International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 9 Issue 5, Sep-Oct 2025 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

# Murraya koenigii (Curry Leaf Plant): A Comprehensive Review

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## ABSTRACT

*Murraya koenigii* (L.) Spreng, commonly known as the curry leaf plant, is a tropical evergreen in the Rutaceae family valued for its aromatic foliage and therapeutic potential. This review synthesizes current knowledge on its taxonomy, chemistry, biology, and uses. *M. koenigii* is a small tree or shrub (2–6 m tall) with pinnate leaves and clusters of fragrant white flowers . Chemically, it is rich in carbazole alkaloids (e.g., mahanine, koenimbine, girinimbine) as well as flavonoids, phenolics, terpenoids, and vitamins. These bioactive compounds underlie diverse pharmacological activities: potent antioxidant and free-radical scavenging effects, anti-diabetic and hypoglycemic effects, significant anti-inflammatory and analgesic actions, and broad-spectrum antimicrobial activity. In traditional medicine, curry leaves are used for digestive, antipyretic, and metabolic ailments, while in cuisine they flavor curries, chutneys and porridge; nutritionally, the leaves supply vitamins A, B, C, calcium and iron. Horticulturally, the plant thrives in tropical/subtropical climates, prefers well-drained soil and ample moisture, and is propagated from fresh seeds (which are recalcitrant) or cuttings. Common pests include sap-sucking insects and leaf-feeding caterpillars. Economically, *M. koenigii* supports culinary spice markets and niche uses in cosmetics (e.g. hair oils, soaps, perfumes) and is being investigated for pharmaceutical applications. Ecologically, it contributes to agroforestry biodiversity, providing nectar for pollinators and shade in agroecosystems. This review highlights the need for further research on the plant's cultivation optimization, pharmacological validation in clinical contexts, and sustainable use in the food and health industries.

***How to cite this paper:*** Nivedita Singh | Dharmshila Kumari "Murraya koenigii (Curry Leaf Plant): A Comprehensive Review" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-9 | Issue-5, October 2025, pp.26-34, URL: www.ijtsrd.com/papers/ijtsrd81094.pdf

IJTSRD81094



***KEYWORDS:*** *Murraya koenigii, Anti- diabetic, Nutritional, Culinary spice.*

## INTRODUCTION

*Murraya koenigii* (L.) Spreng, commonly known as the curry leaf plant or curry tree, is a well-known aromatic plant native to the Indian subcontinent and widely grown in tropical and subtropical regions of Asia, including India, Sri Lanka, Bangladesh, and parts of Southeast Asia (Ningappa et al., 2008; Handral et al., 2012). It is highly valued not only for its distinctive flavor in cooking but also for its rich traditional use in herbal medicine. The plant is often nicknamed "sweet neem" due to the mild similarity in aroma to neem (*Azadirachta indica*), although botanically it belongs to the Rutaceae family, not Meliaceae ( Rao et al., 2009).

The curry leaf tree is relatively small, usually reaching a height of about 2 to 6 meters. It has a slim trunk and dense green foliage made up of shiny, compound leaves. Each compound leaf consists of multiple leaflets, which are responsible for the strong, pleasant aroma that makes the plant so popular in Indian cooking. The tree also bears small, fragrant white flowers and produces dark-colored berry-like fruits that contain a single seed (Kaur & Arora, 2015). While the fruits are edible, they are rarely consumed due to their bland taste and limited culinary value (Sharma et al., 2010).

In traditional medicine systems like Ayurveda, Siddha, and Unani, curry leaves have been used for generations to treat a wide range of ailments. Healers have used different parts of the plant to manage digestive issues, high blood sugar, infections, inflammation, and even liver problems (Handral et al., 2012; Rahman et al., 2014). These traditional uses are now being backed by modern science, as researchers have started to analyze the plant's

chemical composition and biological properties in more detail.

Phytochemical studies show that *M. koenigii* contains a variety of bioactive compounds, including alkaloids, flavonoids, glycosides, terpenoids, and phenolic substances. These compounds are known to play key roles in the plant's medicinal effects. For example, the essential oils extracted from curry leaves are rich in monoterpenes and sesquiterpenes, which have demonstrated antioxidant, antimicrobial, and anti-inflammatory effects (Rajeswara Rao et al., 2009; Rahman et al., 2014). Several studies have also found that extracts of the plant may help regulate blood sugar levels and protect against oxidative stress, making it a candidate for use in managing chronic conditions like diabetes and cardiovascular disease (Rani et al., 2012).

