A Therapeutic Review of Medicinal Potential of Nimba (Azadirachta Indica) In Treatment of Skin Diseases

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Abstract

Azadirachta Indica, commonly known as Nimba, nimba tree or Indian lilac, is a tree in the Meliaceaefamily .Nimba was found to be the source of various bioactive compounds of medicinal and cosmetic importance. The earliest Sanskrit medical writings refer to the benefits of its fruits, seeds, oil, leaves, roots, and bark. Each of these has been widely used in Chinese, Ayurvedic, and Unani medicines worldwide especially in Indian Subcontinent. As Nimba has been renowned for healing as it is packed with antibacterial, anti-inflammatory, antiparasitic, analgesic, wound healing and antifungal properties that not only gives benefits to health but also solves many beauty problems.In this review an insight into some literature reports on the medicinal (skin diseases) and cosmetic applications of natural bioactive compounds &phytoconstituents in various parts of Nimba was provided as an overview.

Keywords

Bioactive compounds,phytoconstituents, medicinal, cosmetics, antibacterial, anti-inflammatory, antiparasitic and antifungal.

Introduction

The Nimba tree, one of the most promising of all plants, may eventually benefit every person on the planet is native to the Indian subcontinent. It is considered a major component in siddha medicine and Ayurvedic and Unani medicine and is particularly prescribed for skin diseases. Nimba leaves have also been used to treat skin diseases like eczema, psoriasis, etc.

Today, the best-established and most widely recognized skin care uses are based on its merits as anantibacterial, anti-inflammatory, antiparasitic, analgesic, wound healing and antifungal properties that not only gives benefits to health but also solves many beauty problems.Nimba preparations are reportedly efficacious against a variety of skin diseases, septic sores, and infected burns.

Nimba ingredients are applied in Ayurveda, Unani, Homeopathy, and modern medicine for the treatment of many infectious, metabolic, or cancer diseases. Azadirachta indica has complex of various constituents including nimbin, nimbidin, nimbolide, and limonoids and such types of ingredients play role in Skin diseases management through modulation of various genetic pathways and other activities. Quercetin and ß-sitosterol were first polyphenolic flavonoids purified from fresh leaves of Nimbaand were known to have antifungal and antibacterial activities [1]. Numerous biological and pharmacological activities have been reported including antibacterial [2], antifungal [3], and anti-inflammatory. Earlier investigators have confirmed their role as anti-inflammatory, antiarthritic, antipyretic, hypoglycemic, antigastric ulcer, antifungal, antibacterial, and antitumour activities [4–7] and a review summarized the various therapeutics role of Nimba [8].

This review summarizes the role of Nimbaand its active ingredients in the skin diseases treatment through the modulation of various biological pathways.

Ayurvedicliterature:- [9-18]

Ayurved Samhita-	
1.Charak Samhita	Gana- kandughna, Tiktaskandh
2.Susruta Samhita	Gana- Aaragwadadi, Guduchyadi, Lakshadi

3. Astanghridaya	Guducyadigana (15/16), Aragwadadigana (15/18)
Nighantu –	
1.Bhavaprakasa Nighantu-	Guducyadivarga (94)
2.Dhanwantari Nighantu-	Guducyadivarga (29)
3. ShaligramNighantu	Guducyadivarga
4.Madanpal Nighantu	Abhayadivarga
5.Kaiyadeva nighantu	Aushadhivarga (883)
6.Raj Nihantu-	Paribhadradivarga (10)

Nimba properties as per Ayurvedicliterature-

As per ayurvedic literature Nimba Rasa (Taste) is Tikta, Kashaya, Guna (Qualities) are Laghu, Ruksha, Veerya (Potency) is Sheeta, Vipaka (Post-digesion effect) is Katu and Karma (Pharmacological activity) are Kaphaghna, Pittaghna karma. Nimbapatra is shothghna ,twagadoshahar, krimighna, kushthahar, vranashodhak and vranaropak. Nimbatwak is graahi, jwaraghna, twagadoshahar&krimighna. Nimba fruit is kushtha, Gulma ,krimi&pramehanashak, Nimba tail is vranashodhak , vranaropak, vaathar, kushthaghna&krimighna.[12]

