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Review on Traditional Therapeutic Approach for Microbial Infection with Ethnomedicinal Plant-*Vitex Nigundo*

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Abstract

Drug resistance to human pathogenic microorganism has been commonly reported from all over the world in recent years. Therefore there arises a need to develop alternative antimicrobial drugs for the treatment of infectious diseases. The plant is widely distributed and also has pharmacological actions against wide spectrum of diseases in traditional system of medicines. Development of organic phyto-pharmaceutical agents is very interesting creation in field of medicinal phyto-chemistry and these phyto-agents are being used to treat various chronic diseases with the help of essential bioactive compounds. *Vitex negundo* is a drug of herbal origin. The word vitex is derived from the latin 'vieo' (meaning to tie or bind) because of the flexible nature of its stems and twigs. It is a woody, aromatic deciduous shrub growing to a small tree. Vitex negundo is also known as the five-leafed chaste tree or monk's pepper. Its most striking feature centers on a cluster of five pointed leaves resembling a palm. This review is reporting the natural products isolated and biological potential of *Vitex negundo* Linn to cure infectious diseases.

Keywords: Infection, microbes, *Vitex negundo*, phytochemicals.

1. Introduction

Microbial infection

The emergence of microbial pathogens or their manifestation with debilitating disease (microbial diseases is primarily related to increases in the numbers of susceptible persons: people with HIV infection, bone marrow and organ transplant recipients, cancer patients being treated with chemotherapy, critically ill persons), and Morbidity, mortality and health care costs associated with fungal infections are high, addressed by Dixon D. M. *et al*[10] (1996). They also suggested that immunocompromised populations are at risk for infection not only with opportunistic pathogens (for example, *Pneumocystis*, *Candida*, *Cryptococcus*, *Trichosporon*, *Malassezia*, *Aspergillus*, *Penicillium marneffei*, and numerous other moulds or yeasts, *E. coli*, *S. dysentera*, *S. typhi*, *P. aeruginosa*, *K. pneumoni*, *S. aureus*, *Streptococcus sp*, *Bacillus subtilis*) and also with endemic fungi (for example, *Coccidioides immitis*, *Histoplasma capsulatum*, and *Blastomyces dermatitidis* and *Sporothrix schenckii*)[1].

2. Antibiotics & side effects

The desired activity of an antibiotic is to kill or prevent the growth of offending pathogenic bacteria, and yet these drugs may impact the host in an injurious manner. Generalized adverse events are common to most antibiotics (e.g., gastrointestinal distress with any oral antibacterial drug), but certain antibiotics are associated with specific effects. Altered drug metabolism is a common side effect that, in the absence of co-drug therapy, could also be considered mild[2]. Life-threatening and morbidity-causing factors of antibiotic therapy are largely direct toxic or allergic reactions[3]. Clinicians should view antimicrobial side effects as related to each organ system and be aware that more often a nonmicrobial medication is the explanation for the drug side effect rather than the antimicrobial. Nonantimicrobial medications are the most common cause of drug fever; among antimicrobials, beta-lactams and sulfonamides are the most common causes of drug-induced fevers. Antimicrobial side effects have important implications for the patient, legal and economic implications for the hospital, and medicolegal implications for the physician. Antibiotic side effects that prolong hospitalization in today's managed care environment have important economic implications. Clinicians should be familiar with the most common side effects of the most frequently used antimicrobials, to minimize

the potential of having adverse reactions occur in patients[4].

Infectious diseases are the cause of death accounting for approximately one-half of all death in tropical countries. Death from infectious diseases, ranked 5th in 1981, has become 3rd leading cause of death in 1992, with an increase of 58%. The clinical efficacy of many existing antibiotics is being threatened by the emergence of multidrug resistant pathogens. There is a continuous and urgent need to discover new antimicrobial compounds with diverse chemical structures and novel mechanism of action because there has been an alarming increase in the incidence of new and re-emerging infectious diseases. Natural products of higher plants may give a new source of antimicrobial agents with possibly novel mechanism of action. Contrary to the synthetic drugs, antimicrobial of plant origin are generally not associated with side effects and have an enormous therapeutic potential to heal many infectious diseases[5].

