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COMPREHENSIVE PROFILE OF PHYTOCHEMISTRY, TRADITIONAL USES THERAPEUTIC POTENTIAL OF *ANISOMELES MALABARICA* (L.) R. BR. EX SIMS

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Abstract

Anisomeles malabarica., L commonly the *"*Malabar catmint" and' Peiyamuriti "in vernacular Tamil name, belonging to Lamiaceae family. This Malabar catmint is natural to tropical and subtropical India and Sri Lanka. Habitually this plant is used as mosquito repellent, dyspsia, rheumatism, amentia, anorexia wound healing and swelling, wart remove, and teething problems in children, snakebite antidote and to treat fever and gastrointestinal discomfort by the people of South India. It is a vital endemic plant used in the native medicine systems of India such as Ayurveda, Siddha, and Unani in several preparations. The ridiculous phytochemistry of *A. malabarica* includes cembrane terpenes, flavonoids, alkaloids, steroids, flavones, glycosides, and other bioactive compounds contributing for its medicinal potential. Extracts and metabolites of *A. malabarica* shows extensive variety of substantial pharmacological effects in combating cancer cells through apoptosis, inhibiting viral agents (HPV and SARS-CoV-2), immune regulation, and DNA protection. The phytocompounds of *A. malabarica* were also informed for anti-malarial, anti-rheumatic, anti-inflammatory, anti-epileptic, anti-diabetic, anti-parasitic activity anti -anaphylactic, anti-bacterial and hepatoprotective properties. This systematic review summarizes the therapeutic assets with botanical characteristics, ethnobotany, and phytochemistry of *A. malabarica.* It also documents the ingrained traditional use of *A. malabarica* in spiritual custom in southern states of India. The present study reveals the numerous aspects of A.*malabarica* pharmacological properties, and cultural practices.

KEYWORDS

Anisomeles malabarica; ethnobotany; phytochemicals; pharmacology; anisomelic acid

Introduction

Medicinal plants have played a pivotal role in healthcare since antiquity, owing to their therapeutic efficacy and natural origin. Plant-derived medicines are widely favored for their effectiveness and comparatively minimal side effects (Harborne, 1998; Trease and Evans, 2009). Anisomeles malabarica, commonly referred to as Malabar Catmint, is a prominent member of the Lamiaceae family, extensively distributed throughout India and Southeast Asia (Gamble, 1935). Traditionally, it has been utilized in Ayurveda and Siddha medicine for the management of fever, cough, inflammation, wounds, digestive ailments, respiratory infections, and dermatological disorders (Balasubramaniam et al., 2024). Contemporary pharmacological studies have confirmed a spectrum of bioactivities, including antioxidant, antimicrobial, anti-inflammatory, antidiabetic, antiviral, hepatoprotective, and anticancer properties (Madhivardhana et al., 2025; Bhuvaneshwari R and R Anandhan, 2024).

The Lamiaceae family encompasses 45 genera and 574 species, while globally, an estimated 45,000 plant species are regarded as medicinal (Dharasurkar et al., 2019). The genus Anisomeles includes 29 species in India, with Anisomeles indica and Anisomeles malabarica being the most prevalent in Asian countries. These species are integral to traditional medicine, particularly in southern India along the Western Ghats (Murthy et al., 2015). Anisomeles malabarica is commonly found in Tamil Nadu, Kerala, and Maharashtra. The plant is known by various vernacular names, including Malabar catmint, peymarutti (Tamil), karithumbai (Kannada), Chodhara (Marathi), Gauzaban (Hindi), and catnip (English) (Khan, 2018). Its distinctive aromatic profile and essential oils confer notable pharmacological properties (Raja, 2012).

Phytotherapy has emerged as a precise alternative to both herbal and biomedical treatments. In the early twentieth century, herbal remedies constituted the mainstay of healthcare, prior to the advent of antibiotics and synthetic analgesics. With the rise of allopathic medicine and the rapid therapeutic effects of synthetic drugs, herbal remedies gradually waned in popularity (Singh, 2007). Recently, there has been a global resurgence in the preference for herbal medicine, encapsulated in the “Return to Nature” movement. The use of medicinal plants as potent sources of therapeutic agents is recognized worldwide (Sharma and Kumar, 2013), a practice dating back to early humans who explored their surroundings for relief from pain and disease, ultimately giving rise to a diverse pharmacopeia of plant, animal, mineral, and other natural constituents.

