

A review on antibacterial properties of *Melia azadirachta*

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ABSTRACT

Aim: The aim is to evaluate the antibacterial properties of "*Melia azadirachta*." **Data and Sources:** The databases of Medline, Google Scholar, Embase, and Scholars Portal databases were searched for the related topics, which were also manually analyzed by the reviewers, according to the inclusion and exclusion criteria. Bibliographies of reviews and randomized control trials, identified in the search strategy, were analyzed for studies published outside the electronically searched journals. The studies considering in this review were evaluated and ranked based on the protocol put forth by center for evidence-based medicine (Oxford, 1995). **Study Selection:** The studies considered were based on the data extraction and analysis of quality and publication bias. **Conclusion:** The extracts are found to be beneficial in diseases such as herpes, heart diseases, hepatitis, fungal infection, malaria, psoriasis, and ulcer. There is wide scope for the material in the treatment of various diseases.

KEY WORDS: Dentistry, *Melia azadirachta*, Neem, Oral health

INTRODUCTION

"Neem" is also called by the name "Indian lilac" or "Pride of India" due to its popularity.^[1] It is the tall evergreen tree which is native to South Asia. It grows in tropical or semi-tropical regions. It was popularly considered as the state tree of Hyderabad Deccan region. The common names of it in various languages include Nim, Nimmi, Vepa, Neem, Tamarkha, Mittha or Sweet Neem, Karwa, or Bitter Neem; in English, it is called as Margosa. The other scientific names are *Azadirachta indica* and *Melia azadirachta*. "Nimba" is its Sanskrit name.^[2] The neem extracts have been used in India for over two millennia for their medicinal properties.^[3] They are said to be antibacterial, antidiabetic, antifungal, antiviral, sedative, and contraceptive. Neem products are well used in controlling selective pests in plants. Neem is considered a part of Ayurvedic medicine.^[4]

A. indica

Scientific classification

Kingdom:	Plantae
Division:	Magnoliophyta
Order:	Sapindales
Family:	Meliaceae
Genus:	Azadirachta

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Each and every part of its body is humanly useful in many ways. Let us discuss all its uses in detail. Its medicinal properties were well known since ages. It is also known as "village pharmacy."^[5]

DISCUSSION

Neem bears various properties that are useful to human body [Figure 1].

Neem Fruit and Seed

The fruits are very small, oval shape and are yellow in color. Neem oil is made from the seeds of this fruit. It is clinically been tested as an external contraceptive, antiseptic, and insecticide.^[6] It has the nature of protecting the bark of other trees from termites. It can also protect the seedlings from moths and pesticides by injecting it into them.^[7]

Neem Bark and Leaves

The bark and the resin contain in it keep the air clean and free from insects when it is burnt. A steaming ground neem bark acts as a medicine to boost in cases of irregular fever and loss of appetite.^[8] The tender new neem leaves should be taken in the early morning in case of diabetes. The thinner branches of bitter neem are used by the villagers as toothbrush (Datoon) which makes the gums fit and germ free.^[9]

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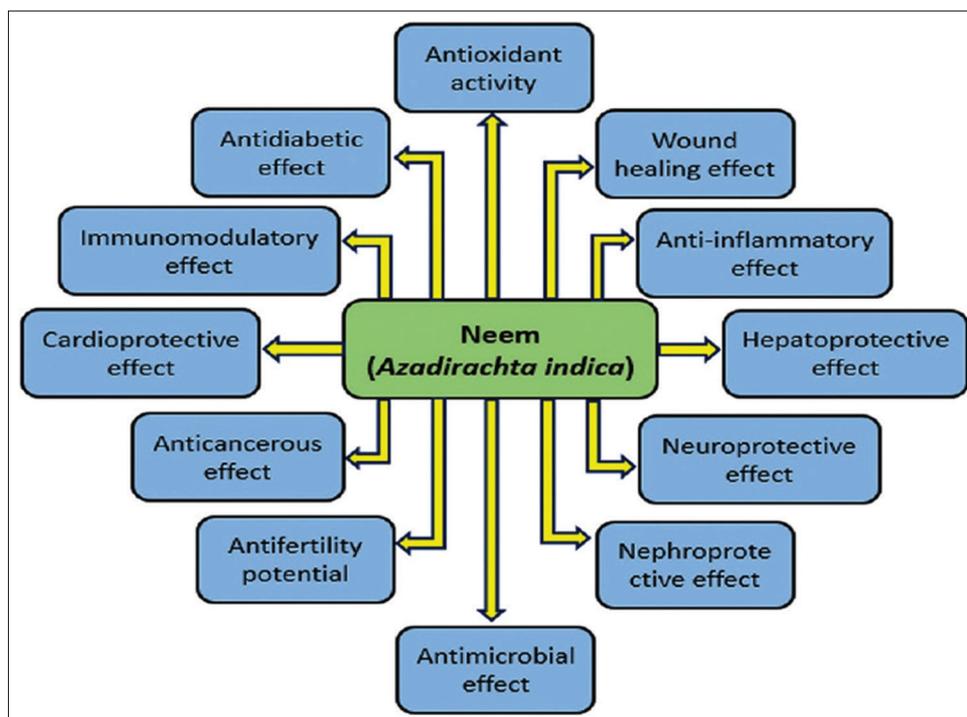