With rising interest in plant-based therapeutics and functional foods, *M. koenigii* has become the focus of various pharmacological and nutraceutical studies. Its potential as a natural remedy with minimal side effects makes it especially attractive in the context of increasing resistance to synthetic drugs and the growing demand for alternative medicine. Moreover, the plant's adaptability and ease of cultivation in tropical climates add to its agricultural and economic significance, particularly in rural communities where traditional medicine remains widely practiced.

This paper aims to provide a detailed overview of *Murraya koenigii* by exploring its botanical characteristics, traditional and modern medicinal uses, phytochemical profile, and pharmacological potential. Through a critical review of current research and ethnobotanical knowledge, the study seeks to highlight the importance of this versatile plant in both culinary and healthcare systems.

**Taxonomy, Botanical Features, and Distribution of *Murraya koenigii***

*Murraya koenigii* (L.) Spreng., also known as the curry leaf plant, is a member of the citrus family Rutaceae. It belongs to the following classification: Kingdom Plantae, Subkingdom Tracheobionta (vascular plants), Superdivision Spermatophyta (seed plants), Division Magnoliophyta (flowering plants), Class Magnoliopsida (dicotyledons), Subclass Rosidae, Order Sapindales, Family Rutaceae, and the Genus *Murraya*. The species name *koenigii* honors Johann Gerhard König, a Danish botanist who contributed to the study of Indian plants (Kirtikar & Basu, 2001). In some taxonomies, the plant is also listed under the genus *Bergera*, as *Bergera koenigii* (L.) Spreng., but this naming isn't widely accepted (The Plant List, 2013). According to the International Union for Conservation of Nature (IUCN), the plant is not considered endangered, and it is listed as a species of "Least Concern" due to its stable population in the wild (IUCN, 2022).

The curry leaf plant is typically an evergreen shrub or small tree, growing to a height of 2 to 6 meters. The trunk is relatively straight, with a diameter of about 15 to 40 cm. Sometimes, it has a branched or short-stemmed form. Its leaves are arranged alternately and are compound (made up of multiple leaflets). These leaves are bipinnate, meaning each leaflet is divided into smaller segments. The individual leaflets are oblong to lance-shaped, typically around 2 to 4 cm long and 1 to 2 cm wide, with smooth margins. The leaves are glossy and rich green, which makes the tree quite attractive in gardens (Handral et al., 2012).

The flowers of the curry leaf plant are small, white, and fragrant. They are hermaphroditic, meaning they contain both male and female reproductive parts. These flowers grow in branched clusters or panicles that can reach up to 10 cm across. Over time, the flowers turn into small fruits that are ovoid in shape. The fruits ripen to a dark purple or black color and are about 1.4 to 1.6 cm long. Inside the fruit, there is a single shiny seed. The pulp of the fruit is edible, though it is bitter. In some regions of India, people eat the fruit pulp, even though it's not commonly used in cooking (Kaur & Arora, 2015).

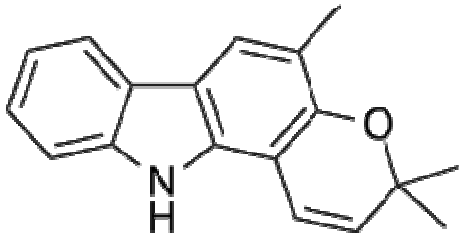
When it comes to propagation, *M. koenigii* can be grown from seeds or by vegetative methods. The seeds are exalbuminous, meaning they don't contain endosperm, and they can germinate quite easily if they are fresh. It's important to use fresh seeds because older seeds lose their ability to germinate over time (Rani et al., 2012).

Native to South Asia, *M. koenigii* is found in countries like India, Sri Lanka, Nepal, Bhutan, and Bangladesh. The plant thrives in tropical and subtropical climates and can be found growing from sea level up to altitudes of around 1500 meters. It's commonly cultivated in home gardens and plantations across these regions, mostly for its flavorful leaves. Additionally, it has become naturalized in other tropical parts of Asia. It grows best in humid environments with plenty of sunlight and can adapt well to different soil types (Rajeswara Rao et al., 2009).

