Murraya koenigii [Curry Leaf]: A Boon for Health

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Abstract

Murraya koenigii or Curry Leaf is an evergreen perennial plant. It is found throughout India but it is most important ingredient of South Indian cuisine due to its aroma and flavour. Curry leaf is well known for its various health benefits and cosmetic use. It is a treasure of wide variety of therapeutic properties like Antihyperglycemic, Antihyperlipidemic, Anti-inflammatory, Antioxidants, Hepatoprotective activity etc. The plant is easily available in Indian outdoors and the leaves are found in most of the household for culinary purpose hence, cultivation of plant is easy. Growing need for herbal formulation makes the plant suitable for cultivating to gain good chunk of money. The main challenge in formulating herbal formulation containing curry leaf is that despite of various activities found in the plant the scientific data and clinical trial data is lacking for proving its clinical effectiveness. The objective of review is to showcase potential health benefits and future perspective of curry leaf.

Key-words: *Curry leaves, formulation, chemical constituents, therapeutic activity*

Abbreviations: Murraya koenigii- MK, Essential Oil- EO, Chemical constituents- CC

Introduction

Curry leaf is an evergreen perennial plant having pleasant aroma and flavor distributed in tropical and sub-tropical parts of world [6]. Leaves of curry plants are used from ancient times in culinary and it is also used as traditional medicine in Ayurveda and Unani [1, 32]. The plant consists of various pharmaceutical, nutraceutical and functional food potential [20]. Different parts of curry leaf plants are used in ayurveda for various traditional purpose like-antihypertensive, skin disease, hysteria, hepatitis etc. [7]. EO found in plant is infused with hair growth promoter and stop premature graying of hairs. Curry leaf is treasure of multiple medicinal properties which makes the plant a potential cash crop for future. The plant consists of approximately 150 genera and 1600 species worldwide [8]. The whole plant including roots, stem, leaves all have potential health benefits. Curry plant consist of pinnate shaped green leaves that can be used fresh or in dried form.

Curry leaf shows positive response in preclinical study as Antidiabetic, Antihyperlipidemic, Antiulcer, Antioxidants, Antidiarrheal, Hepatoprotective, Mosquitocidal and many more activities which make it a miracle plant [16, 19]. But despite of having numerous health benefits the plant is still unexplored and the cultivation is restricted to South Indian states only [6].

WHO stated that herbal drug market is widely developing throughout the years and it is expected to grow up to 5 trillion dollars by 2050 due to presence of various bioactive in traditional plant [12]. Nowadays pharma industry is focusing on ethno-botanical treatment of disease because due to unhealthy lifestyles we are getting prone to many chronic diseases and even after wide variety of medicines available the course of treatment is costly which can be overcome by herbal formulation. Plants like curry leaf containing vitamins, minerals, secondary plant metabolite should be undergone through more scientific researches and clinical trials to prove their effectiveness and promote them in global level [7, 10, 12].

Figure 1: Curry Leaf [*Murraya koenigii*] Plant

Plant Description

Curry leaf or *Murraya koenigii* is a plant found in tropical and subtropical region. The height of tree is about 4-6 m; trunk diameter is approx. 40cm. It requires well drained soil for cultivation. The leaves are pinnate in shape and green in colour which can be used as fresh or dried. Small white colour flower bloom around the month of April- May, red and black colour fruits appear in bunch around June-July which is slightly sweet and acrid in taste [2]. Different parts of curry leaf plant are used for traditional remedies like leaves are used as Antidiabetic, Insect repellent, Weight loss, Vision, Anaemia, Digestion, Hair growth, Mouth wash and Face packs [12,34,36], Stem or bark are used as Anti-inflammatory, Hair tonic and Dental care [8], Roots of plant are used for Anti-inflammatory purpose [12].

Table 1. Taxonomical Classification [16].

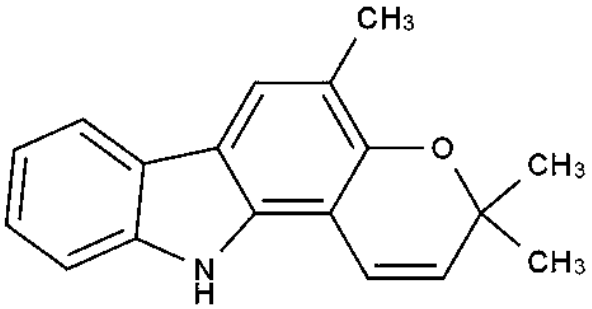
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliospida
Order	Sapindales
Family	Rutaceae
Genus	*Murraya*
Species	*koenigii*
Common Name	Karri Patta in Hindi, Barsunga in Bangali, Lacari in Vietnamese, Karry Blad in Danish [17]

