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A review and its potential of *Murraya koenigii*

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Abstract

*Murraya koenigi*i is a multipurpose plant, the plant is a native of India. It is found in tropical and sub-tropical region in the world. All parts of plants is useful for treat and cure various diseases and useful for preparation of various pharmaceutical formulation and cosmetic preparation. Different parts of the *murraya koenigi*i plant like roots, leaves, stem, bark, fruits and seeds have been used in combating infection and strengthening the immune system. The plants contains many major phytochemical compounds, Vitamins and Nutrients, it also rich source of nutrients and also it contains many pharmacological activity like anti-inflammatory, anti-pyretic, hypoglycemic, anti-ulcer, wound healing, anti-microbial, anti-fungal and memory enhancing etc.. The main goal of this review study was to be convey the information about *Murraya koenigi*i plant.

Keywords: Anti-oxidant; Curry leaves; *Murraya koenigi*i fruits; Phytoconstituents; Pharmacological activity; Parts of murraya

1. Introduction

In India, the different systems of medicinal usage like Ayurveda, Siddha, Unani, and local health traditions, focuses on the use of plant products for the treatment of human and animal diseases. Plants have been used as medicines for thousands of years all over the world. According to WHO (World Health Organization), 80% of the population, mostly in developing countries still rely on plant-based medicines for their primary health care. *Murraya koenigi*i, which commonly known as curry leaf or kari patta in India, belong to Family Rutaceae which also represent more than 1600 species and 150 genera. *Murraya koenigi*i is a highly valuable plant for its characteristic odour aroma and medicinal values. It is an important medicinal plant of our country and is grown in almost every house for its aromatic leaves. Systematic scientific studies have been conducted regarding the efficacy of different plant parts in the treatment of various diseases. There is a need to review the information available in literature on *Murraya koenigi*i to answer the gaps between ethnobotanical uses and phytochemical studies, so that it would aid future research by Phytochemists, pharmacologists Medicinal plants contain numerous biologically active compounds which are helpful in improving the life and treatment of disease. Medicinal plants contain numerous biologically active compounds which are helpful in the treatment of various diseases and improving human life. In addition to being a good source of anti-infective agents, they are also cost-effective and have fewer side effects[1]. India has rich plant diversity and houses about 47,000 plant species, out of these 7,500 have medicinal value; but only 800 plant species are used in the preparation of herbal drugs .A large number of plants still remain unexplored with regard to their medicinal properties and they can be sources of potential bioactive compounds for the development of new “leads” to combat various diseases. *M. Koenigii* contains a number of chemical constituents that interact in a complex way to elicit their Pharmacodynamic response. A number of active constituents responsible for the medicinal properties have been isolated and characterized. This plant has been

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reported to have anti-oxidative, cytotoxic, antimicrobial, antibacterial, anti-ulcer, positive inotropic and cholesterol reducing activities. . Compounds such as carbohydrates, proteins, enzymes, fats, oils, terpenoids, flavonoids, sterols simple phenolic compounds etc. Natural products are the source of synthetic and traditional herbal medicine and are still the primary health care system. The leaves of this plant also found to possess so many activity. The very little study has been investigated on fruits of *murraya koeniigi*i except the work done on fruit of *murraya koenigi*. So the present work investigated to study phytochemical constituents and pharmacological activity of *murraya koenigi* of different plant parts in the treatment of various diseases. . There is a need to review the information available in literature on *Murraya koenigi*i, so that it would aid future research by phytochemists, pharmacologists, clinicians, scientists, researchers and toxicologists. The information collected has been compiled and made available at one place in the interest of the scientific community.

2. Plant description and Habitate

The plant is distributed and cultivated throughout India and Cochin. Propagation is done by seeds, which germinate freely under partial shade[3]. Is also available in other part of Asian region like in moist forests of 500-1600 m height in Guangdong, S Hainan, S Yunnan (Xishuangbanna), Bhutan, Laos, Nepal, Pakistan, Sri Lanka, Thailand, nd Réunion island.outside the Indian sphere of influence, they are rarely found. *M. Koenigii* is an unarmed, semi deciduous aromatic shrub or small tree with slender but strong woody stem and branches covered with dark grey bark, leaves are imparipinnate, glabrous, and very strongly aromatic Leaflets 9-25 or more.short stalked, alternate, gland dotted and strongly aromatic[4].

