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Murraya koenigii (Curry leaf): Ethnobotany, Phytochemistry and Pharmacology - A Review

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ABSTRACT

Murraya koenigii is genus of tree, native to tropical Asia from Himalaya foothill's of India to Srilanka eastward through Myanmar, Indonesia, Southern China and Hainan. In India it occurs in foothill of Himalaya, Assam, Sikkim, Kerala, Tamilnadu, Andhra pradesh and Maharashtra. The various parts of this plant are widely used by different tribal communities. The leaves of plant are use as tonic, stomachic, carminative, internally in dysentery also checking vomiting. Anthelmintic, analgesic, cures piles, allays heat of the body, thirst, inflammation and itching. Following various claims for cure the numerous diseases, efforts have been made by researchers to verify the efficacy of the plant through scientific biological screening. A scrutiny of literature reveals some notable pharmacological activities of the plant such as activity on heart, Anti diabetic and cholesterol reducing property, antimicrobial activity, antiulcer activity, antioxidative property, cytotoxic activity, anti diarrhea activity, phagocytic activity. The present review is an attempt to highlight various ethnobotanical and traditional use as well as phytochemical and pharmacological reports of Murraya koenigii.

Key Words: *Murraya koenigii*, Ethnobotanical use, Pharmacognosy, Pharmacological activity, Phytochemistry.

INTRODUCTION

A handsome, aromatic, more or less deciduous shrub or tree up to 6 m in height and 15-40 cm in diameter with short trunk, thin smooth grey or brown bark and dense shady crown[1, 2]. Most part of plant is covered with fine down and has a strong peculiar smell. *Murraya koenigii is genus* of tree, native to tropical Asia from Himalaya foothill's of India to Shrilanka eastward through Myanmar, Indonesia, Southern China and Hainan. In India it occures in foothill of Himalaya, Assam, Sikkim, Kerala, Tamilnadu, Andhra pradesh and Maharashtra.[3,4] The *Murraya koenigii* having the dark grey to grey colour bark, having a longitudinal striatations on it. Beneath it a white bark is present. Leaves are bipinnately compound, 15-30 cm long each bearing 11-25 leaflets alternate on rachis, 2.5 - 3.5 cm long ovate lanceolate with an oblique base. Margins irregularly creatate, Petioles 2 - 3 mm long, flowers are bisexual, white, funnel shaped sweetly scented, stalked, complete, ebracteate, regular with average diameter of fully opened flower being in average1.12 cm inflorescene, terminal cyme each bearing 60 -90 flowers. Fruits are Ovoid to subglobose, wrinkled or rough with glands. It is having the size 2.5 cm long, 0.3 cm in diameter. It is get purplish black when ripe.

Fruits are generally biseeded. Seeds are generally occurs in spinach green colour, 11 mm long, 8 mm in diameter, weights up to 445 mg. [1, 3]

PHYTOCHEMISTRY

Leaves are aromatic and contain proteins, carbohydrates, fiber, minerals, carotene, nicotinic acid and vitamin C. It is rich in vitamin A. and calcium The leaves contain high amount of oxalic acid, leaves also contains crystalline glycosides,carbazole alkaloids, koenigin, resin, fresh leaves contain yellow color 2.5 % volatile oil.[4] It also contain girinimbin, iso-mahanimbin, koenine, koenigine, koenidine and koenimbine.[5] Mahanimbicine and bicyclomahanimbicine, phebalosin, coumarine as Murrayone imperatoxin etc isolated from leaves.[6] Triterpenoid alkaloids cyclomahanimbine, tetrahydromahanmbinealso presents in the leaves.[7,8] Murrayastine, murrayaline, pypayafolinecarbazole alkaloids and many other chemical compounds have been reported in the leaves of *Murraya koenigii*.[9] Bark mainly contain the carbazole alkaloids as murrayacine, murrayazolidine, murrayazoline, mahanimbine, girinimbine, koenioline, xynthyletin.[10] The pulp of fruits generally contain 64.9% moisture, 9.76% total sugar, 9.58% reducing sugar, 0.17% non reducing sugar and negligible amount of tannin and acids. It also contains 13.35% of vit. C. The pulp of fruits also contain trace amount of minerals 1.97% phosphorus, 0.082% potassium, 0.811% calcium, 0.166% magnesium, 0.007% iron. It also contain markable amount of protein.[2]

