



Medicinal Properties of Neem: A Review

Dash A^{1*}, Dutta AK¹, Sahu S² and Sahoo M¹

¹Gayatri Institute of Science and Technology, India

²Department of Pharmacology, Gayatri Institute Of Science And Technology, India

***Corresponding author:** Abhilash Dash, Gayatri Institute of Science and Technology, Gunupur, Rayagada, Odisha, Tel: 7008795599; Email: abhilashdash55@gmail.com

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Abstract

Neem is a very useful traditional medicinal plant in Asian and African subcontinent. Each part of the tree including leaves, seeds, roots, bark and flowers have some medicinal properties. The extract of Neem has antidiabetic, anti-inflammatory, anti-allergic, antibacterial, antifungal, antiviral, anthelmintic properties. It's a versatile medicinal plant, because of its diverse therapeutic properties. The traditional name for the neem plant in Sanskrit is Nimba. It popularly known as the "Miracle tree", "Indian lilac" and "Village pharmacy". In modern era use of herbal products is gaining popularity because people prefer low side effect and high therapeutic product. This tree has a wide range of scope for the utilization in the several diseases.

Keywords: Neem; Medicinal Properties; Disease and Therapeutic

Introduction

Herbal medication, which has fewer negative consequences and is environmentally safe, has been used to control infectious infections in recent years. The medical benefits of neem (*Azadirachta indica*) are widely recognized. *Azadirachta indica* belongs to the Maliaceae family of mahogany trees. Neem, which thrives in tropical and semi-tropical regions, is the most beneficial traditional medicine in Indian culture and a source of numerous therapeutic compounds. Neem leaf extract has been demonstrated to have growth-promoting properties [1], enhance hematological parameters and performance [2] and the immune system's reaction in broilers [3,4]. All parts of the neem tree—bark, leaves, fruits, seeds, and extracts—are utilized in traditional medicine. According to Raheja [5] its extracts possess antiviral, antibacterial, antifungal, anthelmintic, antiallergic, anti-dermatological, and anti-inflammatory qualities. Neem leaves are used to treat chicken pox, and the oil produced from the seeds is used in medications, cosmetics, and pest control products, among other things. Neem is employed as a pesticide and has

anticoagulant properties in broilers [6,7]. It is claimed by Hindus that the neem tree is home to Sithala, the goddess of chicken pox. Neem tea is used to lower fever and headaches. Intestinal issues are treated using its flowers. Neem bark has analgesic properties and helps treat high fevers caused by malaria. Neem leaves can be used to treat skin conditions as well. In India, there is a strong belief that neem can treat any illness [8]. As natural antimicrobials, herbs such as harida (*Currucuma longa*), amrita (*Tinospora cordifolia*), neem (*Azadirachta indica*), tulsi (*Oscimum sanctum*), and punarnava (*Boerhavia diffusa*) can be used in conjunction to treat anthrax in animals [9]. CTMR stands for Center for Traditional Medicine and Research. The medical applications of various neem tree parts, including fruits, seeds, leaves, roots, bark, were discovered in Chennai, India. Like the leaves of most tropical trees, neem leaves contain bioactive chemicals that may influence how nutrients are used [10,11]. Animals' hematological and serum biochemical markers may also be changed by these bioactive substances. Unfortunately, neem leaf meal's high fiber content seriously impairs poultry diets' ability to be consumed and digested [12]. Therefore,

this obstacle to utilizing the beneficial nutritional qualities of neem leaf meal could be removed by using neem leaf extracts. Nimbin, Nimbinene, 6-desacetylnimbiene, Nimbandiol, Nimbolide, and quercetin are all included in the neem leaf extract [13]. According to reports, a 10% aqueous extract of tender leaves has antiviral qualities against the New Castle disease virus (NDV), infectious bursal disease, and fowl pox. It also considerably increases the production of antibodies against these viruses [14].

Taxonomy

Taxonomic position is as follows:

Kingdom	: Plantae
Order	: Rutales
Sub order	: Rutinae
Family	: Mileaceae
Sub family	: Melioidae
Tribe	: Melieae

Genus	: Azadirachta
Species	: Indica

Active Compounds of Neem

Azadirachta indica L. (neem) have very useful plant in health care system due to presence of various type of ingredients. The main active constituent is azadirachtin and the others are Nimbolinin, Nimbin, Nimbidin, Nimbidol, Sodium nimbininate, Gedunin, Salannin, and Quercetin. Leaves contain ingredients such as Nimbin, Nimbanene, 6-Desacetylnimbinene, Nimbandiol, Nimbolide, ascorbic acid, n-hexacosanol and Amino acid, 7-desacetyl-7-benzoylazadiradione, 7-Desacetyl-7-benzoylgedunin, 17-Hydroxyazadiradione, and Nimbiol. Quercetin and β -sitosterol, Polyphenolic flavonoids, were purified from neem fresh leaves and were known to have antibacterial and antifungal properties and seeds hold valuable constituents.

Parts of the neem tree	Bioactivity	Compound responsible
Bark	Antioxidant	Flavonoids, Phenol
	Antimicrobial	Margolone, Margolonone, Saponins, Tannins, Flavonoids
	Anti-inflammatory	Galic acid, Catechin
	Haemolytic	Saponins
Leaf	Anti-oxidant	Nimbin, Nimbolide, Scopoletin
	Antioxidant and Antihyperglycemic	Rutin
Seed	Antibacterial	Nimbidin, Nimbolide
	Antifungal	Gedunin, Nimbidin
	Antimalarial	Nimbolide, Gedunin
	Antipyretics	Nimbidin
	Diuretics	Nimbidin
	Anti-inflammatory	Sodium Nimbidate, Nimbidin

Table 1: Bioactivity of parts of neem plant [15].