Botanical Description of Nimba

Nimba tree belongs to the family Meliaceae which is found in abundance in tropical and semitropical regions like India, Bangladesh, Pakistan, and Nepal. It is a fast-growing tree with 20–23 m tall and trunk is straight and has a diameter around 4-5 ft. The leaves are compound, imparipinnate, with each comprising 5–15 leaflets. Its fruits are green drupes which turn golden yellow on ripening in the months of June–August.

Taxonomic Identity

Nimbais a member of the Mahogany family. The word Azadirachta is derived from the Persian azaddhirakt (meaning 'noble tree'). The taxonomic position of Nimba is as follows:

Kingdom :	**Plantae– Plants**
Subkingdom	Tracheobionta – Vascular plants
Superdivision	Spermatophyta – Seed plants
Division:	Magnoliophyta – Flowering plants
Class:	Magnoliopsida – Dicotyledons
Subclass	Rosidae
Order :	Sapindales
Family	Meliaceae – Mahogany family
Genus	Azadirachta A. Juss. – azadirachta P
Species	Azadirachta indica A. Juss. – Nimba P

Active Compounds of Azadirachtaindica L. (Nimba)

Azadirachta indica L. (Nimba) shows therapeutics role in health management due to rich source of various types of ingredients like nimbolinin, nimbin, nimbidin, nimbidol, sodium nimbinate, 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 Azadirachtaindica A. Juss. (Nimba)Fruit and Seeds are source of several bioactive triterpenoids. [19–24]

Mechanism of Action of Active Compounds

Nimba(Azadirachtaindica) plants parts shows antimicrobial role through inhibitory effect on microbial growth/potentiality of cell wall breakdown. Azadirachtin, a complex tetranortriterpenoid limonoid present in seeds, is the key constituent responsible for both antifeedant and toxic effects in insects [25]. Results suggest that the ethanol extract of Nimbaleaves showed in vitro antibacterial activity against both Staphylococcus aureus and MRSA with greatest zones of inhibition noted at 100% concentration [26].Nimba plays role as free radical scavenging properties due to rich source of antioxidant. [27].

Therapeutic Implications of Nimbaand Its Various Ingredients in Health Management

1. Effect of Nimba as Anti-Inflammatory

A study result has confirmed that extract of Azadirachta indica leaves at a dose of 200 mg/kg, p.o., showed significant anti-inflammatory activity in cotton pellet granuloma assay in rats [28].Nimbaleaf extract showed significant anti-inflammatory effect but it is less efficacious than that of dexamethasone [29]nimbidin suppresses the functions of macrophages and neutrophils relevant to inflammation [30].Earlier finding showed immunomodulator and anti-inflammatory effect of bark and leave extracts and antipyretic and anti-inflammatory activities of oil seeds [31,32]. One study showed that Nimba seed oil showed significant analgesic effect in the dose of 1 and 2 mL/kg and oil has dose-dependent analgesic activity [33].

2. Wound Healing Effect

A study was made to evaluate the wound healing activity of the extracts of leaves of A. indica and T. cordifolia using excision and incision wound models in SpragueDawley rats and results revealed that extract of both plants significantly promoted the wound healing activity in both excision and incision wound models [34]. Other results showed that leave extracts of Azadirachta indica promote wound healing activity through increased inflammatory response and neovascularization [35].

3. Antimicrobial Effect

Nimba and its ingredients play role in the inhibition of growth of numerous microbes such as viruses, bacteria, and pathogenic fungi.