Currently, a substantial segment of the population regularly consumes products derived from medicinal plants for both curative and preventive purposes. The increasing popularity of traditional medicine and phytotherapy reflects their growing role in addressing global health challenges (Nair and Chandra, 2007). Isolated phytochemicals and their derivatives now form the basis of numerous essential drugs. Between 1983 and 1994, approximately 39% of newly approved drugs were natural products or derivatives thereof (Cragg et al., 1997). Medicinal plants serve as crucial sources of raw materials for extracting active compounds used in the formulation of pharmaceuticals, such as antibiotics, antimalarials, blood thinners, and laxatives. The United Nations Educational, Scientific and Cultural Organization (UNESCO) designated 1996 as the International Year of Traditional Medicine, acknowledging the enduring importance of these practices in many developing nations (Bhuvaneswari R, R Anandan,2024)

Methodology

The articles that focus on the studies of *Anisomeles malabarica* were collected data from various sources such as Scopus, Google scholar, PubMed, web of science and Science direct and ethnobotanical databases. The data collected include original research and review articles published in peer-reviewed journals, books evaluated and presented accordingly in suitable subject areas of ethnobotany, phytochemistry and pharmacology.

Botanical Description and Distribution

The taxonomical synonyms of this species include *Anisomeles salviifolia* R.Br., Nepeta pallida K. Koch, Stachys mauritiana Pers., Craniotome mauritianum (Pers.) Bojer, and Ajuga fruticosa Roxb. The plant is referred to by various local names across Indian states, such as peyimeratti (Tamil Nadu), Karithumba (Kerala), Mogabheri (Andhra Pradesh), and Gandubirana Gida (Karnataka) (Murthy et al., 2015).

Taxonomical classification:
Kingdom: Plantae
Division: Charophyta
Class: Embryopsida
Sub-class: Magnoliidae
Order: Lamiales
Family: Lamiaceae
Genus: Anisomeles
Species: malabarica (L.) R. Br. ex Sims

Figure 1. ***Anisomeles malabarica***



Anisomeles malabarica is a dicotyledonous, aromatic, perennial herb, typically reaching 2 meters in height. It features soft, woody stems and opposite, oblong-lanceolate leaves, which are aromatic, pale green above, white beneath, and crenate-serrate with a woolly texture due to air pockets. The plant bears trigonous nutlets throughout the year, with flowering observed primarily between February and April, lasting approximately 15 days (Prabhakaran and Rekka, 2017). The zygomorphic, bilabiate, gullet-shaped, and nectariferous flowers are purple, arranged in dense whorls on interrupted spikes, and the seeds are compressed and ellipsoid. Fruiting occurs in September, December, January, and April.

Anisomeles malabarica thrives in dry, rocky tropical regions, with a high prevalence in Southeast Asia, India, Bangladesh, Sri Lanka, Malaysia, Mauritius, and Australia. In India, it is most commonly found in the southern states and is occasionally seen in Assam, Orissa, and Maharashtra (Bean et al., 2015). Its traditional medicinal uses are particularly documented in India.

Medicinal Value

A. malabarica is employed in the production of medicines, fragrances, and cosmetics. It has a longstanding history in Indian and Sri Lankan traditional medicine. Various parts of the plant, especially the leaves and roots, are used to address a range of conditions, including hereditary mental disorders, teething fevers, and inflammation. The alkaloids in the plant have contributed to the development of potent analgesics, while tannins are recognized for their antioxidant properties (Trease and Evans, 1983; Dharmanaada, 2003). Tannin-rich herbs are traditionally used to treat diarrhea and dysentery. Folk medicine applications include treatments for fever, anorexia, rheumatism, and wound healing, as well as antispasmodic, anticancer, diuretic, antimicrobial, and anticonvulsant use (Choudhary et al., 2012).