Cultivation and Propagation

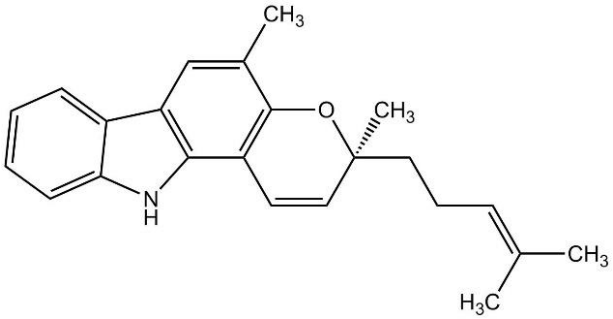
Curry plant can be cultivated before the month of May through ripe-fresh fruit and by grafting through stem. The plant is highly cross-pollinated. The commercial cultivation of plant is restricted to South India- Coimbatore, Periyar, Madurai, Tamil Nadu, Belgaum and Karnataka. Plant needs well drained soil with sunny area or partial sunlight and temperature around 18 ℃. After 10 months of plantation, we can harvest the first batch of leaves which can be up to 250-300 kg/acre. [1,37]

Table 2. Phytochemicals of *Murraya koenigii*

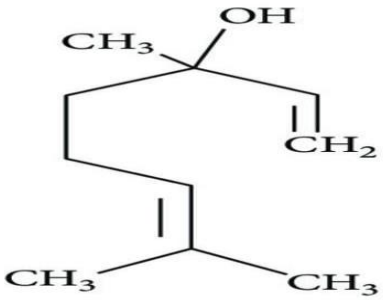
Vitamins	A, C, E, Folic acid [1]
Minerals	Iron, Calcium, Potassium, Magnesium, Phosphorus, Manganese, Selenium, Zinc [20]
Essential Oils	α – pinene, Sabinene, Transcaryophyllene [8]
Primary Plant metabolite	Carbohydrate, Protein [15]
Secondary Plant metabolite	Alkaloids, Glycosides, Terpenoids, Flavonoids, Carotene, Nicotinic acid, oxalic acid, saponins, tannins [7, 9 ,18,]
Toxic compounds [Below USFDA limit]	Arsenic, Cadmium, Mercury, Lead [20]



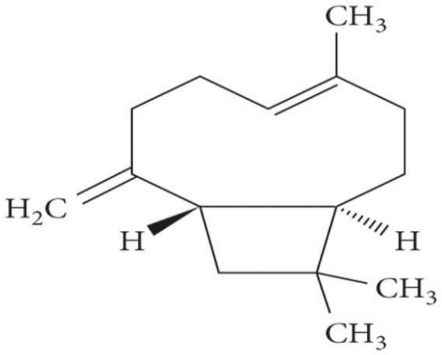
Girinimbine



Mahanimbine



Linalool



β- caryophyllene

Fig.2 Chemical structure of some major constituent of *Murraya koenigii*

Table 3. Pharmacological activity found on *Murraya koenigii* Plant up to the present time

Author	**Work reported**
Kiran B Patil *et.al* 2023	MK leaf extract shows zone of inhibition [A**ntimicrobial activity**] against *E. Coli*, *Staphylococcus Aureus* [9].
R.Gopal*et.al* 2023	MK leaf powder chutney taken 60 days in diet helps in reducing systolic and diastolic **blood pressure** of hypertensive patient [23].
Ani Celestine *et.al* 2023	Aqueous extract of MK leaves show reduction in **body weight**, **body mass indices** and **lipid profile** of obesity induced by high fat diet in mice [3].
Azubuike Raphael *et.al* 2022	Ethanol extract of MK leaves shows A**nti-hyperlipidemic** potential against rats fed with high cholesterol diet [22].
S Mohan *et.al* 2020	Girinimbine a carbazole alkaloid found in curry leaf shows potential in protecting mucosal layer form ethanol induced **Gastric Ulcer** [24].
Teuku Ahmad *et.al* 2020	Curry leaf extract shows potential of acting as **Haemostatic agent** by reducing the bleeding time in rats [26].
Rohan Pathak *et.al* 2019	Oral administration of MK extract shows **reduction in blood glucose** level of STZ-NA induced diabetes in rats [33].
Sujith *et.al* 2018	Methanolic extract of curry plant shows in-vitro A**nthelminthic** activity [29].
Anand Ramasamy *et.al* 2016	Hydro alcoholic extract of MK shows **Antidiarrheal** activity against castor oil induced diarrhea [11].
Ateendra Singh *et.al* 2016	Aqueous extract prepared from MK leaves shows**Analgesic and Anti-Inflammatory** activity in animal model [28].
Hanan Al Harbi *et.al* 2016	Methanol and ethanol extract of MK shows **zone of inhibition** against *E. coli, Staphylococcus, Streptococcus* and *Proteus* [10].
Wang Yong Ho *et.al* 2015	Aqueous extract of leaves shows **Hepatoprotective** activity against paracetamol induced hepatotoxicity in mice [4].