MEDICINAL USE

Traditional uses

Curry leaf tree (*Murraya koenigii* L., Family: Rutaceae) is a plant which has various important uses in the traditional system of medicine in Eastern Asia.[11] Based on ethnomedicine, *Murraya koenigii* is used as a stimulant, antidysentric and for the management of diabetes Mellitus .[12, 13] The plant is highly valued for its leaves an important ingredient in an Indian cuisine to promote appetite and digestion.[3] The leaves, root and bark are tonic, stomachic, and carminative. Leaves are used internally in dysentery also checking vomittig.[3, 14]Steam distillate of the leaves can be used as stomachic, purgative, febrifuge and anti emetic.[12] Leaves are applied externally to bruises and eruption.[14] The leaves and roots are bitter, acrid, cooling, anthelmintic, analgesic, it cures piles, allays heat of the body, thirst, inflammation and itching. It is also useful in leucoderma and blood disorders. An infusion of the toasted leaves in used to stop vomiting.[1] The juice of the root is good for pain associated with kidney. Fruits are also considered as astringent Indo-China. Crushed leaves are applied externally cures skin eruption and to relieves burn. The pastes of leaves are applied externally to treat the bites of poisonous animals.[3] Bark and roots are used as stimulants and externally they are applied to cures skin eruption and the bites of poisonous animals. The plant is credited with tonic and stomachic property.[1] The fruits having knowing for its very high nutritional values. These fruits are also having many medicinal properties. The branches of *Murraya koenigii* are very popular for cleaning the teeth as *datun*. It is also said that the branches of *Murraya koenigii* are used to strengthen gums and teeth's.[15] It has also been used as an anti-periodic and many a time the powdered dry leaf, mixed with honey and juice of betel nut, is recommended in the Ayurvedic system of medicine [16]

PHARMACOLOGICAL ATIVITY

Effect on Heart

Ethanolic extract of fresh leaves of *Murraya koenigii* shows a dose dependent positive inotropic effect on an isolated frog heart. The response to *Murraya koenigii* 62.5 - 1000 microgram was not affected in either way by Theophylline, imidazole, propanolol and sildenafil. The changes in potassium and sodium concentration did not alter. The result suggested that *Murraya koenigii* induced positive inotropic effect possibly by increasing availability of calcium from extra cellular sites. [17]

Antidiabetic and cholesterol reducing property

Curry leaf extract posses the property to decrease blood cholesterol and blood glucose level in diabetic ob/ob mice. Mice were given daily injection of 80 mg/kg of leaves extract intraperitonially for 10 consecutive days. Body weight was found to be reduced after the administration of extract. This study suggests that *Murraya koenigii* may be proved to be clinically important in improving the management of high cholesterol level and type 2 diabetes. [18]

Diet has been recognized as corner stone in the management of diabetes mellitus. Spices are common dietary adjuncts that contribute to be the taste and flavor of foods. Besides spices it is also known to exert several beneficial physicochemical effects. [19]

A single oral administration of variable dose level (200, 300 and 400 mg) aqueous extract leads to loweing of blood glucose level in normal as well as alloxan induced diabetes rabbits conclusion from this study suggested that aqueous extracts of these levels may be prescribed as adjunct to dietary treatment for controlling *diabetes mellitus.* [20]

The effect of daily oral administration of aqueous extract (600 mg/kg body weight) and methanolic extract (200 mg/kg body weight) of *Murraya koenigii* leaves for a period of eight weeks on blood glucose and plasma insulin level was studied in alloxan induced diabetic rat. Study suggested that the hypoglycemic effect may be mediated through stimulating insulin synthesis and/or secretion from the beta cells of pancreatic islets of langerhans. [21]