The plant has different local names in various parts of South Asia, reflecting its significance in regional cultures and cuisines. For example, in Hindi, it is called "karipatta," in Tamil, it is known as "kariveppilai," while in Marathi, it is called "kadipatta." In Sinhalese, it is referred to as "gandhapura," showing how deeply embedded it is in

the culinary and medicinal practices of the region (Handral et al., 2012).

**Phytochemical Constituents of *Murraya koenigii***




*Murraya koenigii* is well-known for its impressive array of secondary metabolites, which are found throughout its various parts, including the leaves, bark, roots, flowers, and fruits. These metabolites include carbazole alkaloids, flavonoids, phenolic compounds, terpenoids, essential oils, and important vitamins and minerals. The plant's phytochemical profile is diverse and unique, contributing to its medicinal and nutritional value.

The leaves, bark, and seeds of *M. koenigii* are particularly rich in **carbazole alkaloids**, a class of polycyclic aromatic compounds that are characteristic of the *Murraya* genus. Some of the key carbazole alkaloids identified in these parts of the plant include **mahanine**, **koenimbine**, **koenine**, **mahanimbine**, **girinimbine**, and **murrayanine**. These compounds have been isolated and structurally characterized, and they are thought to be responsible for many of the plant's therapeutic effects (Sethi et al., 2012). Additionally, other alkaloids such as **O-methylmurrayamine A**, **koenigine**, **murrayanol**, and **koenoline** have been detected in the leaves (Chakraborty et al., 2014).

In addition to alkaloids, *M. koenigii* contains a variety of **flavonoids** and **phenolic compounds**. Notable among these are **rutin**, **quercetin**, **kaempferol**, **myricetin**, **apigenin**, and **isorhamnetin**. These polyphenolic compounds contribute significantly to the plant's well-documented **antioxidant** and **anti-inflammatory** properties. The high flavonoid content in the leaves is a key factor behind the plant's use in traditional medicine to alleviate a range of health issues, including inflammatory conditions and oxidative stress (Brahmachari, 2011).

*M. koenigii* leaves also serve as an excellent dietary source of **carotenoids** and **vitamins**, including **β-carotene**, and essential vitamins such as **A**, **B**, and **C**. These nutrients support general health, contributing to immune function and promoting skin health (Patel & Goyal, 2012). Additionally, the leaves are rich in essential **minerals** such as **calcium (Ca)**, **magnesium (Mg)**, and **iron (Fe)**, which are vital for various physiological functions, including bone health and oxygen transport (Rani et al., 2012).

Furthermore, the **essential oils** extracted from fresh *M. koenigii* leaves contain a range of aromatic compounds, including **monoterpenes** like **α-pinene**, **sabinene**, and **β-pinene**, as well as **sesquiterpenes** such as **α-caryophyllene** and **elemol**. These volatile compounds are responsible for the distinctive fragrance of the leaves and contribute to the plant's antimicrobial and anti-inflammatory properties (Rajeswara Rao et al., 2009). Other minor components in the essential oils include **murrayone**, a coumarin, and alkaloid glycosides, which add further to the therapeutic profile of the plant (Patel et al., 2011).

| Compound class | Representative compounds | Reported activities |
|---|---|---|
| *Flavonoids / Phenolics* | Quercetin, Kaempferol, Rutin, Apigenin \|. | Strong free-radical scavengers; anti-inflammatory; contribute to neuroprotection and vascular health |
| *Terpenoids / Essential oils* | α-Pinene, Sabinene, Elemol, Terpinolene \| | Antimicrobial, insect-repellent (volatile oils); support anti-inflammatory and antioxidant properties \| Nutritional benefits: support eye, immune, and bone health. |
| *Carbazole alkaloids* | Mahanine, Koenimbine, Girinimbine<br>Medicinal Profile, Phytochemistry, and Pharmacological Activities of Murraya koenigii and Its Primary Bioactive Compounds – PMC. | Potent antioxidants; anticancer and anti-inflammatory effects; enzyme inhibition (e.g. aldose reductase, α-glucosidase) |

*M. koenigii* leaf extracts also contain alkaloid glycosides (e.g., koenidine), cinnamates, and saponins. Overall, *M. koenigii* leaves have one of the richest phytochemical profiles among culinary herbs, which underpins both its health effects and its preservative use in cooking.