Sushmita Chaoudhary*et.al* 2015	Oral administration of MK leaf extract in rats shows increase in **Hemoglobin** concentration and RBC count [27].
Ali Ghasemzadeh *et.al* 2014	Extract of different species of curry leaves shows **Anti-carcinogenic** activity against breast cancer cell line [MDA_MB_231] [7].
Aaditya Patil *et.al* 2014	EO obtained from MK plant shows **Antitubercular** effect against Mycobacterium tuberculosis by microplate alamar blue assay [31].
Chinnaperumal Kamaraj *et.al* 2014	Myristic acid and β- caryophyllene present in MK leaf extract have **Antimalarial** activity in-vivo & in-vitro [30].
Deboshree Ghosh *et.al* 2013	Aqueous extract of MK leaves shows **Hepatic-protection** against lead induced hepatotoxicity [14].
Deboshree Ghosh *et.al* 2013	MK plant has potential to protect **Nephrotoxicity** against lead induced oxidative stress of kidney [35].
Thilahgavani Nagappan *et.al* 2012	Topical application of MK leaf extract shows rapid **wound healing** in rats [25].
Sadhana Sathaye *et.al* 2012	Ethanolic extract of MK leaves shows **Hepato-protective** potential against ethanol induced hepatotoxicity in rats [13].
Patel Vishal *et.al* 2009	Ethanolic extract of MK leaves shows **Antipyretic** action against yeast induced elevation in body temperature of rats [5].
Mani Vasudevan *et.al* 2008	Feeding MK leaf diet to mice shows positive result in reducing **Amnesia** produced by scopolamine and diazepam [21].

Future Prospective

From the review, Curry leaf plant found to be treasure of health benefits. Detailed study on large scale can be achieve by national & global partnership with various government and non-government running program working in the field of conservation and utilization of medicinal plants. After which clinical trials should be done and through leading herbal brands, we can create safe and effective formulation which can be marketed globally. Curry leaf found to have nootropic potential that is a good lead for researching plant effect in various neurodegenerative diseases. Another study found that Curry leaf have antitubercular activity which can be utilized as alternative in multiple drug resistant Tb. More area should be covered in cultivation of curry leaf and local farmers should get good number of profits.

Conclusion

From various researches and literature survey we have concluded that although Ethno-botanical treatments are on trend and various research projects are ongoing on medicinal plants showing multiple health benefits potential but the scale of research is small. We need to collect more scientific data and clinical trial research data to prove the clinical effectiveness of Curry leaf plant which will help the pharmaceutical industry in manufacturing herbal formulation of such medicinal plants. The review consists of some major pharmacological activity found in Curry leaf plant up to the date.

Acknowledgement

Author is grateful to Siddhartha Institute of Pharmacy for their support and guidance.

