene, <math>\alpha</math>-terpinyl acetate, and (Z)-<math>\beta</math>-farnesene.</p> <p>b. 6b,7b- diacetoxy-13-hydroxy-labda-8,14-diene and rotundi-furan</p> <p>c. Linoleic Acid</p> <p>d. Apigenin , 5-hydroxy -3,6,7,4 - Tetramethoxy-flavone and casticin</p> <p>e. pinnatasterone 24-O-(pyrrole 2-carboxylate)</p>   | <p>Water and ethanol extracts of fruits</p> <p>Hexane extracts of fruits</p> <p>Methanol Extract of Fruits,</p> <p>Water &amp; Ethanol Extract n-Hexane and Ethanol Extracts</p> | <p>Antioxidant activity</p> <p>Affinity to the dopamine-D2-receptor</p> <p>Estrogenic</p> <p>Premenstrual Symptoms</p> | 51-55 |
| 3.   | <p><b>Vitex canescens</b></p> <p>a. 24-epi-abutasterone</p>   | <p>Ethanol extract of the root bark and Acetone extract of the fruits.</p>   | -----  | 56-57 |
| 4.   | <p><b>Vitex trifolia</b></p> <p>a. Vitetrifolin A, B and C, rotun-difuran, dihydrosolidagenone and abietatriene 3b-ol</p>   | <p>Pet. ether and ethanol extracts</p>   | <p>Activity against both gram-positive and gram-negative bacteria</p>  | 58    |
| 5.   | <p><b>Vitex cymosa</b></p> <p>a. Ecdysteroid, 26-hydroxypinnatasterone, 20-hydroxyecdysone</p>  | <p>Stem barks</p>  | -----  | 59    |



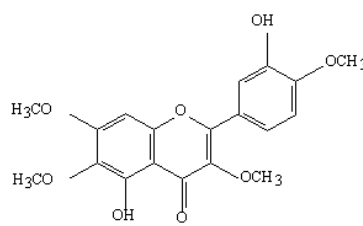
**Fig.1 Acubin**



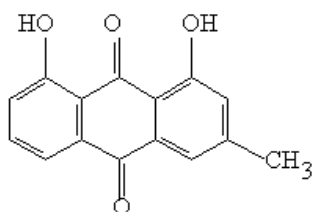
**Fig.2 Agnuside**



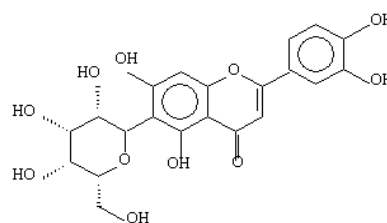
**Fig.3 Artemetin**



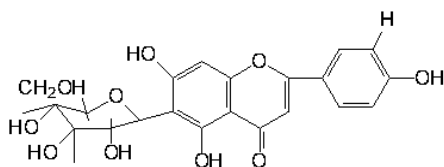
**Fig.4 Casticin**



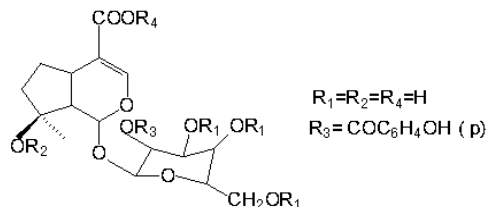
**Fig.5 Chrysophanol**



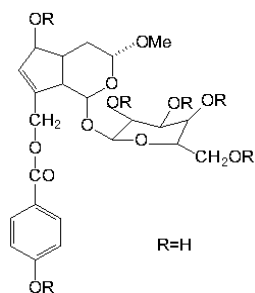
**Fig.6 Iso-orientin**



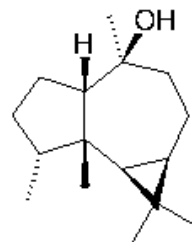
**Fig.7 Iso-vitexin**



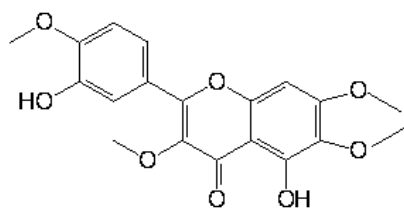
**Fig.8 Negundoside**



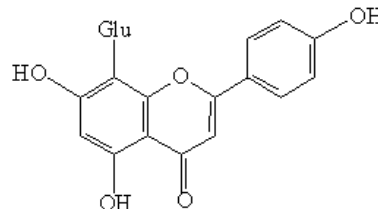
**Fig.9 Nishandaside**



**Fig.10 Viridiflorol**



**Fig.11 Vitexicarpin**



**Fig.12 Vitexin**