



**AN EVIDENCE-BASED REVIEW OF *NIMBA (AZADIRACHTA INDICA A. JUSS.)* WITH
PHARMACOLOGICAL PERSPECTIVES WITH SPECIAL REFERENCE TO ITS
KUSHTHAGHNA, KRIMIGHNA AND ANTIMICROBIAL ACTIVITIES**

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ABSTRACT

Background: Nimba (*Azadirachta indica* A. Juss.), commonly known as Neem, is an important medicinal plant described extensively in Ayurveda. It possesses predominantly Tikta-Kashaya Rasa, Laghu-Ruksha Guna, Sheeta Virya and Katu Vipaka. Classical texts attribute therapeutic actions such as Kushthaghna, Krimighna, Kandughna, Vranashodhana, Jvaraghna and Kaphapittahara to the plant. Modern phytochemical studies have identified several bioactive constituents including nimbin, nimbidin, nimbolide, azadirachtin, gedunin, salannin and flavonoids. Experimental investigations have demonstrated antimicrobial, antifungal, anti-inflammatory, antioxidant and insecticidal activities, providing a pharmacological basis for several traditional applications of Nimba. **Materials and Methods:** Classical Ayurvedic texts, Nighantus, the Ayurvedic Pharmacopoeia of India, standard Dravyaguna textbooks and published scientific literature related to *Azadirachta indica* were reviewed. Information regarding pharmacognosy, phytochemistry, Ayurvedic properties and pharmacological actions was compiled and critically interpreted. **Results & Discussion:** The classical Kushthaghna and Krimighna actions of Nimba show meaningful pharmacological correlation with its experimentally demonstrated antimicrobial, anti-

inflammatory and antioxidant activities. However, laboratory activity should not automatically be interpreted as equivalent to established clinical efficacy. **Conclusion:** Nimba is an important bridge between traditional Ayurvedic pharmacology and modern phytopharmacological research. Its classical applications in skin disorders and Krimi are supported by promising experimental antimicrobial evidence, although further standardized clinical studies are required.

Keywords: *Nimba; Azadirachta indica; Dravyaguna; Kushthaghna; Krimighna; Antimicrobial*

INTRODUCTION

Nimba (*Azadirachta indica* A. Juss.) is one of the most extensively used medicinal trees in Ayurveda and is valued because almost every part of the plant has therapeutic utility. In Ayurvedic literature, *Nimba* has been included among important bitter drugs and is particularly associated with the management of *Kushtha*, *Kandu*, *Krimi*, *Vrana*, *Jvara* and disorders dominated by *Kapha* and *Pitta*. The predominance of *Tikta* and *Kashaya Rasa*, together with *Laghu-Ruksha Guna*, *Sheeta Virya* and *Katu Vipaka*, provides the fundamental *Dravyaguna* basis for its cleansing, drying, antipruritic and *Krimighna* actions. Classical descriptions therefore indicate an important role for *Nimba* in disorders associated with *Kleda*, *Rakta Dushti*, itching and microbial or parasitic involvement.¹

The therapeutic importance of *Nimba* in skin disorders is particularly noteworthy. The term *Kushtha* in Ayurveda encompasses a broad spectrum of dermatological conditions rather than representing a single modern disease. The involvement of *Tridosha*, particularly *Kapha* and *Pitta*, along with *Twak*, *Rakta*, *Mamsa* and *Lasika*, is described in the pathogenesis of *Kushtha*. Drugs possessing *Tikta-Kashaya Rasa*, *Ruksha Guna*, *Kaphapittahara*, *Kandughna* and *Krimighna* properties are therefore therapeutically significant. *Nimba* exhibits several of these attributes and consequently occupies an important position in classical formulations intended for chronic skin disorders, itching, wounds and related conditions.²

From a modern perspective, *Azadirachta indica* is a member of the family Meliaceae and is recognised as an important medicinal and economically useful tropical tree. Its different parts contain structurally diverse phytochemicals, particularly limonoids, tetranortriterpenoids, flavonoids and sterols. Azadirachtin, nimbin, nimbidin, nimbolide, salannin, gedunin and quercetin are among the frequently investigated constituents. Experimental research has reported antibacterial, antifungal, anti-inflammatory,

antioxidant, antiparasitic and insecticidal actions. These findings provide a scientific basis for investigating possible correlations between classical *Kushthaghna-Krimighna Karma* and modern antimicrobial pharmacology.³