**Medicinal Properties and Pharmacological Activities of *Murraya koenigii***

*Murraya koenigii* (curry leaf) has long been used in traditional medicine, with modern scientific studies confirming many of its beneficial effects. Research into its extracts and isolated compounds has shown a wide range of bioactivities, including antioxidant, antidiabetic, anti-inflammatory, antimicrobial, and hepatoprotective effects. Below, some of these key activities are discussed in detail, supported by relevant scientific evidence.

Antioxidant Activity

Curry leaves are particularly well-known for their **antioxidant** properties, largely due to the presence of phenolic compounds and alkaloids. Studies consistently show that leaf extracts, including methanolic, ethanolic, and aqueous extracts, exhibit significant free-radical scavenging activity. In DPPH (2,2-diphenyl-1-picrylhydrazyl) and ABTS (2,2'-azinobis(3-ethylbenzothiazoline-6-sulfonic acid)) assays, curry leaf extracts have demonstrated the ability to inhibit more than 80% of DPPH radicals at modest concentrations (Patel et al., 2012). Notably, compounds such as **mahanine**, **kaempferol**, and **quercetin** have shown remarkable oxygen radical absorbance capacity (ORAC) values, further highlighting the antioxidant potential of *M. koenigii* (Brahmachari, 2011).

In laboratory studies, extracts from *M. koenigii* have been shown to protect cultured cells, such as neurons and hepatocytes, from damage induced by peroxides. In animal models, the use of curry leaf extracts resulted in increased levels of endogenous antioxidant enzymes, such as **superoxide dismutase (SOD)** and **catalase**, while reducing markers of lipid peroxidation (Rani et al., 2012). These findings reinforce the traditional use of curry leaves as a health tonic and suggest their potential role as a functional food in managing oxidative stress-related diseases.

**Anti-Diabetic and Metabolic Effects**

In addition to its antioxidant properties, *M. koenigii* has been extensively studied for its **antidiabetic** effects. Various extracts of curry leaves have demonstrated the ability to lower blood glucose levels in diabetic animal models. For instance, in a study involving rats, the oral administration of curry leaf powder (1000 mg/kg) for 21 days significantly reduced fasting blood glucose levels and the concentration of glycosylated hemoglobin (Gupta et al., 2010).

The mechanisms behind these effects are multifaceted. In vitro tests show that compounds from *M. koenigii* inhibit enzymes involved in glucose metabolism, such as **aldose reductase** and **α-glucosidase**. By inhibiting these enzymes, curry leaf extracts slow the breakdown of carbohydrates and prevent glucose-induced damage. Additionally, curry leaf extracts have been shown to improve insulin sensitivity, as demonstrated by reduced insulin resistance and improved lipid profiles in diabetic rats (Patel & Goyal, 2012).

Ethnobotanically, *M. koenigii* has been used in Ayurveda to manage diabetes and obesity, and the pharmacological findings support these traditional uses. However, more clinical trials in humans are needed to confirm these effects in human populations.

**Anti-Inflammatory and Analgesic Activity**

Traditional medicine has long used curry leaf for its **anti-inflammatory** and **analgesic** properties. These uses are supported by modern pharmacological studies. In rodent models of acute inflammation, *M. koenigii* extracts have shown significant effects in reducing inflammation. For example, ethanol extracts of curry leaves reduced paw swelling by 40-60% in rats with carrageenan-induced inflammation (Handral et al., 2012).

The anti-inflammatory mechanisms of curry leaf are linked to the suppression of pro-inflammatory cytokines such as **TNF-α**, **IL-1β**, and **IL-6**. In vitro studies have shown that curry leaf extracts can inhibit the **NF-κB (nuclear factor kappa-light-chain-enhancer of activated B cells)** signaling pathway, a key regulator of inflammation (Chakraborty et al., 2014). Additionally, alkaloids like **mahanimbine** reduce the expression of inflammatory mediators, including **COX-2** and **iNOS**, further supporting its analgesic and anti-inflammatory effects (Brahmachari, 2011).