Parts of neem	Medicinal use
Leaf	Leprosy, skin ulcer, eye problem, intestinal worms, anorexia
Bark	analgesic
Fruit	Urinary disorder, relieves piles, epis taxis
Twig	Relieve cough, asthma, piles, tumour, diabetes, urinary disorder
Gum	Effective against ring worm, scabies, wound and ulcer
Seed	Leprosy and intestinal ulcer
Root, bark, leaf, flower, fruit together	Itching, skin ulcer, blood morbidity, biliary affliction

Table 2: Medicinal use of neem in Ayurveda.

Review of Literature

Abdel Moaty, et al. [16] studied the effect of different concentration of neem leave powder, in Alloxan induced diabetic rats and concluded that neem leave extract or powder had contain antioxidant and antidiabetic properties which is very effective on alloxan-induced diabetic rats. Fatemeh Yarmohammadi, et al. [17] reported that neem reduced the glucose uptake by the mechanism of upregulation of glucose transporter 4 (GLUT4) and by inhibition of intestinal enzymes glucosidase. Shipra Gautam, et al. [18] reported that neem contain various chemical constituent like tannins, saponins, sterols, flavonoids, terpenoids, anthraquinones, and alkaloids, which can assist in management of diabetes and also it is stated that the constituent like rutin and quercetin shows antihyperglycemic activity.

Abderrezzak Abadi, et al. [19] conducted the evaluation of antifungal activity of neem seed extract against two pathogenic fungi i.e. *Thielaviopsis paradox* and *Fusarium solani* and it is found that *Thielaviopsis paradox* is completely inhibited at a lower concentration of neem seed extract, which indicated that the neem seed extract possesses strong antifungal properties.

Mei Xu, et al. [20] studied the antibacterial effect of neem extract against *Escherichia coli* and *Staphylococcus aureus* and concluded that the neem leave extract showed inhibitory action with the increase of extract concentration in vitro and suggested that to prevent diseases in livestock and poultry production *Azadirachta indica* can be used as a substitute for antibiotics. Steward Mudenda, et al. [21] reported that neem (*Azadirachta indica*) has antibacterial activity against some gram positive and gram-negative bacteria like *Escherichia coli*, *Staphylococcus aureus*, *Enterococcus faecalis* due to presence of many phytochemicals such as phenolics, tannins, saponins, flavonoids, terpenoids, fatty acids, and alkaloids.

Modi Chirag M, et al. [22] studied the antioxidant and anti-inflammatory potential of *Azadirachta indica* flower and concluded that methanol extract of *Azadirachta indica* has potent free radical scavenging effects along with anti-inflammatory activity.

Michael O Eze, et al. [23] studied the Anti-COVID-19 potential of *Azadirachta indica* (Neem) leaf extract and hypothesized that acetone water extract of neem leaf will prevent the binding of SARS-CoV-2 to the VE, and therefore it is an effective therapeutic formulation against COVID-19 and also reported that acetone-water extract of the Neem leaf has broad spectrum effect. NP M [24] reported that neem extract is very effective in inhibition of polio virus, HSV Influenza virus, HIV, coxsackie B group virus and also it acts as viricidal agent against coxsackievirus B-4 by virus inactivation. Vikas

B Rao, et al. [25] carried out a computational experiment of analysing potential effect of small molecules of Neem on Dengue virus infection through simulation of molecular binding at structural level and reported that overall, all content of neem potentially effective against Dengue virus, particularly Gedunin and Pongamol had strong effect.

Atikur Rahaman, et al. [26] studied the effect of Neem leave as anthelmintic in cattle and it was observed that neem leaves had a significant effect on the number of fecal eggs count. S Khan, et al. [27] studied the effect of neem extract upon wheat allergens. in their study they characterized the wheat protein and found the possible allergens having molecular weight 7 kDa, 9 kDa, 15 kDa, 12 kDa, 17 kDa, 36 kDa 45 kDa and 77 kDa . when treated with the neem extract it showed that high reduction of allergenic proteins [28-30].

Discussion

The medicinal properties of Neem (*Azadirachta indica*) have been extensively studied, revealing a wide range of therapeutic effects. These effects include anti-inflammatory, antiviral, antidiabetic, antifungal, anti-allergic, anthelmintic. The presence of various active constituents such as Flavonoids, Phenol, Margolone, Margolonone, Tannins, Saponins, Nimbin, Nimbolide, Scopoletin, Gedunin, Nimbidin contributes to these medicinal properties. these compounds offer promise for development of novel drug formulation.

Future Perspective

With the increasing demands for natural and sustainable product, the pharmaceutical industries can be benefit greatly from the medicinal properties of Neem. The neem derived compounds can provide a good substitute to conventional medicine. Furthermore, environmental impact of pharmaceutical production can be reduced by the use of Neem derived compound.

Conclusion

The medicinal properties of Neem (*Azadirachta indica*) have been extensively studied and it is found that this tree have a wide range of pharmacological effect including anti-inflammatory, antiviral, antidiabetic, antifungal, anti-allergic, anthelmintic activities, Which due to presence of many active constituents.

Neem is rich source of different compound having various medicinal properties. To get these benefits of this plant drug development programme should be started utilizing the medicinal properties of neem. In recent years there are some herbal products of neem have been formulated but still there is a number of scopes for the utilization of the wonder plant.

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