Traditional remedies employ crushed *A. malabarica* for hysteria and abdominal pain. Its widespread use in southern India, particularly along the Western Ghats, underscores its ethnomedicinal importance (Murthy et al., 2015). The plant is an essential component in the preparation of Ayurvedic, Siddha, and Unani medicines, reflecting a synthesis of indigenous botanical knowledge and therapeutic practice (Samal, 2016; Sen and Chakraborty, 2017).

Ethnobotanical Applications

Among tribal communities such as the Paliyar, Valaiyan, Urali, Irula, and Kani in Tamil Nadu and Kerala, *A. malabarica* extracts and juices are used for treating fever, wounds, gastric ailments, and as an antidote for snakebite. The Kani community uses a preparation called “Visakallu” for snake venom absorption. In Andhra Pradesh, it serves as a mosquito repellent among Chenchu, Yerkula, Lamadi, and Yanadi communities. Diverse plant parts are processed as decoctions, juices, and extracts for therapeutic purposes.

Ayurvedic Medicine

Known as “Sprikka” in Sanskrit, *Anisomeles malabarica* is incorporated in Ayurvedic formulations for skin disorders, muscle weakness, cramps, oral diseases, and as a topical agent for diabetic carbuncles and boils. Notable commercial products include Eladithailam, Aladhatryadithaila, Arimedadithailam, Nisosiradithailam, and Sahachrdithailam (D’Souza, 2019).

Traditional Practices of Tamil People

A. malabarica holds religious significance among the Tamil people, believed to foster mental well-being and domestic prosperity. Leaves are used as wicks in ritual lamps, with the aromatic fumes thought to promote positive thinking and tranquillity, possibly due to neuroactive volatile compounds.



Figure 2. Ethnobotanical use; Tamil people's custom of using *Anisomeles malabarica* leaf as wick in lighting lamp.

Phytochemical Profile

Metabolic characterization of *A. malabarica* has identified a rich array of bioactive compounds, including flavonoids, alkaloids, tannins, terpenoids, glucosides, steroids, saponins, lignin, polyphenols, and reducing sugars (Sing et al., 2003; Selvakumar and Vimala Balan, 2018; Selvakumar et al., 2019). Chloroform and ethyl acetate extracts are particularly rich in terpenoids, phenols, and flavonoids (notably quercetin and tannins). LC-SRM/MS analysis of ethyl acetate leaf extracts revealed phenolic compounds and flavonoids such as luteolin and kaempferol (Kotha et al., 2019). The therapeutic properties of panchangakshara (a formulation with burnt leaf ash) were evaluated by Nagare (2020). Anisomelic acid (AA), a unique 14-membered cembranoid diterpene lactone, has been isolated and characterized from *A. malabarica*, with its structure confirmed via UV, FTIR, and NMR analyses (Purushothaman et al., 1975; Preethy et al., 2012).

Phytochemical Activities

Plant-derived phytochemicals, including terpenoids, phenolics, and proteins, are recognized for their antimicrobial activities (Kavimani et al., 2015). As the overuse of chemical antimicrobials poses challenges, natural alternatives from plants are increasingly investigated (Dahham, 2016; Packia, 2015). The major phytoconstituents identified in A. malabarica include anisomylic acid, anisomyloid, 2-acetoxy malabaric acid, malabaric acid, citral, geranic acid, ovatodiolide, and various triterpenes. Essential oils and active metabolites have demonstrated insecticidal and repellent properties.

These phytochemicals exhibit wide-ranging therapeutic potential, exerting anticancer, antiviral, antidiabetic, antioxidant, antirheumatic, antipyretic, anti-inflammatory, antiepileptic, antispasmodic, antimalarial, and antianaphylactic effects (Kavitha et al., 2012; Ramaraj and Unpaprom, 2013).