3.1. Antibacterial Activity

In trials Nimb oil has suppressed several species of pathogenic bacteria, including Staphylococcus aureus.A common source of many pus-forming disorders (for example, boils and abscesses), this bacterium also causes secondary infections in cystitis. An experiment was made to evaluate the antibacterial activity of the bark, leaf, seed, and fruit extracts of Azadirachta indica (Nimba) on bacteria isolated from adult mouth and results revealed antibacterial activity against all the test bacteria used [36].

3.2 Antiviral Activity

In India, It's efficacy-particularly against pox viruses—is strongly believed, even among those of advanced medical training. Smallpox, chicken pox, and warts have traditionally been treated with a paste of Nimba leaves—usually rubbed directly onto the infected skin. Recent pharmacological studies have supported the belief that Nimbaleaves possess some antiviral activity.

3.3. Antifungal Activity

In one laboratory study,2 Nimba preparations showed toxicity to cultures of 14 common fungi, including members Trichophyton, Epidermophyton;Microsporum, Geotrichum, Candida.Alcoholic extract of Nimba leaf was most for retarding the growth of fungal species [37]. Another finding showed the antimicrobial role of aqueous extracts of Nimba cake in the inhibition of spore germination against three sporulating fungi such as C. lunata, H. pennisetti, and C. gloeosporioides f. sp.mangiferae [38].Aqueous extracts of various parts of Nimba such as Nimba oil and its chief principles have antifungal activities and have been reported by earlier investigators [39-41].

4. Role of Nimba in Dentistry

A study confirmed that A.indica mouth rinse is equally effective in reducing periodontal indices as chlorhexidine [42].Chloroform extract showed strong activity againstStreptococcus salivarius and third strain Fusobacterium nucleatum was highly sensitive to both ethanol and water extract [43]. Earlier finding confirmed that dried chewing sticks of Nimbashowed maximum antibacterial activity against S. mutans as compared to S. salivarius, S. mitis, and S. sanguis [44].

5.Maintains Oral Health

Nimba oil can play a major role in treating gum disease. Mouthwashes that contain Nimbaextracts inhibit the growth of Streptococcus mutans in the mouth, a bacteria that causes oral issues. . In fact, Nimba oil is added to certain toothpastes as the oil acts as a purifier and an antimicrobial agent.Nimbaleaves are also rich in antioxidants and build the immune response of the gums and tissues of the mouth (45).

6. Helps Treat Leprosy

As per an Egyptian study, Nimba seed oil can be used to treat leprosy. The study also claims that Nimba is non-mutagenic, which means it doesn't lead to any undesirable changes in the DNA of the individual (46).But beware of the consumption of Nimba seed oil – as it is said to produce toxic effects.

7. Skin care and treatment

7.1 Treats Wounds and Rashes

The topical use of Nimba oil was found to treat chronic non-healing wounds in combination with Haridra showed good results (47).A paste of Nimbaand turmeric applied topically was found to treat chronic ulcers and scabies (48). Though safe for adults, it might be harmful for children.

7.2. Relieves Dry Skin&Smoothens Wrinkles

With its regenerative properties and immune-boosting compounds, Nimba oil enables the skin to fight pathogens that are present below the skin surface. This keeps the skin smooth and fights wrinkles. Using Nimba oil for face or including Nimba powder in face packs soothes the skin thereby reducing the effects of aging (49).Vitamin E and

EFAs enable Nimba oil to seep deep into the skin thereby healing cracks caused by dryness.

7.3. Stimulates Collagen

Here's another addition to benefits of Nimba oil for skin. Nimba stimulates collagen production which slows down the aging process of the skin. (5) Regular usage of Nimba oil not just smoothens wrinkles and fine lines but also makes your skin look young and supple. (50)

7.4. Reduces Eczema

Nimba oil is an age old natural remedy for eczema symptoms like itchy, dry skin. Though it soothes the skin, Nimba oil does not cure the root causes of eczema. These causes could be hereditary or acquired. Regular use of Nimba oil helps a great deal in treating eczema irritation and red rashes (51).