It was observed that feeding of diet containing various doses of curry leaf (5, 10, 15%) to normal rats for seven days as well as mild diabetic blood glucose level >175 mg/dl induce s by alloxan 35 mg/dl IP) and moderate diabetic rat (blood glucose level > 250 mg/dl by STZ 60 mg/kg IP). for 5 weeks showed varying hypoglycemic and antihyperglycemic effect of *Murraya koenigii* spreng. [22]

Murraya koenigini leaves powder supplementation (12 gm providing 2.5 % fiber) was carried out for a period of 1 month in 30 non insulin dependent diabetes mellitus patients. Parameter monitored at 1, 15 and 30 days as fasting and 2 Hr. post prandial blood sugar level, lipid profile, glycated proteins and amino acids. The result indicated a transient reduction in fasting and post prandial levels at 15th day gives no appreciable changes in the lipid profile, glycated proteins and amino acids. [23]

Effect of the leaves of *Murraya koenigii* on carbohydrate metabolism has been studied using rats as experimental animals. It showed significant hypoglycemic action. There was increase in the concentration of hepatic glycogen[24]

Antimicrobial Activity

Benzoisofuranone derivatives along with six known carbazole alkaloids and three known steroids were isolated from stem bark of *Murraya koenigii*.These compounds are found to be effective in range 3.13 - 100 µg / ml concentration. [25]

Literature survey revealed that methanolic extract of 21 plant species were screened for in vitro anti bacterial activity against multi resistant bacterial isolates including gram +ve and gram -ve strains. Study showed that *Murraya koenigii* shown maximum antibacterial activity. *S. epidermidis* was significantly inhibited by *Murraya koenigii.* [26]

Mahanimbine, murrayanol and mahanine are three carbazole alkaloids isolated from the acetone extract of the fresh leaves of *Murraya koenigii*. Of these three, murrayanol showed an IC50 of 109 µg/mL against hPGHS-1 and an IC50 of 218 µg/mL against hPGHS-2 in anti-inflammatory assays, while mahanimbine displayed antioxidant activity at 33.1 µg/mL. All these three carbazole alkaloids were mosquitocidal and antimicrobial and exhibited topoisomerase I and II inhibition activities [27].

Antiulcer Activity

Antiulcer activity of aqueous and solvent ether extracts of *Murraya koenigii* was studied in reserpine induced gastric ulcer model in albino rats. Aqueous and solvent ether extracts of *Murraya koenigii* effective in gastric ulceration and suggested as protective as ranitidine. [28]

Antioxidative Property

Isolated carbazole alkaloids from dichloromethane extract of leaves of *Murraya koenigii* were evaluated on the basis of oil stability index together with their radical scavenging ability against (DPPH) radical on the basis of lag time to reach a steady state. The 12 carbazole were classified in to 3 groups. It suggested that an aryl hydroxyl substituent on the carbazole ring plays a role in stabilizing the thermal oxidation and rate of reaction against DPPH radicals. [29]

The antioxidative properties of the leaf extracts of *Murraya koenigii* using different solvents were evaluated based on the oil stability index (OSI) together with their radical scavenging ability against 1, 1-diphenyl-2-picrylhydrazyl (DPPH) [30]

Mahanimbine and koenigine, two carbazole alkaloids, isolated from the leaves of *Murraya koenigii* showed antioxidant activity. Koenigine also showed a high degree of radical-scavenging properties [31]

Cytotoxic Activity

The isolated carbazole alkaloid as Koenoline from root bark of *Murraya koenigii* exhibited the cytotoxic activity against KB cell culture system**. [32]**

Carbazole alkaloids isolated from the stems of *Murraya koenigii* (Rutaceae) have effects on the growth of the human leukemia cell line HL-60. Also the carbazole alkaloids, mahanine,

Pyrafoline-D and murrafoline-I showed significant cytotoxicity against HL-60 cells and induced the loss of mitochondrial membrane potential [33]