Figure 1: Various uses of *Melia azadirachta* (Neem)

General Uses of Neem Tree

Bark	Curative of fever, Analgesic
Flower	Elimination of intestinal worms and phlegm, bile suppression
Fruit	Eye problem, piles, intestinal worms, phlegm, urinary disorder, epistaxis, diabetes, wounds, and leprosy.
Twig	Intestinal worms, cough, asthma, piles, phantom tumor, spermatorrhea, diabetes, obstinate urinary disorder.
Gum	Scabies, wounds, skin diseases
Seed	Intestine worms, leprosy
Oil	Intestine worms, skin diseases
Root	Refrigerant, diuretic
Leaf	Leprosy, eye problem, epistaxis, biliousness, intestinal worms, skin ulcers, anorexia

1. It is safe to use around pets and wildlife. As it is biodegradable and non-toxic, it can be used around pets, animals, fish, and livestock.^[10]
2. Neem oil can have different active chemicals depending on how it is processed though it is organic and biodegradable.^[11]
3. It is very precise and targets leaf sucking insects and pests unlike other synthetic insecticides.
4. When smaller quantities are used neem oil would not harm any bees or flies.
5. It can be used through the entire planting season, which is easy to apply.
6. The neem products will not cause harm or toxicity to water bodies.
7. Neem oil comes in various forms such as wettable powders, granules, dust, or emulsifiable.^[12]
8. The plants can be protected from viruses, pests, and fungi by applying neem oils

9. It can prevent fire blight by playing bactericidal role.
10. It acts as a great fungicide and is safe for greenhouse use.^[13]
11. When the neem oil is applied in the greenhouse, the beneficial earthworms will not get harm.^[14]
12. Nematodes are very destructive to plants; neem oil controls them by preventing the larvae from hatching

Medical Uses

Antimicrobial properties

Neem leaves bear great antibacterial activity confirming the great potential of bioactive compounds and can rationalize in primary health care.^[15] It is proved by many authors that when it is used as a medicinal plant, it can greatly inhibit the growth of carcinogenic bacterium, *Streptococcus sobrinus*.^[16] The phytoconstituents such as alkaloids, flavonoids, glycosides, and saponins are the antibiotic agents of plants. These are the defensive mechanism of the plants against different pathogens.^[17,18]

Antiallergic properties

It has antiallergic properties. It has the capability to inhibit allergic reactions both externally and internally. It is proved as an effective male birth control pill in recent decades. The production of men birth pill was the 1st time in human history without affecting libido or sperm production has become possible within the span of controlled study.^[19]

It will enhance the human immune system. Furthermore, the future cancer cure can occur with its immune

polysaccharides property. The decreases in blood sugar level and its reduction are possible by the usage of insulin to 30%–50%; hence, it is effective for diabetic patient.^[20] The extracts are found to be beneficial for other diseases as well such as herpes, heart diseases, hepatitis, fungal infection, malaria, psoriasis, and ulcer.

Antifungal properties

HPLC elutes the mixture of fractions which was more effective than the pure nimonol, even at the highest concentration (20%), the low antifungal activity occurs which may be explained by a fact that these triterpenoids, in combination, exhibit an additive effect which produce the excellent antifungal activity from neem leaf extracts (NLEs).^[21]

It was explained that the change in hydrophobicity of candidal cells occurs by inhibiting the growth of dermatophytes during assays in yeast adhesion to hydrocarbons. This was confirmed with the antiadhesive mechanism by Rodrigues *et al.* who explained the effect of neem extracts on biofilm formation and cell surface hydrophobicity, which affect the colonization by *Candida albicans*.^[22]

Leprosy

This neem oil has previously been used in leprosy with variable results. The cases can treat with intramuscular and intradermal methods. It has the potential to decrease the number of lepra bacilli cells present in the lesions.^[23]

Dental plaque

Initial researches suggest that the NLE gel application to the teeth and gums for 6 weeks might reduce plaque formation. The evidence of reduction in the number of bacteria inside the mouth that can cause plaque

has been published by many authors.^[24] The usage of mouth rinse containing neem extract for 2 weeks appears to reduce plaque or gingivitis.

