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REVIEW ARTICLE

A rewiew on pharmacological activity of *Murraya Koinigii* and there effective doses

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ABSTRACT

The traditional medicine literature describes the potential role of plants as a source of many vitamins and a domestic remedy for many disorders like diabetes, cancer, arthritis and many others**.** There is a proportional increase in demand for herbal products both locally and internationally. *Murraya koenigii* (Rutaceae) is one of the two species of *Murraya* found in Peninsular Malaysia. The plant usually cultivated for its aromatic leaves is normally used for natural flavouring in curries and sauces. This plant is also distributed in India, Andaman Islands and throughout Central and Southeast Asia. The plant was spread to Malaysia, South Africa and Reunion Island by South Asian immigrants. Parts of the plant have been used as raw material for traditional medicine formulation in India. *Murraya koenigii* is used traditionally as antiemetic, antidiarrhoeal, febrifuge and blood purifier. The whole plant is considered to be a tonic and stomachic. The leaves are used extensively as a flavouring agent in curries and chutneys. Phytochemical screening of *Murraya koenigii* revealed the presence of some vitamins, alkaloids, terpenoids, phenolic compounds and mineral content such as calcium, iron, zinc and vanadium etc. in addition, carbazole alkaloid present in *Murraya koenigii*. The current review provides a detailed report of the pharmacological and pre-clinical works carried out on this culinary plant and also throws light on its therapeutic effective doses.

INTRODUCTION

Medicinal plants or their bioactive compounds have been utilized by developing countries for primary and traditional healthcare system since very long period of time. In several ancient systems of medicine including Ayurveda, Siddha and Unani, Murraya koenigii, a medicinally important herb from mainly Asian origin has vast number of therapeutic applications such as in bronchial disorders, piles, vomiting, skin diseases etc. *Murraya Koenigii* an 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).

BOTANICAL DESCRIPTION

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). Most part of plant is covered with fine down and has a strong peculiar smellThe *Murraya koenigii* having the dark grey to grey colour bark, having 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.

Fig. 01: leaves of *Murraya koenigii*

TRADITIONAL MEDICINAL USES

Fresh leaves, dried leaf powder and essential

oil are widely used for flavouring soups, curries, fish and meat dishes, eggs dishes, traditional curry powder blends, seasoning and ready to use other food preparations. The essential oil is also utilized by soap and cosmetic aromatherapy industry (5). Curry leaves are boiled with coconut oil till they are reduced to blanked residue which is then used as an excellent hair tonic for retaining natural hair tone and stimulating hair growth. It is traditionally used as a whole or in parts as antiemetics, antidiarrheal, febrifuge, blood purifier, antifungal, depressant, anti-inflammatory, body aches, for kidney pain and vomiting (6-18).

PHARMACOLOGICAL ACTIVITY OF *MURRAYA KOENIGII*

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 (19).

Antidiabetic and Cholesterol Reducing Property

Curry leaf extract posses the property to decrease blood cholesterol and blood glucose level in diabetic 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 (20).

A single oral administration of variable dose level (200, 300 and 400 mg) aqueous extract leads to lowering 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 (21). 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 (22).

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 (23-24). 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 IC_{50} of 109 µg/mL against hPGHS-1 and an IC_{50} 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 (25).

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 (26).

The extract dose of murraya koenigii 200-400 mg/kg produced significant inhibition of gastric secretion.

Antioxidative Property

The alcohol: water (1:1) extract of curry leaves showed the highest antioxidant and free radical scavenging activity. It inhibited membrane lipid peroxidation by 76%, at 50 µg/ml, scavenged 93% of superoxides at 200 µg/3 ml. the total alkaloidal extracts of Murrya koenigii leaves in doses of 20 and 40 mg/kg p.o., improved the values of protective antioxidants like glutathione peroxidase (GPX), reduced glutathione (GSH), glutathione reductase (GRD), superoxide dismutase (SOD) and catalase (CAT) in brain homogenate. Additionally, it demonstrated a reduction in lipid peroxidation (LPO) and nitric oxide assay (NO). There also was an increase in the acetylcholine (Ach) levels and decrease in the anticholinesterase (AchE) activity.

