



Medicinal Properties of Neem: A review

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Abstract

Popular tree Neem (*Azadirachta indica*) is a member of the Meliaceae family. Many foods are prepared using bark, leaves, flowers, seeds, oil, and other materials in the Traditional System of Medicine. For pharmaceutical uses, neem has been the subject of several patent applications. The pharmacognosy, phytochemistry, and pharmacological activities that have been documented thus far are all thoroughly examined in this review. As a source of several therapeutic substances in Indian culture and a plant that thrives in tropical and semi-tropical regions, neem is the most beneficial traditional medicine. All parts of the neem tree—bark, leaves, fruits, seeds, and extracts—are utilized in traditional medicine. Its extracts are anti-inflammatory, anti-viral, anti-bacterial, anti-fungal, anthelmintic, and anti-allergic. The names "free tree of India," "wonder tree," "Nature's drug store," "Village dispensary," "Divine tree," "heal all," and "Panacea of all Diseases" are also used to neem.

In current times, non-toxic herbal items should be used with specific concentration to control animal and human ailments. There is much room for this amazing plant to be used more effectively.

Key-words: Neem, Therapeutic and diseases, Pharmacognosy, Pharmacological activity

Introduction

The valuable medicinal tree *Azadirachta indica* is a member of the Meliaceae family. Due to the positive benefits neem has on human illnesses, all parts of the plant have achieved worldwide recognition. *Azadirachta indica* has been a plant in India for 4,000 years. (1) *A. indica* is sometimes referred to as the Margosa tree, and in Sanskrit, it means "to give good health" as "arista" or "nimba" and "nimbat swasthyamdadati." The "Charak-Samhita" and "Susruta-Samhita," which serve as the foundation for the Ayurvedic medical system, highlight the biological advantages of neem. In Persian, "Azad- Darakth- E- Hind" means "Free tree of India." Neem is a plant that has a complex genetic makeup. Neem was utilized in ancient India to treat smallpox and chicken pox. It has been applied to prevent environmental problems

such soil erosion, soil fertility, pesticides, and insecticides, among others. (2)



Fig. 1: Neem Leaves

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Fig. 2: Neem Leaves and Seeds

Classification

Kingdom: Plantae
Division: Magnoliophyte
Class: Magnoliopsida
Order: Sapindales
Family: Meliaceae
Genus: *Azadirachta*
Species: *indica*
Scientific name: *Azadirachta indica*

Vernacular names

Hindi – Nim, Nimb
English – Margosa, Neem, Indian Lilac
Konkani – Beva-rooku
Bengali – Nim, Nimgach
Marathi – Kadunimb
Gujarathi – Limba
Tamil – Veppamaram, Vempu, Veppam
Punjabi – Nimb
Malayalam – Veepu, Aryaveppu, Aruveppu, Kaippan, Veppu, Vepa
Oriya – Nimo
Telugu – Vepa, Yapachettu
Kannada – Bevinmar, Kahibevu (7)

Description of botany

Features at the Macroscopic Level
A huge, evergreen tree with a bitter flavor that is 12 to 18 meters tall.

Bark features: scaly, oblique furrows, thick, strong, woody, dark brown to greyish, sharp exterior surface, distinct odour, and straight trunk. Leaves: The leaves are complex, ovate-lanceolate, attenuate, opposite, imparipinnate (5–15 leaflets), with a characteristic odour and dark green colour. They also have serrated edges and short, 3–8 cm long petioles.

Fruits: drupe-like, glabrous, green, oblong to roundish, tasty, with thin skin.

Flowers: Protandrous, bisexual, white, fragrant flowers are grouped in axillary panicles.

Seed: One single seed, greasy, gritty, and dirty brown in shade.

Standard uses and actions

Bark: It is astringent, acrid, pectoral, tonic, and used to treat hyperdipsia, leprosy, skin conditions, eczema, leucoderma, pruritis, malaria, burning sensation, tumor, dyspepsia, intestinal worms, hepatopathy, lumbago, ulcers, amenorrhea, lumbago, hemorrhoids, otalgia, syphilis, and exhaustion.