Anti Diarrhea activity

The bioassay guided fractionation of the *n*-hexane extract of the seeds of *Murraya koenigii* Spreng (Rutaceae) resulted in the isolation of three bioactive carbazole alkaloids, kurryam, koenimbine and koenine. The structures of the compounds were confirmed from their 1H-, 13C-, and 2D-NMR spectral data. Of the three compounds kurryam and koenimbine exhibited significant inhibitory activity against castor oil-induced diarrhea and PGE2-induced enter pooling in rats. The compounds also produced a significant reduction in gastro-intestinal motility in the charcoal meal test in Wister rats [34]

Phagocytic Activity

The methanol extract of *M. koenigii* leaves was evaluated on human oral and cell mediated immune response to ovalbumin, phagocytic activity by carbon clearance test, nitric oxide (NO) release from murine peritoneal macrophages and cyclophosphamide induced myclosuppression [35]

CONCLUSION

In recent years, ethnobotanical and traditional uses of natural compounds, especially of plant origin received much attention as they are well tested for their efficacy and generally believed to be safe for human use. They obviously deserve scrutiny on modern scientific c lines such as phytochemical investigation, biological evaluation on experimental animal models, toxicity studies, investigation of molecular mechanism of action (s) of isolated phytoprinciples and their clinical trials. It is a best classical approach in search of new lead molecules for management of various diseases. Thorough screening of literature available on *Murraya koenigii* depicted the fact that it is a popular remedy among the various ethnic groups, Vaidyas, Hakims and ayurvedic practitioners for cure of variety of ailments. Following the traditional and folk claims, very litt le eff orts have been made by the researchers to explore the therapeutic potential of this plant. It is interesting to note that crude organic extracts of leaves of *Murraya koenigii* have been screened for some pharmacological activities and found to possess anti diabetic, cholesterol reducing property, anti diarrhea activity, cytotoxic activity antioxidant property, antiulcer activity antimicrobial, antibacterial potential. Till other parts of plant such as seeds, leaves and seed oil which are documented to possess important medicinal virtues, are not explored scientifically for their biological potential. In future study, the isolated principles from curry leaf needs to be evaluated in scientific manner using scientific experimental animal models and clinical trials to understand the molecular mechanism of action, in search of lead molecule from natural resources.

REFERENCES

1. Mhaskar, K. S., Blatter, E., Caius, J. F., In; Kirtikar and Basu's Illustrated Indian Medicinal Plants Their Usage in Ayurveda and Unani Medicine, Vol.- 3, Shri Satguru Publication, Delhi, 2000, 656-659.
2. Parmar, C., Kaushal, M. K., In; Wild Fruits, Kalyani Publishers, New Delhi, 1982,45-48.
3. Parrota J. A., In; Healing Plants of Peninsular India, C.A.S.I. Publication, U.S.A., 2001, 639.
4. Prajapati, N. D., Purohit, S. S., Sharma, A. K., Kumar, T., In; A andbook of Medicinal Plants, 1st ,Edn., Agrobios India, 2003, 401.
5. Narasimhan, N. S., Paradkar, M. V., Chitguppi, V. P., Kelkar, S. L., Ind. J. of Chem., Octo.1975, 13, 993-999.
6. Rastogi,R. P.,Mehrotra,B. N., In; Compendium of Indian Medicinal Plants,Volume 2, Central Drug Research Institute,Lukhnow and National Institute of Science Communication,New Delhi,1980-1984, 473-475.
7. Kureel, S. P., Kapil, R. S., Popli, S. P., Tetrahedrone Letters, 1969, 44, 3857-3862.
8. Chakraborty, D. P., Das, K. C., Chem. Commun., 1968, 967.
9. Furukawa, H., Ito, C., Yogo, M., Wu, T. S., Chem. Pharm. Bull., 1986, 34(6), 2672-2675.
10. Rastogi, R. P., Mehrotra, B. N., In; Compendium of Indian Medicinal Plants,Vol. 4, Central Drug Research Institute,Lukhnow and National Institute of Science Communication,New Delhi,1980-1984, 486-489.
11. MB Ningappa; L Srinivas. *Toxicology in Vitro*, 2008, 22, 699-709.
12. J–T Xie; W–T Chang; C–Z Wang; SR Mehendale; J Li; R Ambihaipahar; U Ambihaipahar;HH Fong; C–S Yuan. *The American Journal of Chinese Medicine*, 2006, 34, 279-284.
13. MK Vinuthan; KV Girish; JP Ravindra; NK Jayaprakash. *Ind. J. Physio. Pharmacol.*, 2004,48, 348-352.
14. Kumar, V. S., Sharma, A., Tiwari, R., Kumar, S., J. of Med. and Aromat. Plant Sci., 1999, 21, 1139-1144.