MATERIALS AND METHODS

The present narrative drug review was prepared by collecting information from classical Ayurvedic texts including Charaka Samhita, Sushruta Samhita and Bhavaprakasha Nighantu, together with the Ayurvedic Pharmacopoeia of India, standard *Dravyaguna* literature and scientific publications indexed in biomedical literature. Botanical identity, morphology, pharmacognostic characters, phytochemistry and pharmacological activities were critically compiled. Particular emphasis was placed on information relevant to *Kushthaghna*, *Krimighna* and antimicrobial actions. Scientific evidence was interpreted primarily as pharmacological support and was not considered equivalent to clinical proof unless supported by appropriate human studies.⁴

DRUG REVIEW

Introduction

Nimba is a medium to large evergreen or semi-evergreen tree widely recognised in Indian traditional medicine. The accepted botanical name is *Azadirachta indica* A. Juss. and the plant belongs to family Meliaceae. Different parts including stem bark, leaves, flowers, fruits, seeds and seed oil are therapeutically utilised. The multiplicity of usable parts and the broad spectrum of traditional indications have resulted in *Nimba* being regarded as one of the major multipurpose medicinal trees used in Ayurveda.⁵

Taxonomical Classification

Taxonomic Rank	Classification
Kingdom	Plantae
Phylum	Streptophyta
Class	Equisetopsida
Subclass	Magnoliidae
Order	Sapindales

Family	Meliaceae
Genus	Azadirachta
Species	Azadirachta indica A. Juss.

The currently accepted botanical name is *Azadirachta indica* A. Juss.; *Melia azadirachta* L. is treated as a botanical synonym.⁶

Vernacular Names

Language	Name
Sanskrit	Nimba, Arishta
Hindi	Neem, Nim
English	Neem, Margosa, Indian Lilac
Bengali	Nim
Gujarati	Limdo/Limbado
Marathi	Kadunimb
Punjabi	Nim
Tamil	Vembu/Veppai
Telugu	Vepa
Kannada	Bevu/Bevina Mara
Malayalam	Veppu/Aryaveppu
Odia	Nimba

Synonyms

Sanskrit Synonym	Traditional Significance
Nimba	Principal classical name
Arishta	Considered beneficial/protective
Pichumarda	Classical synonym
Tiktaka	Indicates intense bitter taste

Sarvatobhadra	Beneficial in multiple conditions
Prabhadra	Auspicious/beneficial drug
Hinguniryasa	Descriptive synonym
Paribhadra	Recorded in traditional literature

Classical synonyms often express either the morphology, taste or therapeutic reputation of the drug and illustrate the importance attached to *Nimba* by earlier physicians.⁷

Geographical Distribution

Nimba is a tropical tree widely cultivated and naturalised throughout India and many other tropical and subtropical regions. Botanical databases describe its native range broadly from Assam and adjoining South-East Asian regions, while centuries of cultivation have resulted in extensive distribution throughout the Indian subcontinent, Africa and other warm regions. It grows successfully in comparatively dry conditions and is commonly seen along roadsides, agricultural boundaries, village areas and wastelands. It is adaptable to a wide range of soils but generally does not tolerate prolonged waterlogging.⁸

Morphological Characters

Nimba is generally a medium to large tree, commonly attaining approximately 15-20 m or more under favourable conditions. The trunk is relatively straight with spreading branches forming a broad crown. Bark is greyish to brown, rough and fissured in older trees. Leaves are alternate and pinnately compound with serrated leaflets. Flowers are small, white to cream coloured, fragrant and occur in axillary panicles. The fruit is a smooth, olive-like drupe, becoming yellowish on ripening and usually containing one seed. The plant possesses a characteristic intensely bitter taste, particularly evident in the leaves and bark.⁹

Macroscopic Study According to API

The stem bark occurs in curved or channelled pieces of variable dimensions. The external surface is greyish-brown to dark brown and is rough with longitudinal and oblique fissures, while the inner surface is comparatively yellowish-brown and longitudinally striated. Fracture is short externally and more fibrous internally. The bark possesses a characteristic odour and a distinctly bitter taste. Diagnostic macroscopic examination is useful for establishing identity before further pharmacognostic evaluation.