7.5. Treats Psoriasis

Psoriasis is a painful skin disease which leaves your skin looking sunburnt. Dryness and scaling are the two leading symptoms associated with Psoriasis. Vitamin E rich Nimba oil is incredibly helpful in soothing the itchiness and irritation caused by Psoriasis. Nimba, with its antibacterial properties prevents the development of any further skin infections (52)

7.6. Treats all Types Of Dermatitis, scars, fights acnes

It is loaded with compounds like Nimbidin and Nimbin, which prevents redness and swelling thereby retaining the skin moisture. Nimba oil is a tested remedy for all types of dermatitis (53).Nimba seed oil removes acne causing bacteria from skin; the high amount of fatty acid in Nimba oil prevents and treats scars left by acne.

7.7. Anti-Aging Serum

Nimba oil, enriched with fatty acids, vitamin E, antioxidants and anti-inflammatory properties shield the skin from environmental damage. It also contains carotenoids that accelerate skin's defence against free radicals which cause aging (54).

7.8. Ringworm, Warts And Moles, Cold Sores And Herpes

Nimba oil has a significant effect on chronic skin conditions like Ringworm, warts & moles, cold sores and herpes. Applying good quality, organic Nimba oil packed with antifungal properties on affected skin areas will not just soothe the irritation but will also kill the bacteria that are the root-cause of these conditions. Nimba oil has been commonly used in the Siddha medicine for the treatment of skin diseases (55).

7.9. Urticaria

Urticaria, commonly known as hives appear as patchy red bumps on the skin caused by allergic reactions. Nimba has antihistamine and other compounds that help ease Urticaria (56). Applying Nimba oil on affected area prevents and cures this skin condition.

7.10. Promotes A Healthy Scalp

Nimba oil uses for scalp and hair treatment are fascinating. The beauty of your hair depends on the health of your scalp. Nimba oil, with all its remedial properties, treats your scalp thereby enhancing the beauty of your hair. Nimba oil not just moisturizes your hair but also works on keeping your scalp healthy (57).

8.NimbaOil For Internal & External Use

A) Internal Uses Of Nimba Seed Oil

8.1. Gingivitis and Pyorrhoea

Nimba oil is an extremely effective oral remedy for all dental problems. Be it bleeding gums, toothache or foul breath, the antiseptic properties of Nimba are proven to keep gums and teeth healthy. Many dental care products include Nimba oil as a major ingredient for this same purpose (58).

B) External Uses OfNimba Seed Oil

8.2 . Mosquito Repellent

According to a study published in the Journal of the American Mosquito Control Association, the researchers mixed 2%Nimbaseed oil to a bowl of coconut oil provided complete protection for approximately 12 hours from the bites of all anopheline species (59).

14. Immunomodulatory and Growth Promoting Effect

Experiment was performed to investigate growth promoting and immunomodulatory effects of Nimba leaves infusion on broiler chicks showed improved antibody titre, growth performance [60].Another study showed that AI (2 g/kg) treatment significantly enhanced the antibody titres against new castle disease virus (NCDV) antigen [61].

Conclusion

Popularity of natural products or their derivatives role in diseases cure and prevention is increasing worldwide due to less side effect properties. Nimba and its ingredients have therapeutics implication and have been traditionally used worldwide especially in Indian Subcontinent since ancient time. Clinical based studies confirmed that Nimba plays pivotal role in prevention of various diseases. A lot of research and studies have concluded that the Nimba tree oil benefits are magical—be it skin, hair, chronic or viral diseases, stress or overall wellness. The list of benefits just doesn't seem to end! This is a gentle reminder of the old yet wise phrase: Old is gold! No matter what your problem is, the Nimba will always come to your rescue. The detailed study should be made based on animal to know the exact mechanism of action in the diseases management.

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