Figure 1 *Murraya Koenigii* Plant Over View

2.1. Various Names of *Murraya koeniigii*

- English ; Curry leaves
- Kannada ; Karibevu Karipatta,
- Hindi ;Mithanim
- Tamil ;Kariveppilai
- Malayalam ; Kariveppu
- Marathi ; Kadhilimb

2.2. Phytochemical Constituents of *Murraya Koeniigii*

Constituents that have been stimulated the most interest includes a wide range of carbazole alkaloids, essential oil and carotenoids. The following major group of bioactive constituents summarizes the constituents of *murraya*.

2.2.1. Leaves

The *Murraya koenigi*i leaves possess 66.3% moisture; 6.1 % protein; 1.0% fat(ether extract); 16.0% carbohydrate; 64.0 % fibre; 4.2% mineral matter; 810.0 mg calcium; 600.0 mg phosphours; 3.1 mg Iron:12600 i.u. carotene (as vitamin A): 2.3 mg nicotinic acid and 4 mg/100 g vitamin C[5].The leaves are devoid of thiamine and riboflavin. From the root and stem bark of the curry leaf plant many carbzole alkaloids, murrayanine, murrayastine, murrayacine and murrayazolinol have been isolated.

2.2.2. Stem

From stem bark contain Murrayazolinol, mahanimbinol, murrayazolidine,murrayacinine, mukonidine, murrayazolinine, murrayanine, girinimibine and mahanimbine, girinimbinol and mahanimbilol (possible biogenetic precursors of girinimbine and mahanimbine) present[4].From alcohol extract of stem bark Saha et.al has isolated koenigine- quinone A and koenigine quinone B, structures were established as 7- methoxy- 3 methyl carbazole- 1,4- quinone and 6, 7-dimethoxy-3-methyl carbazole-1, 4- quinone respectively . 9- carbethoxy-3-methyl carbazole and 9- formyl –3- methyl carbazole were identified[7].