Cancer-Fighting Properties

Recent studies have highlighted the anticancer potential of A. malabarica. Various solvent extracts have demonstrated cytotoxic effects in biochemical assays, in vitro cell lines, and in vivo animal models. Jayachandran et al. (2007) initially reported hepatoprotective and antitumor activity against DEN-induced liver carcinoma in mice. Extracts reduced serum and liver protein markers and mitigated histopathological damage. Hexane and chloroform extracts, as well as isolated AA, significantly inhibited proliferation of HPV-16-induced cervical tumors and breast cancer cell lines (Preethy et al., 2012, 2013). These effects were linked to apoptosis induction, as confirmed by multiple biochemical and morphological assays. AA also downregulated HPV oncoproteins E6/E7, altered Bcl protein expression, and stabilized p53, further corroborating its anti-tumor mechanisms (Paul et al., 2014; Senthilkumar et al., 2015). Owing to these properties, AA has been patented for pharmaceutical applications (Eriksson et al., 2016).

Anti-Malarial Activity

Resistance to synthetic insecticides necessitates environmentally sustainable alternatives for mosquito control. A. malabarica leaf extracts and biosynthesized silver nanoparticles have demonstrated acute toxicity against Anopheles subpictus larvae, vectors of malaria (Govindarajan, 2011).

Anti-Inflammatory Properties

In vivo and in vitro studies confirm the anti-inflammatory and anti-rheumatic effects of A. malabarica extracts, with notable efficacy in animal models of inflammation and arthritis (Lavanya et al., 2010b; Sheikh et al., 2016; Sudha and Srinivasan, 2014).

Hepatoprotective Potential

Aqueous root extracts of A. malabarica reversed paracetamol-induced hepatic toxicity in mice, normalizing serum markers and liver histology, likely due to glycosides and phenolic compounds (Rani et al., 2020).

Anti-Leishmanial Activity

Methanolic and acetone leaf extracts display significant activity against Leishmania promastigotes (Zahir et al., 2009).

Antidiabetic Properties

A. malabarica leaves contain flavonoids and phenolic compounds with antihyperglycemic effects, traditionally used for managing diabetes and related metabolic disorders (Akkati et al., 2011; Kotha et al., 2017).

Anti-HIV Activity

Ovatodiolide, a diterpenoid from A. indica, exhibits moderate anti-HIV-1 activity in vitro (Alam et al., 2000).

Antinociceptive and Anxiolytic Properties

Methanolic extracts of A. malabarica demonstrate analgesic, antidepressant, and anxiolytic activities, with favourable pharmacokinetics and safety profiles for key constituents such as 3,4-dihydroxybenzoic acid and apigenin (Uddin et al., 2018).

Antimicrobial Activity

Experimental studies have demonstrated that A. malabarica extracts inhibit both gram-positive and gram-negative bacteria, with ethanolic extracts showing pronounced antibacterial activity (Preethy et al., 2012, 2013).

The anti-cancer property of AA was further evaluated in HPV-transformed cervical cancer cells, demonstrating induction of apoptosis via caspase activation and modulation of key regulatory proteins. In ovo studies using the chick chorioallantoic membrane model confirmed tumor growth inhibition (Paul et al., 2014). Nanoparticle delivery systems utilizing AA have enhanced apoptotic effects in cancer cells (Senthilkumar et al., 2015). The promising antiviral and anticancer activities of AA have been substantiated by patent filings (Eriksson et al., 2016).

CONCLUSION

In summary, Anisomeles malabarica represents a promising medicinal resource, bridging traditional wisdom and contemporary scientific evidence. Its rich phytochemical composition, particularly anisomelic acid, confers a spectrum of pharmacological properties including anticancer, antiviral, antidiabetic, anti-inflammatory, and hepatoprotective activities (Kavitha et al., 2012; Preethy et al., 2012; Rani et al., 2020).

Demonstrated efficacy against HPV-related cancers and malarial vectors underscores its potential for drug discovery and development (Eriksson et al., 2016; Govindarajan, 2011). Continued research is necessary to validate these effects through in vivo studies and clinical trials, ensuring both safety and therapeutic value (Sen and Chakraborty, 2017). Further exploration of biosynthesis, cultivation, and genetic engineering could expand its medicinal applications. Integrating ethnobotanical insights with robust scientific validation, A. malabarica stands out as a compelling candidate for future pharmaceutical advancements.

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