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Review Article

Exploring The Medicinal Wonders Of The Kadamba Tree (Neolamarckia Cadamba): A Review Article

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ABSTRACT

The Kadamba tree (*Neolamarckia cadamba*), a native species of South and Southeast Asia, has long been recognized for its extensive therapeutic applications in traditional medicine. It holds a significant place in Ayurveda due to its anti-inflammatory, antimicrobial, antioxidant, hepatoprotective, antidiabetic, and wound-healing properties. Various parts of the plant, including bark, leaves, fruits, and roots, are traditionally used in the treatment of fever, skin disorders, digestive disturbances, ulcers, diabetes mellitus, infections, and general debility [1,3,4]. Phytochemical investigations reveal that *Neolamarckia cadamba* is rich in alkaloids, flavonoids, tannins, saponins, glycosides, and triterpenoids, which contribute to its diverse pharmacological actions [7,11,18]. Compounds such as cadambine, isocadambine, quinovic acid, quercetin, and kaempferol have demonstrated significant medicinal value in experimental studies [7,11,12]. Despite its immense therapeutic and nutritional potential, commercialization remains limited due to its astringent taste, lack of public awareness, and insufficient clinical validation. This review compiles available literature on the taxonomy, morphology, Ayurvedic properties, phytochemistry, medicinal uses, and pharmacological activities of *Neolamarckia cadamba*, while highlighting future research directions for its wider acceptance in evidence-based herbal medicine.

Introduction

For centuries, the Kadamba tree (*Neolamarckia cadamba*] has occupied a prominent place in Indian tradition, mythology, literature, and herbal medicine [1,4,13]. It is a large deciduous tree belonging to the family Rubiaceae and has been extensively utilized in Ayurveda for the management of various diseases. Traditionally, its leaves, bark, fruits, and roots have been employed in the treatment of fever, inflammation, skin disorders, wounds, digestive disturbances, diarrhoea, dysentery, diabetes mellitus, and general debility [3,4,5].

In classical Ayurvedic literature, Kadamba is valued for its *Tikta* (bitter) and *Kashaya* (astringent) rasa, *Sheeta virya* (cold potency), and *Katu vipaka* (pungent post-digestive effect), making it highly useful in managing *Pitta* and *Kapha* disorders [4,5]. The bark is especially known for its anti-inflammatory and antipyretic actions, while the leaves are commonly used externally for wound healing and ulcer management [8].

With the increasing global demand for plant-based therapeutics and natural alternatives to synthetic drugs, *Neolamarckia cadamba* has gained considerable scientific attention due to its diverse phytochemical composition and broad pharmacological potential [7,12]. Modern research has identified numerous bioactive compounds such as alkaloids, flavonoids, tannins, and saponins responsible for its medicinal efficacy[11,18].

This review aims to provide a comprehensive overview of the medicinal importance of *Neolamarckia cadamba*, integrating traditional Ayurvedic knowledge with modern pharmacological evidence.

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Materials And Methods

This review was conducted using published literature available between 2000 and 2024. Relevant information was collected from scientific databases including PubMed, ScienceDirect, Google Scholar, Scopus, and ResearchGate. Search terms used included "*Neolamarckia cadamba*," "Kadamba tree," "medicinal uses," "phytochemistry," "Ayurvedic uses," and "pharmacological activities."

Only peer-reviewed articles, ethnobotanical surveys, classical Ayurvedic references, and research studies focusing on medicinal, phytochemical, and biochemical aspects were included. Studies lacking scientific validation or relevance to medicinal applications were excluded. Data were systematically analyzed to compile information regarding taxonomy, morphology, Ayurvedic properties, phytoconstituents, medicinal applications, and pharmacological actions.

Taxonomy

- **Kingdom:** Plantae
- **Phylum:** Magnoliophyta
- **Class:** Magnoliopsida
- **Order:** Gentianales
- **Family:** Rubiaceae
- **Genus:** *Neolamarckia*
- **Species:** *cadamba* [1,2]

Parts Used In Ayurvedic Medicine

Fruits

Used in gastric irritability, persistent thirst associated with fever, and as a blood purifier [3,4,5].

Leaves

Used for gargling in stomatitis and oral inflammations. They are also externally applied on wounds and ulcers for promoting healing and reducing inflammation [4,5,8].