15. The Wealth of India, A Dictionary of Indian Raw Materials and Industrial Products,Raw Materials, Vol-4, Publication and Information Directorate, Council of Scientific and Industrial Research, New Delhi, 2003, 317.
16. JS Purthi. Spices and Condiments, National Book Trust, New Delhi, India, 1976; 110.
17. Shah, K. J., Juvekar, A. R., Ind. J. of Exp. Bio., June 2006, 44, 481-484.
18. Xie J. T., Chang W. T., Wang C. Z., Mehendale, S. R., Li, J., Ambihaipahar, R., Ambihaipahar, U., Fong, H. H., Yuan, C. S., Am. J. Chin. Med., 2006, 34(22), 279-284.
19. Shrinivasan, K., Int. J. Food Sci. Nutr. Sept 2005, 56(6), 399-414.
20. Kesari, A. N., Gupta, R. K., Watal, G., J. Ethanopharmacol, 2005, 97(2), 247-251.
21. Venuthan, M.K., Girish Kumar V., Ravindra J. P., Jayaprakash, Narayana, K., Ind. J. Physio. Pharmacol., Apr. 2005, 49(2), 241-242.
22. Yadav, S., Vats, V., Dhunnoo, Y., Grover, J. K., J. thanopharmacol., Oct. 2002, 82(2-3), 111-116.
23. Iyer, U. M., Mani, U. V., Plant Food Hum. Nutri., Oct.1990,40(4), 275-282.
24. BA Khan; A Araham; S Leelamma. *Indian Journal of Biochemistry and Biophysics*, 1995, 32, 106-108.
25. Rahman, M. M., Gray, A. I., Phytochem. 2005, 66(13), 1601-1606.
26. Thomas, E., Shanmughan, J., Raf, M. M., Biomedicine, 1999, 19(3), 185-190.
27. SP Kureel; RS Kapil; SP Popli. *Chemistry and Industry*, 1970, 958
28. Ram,H. N. A., Hatapakki, B. C., Hukkeri I. V. J., Aryavaidyan, 2002, 16(1), 40-44.
29. Yukari, T., Hiroe, K., Nordin, H.L., Nobuji N., J. Agri. Food Chem., 2001,49, 5589-5594.
30. .SP Kureel; RS Kapil; SP Popli. *Experientia*, 1969, 25, 790-791.
31. LJM Rao; K Ramalakshmi; BB Borse; B Raghavan. *Food Chemistry*, 2006, 100, 742-747.
32. Manfred, F., John, M. P., Dajaja, D. S., Douglas A. K., Phytochem., Nov. 1985, 24(12), 3041-3043.
33. C Ito; M Itoigawa; K Nakao; T Murata; M Tsuboi; N Kaneda; H Furukawa. *Phytomedicine*, 2006, 13, 359-365.
34. Mandal; A Nayak; M Kar; SK Banerjee; A Das; SN Upadhyay; RK Singh; A Banerji; J. Banerji. *Fitoterapia*, 2010, 81, 72-74.
35. AS Shah; AS Wakade; AR Juvekar. *Indian Journal of Experimental Biology*, 2008, 46, 505-509.

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