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A Review on Medicinal Benefits of Curry Leaves

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ABSTRACT

Although they are often referred to as "sweet neem leaves," the leaves are more commonly known as "curry leaves." In South India, where curry seems flavourless without curry leaves, it is an essential component of curries. Given that the leaves' appearance resembles that of the distinctive bitter neem tree, the Kannada name for the plant is "black neem," translating as "black neem". It is a very valuable product used in the cosmetic and pharmaceutical industries as well as for food flavouring. Therefore, from the standpoint of both farmers' and industries' well-being, the cultivation of Curry leaf plants is quite essential. Much to bay leaves, these fragrant leaves are used to flavour many Indian foods, particularly curries with fish or coconut milk. The sauce of these spicy foods is described by the creative Indian term "Kari," which gives rise to the name curry leaf. There is a need to grow more and more curry leaves because they are widely used in industries for their best medicinal qualities as an anti-diabetic, antioxidant, antimicrobial, anti-inflammatory, hepatoprotective, anti-hypercholesterolemic, etc. and for preparing cosmetics. The financial situation of the farmer can also be improved in way.

Keywords: *Curry leaves, Therapeutic properties, culinary uses, hepatoprotective, anti-hypercholesterolemic.*

INTRODUCTION

Kari (or curry) leaf (called kariveppilai in Tamil) is grown all over India and has been used for centuries in South India and Sri Lanka as a flavoring for curries, chutneys, vegetables, and beverages. South Indian traders introduced it into Malaysia, Burma, and Singapore. When the British were in India, they called it curry leaf, naming it after the seasoned sauce (called kari in Tamil) that it was added to. India is frequently known by enormous biodiversity of medicinal plants. Among them *Murraya koenigii* have a lots of bioactive principles due to which plant has been proven as the medicinally important plant but least or no attention received by the scientist[1].

Murraya koenigii is proven as the natural medicinal plant. There are different forms of *Murraya koenigii* due to which they are found as the useful plant such as extract, essential oil, or directly used due to the presence of following active constituent bismahanine, murrayanine, murrayafoline-A, bi-koeniquinone-A, bismurrayaquinone, mukoenine-A, mukoenine-B, mukoenine-C, murrastifoline, Murrayazolinol, murrayacine, murrayazolidine, murrayazoline, mahanimbine, girinimbine, koenioline, xynthyletin, koenigine-Quinone A and koenigine-Quinone B for therapeutic purpose by folk people[2–5]. Many medicines such as digitalis, vinblastine, aspirin and quinine have plant as a source of origin for example foxglove (*Digitalis purpurea*), willow bark (Salix spp.), quinine bark (*Cinchona officinalis*).

For therapeutic or prophylactic purposes medicinal plant are used. For the therapeutic properties of medicinal plants presence of secondary metabolites plays a very important role

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such as alkaloids, flavonoids, terpinoids, vitamins, tannins etc., these all are the secondary metabolites of the plant as active constituent[6]. These all secondary metabolites of plant physiologically affect the body at different stages of body development and make the body disease free. The plant *Murraya koenigii*belonging to the family Rutaceae is largely growing plant throughout the spring, summer and in rain fall season in every part of the tropical region up to the height of 1500 to 1655m from sea level[6,7]. It is also known as Curry Leaf English, Mitha Neem in Hindi, and Karuveppilei in Tamilnadu and Surabhinimba in Sanskrit[2].

Botanical Name: *Murraya koenigii*
Family: Rutaceae (Citrus family)

ORIGIN
The curry leaf is native to India and is found nearly everywhere in the Indian subcontinent. It is also found in Srilanka and many parts of south East Asia including Indonesia, Burma, Thailand, etc.

In India in the regions from the Ravi to Sikkim and Assam, besides Bengal, Madhya Pradesh, Maharashtra, Kerala, Karnataka, Orissa and Andhra Pradesh, curry leaves can be seen in abundance[3].

Origin and Varieties
Indigenous to India and cultivated all over India, including the Himalayas, Sri Lanka, Southeast Asia, and the United States (California and Florida)[3].