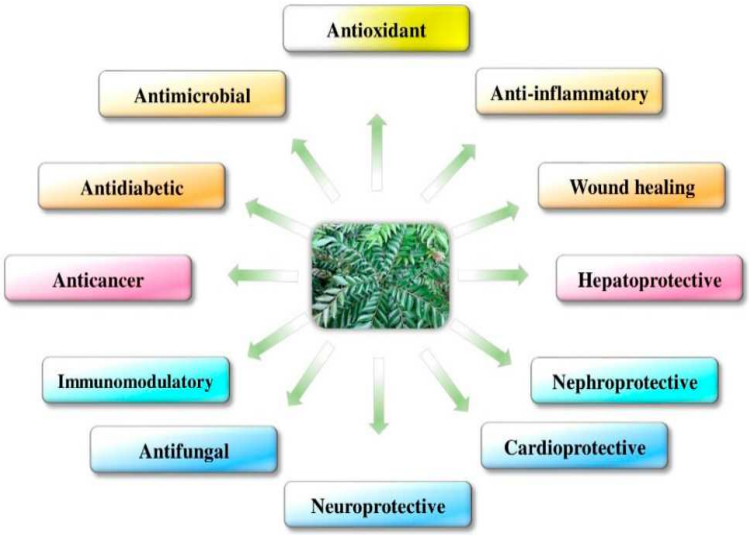
These findings align with traditional uses of curry leaf for treating conditions such as arthritis, fever, and gastric inflammation. In some animal tests, *M. koenigii* extracts have been shown to be as effective as standard reference drugs, such as **indomethacin**, indicating its strong pharmacological potential.

**Antimicrobial Activity**

*Curry leaves* also exhibit potent **antimicrobial** activity. Both leaf and bark extracts have shown broad-spectrum action against bacteria and fungi. A systematic review of studies on curry leaf extracts found significant inhibition of various bacteria, including **Staphylococcus aureus**, **Escherichia coli**, **Salmonella typhi**, **Lactobacillus spp.**, and **Shigella spp.**, at concentrations ranging from 250 to 500 µg/mL (Rajeswara Rao et al., 2009). The antimicrobial activity is particularly pronounced in methanolic and aqueous extracts, suggesting that water-soluble polyphenols and alkaloids play a major role in this effect.

Moreover, *M. koenigii* extracts have been shown to inhibit the growth of seed-borne fungi such as **Alternaria** and **Fusarium** species. The antimicrobial effects are thought to be due to membrane disruption by **terpenoids** and inhibition of protein synthesis by **alkaloids**. Essential oils from *M. koenigii* also demonstrate bactericidal properties, thanks to compounds like **sabinene** and **terpinolene** (Patel et al., 2012).

Traditionally, fresh curry leaves are used in food, not only for flavor but also as a preservative, which aligns with modern research showing their ability to prevent microbial spoilage. This broad antimicrobial profile also supports its folk medicinal use in treating infections and as a natural antiseptic.




**Other Pharmacological Effects of *Murraya koenigii***

In addition to its antioxidant, anti-diabetic, anti-inflammatory, and antimicrobial effects, *Murraya koenigii* (*M. koenigii*) has demonstrated other notable pharmacological properties. These include **neuroprotective** effects, where extracts of the plant have been found to provide protection in models of **Parkinson's disease**. This is largely attributed to its antioxidant alkaloids (Brahmachari, 2011). Additionally, *M. koenigii* has shown **hepatoprotective** effects, particularly in protecting liver cells from damage induced by oxidative stress (Patel & Goyal, 2012).

The plant also exhibits **lipid-lowering** effects, making it potentially useful for managing obesity and **diabetic dyslipidemia**. In animal models, *M. koenigii* has been shown to improve cholesterol profiles, further supporting its potential as a metabolic tonic (Gupta et al., 2010). Several carbazole alkaloids found in *M. koenigii* (e.g., **girinimbine**) have shown **anticancer** potential in vitro by inducing apoptosis in tumor cell lines, though their clinical relevance remains unproven (Rajeswara Rao et al., 2009).