Microscopic Study According to API

Transverse examination of stem bark shows an outer multilayered cork composed of tangentially elongated brown cells. Beneath the cork, cortical tissue consists of collenchymatous and parenchymatous cells. The secondary cortex and phloem region contain parenchymatous tissue, fibres and medullary rays. Lignified fibres are prominent in the deeper region. Calcium oxalate crystals and starch grains occur within parenchymatous cells and constitute useful diagnostic characters. Powder microscopy may reveal cork fragments, fibres, parenchymatous cells, starch grains and prismatic or clustered crystals of calcium oxalate.¹⁰

Chemical Composition

Plant Part	Important Constituents
Leaves	Nimbin, nimbolide, quercetin, flavonoids, polyphenols
Bark	Nimbin, nimbidin, tannins, sterols, polysaccharides
Seeds	Azadirachtin, salannin, nimbin, fatty acids
Seed oil	Limonoids, triglycerides, oleic, stearic, palmitic and linoleic acids
Flowers	Flavonoids, phenolic compounds and volatile constituents
Fruits	Limonoids and related terpenoid compounds
General plant profile	Azadirachtin, nimbin, nimbidin, nimbolide, gedunin, salannin, quercetin, beta-sitosterol

The chemical diversity of *Nimba*, particularly its limonoids and phenolic compounds, is considered responsible for much of its experimentally observed biological activity.¹¹

Ayurvedic Properties

Parameter	Property
Rasa	Tikta, Kashaya
Guna	Laghu, Ruksha

Virya	Sheeta
Vipaka	Katu
Doshaghna	Mainly Kapha-Pittahara
Principal Karma	Kushthaghna, Krimighna, Kandughna, Jvaraghna, Vranashodhana, Shothahara, Grahi
Major indications	Kushtha, Krimi, Kandu, Vrana, Jvara, Prameha
Parts used	Bark, leaves, seeds, seed oil, flowers and fruits

The classical combination of *Tikta-Kashaya Rasa*, *Ruksha Guna* and *Katu Vipaka* explains its ability to reduce *Kapha* and *Kleda*, whereas *Sheeta Virya* contributes to *Pitta Shamana*. This pharmacodynamic profile provides the Ayurvedic rationale for its use in inflammatory, itchy and exudative skin disorders.¹²

PHARMACOLOGICAL ACTIONS

Antimicrobial Activity

Extracts prepared from leaves, bark, seeds and other parts of *Azadirachta indica* have demonstrated inhibitory activity against various bacterial and fungal organisms in experimental studies. The activity varies considerably according to plant part, extraction method, solvent, concentration and test organism. Nimbidin, nimbin, nimbolide, azadirachtin and various flavonoids are among the constituents proposed to contribute to antimicrobial effects.

Antifungal Activity

Neem extracts have demonstrated activity against several fungi in laboratory investigations. The antifungal effect may involve alteration of microbial membrane functions, interference with fungal growth and the combined activity of limonoids and phenolic compounds. Such observations are particularly relevant when interpreting the traditional use of *Nimba* in itching and skin conditions.

Anti-inflammatory Activity

Extracts and isolated constituents of *Nimba* have demonstrated modulation of inflammatory pathways in experimental models. Reduction of inflammatory mediators can

complement antimicrobial effects by reducing redness, swelling and local inflammatory responses.

Antioxidant Activity

Flavonoids, polyphenols and other phytoconstituents present in Neem exhibit free-radical scavenging and antioxidant activity. Control of oxidative stress may contribute to tissue protection and support healing responses in inflammatory conditions.

Anthelmintic and Antiparasitic Activity

The traditional designation *Krimighna* encompasses a broader concept than antibacterial activity alone and includes several forms of biological infestation. Experimental investigations of Neem have reported insecticidal, antiparasitic and anthelmintic potential, providing a partial modern correlation with this classical action.