Other Names
Curry leaf. It is also called barsunga (Bengali), pindosin (Burmese), gai leu yiph (Cantonese), karry blad (Danish), kerriebladerer (Dutch), feuilles de curry (French), curryblatter (German), kari patta, meetha neem (Hindi), aley kari (Hebrew), curry levelek (Hungarian), fogli di cari (Italian), daun kari (Indonesian/ Malaysian), kore rihu (Japanese), karibue (Kannada), khibe (Laotinan), kareapela (Malayalam), kadhi limbu (Marathi), karriblader (Norwegian), folhas de caril (Portuguese), bowala (Punjabi), listya karri (Russian), karapincha (Singhalese), hojas de curry (Spanish), bizari (Swahili), bignay (Tagalog), kariveppilai (Tamil), karepeku (Telegu), bai karee (Thai), and la cari (Vietnamese)[3,4].

Spice Description
Kari leaf is very fragrant when used fresh, but it loses its flavor intensity when dried. The fresh or dried leaf is used whole, crushed, and chopped. Properties: the fresh leaf has a spicy, strong piney-lemony aroma, and a slightly tangerine peel-like taste[5].

Hardiness
It can be grown outside in pots during the hottest part of summer in a sheltered place but needs heated protection for the rest of the year. The most flavorful leaves are produced when the plants are grown in hot and dry conditions[5].

Propagation
Some of the twigs which are not very floppy and green nor very hard and woody (this stage is called semi-ripe), and remove most of their lower leaves. Cut the stem cleanly at a node, and push the cutting a few centimetres into a 50/50 mix of potting compost and aquarium gravel, with about 3 leaves above the surface.

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Put the cuttings in a propagator or covered pot, in a warm light place out of direct sunlight. Rooting will take about 3 weeks. Alternatively, if you find some fresh curry leaves with ripe seeds on you can grow these: they require about 20°C to germinate and may take a long time to germinate[5].

Cultivation

The curry leaf plant is planted just before the arrival of the monsoon in May. It is cultivated using propagation method. The plants mature after fifteen months after which the leaves are harvested. Fully grown curry tree can yield nearly 100 k.g of leaves each year. Established plants need a sunny, well-drained place. They may easily outgrow any space you have for it. As the plants grow, keep trimming them regularly to maintain a supply of young leaves for cooking. Water regularly and feed during the growing season. In winter, keep the pot in a warm, frost-free place (minimum temperature 12°C.) In early April, soak the pot, repot if needed, and move the plants to a warm light place (around 18-20°C)[5].

Pests

Usually healthy. Watching out for scale insects keep the same plants for a long time[6].

Chemical Components

The essential oils vary based on different varieties. The fresh leaf has about 0.5% to 2.5% essential oil, mostly monoterpenes. There is a gradual decrease in volatile content with advancing maturity so fresh leaves have more volatiles than the older leaves. The essential oils mainly consist of sabinene (9% to 34%), α-pinene (5% to 27%) and dipentene (6% to 16%) with β-caryophyllene (8% to 20%), β-gurjunene, β-elemene, β-phellandrene, limonene, β thujene, and bisbolene. Curry leaf has a good amount of vitamin A (beta-carotene is 12,600 IU/100 gm), with calcium (810 mg/100 gm), phosphorus (600 mg/100 gm), iron (3.1 mg/100gm), vitamin C (4 mg/100gm), and fiber (6.1%). It also has high levels of oxalates (1.35%)[7].

Culinary Uses

It is an essential spice in South Indian, Sri Lankan, and Malaysian curries, dals, samosas, dosai fillings, chutneys, snacks, sambars, soups, breads, and vegetables. Kari leaf is popularly used in South Indian vegetarian and fish dishes and Sri Lankan meat and chicken curries. Kari leaves par well with mustard seeds, turmeric, ghee, cumin, coriander, fenugreek, dals, ginger, garlic, tomatoes, and yogurt. It provides a certain zest to yogurt-based salad dressings and vegetable dishes, such as fried cabbage, lentils, beans, okra, or eggplant. It is usually removed before the food is eaten.