Stem Bark

Used for antibacterial purposes, inflammation of the eyes, diarrhoea, dysentery, fever, and burning sensations [1,3,5,9].

Vernacular Names[1,3,13]

Table:1

Language	Name
Hindi	Kadamb, Kadamba
Marathi	Kadamb

Morphology

Neolamarckia cadamba is a large, fast-growing deciduous tree with a cylindrical bole and a broad, umbrella-shaped crown. It may attain a height of up to 45 meters with a stem diameter ranging from 100–160 cm and slight buttresses extending up to 2 meters [2,13].

The bark is deep grey with longitudinal fissures and thin exfoliating scales. The branches are horizontally arranged in tiers, giving the tree a symmetrical appearance. Leaves are large, simple, ovate-elliptical, glossy on the upper surface, and rough beneath, measuring approximately 15–50 cm in length and 8–26 cm in width with pinnate venation [2,13,14].

The flowers are small, orange, fragrant, and arranged in dense globose heads. Flowering generally occurs during the rainy season from April to August, although it may begin as early as December in some regions. Fruits are small, fleshy capsules forming yellowish-orange infructescences containing nearly 7000 seeds. Mature fruits are spherical, hard, yellow, and possess a sweet and tangy taste [2,14].

Organoleptic Characters

- **Colour:** Green (Leaf)
- **Touch:** Glossy (upper surface), rough (lower surface)
- **Odour:** Odourless
- **Taste:** Acrid, bitter
- **Size:** 15–50 cm long; 8–26 cm wide
- **Shape:** Simple, ovate-elliptical, petiolated
- **Margin:** Slightly undulated
- **Venation:** Pinnate [13,14]

Localization And Distribution

The Kadamba tree is widely distributed throughout India, particularly in the temperate Himalayan regions extending from Kashmir to Bhutan. It is commonly found in Garhwal, Himachal Pradesh, Assam, Sikkim, Karnataka, Kerala, and Manipur. It is especially prevalent in the districts of Pauri, Tehri, Chamoli, and Uttarkashi in Garhwal [2,14].

It thrives well in moist tropical and subtropical climates and is commonly associated with riverbanks and fertile alluvial soils.

English	Wild Cinchona
Sanskrit	*Vrittapushpa, Priyaka*
Tamil	Kapam, Vellai
Telugu	Kadambamu
Kannada	Kadawala
Assamese	Roghu, Kadam

Ayurvedic Properties (Rasapanchaka)

Rasa (Taste)

- Tikta (Bitter)
- Kashaya (Astringent)

These tastes help in wound healing, reducing inflammation, and treating skin disorders [4,5,13].

Guna (Qualities)

- Laghu (Light)
- Ruksha (Dry)

These qualities aid digestion, reduce excessive moisture, and support wound healing [4,13].

Virya (Potency)

- Sheeta (Cold)

Useful in reducing fever, burning sensations, inflammation, and Pitta disorders [4,5].

Vipaka (Post-digestive Effect)

- Katu (Pungent)

Supports digestive fire, relieves bloating, and improves metabolism [4,13].

Prabhava (Specific Action)

Specialized action in chronic wound healing, skin disorders, antimicrobial activity, and possible antitumor effects [4,12].

Key Phytochemical Constituents

Alkaloids

- Cadambine
- Isocadambine
- Dihydrocadambine [7,12]

Flavonoids

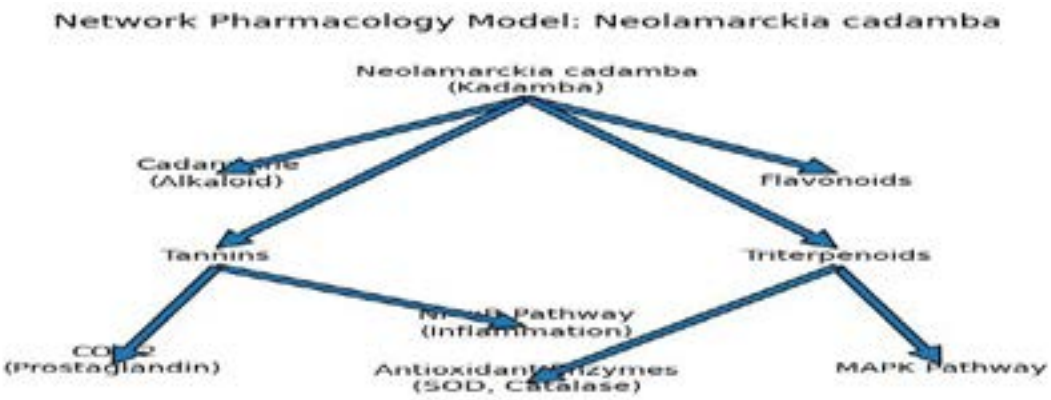
- Quercetin
- Kaempferol
- Apigenin [7,11,18]