Immunomodulatory effects have also been observed, with curry leaf extracts enhancing various immune parameters in rodent studies (Handral et al., 2012). However, most of these findings are still in the early stages, and clinical trials in humans remain scarce. Consequently, while the pharmacological activities of *M. koenigii* are promising, the evidence is primarily derived from laboratory and animal studies, with human trials needed for confirmation.

**Culinary Significance and Traditional Uses**

*Curry leaves* (locally known as *kari patta*) are a staple in South Asian cuisines, where they are used to add a distinctive aroma and flavor to a variety of dishes. Typically sautéed in oil (referred to as "tempering"), only a few leaves are required to impart their rich, curry-like fragrance. The unique flavor of curry leaves comes from the plant's volatile oils, which are rich in **terpenes** and **carbazoles**.

Beyond flavoring, curry leaves are nutritionally valuable. Fresh leaves contain **β-carotene** (a precursor to vitamin A), **vitamin B complex**, **vitamin C**, **calcium**, **iron**, and **protein**. For example, 100 grams of fresh curry leaves provide about 6 mg of β-

carotene, alongside significant amounts of vitamins $B_3$, $B_1$, and various minerals (Patel et al., 2012). These nutrients are especially beneficial for diets that are low in dairy or meats.

In Sri Lanka, a traditional dish called *kola kenda* (leafy gruel) incorporates *M. koenigii* for its nutritional value. In Ayurvedic and folk medicine, curry leaves have diverse applications. The leaves and their extracts are used to alleviate gastrointestinal complaints, such as **diarrhea** and **dyspepsia**, and to relieve **nausea** and **vomiting** (Brahmachari, 2011). The leaves are also considered a **blood purifier** and are used to reduce fever (as a febrifuge) and as an **antipyretic**. The roots and bark, though less commonly used, have been applied as **antihelminthics**.

Chewing the twigs, known as 'datum', is traditionally believed to strengthen gums and whiten teeth. Additionally, oil extracted from the leaves is applied externally to treat wounds, bruises, and skin eruptions, and it is also used in **hair care** to promote growth and condition the hair. The essential oil of *M. koenigii* is further utilized in the **perfumery** and **soap-making industries** (Rajeswara Rao et al., 2009).

**Common Traditional and Culinary Uses:**

- **Flavoring Agent**: Curry leaves are used in curries, dals, chutneys, and soups across South Asian and Southeast Asian cuisines.
- **Nutritional Supplement**: Fresh leaves are consumed for their vitamins and minerals, often found in leafy porridges and herbal teas.
- **Digestive Aid**: Used as an antiemetic and carminative to ease stomach upset and loss of appetite.
- **Antidiabetic/Traditional Tonic**: Leaf preparations, including teas and powders, are used to help control blood sugar and act as metabolic tonics in folk practice.
- **Skin and Hair Care**: Leaf pastes are applied to the scalp to improve hair health, and the oil is used for treating wounds and skin conditions.
- **Oral Hygiene**: Twigs are chewed as a natural toothbrush to strengthen gums and freshen breath.
- **Antimicrobial Spice**: The compounds in curry leaves help preserve cooked foods and may explain their traditional use as remedies for infections.

These uses, passed down through generations, have been substantiated by scientific studies, confirming the plant's effectiveness in treating conditions such as diabetes and infections (Patel et al., 2012).

**Agricultural and Horticultural Aspects**

*M. koenigii* is cultivated primarily in tropical and subtropical regions, thriving in humid, frost-free climates (USDA zones 10–11). The plant prefers full sun or light shade and well-drained soils, typically loamy to clay loam. Once established, it is moderately drought-tolerant, although regular watering helps produce better foliage. In regions with seasonal rains, such as its native Indian environment, the plant flourishes, benefiting from the monsoon cycle followed by dry spells.

Propagation of *M. koenigii* is typically done by **seed** or **vegetative cuttings**. Fresh seeds germinate easily but are recalcitrant and lose viability quickly if dried or exposed to temperatures below ~10°C. Therefore, seeds should be sown immediately after harvest, with germination occurring in 1–2 weeks under warm, moist conditions. However, since curry leaf is primarily cross-pollinated, seedlings may show genetic variability in growth rate and flavor. For more consistent results, **stem cuttings** are often used to propagate the plant, ensuring true-to-type plants with uniform leaf production.