Cytotoxic Activity

The isolated carbazole alkaloid as Koenoline from root bark of *Murraya koenigii* exhibited the cytotoxic activity against KB cell culture system (27)**.** 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; 200 mg/kg b.w drug was effective for this activity (28).

Effect on Dental Caries

Feeding of murraya leaf extract in golden hamsters showed lower caries scores compared to control group. Murraya extract or isomahanine, murrayanol and mahanine incorporated in foods (such as candies, biscuits, cakes, chewing gums, and juices) showed 86.2% inhibition of methyl suphydral formation by cultured *Fusobacterium nucleatum* 126. *M. koenigii* leaf extract containing mahanin, isomahanin or murrayanol as active ingredient formulated in toothpaste, was found to be useful as oral disinfectant to protect against dental caries and periodontal disorders. They are also effective against S*treptococcus mutans* and *Porphyromonas gingivalis* (29-32).

Anticancer Activity

Intraperitoneal inoculation of Dalton's Ascitic Lymphoma (DAL) cells in the mice produced an enormous increase in the cancer cell count which indicated that there is progression of cancer in the animals. The decrease in the cancer cell number observed in the ether extract of *Murraya koenigii* the treated mice of G4 indicates that the test drug is having significant inhibitory effect on the tumour cell proliferation. The increase in tumour weight of G2 may be due to accumulation of peritoneal fluid as an abnormal enlargement of peritoneal cavity was observed in tumour-induced mice. Treatment with extract of *Murraya koenigii* reduced the tumour weight and hence increased the life span. These observations on the effect of extract of *Murraya koenigii* on parameters studied to evaluate the antitumour activity enabled to conclude that it has significant antitumor activity. However further investigations are essential for the isolation of the principle of extract of *Murraya koenigii* and its mechanism of action (33).

Immunomodulatory activity

The methanolic extract of *M. koenigii* showed significant increase in phagocytic index by rapid removal of carbon particles from blood stream. The extract also increased the antibody titre against ovalbumin and protection towards cyclophosphamide-induced myelosuppression in albino mice (34). Oral administration of the aqueous extract of leaves at doses of 250 and 500 mg/kg significantly enhanced the delayed-type hypersensitivity. The extract also potentiated the production of circulating antibody titre significantly in response to ovalbumin (35).

Alzheimer disease therapy

Administration of ethanolic extract of M. Koenigii Leaves for 15 days produces significant dose-dependent improvement of memory. The results also indicated to reduce the brain cholinesterase activity and total cholesterol level(36),Diet rich in M. koenigii leaves produced significant dose-dependent improvement in the memory scores of young and aged mice and significantly reduced the amnesia induced by scopolamine (0.4 mg/kg, intraperitoneally) and diazepam (1 mg/kg, intraperitoneally).

Cosmetic use

Hyaluronidase inhibitors are extracted from M. koenigii and are formulated in a cream base. *M. koenigii* extract is included in a skin-lightening cosmetic for its moisturizing, antioxidant and hyaluronidase inhibitory activity. Herbal composition containing *M. koenigii* stem extract as one of the ingredient showed skin lightening and rough skin improving effect(37). *M. koenigii* was studied for sun protection. it was suggested that it can be used to maintain the natural pigmentation of the skin or can be used as an adjuvent in other formulations to enhance the activity. Curry leaf oil cream showed the sun protection factor (2.04±0.02).

CONCLUSION

Keeping in view the tremendous pharmacological activities and wealth of literature available, *M. koenigii* may be utilized to alleviate the symptoms of variety of diseases as evident from the pre-clinical data. Although crude extract from various parts of curry neem have numerous medical applications, modern drugs can be developed after extensive investigation of its bioactivity, mechanism of action, pharmacotherapeutics, toxicity studies, proper standardization and clinical trials. The available literature and wide spread availability of *M. koenigii* in India thus makes it an attractive candidate for further pre-clinical and clinical research.

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