Other Constituents

- Tannins
- Saponins
- Glycosides
- Quinovic acid
- Cadambagenic acid
- Triterpenoids
- Phenolic compounds [7,11,18,19]

These phytochemicals contribute significantly to the plant's medicinal and pharmacological activities [7,11,19].

Figure;1



Medicinal Uses

The whole plant, including bark, roots, leaves, and fruits, possesses medicinal importance [1,3,4].

- Leaves are externally applied to wounds and ulcers after gentle warming to reduce pain, swelling, and promote healing [8].
- Bark decoction is used internally for diarrhoea, dysentery, and colitis [3,4,5].
- Bark juice mixed with honey and cumin helps reduce vomiting [3].
- The plant is used in the treatment of diabetes mellitus, fever, inflammation, haemoptysis, cough, ulcers, debility, and bacterial infections [1,4,12].
- Fruit juice acts as a blood purifier and galactagogue, enhancing lactation in nursing mothers [3,13].
- Kadamba improves skin complexion and is beneficial in skin disorders [4,13].
- Bark is useful in reducing fever and burning sensations associated with excess body heat [3,5].

Pharmacological Effects

Anti-inflammatory Activity

Kadamba bark extract has shown significant anti-inflammatory effects in experimental animal models by reducing edema and inflammatory mediators [11,12].

Antimicrobial Activity

Leaf and bark extracts exhibit strong antibacterial and antifungal activities against common pathogens such as *Staphylococcus aureus* and *Escherichia coli* [9,12].

Antioxidant Activity

The abundance of phenolic compounds and flavonoids helps neutralize free radicals and reduces oxidative stress [11,18,19].

Hepatoprotective Activity

Studies indicate that leaf extracts may protect the liver against chemically induced hepatic damage [10].

Antidiabetic Activity

Certain phytoconstituents show promising blood glucose-lowering effects and support traditional use in diabetes management [7,12].

Results

Research findings suggest that *Neolamarckia cadamba* is a rich source of bioactive compounds with multiple therapeutic applications. Compounds such as quinovic acid, cadambine, and cadambagenic acid have demonstrated significant antibacterial, antioxidant, anti-inflammatory, and antidiabetic properties [7,11,12].

Nutritional analysis of the fruit reveals substantial levels of calcium, iron, and potassium, supporting its use in functional foods and nutraceutical products [6,13]. Traditional use of bark and leaves in treating infections, digestive disorders, and metabolic diseases is increasingly supported by modern scientific investigations [3,4,12].

DISCUSSION

The medicinal potential of *Neolamarckia cadamba* is strongly supported by both traditional Ayurvedic knowledge and modern pharmacological research. Its broad-spectrum antioxidant, antimicrobial, anti-inflammatory, and hepatoprotective activities make it a promising candidate for herbal drug development [7,10,11,12].

However, most available studies are limited to in vitro experiments and animal models. Human clinical trials are still lacking, which restricts its wider acceptance in evidence-based medicine. Standardization of extraction procedures, dosage forms, and safety profiling is also necessary for therapeutic validation [7,12].

Its fruits also hold promise in the development of beverages, health supplements, and functional foods due to their mineral-rich composition [6,13]. Nevertheless, commercialization remains limited because of the fruit's astringent taste, lack of public awareness, and inadequate product development strategies.

Future research should focus on clinical trials, formulation development, and industrial applications to fully utilize the medicinal and economic potential of Kadamba.

Conclusion

Neolamarckia cadamba is far more than a culturally significant tree; it represents a valuable medicinal resource with immense therapeutic potential. Its diverse phytochemical composition and broad spectrum of pharmacological activities make it an important candidate for future herbal medicine and pharmaceutical research [7,11,12].

Figure 2:*Neolamarckia cadamba Tree with Fruiting stage*

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