Kushthaghna Activity

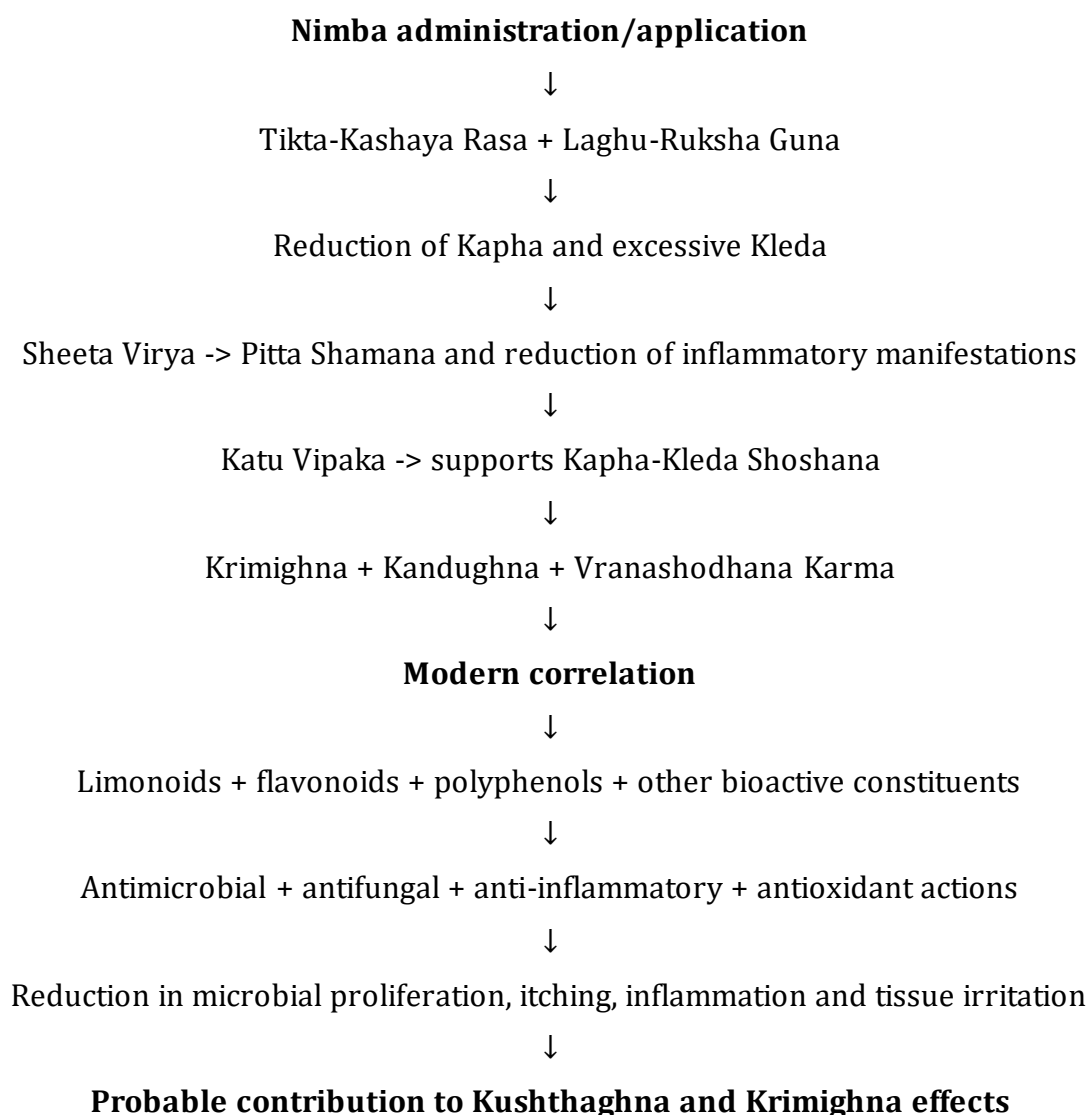
Kushthaghna activity cannot be reduced to a single antimicrobial mechanism. From an Ayurvedic perspective, the action reflects combined *Kapha-Pitta Shamana*, *Kleda Shoshana*, *Krimighna*, *Kandughna* and *Rakta-Twak* related effects. Modern antimicrobial, anti-inflammatory and antioxidant findings may therefore represent complementary pharmacological components of this broader traditional therapeutic action.¹³