Kari leaf also provides a distinct spicy flavor to cold dishes and buttermilk. It gives a more intense flavor and crunchiness when it is toasted in oil or ghee, and this mixture is then added to many vegetarian foods. Sometimes it is toasted, ground, or crushed to season or garnish soups, sambars, and curries. Kari leaf can be kept frozen or refrigerated in a plastic bag for about two weeks. Freezing better retains its flavor, but its color changes to black. To retain its fresh flavor, it is best not to remove the leaves from its branches until ready to use. Spice Blends: curry blends, sambar podi, rasam podi, chutney blends, and fish curry blends[8].

BENEFITS OF CURRY LEAVES[9]

Packed with a multitude of nutrients like carbohydrate, fiber, calcium, phosphorous, iron, magnesium, zinc, multi vitamins and flavonoids, curry leaves are an arcade of health benefits.

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It is extensively used in the treatment of anemia, diabetes, indigestion, obesity, kidney problems, hair and skin problems.

1) **High on Fiber:** Curry leaves are an excellent source of fiber. It makes better our digestive health and regular bowel movements. It is useful in treating diarrhea and nausea and also controls the blood glucose levels in the body.
2) **Loaded with Proteins:** Curry leaves have a high concentration of proteins which are considered to be the building blocks of the body. It is essential for the proper growth and development of the body and strengthens our immune system.
3) **Powerhouse of Calcium:** Calcium is broadly known for its importance in improving bone health. Being a power house of calcium, curry leaves are effective for strengthening the teeth and bones and preventing diseases like osteoporosis and osteomalacia.
4) **Rich in Phosphorus:** Being one of the most important nutrients in curry leaves, phosphorus helps in cleansing the kidneys. It preserves normal heart beat, lessen painful muscle spasm after exercise and also strengthens the teeth and bones. At the cellular level, phosphorus is used for the growth and repair of cells and tissues.
5) **Abundance of Essential Oils:** Apart from the minerals and vitamins, curry leaves are a source of power to a number of volatile essential oils like α-pinene, sabinene, β-pinene, α-terpinene etc. These essential oils acquire anti-inflammatory, anti-bacterial, anti-diabetic, anti-dysenteric, carminative and digestive properties which are particularly beneficial for the hair, skin and oral health. It is also effective against hyperglycemia, high cholesterol and aids in digestion.

Attributed Therapeutic Properties

The leaves, root, and bark are used as medicinal aids in India. The leaves are used to help blood circulation and menstrual problems. The fresh leaves are taken to cure dysentery, and an infusion made of roasted leaves stops vomiting.

It is also recommended for relieving kidney pains. Recent studies have shown that it has a hypoglycemic action, thereby a possible treatment for diabetes, as well as found to prevent formation of free radicals. It is shown to prevent rancidity of ghee (or clarified butter). Biological activity of *Murraya koenigii* are reported which included the following these activities are studied on the following the crude extracts which are as follow in the *Murraya koenigii* has been mentioned in the traditional medicinal system in Ayurveda different studies were performed on the Bark, root, leaves, fruit and fruit pulp of *Murraya koenigii* (Table 4)[10–13].

Table 4. Pharmacological Use of Curry leaves *Murraya koenigii*[10–13].

S.No	Uses	Chemical Constituent Used	Pharmacological Action On
1	Anti-Diabetic	Koenimbidine, Murrayacine, Murrayazolinine.	Decreases Oxidative Stress By Acting On Paraoxonase 1 Activity
2	Anti-Trichomonal	Girinimbine, Mahanimbilol Girinimbiol	Act Against Trichomonas Gallinae
3	For Oral Health	Essential Oil	By Stimulating The Salivation Process
4	Vasodilation	Mahanimbilol, Murrayazolinine.	By Acting On Negative Chronotropic Effect
5	Anti-Oxidation Activity	Mahanimbine, Koenigine	Increases The Gsh Content In The Liver And Reduction In Hepatic Malondialdehyde In Kidney
6	Anti-Cancer Activity	Mahanimbine, Girinimbine, Mahanine, Murrayafoline	Increase The Death Of Cancerous Cell Proteasome Inhibitor
7	Effect On Bronchial Disorders	Girinimbine, Mahanine	By Blocking 5-Lipooxygenase Activity

