



Review on Nature's Drugstore: *Azadirachta indica*

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Received: 19-12-2023; Revised: 26-01-2024; Accepted: 04-02-2024; Published on: 15-02-2024.

ABSTRACT

Neem has grown to be treasured plant in the world which indicates the solutions for hundreds to thousands of problems. Neem has grown to be important in the worldwide context nowadays because it gives answers to the major concerns facing mankind. It has been substantially utilized in Ayurveda, Unani and Homoeopathic medicine and has become a centre of enchantment of modern medicinal drug. *Azadirachta indica* (neem) is an unexpectedly developing evergreen widely known tree found generally in various regions of worldwide like USA, Africa and India. The aim of this review article offers information particularly on various pharmacological activities like anti-inflammatory, antimalarial, antiulcer, antidiabetic, antifungal, antibacterial, wound healing, antioxidant activity and different pharmacological activities of neem plant and medicinal uses.

Keywords: *Azadirachta indica*, Taxonomical classification, pharmacological activities.

INTRODUCTION

WHO pointed out that more than 80% of global's population depends on vegetation to meet their primary health care needs. *Azadirachta indica* is popularly known as Indian neem or margosa tree. It's been appreciably used in ayurveda, unani and homoeopathic medication due to the fact that time immemorial. In Sanskrit a "good health" circumstance is expressed as "Nimba"¹, which on due time derived in to "Neem", addition the tree is considered as "Sarvaroga nivarini" method remedy illnesses.

In Ayurveda neem is referred as "Arishtha" that means 'reliever of diseases. The tree continues to be appeared as "village pharmacy" or "Divine tree" due to presence of medicinal properties in India². According to the Hindus, it's far believed that the goddess of the chicken pox, Sithala lives in the neem tree. Neem tea is taken to reduce headache and fever. Its flowers are used to remedy intestinal problems. Neem bark acts as an analgesic and might treatment high fever as of malaria. Even the skin diseases can be cured from the neem leaves. India believes plenty that the neem can treatment all diseases³.

Herbs like tulsi (*Oscimum sanctum*), neem (*Azadirachta indica*), punarnava (*Boerhavia diffusa*); amrita (*Tinospora cordifolia*) and harida (*Currucuma longa*) act as natural anti-microbial agents and can be utilized in aggregate for treatment of anthrax in animals¹². Neem is the most useful traditional remedy as a supply of many therapeutic agents within the Indian culture and grows well in the tropical and semi-tropical countries.

It has been proven that neem leaves extract acts as a growth promoter⁴, improve overall performance and hematological parameters⁵ and immune response⁶⁻⁷ in broilers. In indigenous device of medicine, every part of neem tree is used, viz. bark, and leaves, fruits, seeds and extracts. Its extracts have antiviral, antibacterial,

antifungal, anthelmintic, antiallergic, anti-dermatic and anti-inflammatory properties⁸.

Neem oil extracted from its seeds is used in medicines, pest control and cosmetics etc. and its leaves are used in the remedy of chicken pox. Neem also has anticoccidial impact in broilers and is used as pesticide⁹.

Taxonomical Classification:

It has similar properties to its close relative, *Melia azederach*. The word Azadirachta is derived from the Persian azaddhirakt (meaning 'noble tree'). The taxonomic positions of neem are as follows¹⁰:

Order: Rutales
Suborder: Rutinae
Family: Meliaceae
Subfamily: Melioideae
Tribe: Melieae
Genus: Azadirachta
Species: indica

Vernacular names¹¹:

Bengali: Nim, Nimgachh
Gujarati: Danujhada, Limbado, Limbra, Limdo
Hindi: Nim, Nimb
Sanskrit: Arista, Nimba, Nimbah, Picumarda
English: Indian Lilac, Margosa tree, Neem tree
Kannada: Bemu, Bevinamara, Bivu, Kaybevu
Punjabi: Bakam, Drekh, Nim.



HOME REMEDIES OF NEEM

A home remedy is characterized as a basically pre-arranged remedy or tonic frequently of dubious viability regulated without solution or professional oversight.