References

1. Chaudhary, A. **(2020)**. A Review on the Culinary Uses and Therapeutic Properties of Murrayakoenigii. Journal of Advancement in Pharmacognosy, 1(1), 1-8.
2. Sharma, N., Minocha, N., & Kushwaha, N. **(2020)**. A review on the activities of Aloe vera and curry leaves. International Journal of Recent Scientific Research, 11(11), 12-17.
3. Okafor, A. C., Mirian, N. E., Luke, N. M., Ogbonna, O. R., Obinna, O. K., & Jude, U. O. **(2023)**. Evaluation of the Anti–Obesity Effect of Ethanolic Leaf Extract of MurrayaKoenigii (Curry Leaf) on High Fat Diet Induced Obesity in Wistar Rat. Applied Sciences Research Periodicals, 1(6), 29-38.
4. Ho, W. Y., Beh, B. K., Lim, K. L., Mohamad, N. E., Yusof, H. M., Ky, H., ... & Yeap, S. K. **(2015)**. Antioxidant and hepatoprotective effects of the food seasoning curry leaves Murrayakoenigii (L.) Spreng.(Rutaceae). RSC advances, 5(122), 100589-100597.
5. Patel Vishal, R., Patel Madhavi, G., & Patel Rakesh, K. **(2009)**. Anti-pyretic activity of the ethanolic extract of the powdered leaves of MurrayaKoenigii (L.) Spreng. Journal of Pharmacy Research, 2(4).
6. Raghu, B. R., Aghora, T. S., & Dhananjaya, M. V. **(2022)**. Curry leaf Improvement in India.
7. Ghasemzadeh, A., Jaafar, H. Z., Rahmat, A., & Devarajan, T. **(2014)**. Evaluation of bioactive compounds, pharmaceutical quality, and anticancer activity of curry leaf (Murrayakoenigii L.). Evidence-based complementary and alternative medicine, 2014.
8. Bhusal, D., & Thakur, D. P. **(2021)**. Curry Leaf: A Review. Reviews in Food and Agriculture, 2(1), 31-33.
9. Patil, M. K. B., & Patil, M. M. S. (2023). CURRY-LEAF TREE (MURRAYA KOENIGII) LEAF EXTRACTS: PHYTOCHEMICAL INVESTIGATION AND ANTIMICROBIAL ACTIVITY. Ann. For. Res, 66(2), 185-198.
10. Al Harbi, H., Irfan, U. M., & Ali, S. **(2016)**. The antibacterial effect of curry leaves (MurrayaKoenigii). EJPMR, 3, 382-387.

11. Ramasamy, A., Das, S., Mani, V., Sengottuvelu, S., & Vinoth Prabhu, V. **(2016)**. Evaluation of anti-diarrheal potential of hydro-alcoholic extracts of leaves of Murrayakoenigii in experimental animals. Journal of Dietary Supplements, 13(4), 393-401.
12. Kolekar, Y. S., Tamboli, F. A., More, H. N., Mulani, S. A., & Mali, N. P. **(2021)**. Medicinal plants used in cosmetics for skin and hair care. International Journal of Pharmaceutical Chemistry and Analysis, 8(2), 36-40.
13. Sathaye, S. A. D. H. A. N. A., Amin, P. D., Mehta, V. B., Zala, V. B., Kulkarni, R. D., Kaur, H. A. R. P. R. E. E. T., &Redkar, R. **(2012)**. Hepatoprotective activity of Murrayakoenigii against ethanol induced liver toxicity model in experimental animals. International Journal of Pharmacology and Biosciences, 3(1), 430-438.
14. Ghosh, D., Firdaus, S. B., Mitra, E. L. I. N. A., Dey, M., Chattopadhyay, A. I. N. D. R. I. L. A., Pattari, S. K., ... & Bandyopadhyay, D. E. B. A. S. I. S. H. **(2013)**. Hepatoprotective activity of aqueous leaf extract of Murrayakoenigii against lead-induced hepatotoxicity in male wistar rat. Int J Pharm Pharm Sci, 5(1), 285-295.
15. Peter, K. V. (Ed.). **(2006)**. Handbook of herbs and spices: volume 3. Woodhead publishing.
16. Singh, S., More, P. K., & Mohan, S. M. **(2014)**. Curry leaves (Murrayakoenigii Linn. Sprengal)-a mircale plant. Indian Journal of Scientific Research, 4(1), 46-52.
17. Handral, H. K., Pandith, A., & Shruthi, S. D. **(2012)**. A review on Murrayakoenigii: multipotential medicinal plant. Asian Journal of pharmaceutical and clinical research, 5(4), 5-14.
18. Vats, M., Singh, H., & Sardana, S. **(2011)**. Phytochemical screening and antimicrobial activity of roots of Murrayakoenigii (Linn.) Spreng.(Rutaceae). Brazilian Journal of Microbiology, 42, 1569-1573.
19. Deepika, T., & Noorjahan, C. M. **(2019)**. Phytochemical Screening and Antioxidant Property of Aqueous MurrayaKoenigii (Curry Leaf) Extract. Int J Res Advent Technol, 7(2), 738-43.
20. Nouman, S. M., Shehzad, A., Butt, M. S., Khan, M. I., & Tanveer, M. **(2015)**. Phytochemical profiling of curry (Murrayakoenijii) leaves and its health benefits. Pak J Food Sci, 25(4), 204-15.
21. Vasudevan, M., & Parle, M. **(2009)**. Antiamnesic potential of Murrayakoenigii leaves. Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives, 23(3), 308-316.
22. Nwaji, A. R. **(2022)**. Antihyperlipidemic property of Murrayakoenigii ethanolic leaf extract on lipid profile of rats fed with cholesterol-enriched diets. Nigerian Journal of Physiological Sciences, 37(2), 215-218.
23. Gopal, R., Ambiha, R., Sivasubramanian, N., Bhupendrabhai, P. V., SI, I. G., Govindbhai, S. N., ... &Rameshbhai, V. A. **(2023)**. Effect of curry leaves in lowering blood pressure among hypertensive Indian patients. Bioinformation, 19(10), 1020-1024.
24. Mohan, S., Hobani, Y. H., Shaheen, E., Abou-Elhamd, A. S., Alhazmi, H. A., & Abdelwahab, S. I. **(2020)**. Girinimbine from curry leaves promotes gastro protection against ethanol induced peptic ulcers and improves healing via regulation of anti-inflammatory and antioxidant mechanisms. Food & function, 11(4), 3493-3505.