Drug and Dosage

Preparation/Part	Commonly Described Dose/Use
Dried leaf powder	Approximately 2-4 g
Leaf for decoction	Approximately 12-15 g
Fresh leaf juice	Approximately 10-15 mL
Stem bark powder	Approximately 5-6 g
Bark decoction	Approximately 50-100 mL
Seed oil	Mainly external use; internal use requires strict professional supervision
External decoction	Used according to requirement for washing/local application

Dose should be individualised according to age, strength, disease, preparation and professional judgement. Neem oil should not be considered interchangeable with ordinary oral Neem preparations.¹⁴

FLOW CHART: PROBABLE MODE OF ACTION



DISCUSSION

The classical pharmacodynamic profile of *Nimba* provides a logical basis for its frequent use in diseases involving the skin. *Tikta* and *Kashaya Rasa* together with *Laghu-Ruksha Guna* help counter *Kapha*, *Kleda* and excessive secretions, whereas *Sheeta Virya* is particularly relevant to manifestations associated with aggravated *Pitta*, including burning sensation and inflammatory changes. *Katu Vipaka* further supports the drying and *Kapha*-reducing character of the drug. Thus, *Nimba* acts at several levels relevant to *Kushtha*: it reduces *Kleda*,

controls *Kandu*, supports purification of affected tissues and provides *Krimighna* action. Classical descriptions of *Kushthaghna* should therefore be interpreted as a broad therapeutic action rather than merely a synonym for modern antibacterial activity.¹⁵

The modern phytochemical profile provides an important basis for understanding these classical observations. Limonoids such as nimbin, nimbidin, nimbolide, azadirachtin, gedunin and salannin, together with flavonoids and other phenolic compounds, demonstrate several biological activities in laboratory systems. Antibacterial and antifungal activities are especially relevant to *Krimighna Karma*, while anti-inflammatory and antioxidant actions may contribute to the symptomatic and tissue-level effects traditionally associated with *Kushthaghna* and *Vranashodhana*. The occurrence of several active constituents also suggests that the biological activity of whole-plant preparations may arise from multiple mechanisms rather than a single phytochemical.¹⁶

Nevertheless, evidence-based interpretation requires an important distinction between traditional use, laboratory antimicrobial activity and proven clinical efficacy. Differences in plant part, geographical origin, extraction procedure, dosage, microbial strain and experimental method can produce different outcomes. Many modern observations concerning Neem remain based on in-vitro or experimental studies and cannot independently establish effectiveness for specific human infections or dermatological diseases. Therefore, the strongest scientific interpretation is that modern pharmacological evidence provides plausible support for classical *Krimighna* and *Kushthaghna* concepts, but properly designed clinical trials, standardised preparations, dose determination and safety evaluation remain necessary for therapeutic validation.¹⁷

CONCLUSION

Nimba (*Azadirachta indica* A. Juss.) is an important medicinal drug with a well-established position in Ayurvedic *Dravyaguna*. Its *Tikta-Kashaya Rasa*, *Laghu-Ruksha Guna*, *Sheeta Virya*, *Katu Vipaka* and predominantly *Kapha-Pittahara* action form the pharmacodynamic basis for its classical *Kushthaghna*, *Krimighna*, *Kandughna* and *Vranashodhana* applications. Modern research identifying azadirachtin, nimbin, nimbidin, nimbolide, gedunin, salannin, flavonoids and related constituents provides pharmacological support through demonstrated antimicrobial, antifungal, anti-inflammatory and antioxidant activities. The classical and modern perspectives therefore show substantial conceptual

convergence. However, experimental antimicrobial activity should not be regarded as direct proof of clinical efficacy. Further standardised clinical research is necessary to determine optimum preparations, dosage, safety and therapeutic effectiveness.

CONFLICT OF INTEREST

Nil.

SOURCE OF SUPPORT

None.

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