Leaves: This herb has antiseptic, ophthalmic, ophthalmopathy, intestinal worms, dyspepsia, ulcer, tuberculosis, boils, eczema, malaria, and intermittent fever properties. It is also anthelmintic, insecticidal, demulcent, and refrigerant for skin conditions, leucoderma, burning feeling, leprosy, and itch.

Flowers: It is used to treat intestinal worms, colic, dyspepsia, burning feeling, ophthalmopathy, ophthalmic, stomachic, anthelmintic, and general debility.

Seeds: It is used to treat tumors, leprosy, skin conditions, odontalgia, intestinal worms, wounds, ulcers, diabetes, vulnerability, emollient, anodyne, anthelmintic, depurative, and uterine stimulant.

Oil: It is used to treat leprosy, syphilitic sores, ulcers, ringworm, scabies, fever, and chronic skin conditions. It is also an anodyne and depurative. (1,2,4,7)

Habitation

The neem tree is believed to have originated naturally in south Asia, while its precise original place is unknown. It grows in the dry natural forests of southern India and Burma. Neem has been grown for millennia in Southern Malaysia, the drier Indonesian islands from Java eastward,

Bangladesh, Myanmar, Thailand, India, Pakistan, and Sri Lanka. Neem was brought to Fiji and Mauritius in the early 1700s.

Growth and division

This hardy tree thrives in drought-prone areas and saline soils. Under conditions of waterlogging, growth is slow. propagated from seeds, which have a very limited viability period and should be sown as soon as possible after maturing. Three weeks is all it takes for seeds to sprout. Stem cuttings and root suckers are also utilized in planting. Although it may be cultivated in any kind of soil, black-loam soil is the most ideal. The seedlings reach a height of 120 cm in a year. It has been discovered that leaf culture works well for rapid multiplication. It has been claimed that azadirachtin can be produced from cultures of leaves and flowers using tissue culture techniques. On a dry weight basis, it has been observed that the callus of leaves that are 20 weeks old can contain up to 2.68 percent azadirachtin, while the callus of flowers that are 12 weeks old can contain 2.46 percent.

Climate

It is a drought-resistant tree that grows best in average yearly temperatures between 21 and 32°C. Neem grows best in India in temperatures between 0 and 49°C and with less than 600 mm of annual rainfall. Additionally, the plant is utilized in afforestation projects in semi-arid and dry areas. (4)

Ayurvedic properties

Rasa: Tikta, Kashaya

Guna: Laghu

Veerya: Sheeta

Vipaka: Katu

Doshaghnata: Kaphapitashamaka

Rogaghnata: Vidradhi, Granthi, Amavata, Vamana, Kaphapattika etc.

Karma: Vranapachana, Vranashodhana,

Ampachana, Juaraghna, Vishmapwara pratibandhaka, Chakshushya etc.

Doses

Bark powder: 2 to 4 gm

Leaf juice: 10 to 20 ml;

Powder: 2-4 g.

Oil- 5 to 10 drops (11)

Chemical constituents

More than 100 chemicals, primarily pentanortriterpenoids, tetranortriterpenoid- γ hydroxy butenolides, limonoids (or meliacins or tetranortriterpenoids), and protolimonoids (proto-meliacin) triterpenoids. Aside from a few nontriterpenoid components, hexanortriterpenoid constituents have been recorded from different regions, as listed below.

Leaves: Azadirachtin, azadirachtol, azadirachnol, deacetyl-azadirachtinol (-3- tigloylazadirachtol), azadiradione, an isomer of epoxyszadiradione, 17 epi and 17-hydroxyazadiradione, gedunin, 7-hydroxygedunin, melianone, bol nimboeol (7-acetoxy-7-hydroxy azadiradione), nimocin, 7-deacetoxy-nimolicinol, nimolinone, nimbochalcin, and nimboacetin, Diepoxytirucall-7-en-21-ol salannin, azadirachtanin, azadirone, azadiradione, epoxyazadiradione, isoazadirolide, nimbandiol, nimbinene desacetylnimbinene, nimbin, nimboin, isonimboin, 21, 23, 24, 25-salannin, the compounds nimbolide, nimocinolide, isonimocinolide, nimocinone, kaempferol-3-O-8-glucoside, myricetin, 3-L-arabinoside (mellictrin), 3-O-L-ghanmonide and 3-O-rutinoside, Quinolones, scopoletin, β -sitosterol and its β -D-glucoside, amino acids, β -carotene, carbohydrates, n-hexacosanol, nomacommol, protein, and vitamins are among the substances that include quercetin, its 3-galactoside, 3-O-L-thanoside, and 3-O-rutinoside.