Ulcers

The oral intake of 30–60 mg neem bark extract twice daily for 10 weeks helps heal stomach and intestinal ulcers.^[25]

Skin

Ayurveda promotes the unique health practices with the use of herbal compounds and special diets. Neem is traditionally used for cooling the body, boosting immunity, clearing the skin and promoting healthy respiration and digestion.^[26] It is also used for healthy hair growth and skin hydration.

Psoriasis

Early research suggests that taking neem extract by mouth for 12 weeks, along with daily sun exposure and the application of a coal tar and salicylic acid cream, reduces the severity of psoriasis symptoms in people. Dryness and soreness are most often associated with this skin ailment and neem extracts not only eliminate the redness and itchiness but also moisturize. The antibacterial properties of the oil in the extract will help prevent further skin infections such as eczema.^[27] The emollient nature of its fatty acids made the dermatologists to recommend for skin diseases such as eczema.

Anticancerous properties

Recent studies reveal that NLE activates multiple cell death pathways resulting in effective and rapid killing of leukemic cells [Figure 2]. NLE-mediated pro-apoptotic activities are independent of disease stage,

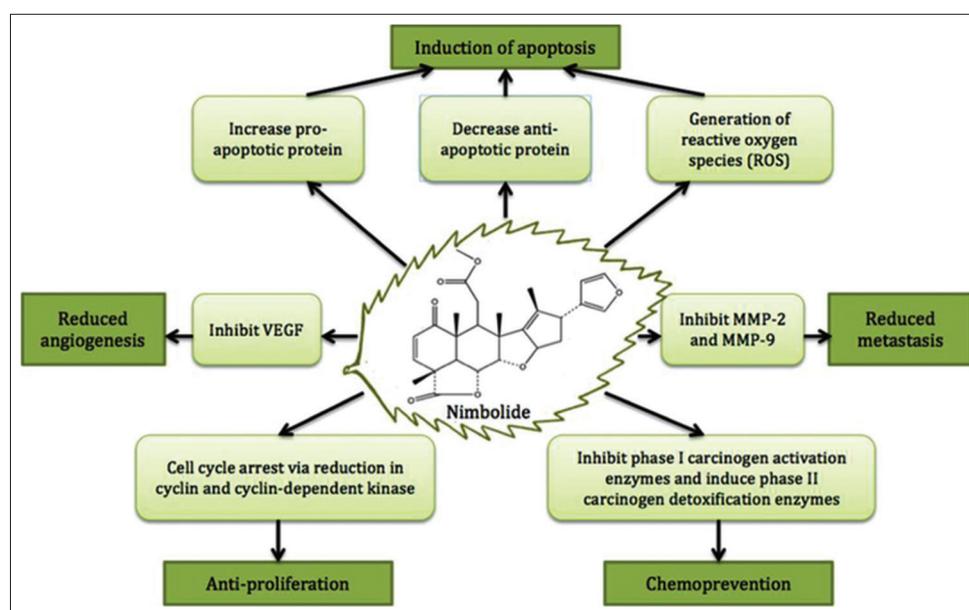


Figure 2: Mechanism of neem in preventing cancerous cells

genetic abnormalities, prior stage, mutation level, and individual immune status. Thus, the NLEs had become an exciting therapeutic strategy for leukemic patients with a heterogeneous genetic background.^[28]

CONCLUSION

It has the ability to enhance the immune system. The future cancer cure can be promoted by its unique immune polysaccharides property. Apart from that, it decreases the blood sugar level and reduces the possible usage of insulin to 30%–50%; hence, it is effective for diabetic patient. The extracts are found to be beneficial for other diseases such as hepatitis, fungal infection (candida, etc.), malaria, herpes, chronic heart diseases, psoriasis, oral ulcer, and skin rashes. According to the report produced by the national institute of health, its extract has the potentiality to be used as an AIDS preventive. However, not sufficient researches have been conducted so far. In Ayurveda, it is respected as “Sarbaroganibarini,” which means “cure for all diseases.”

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