Mature trees may be pruned to keep them bushy, facilitating easier leaf harvesting. In agroforestry systems, *M. koenigii* is often used as a border crop or interplanted with larger crops. Its low height and dense foliage provide shade without competing with larger plants (Gupta et al., 2010).

**Economic Importance and Commercial Applications**

Although *M. koenigii* is not a major global commodity, it holds significant **local and niche economic value**. In South Asia, it is a household herb and minor cash crop, with fresh and dried leaves sold in local markets. The demand for curry leaves is sustained not only by traditional cuisine but also by diaspora communities worldwide. In countries like India, small-scale farmers cultivate *M. koenigii* for sale in local markets or for processing into spice mixes.

Beyond food, *M. koenigii* is increasingly used in **cosmetics** and **health products**. The essential oil, which is steam-distilled from the leaves, is a key ingredient in hair oils, soaps, and perfumes. In addition, curry leaf extracts are included in hair-care products aimed at promoting hair growth and preventing graying (Brahmachari, 2011). Although scientific evidence supporting these cosmetic applications is limited, the plant's high carotenoid content makes it an attractive candidate for **natural food colorants** and dietary supplements.

In the **pharmaceutical** and **nutraceutical** sectors, research is ongoing into the potential of *M. koenigii*

as a source of bioactive compounds. Carbazole alkaloids like **mahanimbine** and **girinimbine** are being investigated for their potential use in diabetes and cancer treatment (Rajeswara Rao et al., 2009). While no drugs have yet been developed from curry leaf, the plant's use in **herbal medicine** continues to grow, particularly in **Ayurvedic** formulations for blood sugar control and lipid management.

**Environmental and Ecological Relevance**

As a **perennial woody species**, *M. koenigii* plays a role in agroecosystems by contributing to biodiversity. It provides canopy cover, serves as a **windbreak**, and supports **pollinators** such as bees and butterflies, which are attracted to its fragrant flowers. The **fruits** (drupes) are eaten by birds and small mammals, aiding in seed dispersal.

Ecologically, *M. koenigii* is well-adapted to its native dry-deciduous and tropical forest margins. It thrives in multi-species cropping systems and is drought-tolerant once established, making it a valuable component in **agroforestry systems** (Gupta et al., 2010). Furthermore, its aromatic leaf compounds provide some natural pest deterrence, reducing the need for synthetic pesticides.

Though not invasive outside its native range, *M. koenigii* is an asset to local ecosystems, offering both ecological benefits and economic value. Future research may explore its interactions in ecosystems to optimize its use in sustainable farming practices.

**Conclusion**

*Murraya koenigii* is a multifaceted plant whose significance spans culinary, medicinal, and agricultural domains. Its rich phytochemistry—especially the unique carbazole alkaloids and flavonoids—accounts for its potent bioactivities such as antioxidation, antimicrobial action, and metabolic regulation (Sasikumar et al., 2020; Bhandari & Kawade, 2019). These properties validate many of its traditional uses in Indian and Asian ethnomedicine (Kumar et al., 2018). Botanically, the curry leaf is a hardy subtropical tree, easily cultivated by seed or vegetative methods, and fits well into diversified farming systems (Patel & Shah, 2021). Economically, it supports niche markets in the spice trade and has emerging potential in nutraceuticals and natural product industries (Chaudhary et al., 2020; Srinivasan, 2019). Ecologically, the plant integrates harmlessly into tropical agroforests and supports pollinators and other beneficial organisms (Rajendran et al., 2022).

Despite extensive basic research, several gaps remain. Clinical trials in humans are needed to substantiate health claims (Joshi et al., 2021). Agronomic studies could improve yield and pest management (Mishra & Nair, 2020), while breeding or biotechnological approaches might enhance desirable compounds like mahanimbine and girinimbine (Sharma & Dubey, 2017). Given the increasing global demand for natural food additives and herbal remedies, *M. koenigii* merits further development. Sustainable cultivation and value-added processing (e.g., standardized extracts and structured value chains) could elevate the curry leaf from a local staple to a broader commercial commodity (Rao et al., 2020). In conclusion, *M. koenigii* exemplifies how a common kitchen herb can hold complex scientific, ecological, and socioeconomic value. Continued interdisciplinary research will help unlock its full potential in medicine, agriculture, and industry (Pandey et al., 2018).

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