Antifungal and Antibacterial Paste: The leaves of neem can be used to cure fungal and bacterial infections. Make a paste of tree leaves and apply to the infection for relief. Paste of Neem leaves is also used for treating chickenpox boils¹².

Neem Oil: The calcium and different mineral content are very high in neem leaves. Neem oil can be applied to the body particularly legs and hands for stronger bones. Also, oil from neem is useful for patients with arthritis because it relieves the pain and reduces the inflammation^[12].

Natural Insecticide: Neem leaves are wonderful mosquito and insect repellent. Burn neem leaves to hold mosquitoes away from your home and surroundings. This trick is mostly used by cattle rearers to keep all sorts of insects away from the cattle¹³.

Oral Health: Chewing neem leaves is beneficial for keeping properly oral fitness. It keeps the infections away from your gums, gives you fresh breath, lessens tooth decay, kills terrible microorganism in your mouth and maintains the pH level of your saliva¹³.

Boost Immunity with Neem Tea: Neem tea boost immunity in body towards sicknesses such as common cold and fever. It is found in studies that neem tea can be as effective as quinine for remedy of malaria affected cells inside the body¹⁴.

Homemade Toothbrush: Small branches or twigs can be used for brushing your teeth. The same has been used for many years and the same blessings can be availed with the aid of the usage of neem toothpaste nowadays¹⁵.

Hair Mask: Neem hair mask has a totally healthful and lasting effect on your hair. It makes your hair strong and shiny. Prepare a paste of neem leaves and apply the same to your hair for better results. The same can also be used to deal with dandruff and fungal infections of your scalp.

Remove Acne: Neem oil removes acne and provides relief when applied to pores and skin acne. Due to its anti-inflammatory properties, neem oil is found very powerful for curing dry skin, itches and pimples, etc.

PHARMACOLOGICAL ACTIVITIES

Anti-inflammatory

Plants or their isolated derivatives are in the practice to treat/act as anti-inflammatory agents. A study result has confirmed that extract of *A. indica* leaves at a dose of 200 mg/kg, p.o., showed significant anti-inflammatory activity in cotton pellet granuloma assay in rats¹⁶. Other study results revealed that neem leaf extract showed significant anti-inflammatory effect but it is less efficacious than that of dexamethasone¹⁷ and study results suggest that nimbidin suppresses the functions of macrophages and

neutrophils relevant to inflammation¹⁸. Earlier finding showed immunomodulator and anti-inflammatory effect of bark and leaves extracts and antipyretic and anti-inflammatory activities of oil seeds¹⁹⁻²⁰. Experimentation was made to evaluate the analgesic activity of neem seed oil on Albino rats and results of the study showed that neem seed oil showed significant analgesic effect in the dose of 1 and 2 mL/kg and oil has dose-dependent analgesic activity²¹. Outcomes of the study concluded that the treated animals with 100 mg/kg dose of Carbon Tetrachloride Extract of *A. indica* fruit skin and isolated ingredient azadiradione showed significant ant nociceptive and anti-inflammatory activities²².

Antimalarial activity

Neem seed and leaf extracts are powerful towards both chloroquin-resistant and sensitive strain malarial parasites. One of the neem's components, "gedunin" (a limonoid), is as powerful as quinine against malaria. Malaria is one of the pandemic sicknesses inflicting tens of millions of deaths each year in India and several other countries. China has adopted neem in a massive manner to gain the antimalarial effects of neem. The anti-malarial formulation "Quinahausa" prepared in China will be available in India as well. Neem oil treated mosquito nets and mosquito-repellent cheap tablets are also becoming popular, due of growing problems of resistance to conventional treatments, it's far becoming increasingly tough to manipulate malaria. Medical trials have been conducted to check the efficacy of neem extracts to control hyperlipidemia in a set of malarial patients severely infected with *P. falciparum*. The lipid level, particularly cholesterol, was found to be lower during therapy when compared to non-malaria patients²³⁻²⁴.

