

A Brief Review on Phytochemical Constituent and Pharmacological Activities of *Anisomeles malabarica* (L.)

Bhuvaneshwari R., R. Anandhan

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ABSTRACT

Anisomeles malabarica L., also known as ‘Malabar catmint’ and ‘Peiyamuritti’ in local Tamil, is a genus of herbaceous herb in the Lamiaceae family. This Malabar catmint is native to tropical and subtropical India and Sri Lanka. Catmint is regarded as a medicinally significant plant because of its anti-inflammatory, anti-allergic, anti-cancer, anti-diabetic, anti-anaphylactic and anti-bacterial properties. It is well-known for its ability to treat a variety of health problems such as dyspepsia, rheumatism, amentia, anorexia, wound healing and swelling, and teething problems in children. Its leaf extract is effective against epilepsy, intestinal worms, halitosis and gout. It is used as astringent, carminative and febrifuge. Because of the presence of various acids such as

anisomelic acid, 2 acetoxymalabaric acid, betulinic acid, ovatodiolide, -sitosterol, anisometyl acetate anisomelin, malabaric acid, triterpenebetulinic acid, geranial acid, and others, this medicinal herb is used not only for medicinal purposes but also as folkloric medicine and in the production of several cosmetics and aromatics. Because the cultivation practices of the medicinally important plant are time consuming, we can use advanced plant cultivation techniques such as tissue culture to produce a large number of plants in a short period of time and in a small area. The purpose of this review paper is to describe the various aspects of *A. malabarica* botanical description, medicinal values, phytochemistry, pharmacological properties, and cultural practices.

Keywords Medicinal plant, High-performance liquid chromatography, Fourier transform infrared, Antibiotics, Antimalarial medications.

INTRODUCTION

Phytotherapy has been developed as a more accurate alternative to herbal or biomedical remedies. Herbal therapy was a leading form of healthcare in the early twentieth century because antibiotics and painkillers had not yet been discovered. After the development of an allelopathic medical system based on the rapid therapeutic effects of synthetic medications, herbal remedies gradually fell out of favor with the public (Singh 2007). There has been a recent shift in the global trend away from synthetic medicine

Bhuvaneshwari R.¹, R. Anandhan^{2*}

¹PhD Scholar, ²Assistant Professor

¹Plant Molecular Biology and Biotechnology, Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalai Nagar 608002, Tamil Nadu, India

²Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalai Nagar 608002, Tamil Nadu, India

Email : bioanandan@gmail.com

*Corresponding author

and toward herbal therapy, also known as “Return to Nature.”

The use of medicinal plants as a rich source of therapeutic substances for disease treatment has been recognized for millennia and is highly valued globally (Sharma and Kumar 2013). Early man searched his immediate natural surroundings for pain and discomfort relief, as well as eternal health and longevity. This resulted in the use of a variety of plant, animal, mineral and other substances, as well as the development of a wide range of therapeutic agents.

Nowadays, many people consume products made from medicinal plants on a regular basis, both to treat illnesses and to maintain good health. Traditional medicine and medicinal plants are gaining popularity as a means of addressing global health issues (Nair and Chandra 2007). Isolated chemical compounds and their derivatives are currently used as important medications. Between 1983 and 1994, 39% of New Approved Drugs (NAD) were natural products, original natural products, semi-synthetic products developed from natural products and synthetic products, based on natural molecules (Cragg *et al.* 1997).

Raw materials from medicinal plants are used to extract the active compounds that are used in the production of various medications. Antibiotics, anti-malarial medications, and blood thinners all contain plant-based chemicals, as do laxatives. According to UNESCO, which declared 1996 the International Year of Traditional Medicine. Traditional medicine and medicinal plants are used to maintain good health in the majority of developing countries.