2.3. All important bioactive constituents of *Muraya koeniigii*

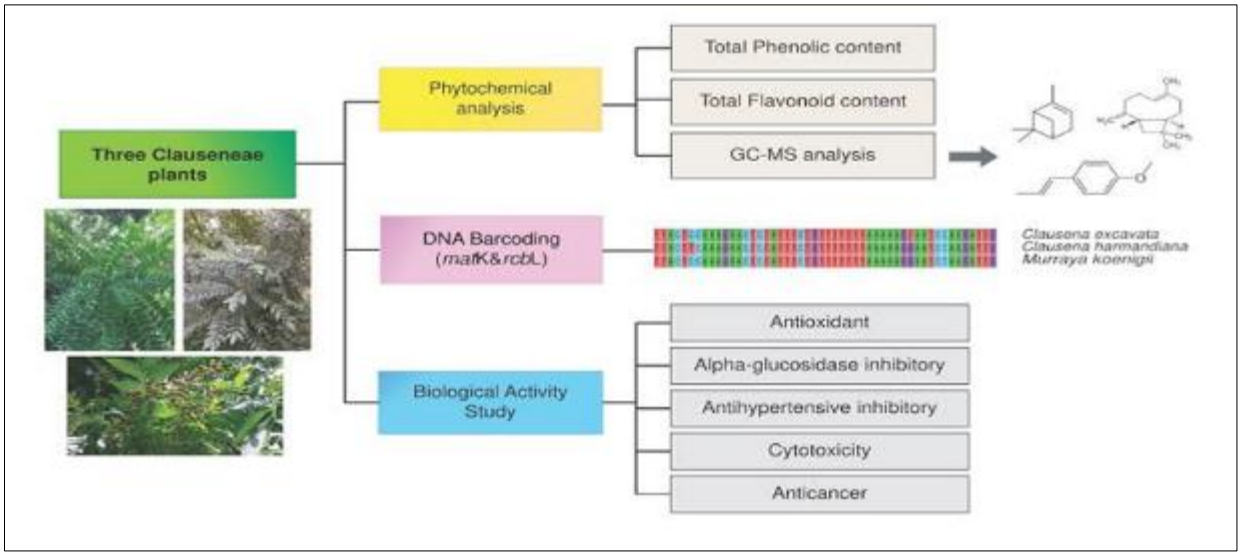

Figure 2 Bioactive Constituents Of *Murraya Koenigii*

2.3.1. Root

Murrayanol, murrayagetin, marmesin- 1"- O- rutinoside were isolated form root extract. Three monomeric and five binary carbazole alkaloids named mukoenine- A, -B and C and murrastifoline –F. bis – 2- hydroxy- 3- methyl carbazole, bismahanine, bi koeniquinone- A and bismurrayaquinone A were isolated form root and stem bark , Koenoline (1- methoxy-3- hydroxy methyl carbazole) was isolated form the root bark65, Mukoline, mukolidine were isolated form the benzene extract of roots. Roots were also found to contain girinimbine[8].

2.3.2. Seed

Mahanimbine, girinimbine, koenimbine, isomahanine and mahanine were isolated form seeds of *M. Koenigii* from Marassana, Sri Lanka. 2- methoxy-3- methyl carbazole was isolated form petroleum ether extract of seeds. Mandal et.al isolated three bioactive carbazole alkaloids, kurryam (I), Koenimbine (II) and koenine (III) with structural confirmation with 2D-NMR spectra[9].

2.3.3. Fruits

The pulp of fruits generally contains 64.9% moisture, 9.76% total sugar (9.58% reducing sugar, 0.17% non-reducing sugar), 13.35% of vitamin C, trace amount of minerals (1.97% phosphorus, 0.082% potassium, 0.811% calcium, 0.166% magnesium and 0.007% iron) and negligible amount of tannin and acids. The Petroleum ether extract of fruits has shown the presence of mahanimbine and koenimbine. Reisch et al. (1992) isolated isomahanine. Murrayanol, mahanimbine, murrayazolidine, girinimbine, koenimbine and mahanine were isolated form fruits[10].

2.3.4. Flowers

Flowers of curry leaf is small white fragrant and funnel shaped regular pentamers staleked complete hypohyness persistent inferiar green corolla polypetalas , polyandrous bright sticky style short ovary inflourances a terminal cyme[11].