3. *Vitex negundo* (Nirgundi)

Fig. 1: *Vitex negundo*

Table 1:- Taxonomic classification of V. negundo

Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Asterids
Order:	Lamiales
Family:	Verbenaceae
Genus:	Vitex
Species:	V. negundo

4. Therapeutic values

Vitex negundo belongs to the family Verbenaceae is a hardy plant and also known as Nirgundi. All parts of this plant possess a wide range of phytochemical secondary metabolites which impart an unprecedented variety of use to the plant[6]. This plant is credited with innumerable medicinal activities like analgesic, anti-inflammatory, anti-convulasant, antioxidant, bronchial relaxant, hepatoprotective, also used as acrid, astringent, cephalic, stomachic, antiseptic, alterant, thermogenic, depurative, rejuvenating, ophthalmic, anti-gonorrhoeic, antipyretic, useful in bronchitis, asthma and enlargement of spleen. Its root are tonic, febrifuge, anti-rheumatic, diuretic and are useful as a demulcent in dysentery, in cephalalgia, otalgia, calic, uropathy wound and ulcers. Bark is useful in odontalgia, verminosis and ophthalmopathy. Leaves are aromatic, bitter acrid, astringent, anodyne, anti-inflammatory, antipyretic or febrifuge, tranquillizer, bronchial smooth muscle relaxant, anti-arthritic, antithelmintic and vermifuge. Flower are cool, astringent carminative, hepatoprotective, digestive, febrifuge, vermifuge and are useful in cardiac disorders. Fruit is nervine, cephalic, aphrodisiac, emmenagogue and vermifuge[7].

Vishwanathan A. S. and Basavaraju R.[8] (2010), reviewed to different properties of *Vitex negundo* (Vn) L., they also represented different phytochemical constituents of leaves, seed, root, essential oil and dried fruit. The phytochemical components of medicinal plants often act individually, additively or synergistically in improvement of health. They also reported necessitated experimental evidence for pharmacological properties like anti-inflammatory and analgesic activity, antioxidant characterstics and therapeutic potential of Vn flavonoid in modulating solenoid induced cataract, root extracts of Vn showed enzyme inhibitory activity against butyryl-cholinesterase, alpha- chymotrypsin, xanthine-oxidase and tyrosine. They have also reported that the aerial parts of Vn indicate HIV type I reverse transcriptase inhibitory activity. They concluded their studies with popular quote of Uniyal et al, which translates as- “A man cannot die of disese in on area where Vitex nigundo are found” (provided that he knows how to use them. The 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.

Priyanka N. and Joshi P. K.[9] (2013), reviewed to several therapeutic uses of *Lantana camara.* They reported that much work conducted in India on the chemical constituents of *Lantana*

camara; extracts from the leaves exhibit antimicrobial, fungicidal, insecticidal, nematicidal, biocidal activity. Lantana oil is used externally for leprosy and scabies. Plant extracts are used as medicine for the treatment of cancers, chicken pox, measles, asthma, ulcers, swellings, eczema, tumors, high blood pressure, bilious fevers, catarrhal infections, tetanus, rheumatism, malaria and atoxy of abdominal viscera.

Prakash P. and Gupta N.[10] (2005), described the therapeutic use of *Ocimum sanctum* Linn (known as Tulsi in Hindi) and its pharmacological actions. They demonstrated that different parts (leaves, stem, flower, root, seeds and even whole plant) of Tulsi use as traditional medicine, have been recommended for the treatment of bronchitis, bronchial asthma, malaria, diarrhea, dysentery, skin diseases, arthritis, painful eye diseases, chronic fever, insect bite etc. The *Ocimum sanctum* L. has also been suggested to possess antifertility, anticancer, antidiabetic, antifungal, antimicrobial, hepatoprotective, cardioprotective, antiemetic, antispasmodic, analgesic, adaptogenic and diaphoretic actions.

Shah P. P. and Mello P.[11] (2004), reported that mentha piperita linn. Helpful in symptomatic relief of the common cold, may also decrease symptoms of irritable bowel syndrome and digestive symptoms such as dyspepsia and nausea and used as an analgesic to treat headaches. They also pointout pipermint oil showed the moderate antimycotic activity against *Aspergillus fumigates*, *Candida albicans* etc.

Parle M. M. *et al*[12] (2014), described that *Acacia catechu* willd has been shown to possess multifarious medicinal properties such anti-microbial, anticancer, anti-diarrhoeal, anti-inflammatory, antimicrobial, antioxidant, antipyretic, anti-ulcer, antisecretory, hepatoprotective, hypoglycaemic, sore throat and wound healing etc. They also reported several phyto-constituents, flavanoids (catechin, (-) epicatechin, epigallocatechin, epicatechin gallate, epigallocatechin gallate, rocatechin, phloroglucinol, procatechuic acid, catecutannic acid, quercetin, quercitrin), alkaloids (kaempferol, dihydrokaempferol, taxifolin, (+)-afzelchin gum), glycosides (Poriferasterol, poriferasterol acylglucosides), tannins (gallic acid, phlobatannins), sugars (d-galactose, d-rhamnose and l-arabinose), present in this plant.