Plant distribution

Anisomeles malabarica is a species of herbaceous shrub in the Lamiaceae family that is also known as the ‘Malabar catmint’ (English), Gouzaban (Hindi), Chodara (Marathi) and Karithumbi (Kannada), Aluri (1992). The Lamiaceae family (or mint family) is one of the largest and most distinctive flowering plant families, with approximately 220 genera and nearly 4000 species worldwide. In India, it is represented by 45 genera and 574 species, including 256 endemic

species. This family has a nearly global range and is one of the primary sources of culinary, vegetable, and medicinal plants around the world.

This family’s members can be found in all types of weather. It is indigenous to tropical and sub-tropical areas of India, Srilanka, Malaysia, Bangladesh, Myanmar, The Bismarck Archipelago, Mauritius and The Andaman Islands. Annapoorani (2019), Ling *et al.* (2001).

It has 1.5-3 cm wide and 3-8 cm long slender green leaves. It blooms with purple flowers in the middle of spring, though it may bloom throughout the year. The flowers are pollinated by carpenter bees and sunbirds (Raju and Reddi 1989), Gupta *et al.* 2008). Originally used in Sri Lankan and Hindi folk medicine, it is now primarily used in medicine, fragrance, and cosmetics. In contrast to other members of the genus, the polished pericarp of the nutlet attracts granivores such as sunbirds (Aluri *et al.* 1992).

The oblong, petiolate leaves are 1.5-3 cm wide and 3-8 cm long, tapering to a point at each end Ling *et al.* (2001), Annapoorani (2019). They are crenated and woolly on top and white on the bottom, with pinnate venation Singh *et al.* (2003). The leaves are similarly lobed, with 14-29 lobes on each side and a visible gland at the tip of each lobe that is less than 1 mm deep.

The petioles are 9-13 mm long, with an abrupt transition from leaves to bracts. The square-shaped stems are covered in hair, some of which may contain glands, however, as the plant ages, the hairs at the top of the stem thin. Phytochemical research has identified anisomelic acid, 2-acetoxymalabaric acid, ovatodiolide, betulinic acid, and -sitosterol, as well as malabaric acid, anisomelol, and anisomelolide Annapoorani (2019), Khare (2007).

The new flowers are about 2.2 cm long, gullet-shaped and fragrant and they last for two days Raju and Reddi (1989). The bottom lip of the corolla, which serves as a landing zone for pollinators, measures about 12 mm by 4 mm Ling *et al.* (2001). On average, one plant produces 400-500 blooms between 1:00 and 5:00, though anthesis is delayed by about

an hour on cloudy or foggy days.

Cultivation practices

Medicinal and aromatic plants are in high demand on the market due to their superior medicinal value and pharmacological activity, necessitating better mechanical and medical management.

The advantage of asexual reproduction is that there is almost no difference between the plant that is grown and the plant from which it is grown. Although *A. malabarica* can be grown from seed or rhizome cuttings, it is commonly harvested from the wild in China (Ling *et al.* 2001).

The amount of daylight, average rainfall, minimum average temperature, as well as temperature variations during the day and night, all have a significant impact on the physical, chemical and biological standards of medicinal plants. Climate influences the plant's pursuit of biochemical necessities (Porwal *et al.* 2020).

Medicinal value

A. malabarica is used to make medicine, fragrances, and cosmetics. It has been used as a medicinal herb in Indian and Sri Lanka folk medicine for generations. All parts of the plant, particularly the leaves and roots, are used to treat a variety of ailments, including congenital mental defects, teething fevers and swelling. Plants produce alkaloids and their remarkable effect on humans has aided in the development of powerful analgesics. Tannins, according to Rease and Evans (1983), play an important role as antioxidants. Subhuti Dharmanaada (2003) claims that astringent herbs with tannins are used to treat diarrhoea and dysentery.

Phytochemical constituent

The presence of terpenoid and saponin components, as well as alkaloids, phenols, tannins, flavonoids, glycosides and steroids was discovered in an ethanol extract of the plant's leaves (Krishna *et al.* 2019).