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8	Effect On Dental Caries	Isomahanine, Murrayanol And Mahanine	Inhibition Of Cavity Formation
9	Anthelmintic Activity	Mahanine, Koenimbidine	Cause Paralysis
10	Wound Healing Effect	Mahanine, Mahanimbicine, Mahanimbine And Essential Oil	Act Against Inflammatory Cells And The Collagen Deposition Was Reduces
12	Protects The Eyes And Improves Eyesight	Essential Oil, Vitamin A	Eye Sight Improvement
14	Anti-Ulcer Activity	Mahanimbine And Essential Oil	Effect Against Lesion Index, Area And Percentage Of Lesion And On Ulcer
15	Anti-Microbial Activity	Mahanimbine, Murrayanol And Mahanine,	Inhibition Of Topoisomerase I And Ii
16	Anti-Diarrheal Activity	Kurryam, Koenimbine Koenine	Prostaglandin E2-Induced Enter Pooling And Reduction In Gastrointestinal Motility
18	Immunomodulatory Activity	Mahanimbine, Mahanine,	Increase In Phagocytic Index By Removing Carbon Partical From Blood
20	Antipyretic Activity	Murrayacine, Murrayazolinine.	Decrease In Fever
27	Anti-Alzheimer's Activity	Isomahanimbine, Murrayazolidine,	Improves The Values Of Protective Antioxidants
28	Anti-Analgesic Activity	Girinimbine, Mahanine, Mahanimbine, Isomahanimbine	Anti-Nociceptive Effects
29	Effective Digestive System	Mahanine, Murrayafoline	Stimulates Digestive Enzymes
30	Anti-Inflammatory Activity	Girinimbine, Mahanine, Mahanimbine, Isomahanimbine,	Cox-Inhibitory Property

THERAPEUTIC BENEFITS OF CURRY LEAVES[14]

1) **Treats Diabetes:** The hypoglycemic property of the curry leaves play a significant role in alleviating the blood sugar level of the body. The production of insulin from the pancreatic β-cells becomes active on consumption of curry leaves. It helps in reducing the breakdown of starch into glucose which in turn leads to low blood glucose level.
2) **Prevents Anemia:** The deficiency of iron in the body causes anemia. Curry leaves having a high concentration of iron is extremely effective in increasing the hemoglobin and red blood cell count of the blood. It acts as a natural blood purifier, improves symptoms of tiredness and fatigue and reduces chances of getting infections.
3) **Good for Vision:** Curry leaves being abundant in Vitamin A and β-carotene play a vital role in improving eye sight and treating eye related problems. It prevents the cornea from drying up and cloud formation in front of the eyes, thus reducing the chances of Xeropthalmia and night blindness.
4) **Fights Infections:** The curry leaves have potent ani-bacterial, anti-fungal, anti-inflammatory and antioxidant properties. So regular consumption of curry leaves shields our body against various infections and germs.
5) **Boon for Weight Loss:** Curry leaves are considered as a boon by people under a weight loss management program. The presence of carbazole alkaloids in the leaves prevents weight gain and reduces the LDL cholesterol (i.e. bad cholesterol) in the blood. It washes out the harmful toxins from the body and burn excess fat.
6) **Aids in Digestion:** The high content of fiber in the leaves has proven to be beneficial in treating several gastro intestinal troubles. The carminative, digestive, antiemetic and anti-

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dysenteric properties of curry leaves not only aid in digestion but also prevent constipation, diarrhea, dysentery, piles, nausea, bloating etc. Being a natural stimulant, it enhances the appetite.

7) **Prevents Cancer:** Recent researches suggest that the presence of phenols and carbazole alkaloids are extremely effective in treating and preventing prostrate and colorectal cancers.
8) **Dental Care:** Curry leaves having anti-bacterial and anti-microbial properties are extremely effective in maintaining good oral health. The essential oil present in the leaves strengthens the gum and teeth, removes bad odor and protects the teeth and gum from any foreign microbes and infections.