Antiulcer Activity

The antiulcer effect was obtained with nimbidin in preventing acetyl salicylic acid, indomethacin, serotonin-induced gastric lesions or stresses as well as cysteamine induced duodenal ulcers or histamine²⁵⁻²⁶. Leaf extract of *A. indica* (Neem) indicates antiulcer effect was reported by Garg *et al.*, and the inhibition of mucus depletion and most cell defragmentation as possible mechanism. Bandyopadhyay *et al.*, isolates the phenolic glycoside as an active constituent, whose characterization and mechanism are under investigation. Therefore, *Azadirachta indica* gives another choice for an effective antiulcer drug and which is safe²⁷. This study was carried out to evaluate the antiulcer activity of the Aqueous Extract (AE) of the leaves of *A. indica* in Wistar rats. Gastric ulcerations were brought on through pyloric ligation, aspirin, and cold restraint stress. AE was used in doses of 150, 300, and 600 mg/kg body weight per OS. Distilled water served as the control and ranitidine 20 mg/kg body weight intraperitoneal as the reference standard. The Ulcer Index (UI) and Percentage Inhibition (PI) values were determined in each model. The volume of gastric contents, free acidity, total acidity, and pH has been measured inside the pyloric ligation-induced ulcer model. AE showed a dose-dependent and significant



($p < 0.05$) decrease in the UI and an increase in the PI in all models employed compared to the control group. AE caused a dose-dependent decline in the gastric content volume, free acidity, and total acidity. The leaves of *A. indica* possess tremendous antiulcer activity and act via multiple mechanisms²⁸.

Antidiabetic evaluation

The pharmacological hypoglycemic action of *Azadirachta indica* has examined in diabetic rats. After treatment for 24 hrs, *Azadirachta indica* 250 mg/kg (single dose study) reduced glucose (18%), cholesterol (15%), triglycerides (32%), urea (13%), creatinine (23%), and lipids (15%). Multiple dose study for 15 days also reduced creatinine, urea, lipids, triglycerides and glucose. In a glucose tolerance test in diabetic rats with neem extract 250 mg/kg demonstrated glucose levels were significantly less compared to the control group. *Azadirachta indica* significantly reduce glucose levels at 15th day in diabetic rats²⁹.

Antifungal activity

From time immemorial it is believed that Neem is effective against certain fungi that infect the human body. Some important fungi against which neem preparations have been found to be effective are: athlete's foot fungus that infects hair, skin and nails; a ringworm that invades both skin and nails of the feet, fungus develops in intestinal tract, bronchi, lungs, and mucous membranes and a fungus that is part of the normal mucous flora that can get out of control leading to lesions in mouth (thrush), vagina, etc. Extracts of neem leaf, neem oil seed kernels are effective against certain fungi including *Trichophyton*, *Epidermophyton*, *Microspor*, *Trichosporon*, *Geotricum* and *Candida*³⁰.

Antibacterial activity

Neem derives compounds especially Azadirachtin is well known for its role as antibacterial agent. It is a complex tetranortriterpenoid limonoid present in the seeds as well as leaves which is highly responsible for toxic effect on microbes³¹. Extracts of the leaves, seed and bark possesses a wide spectrum of antibacterial action against Gram-negative and Gram-positive microorganisms, including *M. tuberculosis* and streptomycin resistant strains. *In vitro*, it inhibits *Vibrio cholerae* *Klebsiella pneumoniae*, *M. tuberculosis* and *M. pyogenes*³². Antimicrobial effects of neem extract have been demonstrated against *Streptococcus mutans* and *S. faecalis*³³. Apart from azadirachtin, other components such as nimbidin, nimbin, nimbolide, gedunin, mahmoodin, margolone, and cyclic trisulfide contribute to the anti-bacterial activity of neem³⁴⁻³⁵. Further, neem extracts are a ray of wish to cure deadly diseases viz., Chagas disease in Latin America which was uncontrolled by any other means of medicines. This disease is caused by a parasite which is carried by an insect called kissing bug. Research has shown that feeding neem to the bugs not only frees them of parasites, but

azadirachtin prevents the young insects from molting and the adults from reproducing.