More phytochemicals have been discovered in seeds than in the corresponding plant parts, leaves

and flowers, in terms of amount. Typically, the nutritional content of seed parts was highest. Alkaloids, flavonoids, tannin and polyphenol chemicals were identified by the quantitative analysis of the plant's phytochemical components.

Because of the presence of alkanes, halogens, alcohols, nitro compounds, esters, aldehydes, acid anhydrides, amino acids, amines, and amides, the absorption spectra of the stem sample could be observed. Sudha and Srinivasan (2014) isolated the bioactive chemicals 3, dihydroxy benzoic acid and 4', 5, 7-trihydroxyflavone from the chloroform extraction of *A. malabarica* leaves.

Pharmacological activities

It has anti-inflammatory, antiepileptic, antifertility, anti-pyretic activity, potential anti-allergic, anti-anaphylactic, antibacterial, anticancer, anti-carcinogenic, antiperiodic, diaphoretic, emmenagogue and antispasmodic properties. Pain is defined by the International Association for the Study of Pain (IASP) as "a distressing sensory and emotional experience related to actual or potential tissue damage."

Anti-arthritic activity

Anisomeles malabarica anti-arthritic efficacy was investigated using the approach known as protein denaturation inhibition. When compared to the standard medication Diclofenac sodium, the plant's methanolic extract showed significant activity at 97.47% at 250 g/ml via inhibiting protein denaturation. Protein denaturation may contribute to the formation of autoantigen in several arthritic diseases.

Anti-leishmanial activity

According to Zahir *et al.* (2009), *A. malabarica* leaf methanol extracts have superior antileishmanial activity against promastigotes. Acetone extracts of *A. malabarica* leaves have also demonstrated significant antileishmanial activity.

Anti-microbial activity

Anisomeles malabarica was grown in the field and tested for antibacterial activity against gram positive

Table 1. Pharmacological activity of *Anisomeles malabarica* L. plant.

Pharmacological activities	References
Antidiarrheal effects	Taufiq-Ur-Rahman <i>et al.</i> (2005)
Antimicrobial	Bellah <i>et al.</i> (2017)
	Boobalan Raja (2010)
	Herrera and Parsonnet (2009)
Antibiotic	Peek and Blaser (2002)
Antifungal activity	Vivek <i>et al.</i> (2013)
	Bhengraj <i>et al.</i> (2008)
Antioxidant activity	Kundu <i>et al.</i> (2013)
Anti-cancer activity	Rezaeian <i>et al.</i> (2015)
	Behzad <i>et al.</i> (2014)
	Uddin <i>et al.</i> (2011)
Neuroprotective activity	Liao <i>et al.</i> (2012)
	Mohebbati <i>et al.</i> (2017)
	Hsieh <i>et al.</i> (2008)
	Rao <i>et al.</i> (2009)
	Dharmasiri <i>et al.</i> (2002)
Antimalarial activity	Sundriyal <i>et al.</i> (2013)
	WHO (1996)
	Govindarajan (2011)
Antiplatelet aggregation activity	Govindarajan <i>et al.</i> (2016)
	Chen <i>et al.</i> (2008)
Anti-HIV activity	Alam <i>et al.</i> (2000)

and gram-negative bacteria such as *E. coli*, *S. aureus*, *P. mirabilis*, *P. aeruginosa* and *K. pneumonia*. Both extracts had different inhibitory effects. Extract inhibitory effects were inversely related to the concentration of leaf from field-grown plants. The ethanol extract demonstrated good antibacterial activity at 200 g/ml (Table 1).

Anti-carcinogenic activity

Cancer is now considered one of the leading causes of death worldwide (Behzad *et al.* 2014). The potential anticancer and anti-carcinogenic effects of isolated chemicals from medicinal plant extracts have recently piqued the interest of researchers. The *A. malabarica* hexane extract was significantly cytotoxic to human pharyngeal squamous carcinoma (FaDu) cells in a dose- and time-dependent manner.