Gupta A. *et al*[13] (2014), reported that *Prosopis cineraria* is used like leaves, bark, twigs, flowers, fruits and pods in treatment of various therapeutic effects, possess anti hyperglycemia, anti hyperlipidemia, anti oxidant analgesic, anti pyretic, anti depressant and skeletal muscle relaxant activity. The bark of plant exhibited antidiabetic, anti atherosclerotic, nootropic activity while pods were reported to have anti bacterial effect.

5. Phyto-Constituents & Bioactivities of Selected Plant

Lakshmanashetty R. H. *et al*[14] (2010), estimated Total phenolic content and total flavonoids of Vn leaf with different organic solvents (ethanol extract > methanol extract > benzene extract > chloroform extract > hexane extract > ethyl acetate extract > petroleum extract). Estimation of TPC was done by using Folin-Ciocalteau reagent (FCR) method and gallic acid used as standard. A calibration curve was constructed using varing concentration of gallic acid. Values were expressed in term of milligrams of gallic acid (mg GAE) pergram of dry weight. TPC equivalents of gallic acid was 249.96 8.34 mg/g of extract. Total flavonoid contents were measured by spectrophotometrically method and calibration curve was prepared using catechin as standard.TFC equivalents of cetachin was 166.67 9.14 mg/g of extract. Free radical scavenging activity was determined by DPPH assay (79.82 2.99% at 500 µg/ml concentration). They point out that *Vitex negundo* L. expressed antioxidant activity in the presence of significant value of TPC & TFC.

Prashith Kekuda T. R. *et al*[15] (2013), conducted in vitro antibacterial, cytotoxic and antioxidant efficacy of methanol extract of two varieties of *Vitex negundo* namely *V. negundo* var. *negundo* (Vnvn) and *V. negundo* var. *purpurascens* (Vnvp). Phytochemical analysis of methanol extract of these plants revealed the presence of higher concentration of phenolic contents and flavonoid contents. Total phenolic and flavonoid content of leaf extracts were estimated by Folin-Ciocalteau reagent and Aluminium chloride colorimetric estimation method respectively. Concentration of phenols (285.69µg GAE/mg) and flavonoids (30.35µg CE/mg) were higher in methanol Vnvp extract. This study showed to Vnvp display marked antibacterial / cytotoxic and antioxidant activity. This study also revealed that extract of Vnvp exhibited higher bioactivities (antibacterial, antioxidant and cytotoxic), is highly ascribed by thw significant level of TPC & TFC.

Gautam L. N. *et al*[16] (2008), have carried out phytochemical investigation of methanolic extract of leaves of *Vitex negundo* resulted in the isolation of eight compounds under silicagel VLC, CC and preparative TLC. They were identified as negundoside, agnuside, vitegnoside, 7,8 dimethyl

herbacetin 3-rhamnoside, 5,3'-dihydroxy—7,8,4'-trimethoxy flavanone, 5-hydroxy-3,6,7,3',4'-pentamethoxy flavone, 5,7 dihydroxy- 6,4' dimethoxy flavonone, and 5 hydroxy-7,4' dimethoxy flavone. The structures of pure compounds were elucidated by MP, Rf values, Co-TLC, Colour reactions (Cerric sulphate spray), mild acid hydrolysis and spectroscopic methods (Mass, UV, IR, 1H, 13C and 2 D NMR). All the isolated compounds were evaluated for their antimicrobial activities. They were also found to have significant antibiotic activity against *Bacillus subtilis, Staphylococcus aureus, Micrococcus pyogenes, Pseudomonas aeruginosa* and *E. coli*. The compounds vitegnoside, and 7, 8 dimethyl herbacetin 3-rhamnoside have MIC 6.25mg/ml.

Khatak S. *et al*[17] (2014), investigated antimicrobial activity of methanolic extract of *Vitex negundo* against *C. Albicans* and *S. mutas*e. They were used petroleum ether, chloroform, water: ethanol (1:1) solvents for extraction of *Vitex negundo* powder (bark & leaves) chloroform and methanol used for re-extraction. They found that *C. Albicans* most sensitive towards the methanolic extract where as *S. mutas*e was least sensitive towards methanolic extract of *Vitex negundo* against *C. Albicans.* The maximum zone of inhibition (28 mm) was shown by both leaf and bark methanolic and chloroform extract against *C. albicans.*

Pandeya K. B. et al[18] (2013) reported and listed the plants which have the antioxidant, antidiabetic, antimicrobial activities of 177 plants.

6. Conclusion

The traditional 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 medication for all diseases. Considerable amount of literature is available on various aspects of the plant – traditional to biochemical and ethnobotanical to pharmacological; however there many gaps which need to be filled by concurrent researchers in different disciplines. One must make the best use of the naturally available resources which provide valuable raw substance for advanced research. Nature has many lessons to point out and the onus is on us to get attuned and grasp whatever is within our reach, before it is too late.

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