CURRY LEAVES IN AYURVEDA AND SUPPLEMENTS

Ayurveda mentions curry leaves as Girinimba or Krishnanimba, entitled after Lord Krishna, the God of Protection in several ancient scriptures. The essential oil extracted from the leaves of the curry leaf tree is widely employed in this traditional holistic healing for the treatment of hair and skin problems, diabetes, eye problem, dental problem, diarrhea *etc*. The curry leaves have Tikta (bitter) and Kashaya (astringent) properties. It is blessed with all the trigunas *i.e.* Laghu (light), Rukhsha(dry) and Tikshna (sharp). It has Ushna Virya (hot potency) and Katu Vipaka (pungent metabolic property). It aggravates the Pitta doshas (digestion) and pacifies Vata (air) and Kapha (earth and water) doshas. The richness of antioxidants and nutrients in these leaves work wonders in giving one a lustrous long hair. It treats damaged hair, strengthens the hair roots, prevents hair fall and also treats dandruff. It is also a natural aid for premature greying of hair[15].

OTHER USES[16]

1) Essential oil *Murraya koenigii* is used as sun protection and erythema agent in formulation.
2) Curry leaf oil in your regular skin care cream or lotion helps by applying it on affected area to cure skin problem such as pimples, athlete's foot, ringworm, itches, acne, boils and septic of wounds and burns.
3) Study evaluated essential oils of *Murraya koenigii* for toxicity and repellent activity against *Callosobruchus maculatus* due to have active constituent α-pinene and caryophyllene.
4) Studies for structure function of *Murraya koenigii* show trypsin inhibitor by a compact structure of helical content at increasing temperature as a inhibitory function of the protein.
5) The effects of column extract of *Murraya koenigii* show a protective effect in Dalton's Ascitic Lymphoma.
6) The possibility of incorporating dried curry leaf powder in common dishes increases the sources of micronutrients.
7) The aqueous extract of *Murraya koenigii* show Larvicidal, pupicidal repellent and anti-vector activity against the larvae and pupae is seen.
8) Richness of vitamin A and calcium in Curry leaf oil is used for strengthening the bone, osteoporosis, calcium deficiency, and radiotherapy and chemotherapy treatments of cancer.
9) Orofacial dyskinesia (OD) is treated by *Murrya koenigii* for the prevention or treatment of neuroleptic-induced.
10) The activity of carbazole alkaloids isolated from *Murrya koenigii* extract and their derivatives against *Trichomonas gallinae*.

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11) Curry leaves and its essential oil is used in both internally and externally for healthy, long, strong, lustrous hair by balancing diet in equal proportion of vitamins, minerals, iron and other nutrients is required to maintain a healthy hair.
12) Curry leaf oil helps in contracting the muscles and tissues.
13) Curry leaf extract help in pigmentation and reduces the white patches all over the body.
14) Fresh leaves, dried leaf powder and essential oil of curry leaf is widely used as flavouring soups, curries, fish, meat dishes, eggs dishes, traditional curry powder blends, seasoning and ready to use other food preparations.
15) The essential oil of *Murraya koenigii* is utilized in soap and cosmetic industry for aromatherapy.
16) The *Murraya koenigii* is beneficial in bruises, eruption and to treat bites of poisonous animals.

CONCLUSION

Murraya koenigii is a medicinal as well as culinary plant that belongs to family Rutaceae. Numerous pharmacological activities of the plant has been seen such as activity on Cholesterol reducing property, Anti diabetic, antimicrobial activity, anti-diarrhoea activity, antioxidative property, antiulcer activity, cytotoxic activity, anti-cancer activity with many other phagocytic activity. The chemical constituents of this plant consists of essential oil alkaloids and terpenoid. Thus, *Murraya koenigii* leaves virtues supplementary phytochemical, pharmacological and clinical investigations for development of an effective natural plant.

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