Fruits & Seeds: Kernels provide between 400 and 48.9% of the oil and are rich in tocopherol, arachidic, linoleic, margosic, myristic, oleic, palmitic, and stearic acids, gedunin, meldonin, meliatriol, nimbine, and mbinene. 6-Nimbinene, nimbidin, nimbidol, desacetyl Nimbidic acid, 6-O-acetylnimbandiol, salannin, 3-desacetylsalannin, salannol and its acetate, salannolide, vepinine, vilasinin, 1,3-diacetylvilasinin, 1-tigloyl-3-acetyl-vilasinin, and tiglic acid (seed oil), azadirachtin, 22,23-dihydro-23-8-methoxy- azadirachtin (vepaul) and its C-23 epimer (isovepaul), Azadirone, azadiradione, epoxyazadiradione, 2-dihydro-epoxyazadiradione, 18,28-diepoxiazadiradione, nimbidin, nimbidin, salannic (nimbidic) acid, and 7-desacetyl-7-benzoyl-geduni acetylneotrichilenone are

examples of compounds with this structure (seeds).

Flowers: Benzyl alcohol, β -sitosterol, thioamyl alcohol, oleic, palmitic, stearic, arachidic, behenic, colic, kaempferol, and its 3-glucoside, myricetin-3-L-arabinoside, quercetin-3-galactoside, azadirachtin, and margosene may all be found. Diepoxazadirol, flowerine, flowerone, and O-methylazadirone. Triterpenoid (trichilenone acetate), flavanones, nimbaflavone, 3'-prenylharingenin, and 4'-(2'-hydroxyethyl) phenol are other components of flowers that are known to exist.

Heartwood: 4,14, α -dimethyl-3- α -ergosta-8, 24-methylene-cycloartenol, β -sitosterol and its glucoside, and tannin 24(28)/d-38-ol 12-methyl-Sa-ergosta-8, 24(28)6-desacetyl nimbinene, nimatone, nimbinene, nimbolins A and B, and dien-38-ol.

Stem bark contains the following compounds: vanilic acid, catechol, campesterol, stigmasterol, sitosterol, β -amyrin, lupeol, nimbin, nimbidin, nimbinin supiol, kulinone, kulactone, kulolactone methyl kulonate, 60-hydroxy-4-stigmasten-3-one, and 68-hydroxy-4-campesten-3-one.

Wood: fraxinellone, nimbolin, 7-deacetoxy-7-axogedunin, and gedunin A gydoeucalemone, A and B melanin.

Twigs: Isomargosinoside, desacetyl isonimbinoside, desacetyl nimbinolide, and margosinoside.

Wood Oil: 24-methylene cycloartenol, β -sitosterol, and cycloeucalenol.

Trunk bark: Nimbiol, sugiol, and bosterol nimbolins A and B (trunk wood).

Root: 4-campesten-3-one, 4-stigmasten-3-one, trans-cinnamic and vanillic acids, nimbin and

nimbidin, 24-methylene-cycloartenol, 24-methylene-cycloartanone, cycloeucalenol, cycloeucalenone.

In addition to aesculetin, cholesterol, Isomeldenin, meldenindiol, 4- and 6-hydroxy-7-methoxycoumarin, 4- and 6-dihydroxy-A-homoazadirone, From different portions of the tree, 17-acetoxymeliacin, 6-O-acetylnimbandiol, desacetylnimbin, nimocinol, isonimolicinolide, and nimolinolic acid have been discovered. (12,17)

Quantitative standard

Foreign matter: Not more than 0.3 % w/w

Ash: Not more than 3.0 % w/w

Acid insoluble ash: Not more than 0.25 % w/w

Alcohol soluble extractive: Not less than 4.5 % w/w

Water soluble extractive: Not less than 5.0 % w/w (11,18)

Compounds and procedures

Nimbarishta, Mahagandhaka vati, Panchaguna taila, Madhyam narayana taila, Guduchyadighana kvatha, Shankhapushpi taila, Jwarasamhara rasa, Mahamarichyadi taila, Pathyadi kvatha, Mahamanjishthadyarishta, Punarnavadi kvatha, and Mahasudarshana churna, Raktashodhaka vati, Nimbaharidra khandra, Nimbarishta, Mahagandhaka vati, Madhyam narayana taila, and Guduchyadighana kvatha. (11)

Therapeutic skills

The Table below lists the phytoconstituents' pharmacological actions that have been documented thus far for this plant.