25. Nagappan, T., Segaran, T. C., Wahid, M. E. A., Ramasamy, P., &Vairappan, C. S. **(2012)**. Efficacy of carbazole alkaloids, essential oil and extract of Murrayakoenigii in enhancing subcutaneous wound healing in rats. Molecules, 17(12), 14449-14463.
26. ARBI, T. A., NOVIYANDRI, P. R., & FADHILA, M. **(2020)**. Influence of Curry leaves (Murrayakoenigii L.) against of bleeding time of Rattus norvegicus. Journal of Syiah Kuala Dentistry Society, 5(2), 70-74.
27. Choudhury, S., & Sinha, M. P. **(2015)**. Effect of aqueous extract of Murrayakoenigii on haematological, hormonal and lipid profile of albino rats. Journal of Coastal Life Medicine, 3(11), 901-905.
28. Singh, A., Singh, A., Chouhan, O., Tandi, G. P., Dua, M., & Gehlot, A. **(2016)**. Anti-inflammatory and analgesic activity of aqueous extracts of dried leaves of Murrayakoenigii Linn. National Journal of Physiology, Pharmacy and Pharmacology, 6(4), 286.
29. Sujith, S., Priya, M. N., Deepa, C. K., & Usha, P. T. A. **(2018)**. Characterization of the Anthelmintic Activity of Murrayakoenigii (Linn.). Pharmacognosy Journal, 10(6s).
30. Kamaraj, C., Rahuman, A. A., Roopan, S. M., Bagavan, A., Elango, G., Zahir, A. A., ... & Kirthi, A. V. **(2014)**. Bioassay-guided isolation and characterization of active antiplasmodial compounds from Murrayakoenigii extracts against Plasmodium falciparum and Plasmodium berghei. Parasitology research, 113, 1657-1672.
31. Patil, A. P., &Karade, P. G. **(2014)**. Anti-tuberculosis activity of Murryakoenigii using TH micro plate alamar blue assay. World J Pharm Res, 3(10), 1284-91.
32. Kasodhan, S., Kumar, M., & Kaushik, D. Asafoetida and Curry Leaves: Processing Methods and Flavor Applications. Recent Advances in Spices, Herbs and Plantation Crops, 309.
33. Phatak, R. S., Khanwelkar, C. C., Matule, S. M., Datkhile, K. D., &Hendre, A. S. **(2019)**. Antihyperglycemic activity of murrayakoenigii leaves extract on blood sugar level in streptozotocin-nicotinamide induced diabetes in rats. Biomedical and Pharmacology Journal, 12(2), 597-602.
34. Gupta, A., & Rawal, A. **(2021)**. Comparative Evaluation of Effectiveness of Curry-leaf Mouthwash, Cinnamon Mouthwash, and Chlorhexidine Mouthwash in Maintaining Salivary and Tongue pH. Journal of Orofacial Research, 4-10.
35. Ghosh, D. E. B. O. S. R. E. E., Firdaus, S. B., Mitra, E. L. I. N. A., Chattopadhyay, A. I. N. D. R. I. L. A., Pattari, S. K., Jana, K. U. L. D. I. P., & Bandyopadhyay, D. E. B. A. S. I. S. H. **(2013)**. Ameliorative effect of curry leaf aqueous extract against lead acetate-induced oxidative stress in rat kidneys. Int J Pharm Pharm Sci, 5(4), 546-556.
36. Visakh, N. U., Pathrose, B., &Narayanankutty, A. **(2023)**. Characterization of secondary metabolites from the leaves of curry leaf (Murrayakoenigii L.) essential oils with insecticidal activities against stored product insects. Biocatalysis and Agricultural Biotechnology, 102973.
37. Aswin Sakthivel, M., Velmurugan, S., Selvi, B. S., & Senthil, A. **(2021)**. Studies on vegetative propagation in curry leaf (Murrayakoenigii Spreng.).