Anti-diabetic property

Diabetes mellitus is a metabolic disorder characterized by hyperglycemia caused by impaired insulin secretion from pancreatic beta cells and/or decreased insulin sensitivity in the liver and peripheral organs (Akkati *et al.* 2011). The leaves of *A. malabarica* are

used in traditional medicine to treat hyperlipidemia, diabetes, and gastrointestinal conditions (Kotha *et al.* 2017). *A. malabarica* leaves contain a variety of active ingredients, including flavonoids (luteolin and kaempferol), phenolic compounds (quinic acid, chlorogenic acid and caffeic acid) and unsaturated fatty acids with antihyperglycemic activity.

Anti-inflammatory property

Anisomeles indica is a traditional herbal remedy that has been used for a long time in Taiwan to treat inflammatory illnesses. Furthermore, as previously reported (Hsieh *et al.* 2008), 50 g/ml whole plant methanolic extract effectively suppressed elevated nitric oxide (NO), tumor necrosis factor (TNF), and interleukin (IL)-12 production. As a result, methanolic extract may contain bioactive substances with anti-inflammatory properties. The anti-inflammatory study made use of column chromatographic separations and HPLC.

Antinociceptive and antixiolytic property

When the plant's methanol extract is used, all tested doses of *A. malabarica* have analgesic effects in both central and peripheral pain models. *A. malabarica*'s current neuropharmacological investigation also revealed antidepressant and anxiolytic efficacy with fewer sedative side effects. The computer programs PASS reflected the antinociceptive action, molecular docking revealed better binding affinity with COX-1, COX-2, and serotonin, and an ADME/Toxicity study revealed good pharmacokinetics and toxicity profiles of 3, 4-dihydroxybenzoic acid and apigenin (Uddin *et al.* 2018).

Anti-malarial activity

Mosquito control is under threat due to the evolution of resistance to synthetic insecticides. Environmentally friendly mosquito management is a critical alternative strategy for developing safer pesticides from botanical sources Govindarajain (2011). Mosquitoes play an important role in the transmission of deadly parasites and infections such as encephalitis, dengue fever, chikungunya, yellow fever and filariasis. The acute toxicity of *A. malabarica* leaf extract and biosynthesized silver nanoparticles (AgNPs) against malaria vector larvae *Anopheles subpictus*,

dengue vector *Aedes albopictus* and encephalitis vector *Culex tritaeniorhynchus* is dose-dependent (Govindarajan *et al.* 2016).

Anti-HIV activity

At 5.0-6.0 g/mL, ovatodiolide, a diterpenoid derived from *A. indica* extracts, had a moderate cytotoxic effect (EC₅₀ : 0.10 g/mL, IC₅₀ : 1.20 g/mL) on HIV-1 (Alam *et al.* 2000).

Herbicidal activity

The essential oil from the leaves of *A. indica* exhibits significant herbicidal activity by reducing the radicle growth, seedling elongation and dry weight accumulation of *B. pilosa*, *C. occidentalis*, *A. viridis* and *E. crus-galli* in a dose-response manner (0.125-2.0 mL/mL). Aqueous preparations of the plant's dried leaf and root powder may have potential herbicidal activity by inhibiting the appearance and spread of *Phalaris minor* and other wheat crop weeds (Batish *et al.* 2007).

CONCLUSION

The adequacy and protection of *Anisomeles malabarica* make it a potential natural remedy, as detailed above in the evaluation of its chemical components and pharmacological effects. The plant is valuable because of its many traditional, medical, and pharmacological uses, and its extraction should be helpful in treatment, but this need be supported by *in-vivo* propagation techniques. According to the research, *A. malabarica* was traditionally used to cure a variety of ailments, including HIV, cancer, tumours, inflammation, rheumatoid arthritis, cancer, and epilepsy. Additionally, research revealed that all of the plants examined belonged to a similar genus class, which explains why they shared a number of ethno-pharmacological characteristics.

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