Chemical constituents	Biological activity
Epoxyazadiradione	Human cervical cancer (22)
Sodium nimbidate	Anti-inflammatory
Nimbidin	Anti-inflammatory Antiarthritic Antipyretic Hypoglycaemic Antigastric ulcer Spermicidal Antifungal Antibacterial

	Diuretic
Nimbin	Spermicidal
Nimbolide	Antibacterial Antimalarial
Gedunin	Antifungal Antimalarial
Azadirachtin	Antimalarial
Mahmoodin	Antibacterial
Gallic acid, (-) epicatechin and catechin	Anti-inflammatory and Immunomodulatory
Margolone, margolonone and isomargolonone	Antibacterial
Cyclic trisulphide, cyclic tetrasulphide	Antifungal
Polysaccharides	Anti-inflammatory
Polysaccharides GIa, GIb	Antitumour
Polysaccharides GIIa, GIIIa	Anti-inflammatory
NB-II peptidoglycan	Immunomodulatory (13-15)
Glycoprotein	Immunomodulatory (19)
Proline	Alzheimer's and Parkinson's disease (20,21)

Estimation by HPTLC

Method is as per identification method, with the exception that the plate is scanned at 424 nm after drying.

The peak area under the curve is used to determine the content of the sample.

Recognition through TLC

Phase of stationery: precoated plates with silica gel GF254

Mobile phase: Glacial acetic acid: toluene: ethyl acetate: 5:5:1.

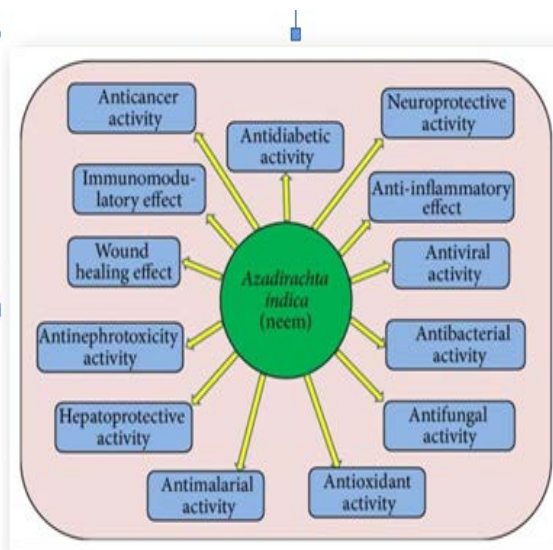
Standard preparation: 5 cc of methanol is mixed with 10 milligrams of epicatechin.

Sample preparation: Reflux 5 g of medication for 8 hours [two times] with methanol. After filtering, extract the solvent. Soak in ten millilitres of methanol.

Spray reagent: Use a 10% potassium hydroxide ethanol solution and observe under a UV light source at 365 nm.

Detection: In both the standard and test, epicatechin is shown to have Rf 0.29.

Pharmacological activity



Safety aspects

The medication may be regarded as safe when taken as directed at customary dosages.

Conclusion

Neem is a plant that can be used to treat a variety of illnesses. Its anti-inflammatory, wound-healing, antipyretic, antiallergic, nephroprotective, hepatoprotective, immunomodulatory, antifertility, dental hygiene, antidiabetic, cardioprotective, antimicrobial, anticancer, and pesticide properties have all been scientifically demonstrated. This review provides information on the molecules that were isolated, their pharmacological action, and the extract. For neem and its products to be used more profitably and therapeutically, a great deal of research and development needs be done. With these advantages in mind, a medication development program exploiting neem's biological and therapeutic qualities ought to be launched. In the present period, non-toxic herbal items should be used with specific concentration to control animal and human ailments. Even if some neem herbal products have been made, there is still much room for improving the way this amazing plant is used.

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