Wound Healing Activity

The wound healing properties in small animal model, the excision and incision wound models were used and water, ethanol-water (1:1, v/v) and ethanol extracts were applied topically (15% w/w in ointment base). In the excision wound model, wound contraction, hydroxyproline content, DNA content, protein content, and nitric oxide levels were estimated after 14 days of topical treatment in conjunction with histopathological examinations. In the incision wound model, wound breaking strength was determined after 10 days of topical application of various extracts of AI. The animals treated with water extract of AI exhibited significant increment in rate of wound contraction (93.39%, $P < 0.01$), hydroxyproline content (13.31 ± 6.65 mg/g of dry tissue, $P < 0.001$), DNA content (20.99 ± 0.68 μ g/100 mg of tissue, $P < 0.01$), protein content (100.53 ± 7.88 mg/g of wet tissue, $P < 0.01$) and nitric oxide level (3.05 ± 0.03 mMol/g of tissue, $P < 0.001$) as well as in wound breaking strength (289.40 ± 29.45 g, $P < 0.01$) when compared with car manipulate organization which was also supported by histopathological studies. The water extract of stem bark of AI possesses significant wound healing property, validating its traditional use³⁶.

Antioxidant activity

The antioxidant activity of neem seed extract has been demonstrated in vivo during horse- grain germination which is associated with low levels of lipooxygenase activity and lipid peroxides³⁷. An antioxidant principle has also been isolated, which is a potent inhibitor of plant lipooxygenases. Anti-oxidants derived from neem is simple and cost effective way to supplement with natural extracts like those derived from Neem, in forms including teas and oils, seem to be a simple and cost-effective manner to introduce antioxidants³⁸.

Anticancer activity

Neem leaf aqueous extract effectively suppresses oral squamous cell carcinoma induced by 7, 12-dimethylbenz[a] anthracene (DMBA), as revealed by reduced incidence of neoplasm³⁹⁻⁴⁰. He has conducted a study in chemoprotective neem compounds viz., azadirachtin, nimbolide and limonoid enrich extracts on models of buccal carcinogenesis in hamsters. Overall studies were tested positive to reduce the expression and cell proliferation antigens. Further, researchers have shown prominent anti-cancerous activities from limonoid-derived compounds from neem. Amongst these, both 1-O-deacetyllochlinolide B and 15-O-deacetylNimbolindin-B are proved to be beneficial to hinder cell growth in human cervical adenocarcinoma⁴¹⁻⁴². A very recent study discovered that alkaloid-derived limonoid, azadiramide-A, is primarily found in Neem leaf ethanolic extracts, showed to stop cell growth and induce apoptosis in both the estrogen independent MDAMB-231 and estrogen



dependent MCF-7 cell lines of breast cancer in human beings⁴³.

Antifertility Activity

Neem seed and leaf extract possess the chemical ingredients which can act as anti-fertility sources. Studies on this idea have revealed that intra-vaginal application of neem oil, can prevent pregnancy, thereby stating it as a novel method of contraception. NIM- 76, a refined product from neem oil, was studied in 10 human volunteers, where intra-vaginal application before sexual intercourse could prevent pregnancy with no adverse effect on vagina, cervix and uterus, further; the study revealed that intrauterine treatment is safe. Aqueous extracts of seeds and leaves contain sodium nimbinat (triterpene) which showed antifertility activity⁴⁴⁻⁴⁶.

Skin Disorders

Neem can treat many skin disorders, such as scabies and lice; in a paste combination with *Curcuma longa* (turmeric), neem was used to treat scabies in 814 people— 97% of them were cured within 3 to 15 days of application, and no adverse reactions were observed⁴⁷.

ACKNOWLEDGMENT

We would like to acknowledge our gratitude to Anandrao Dhonde Alias Babaji Mahavidyalaya, Kada., department of Chemistry for providing necessities for execute this study.

Source of Support: The author(s) received no financial support for the research, authorship, and/or publication of this article

Conflict of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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