2.4. Murraya Parts Containing importartant Pharmacological Activity

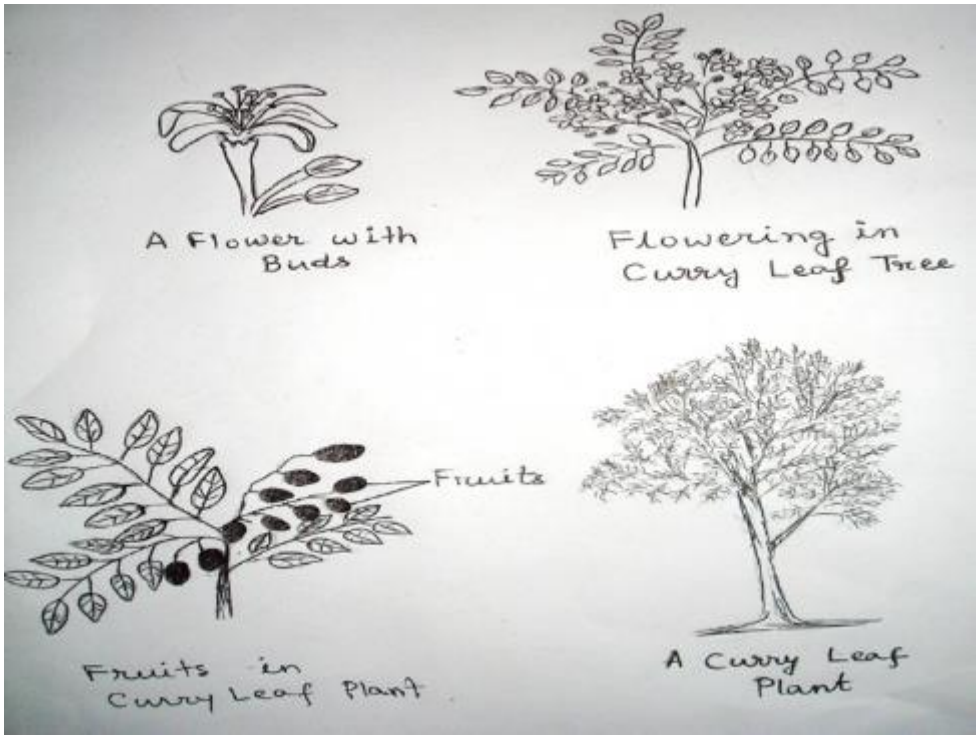

Figure 3 Different Parts Containing Of *Murraya Koenigii* Plant

- **Leaves** : anti oxidants, anti diabetic, anthelmintic, anti diarrheal,chemo protective
- **Stem** : anti caries, anti oxidant, anti microbial, anti cancer, hepatoprotective
- **Bark** : anti fungal, anticancer, wound healing, anti ulcer, analgesic , anti inflammatory
- **Seeds** : anti diabetic, vasodilation, anti pyretic, anti cytotoxic
- **Roots :** dental caries
- **Fruits :** anti Alzheimer activity, anti oxidant, analgesic, anti inflammatory

2.5. Pharmacological activity

*Murraya koenigi*i has been mentioned in the traditional medicinal system Ayurveda . The *Murraya koenigi*i bark, root, leaves, fruits and fruit pulp are widely used in the treatment of antioxidant, anti inflamation ,hepatotoxicity , diabetes, obesity, vomiting, constipation, indigestion, diarrhoea, dysentery, piles, nausea, to relieve kidney pain etc . It contains somany pharmacological activities and therapeutic bioavailability[9].

2.5.1. Diabetic activity

Methanol extract of *Murraya koenigi*i leaves are produce hypoglycemic effect in human showed varying hypoglycemic and anti¬-hyperglycemic effect[11]. The aqueous extract of the leaves of *Murraya koenigi*i after oral as well as intravenous administration to normal and alloxan diabetic dogs produced the hypoglycemia. the hypoglycemic activity of crushed leaves of *Murraya koenigi*i in rabbits, human volunteers and alloxan induced diabetic rats. *Murraya koenigi*i and attributed to increased glycogenesis and decreased glycogenolysis and gluconeogenesis[12].

2.5.2. Hypolipidemic effect

*Murraya koenigi*i supplementation to atherogenic diet was found to decrease plasma triglyceride, plasma phospholipid in male albino rats. *Murraya koenigi*i leaf powder and Brassica juncea seeds decreased the levels of cholesterol and phospholipids in the dimethyl hydrazine (DMH) induced colon carcinogenesis experimental animals[13].It was clear that the majority of the work pertains to the whole leaves or leaf powder of *Murraya koenigi*i. Very few studies were conducted to find out the antidiabetic or antioxidant or hypolipidemic activity of different extracts of the *Murraya koenigi*i leaves[14].

2.5.3. Antioxidant activity[15][16]

Addition of *Murraya koenigi*i leaf powder in the high fat diet resulted in reduction of lipid peroxidation (thiobarbituric acid reactive substances) level to a beneficial extent. Carbazole alkaloids isolated from *Murraya koenigi*i are recognized as sources natural antioxidants and thus play an important role in the chemoprevention of diseases resulting from lipid peroxidation. *Murraya koenigi*i leaf powder was decrease in the concentration of malondialdehyde, while hydroperoxides and conjugated dienes were increased in liver and heart. There was increased activity of Superoxide dismutase and catalase in liver and heart of administered groups[17].Oral feeding of 15% of powdered leaves of *Murraya koenigi*i and 10% powder of seeds of Brassica juncea for a period of 60 days to streptozotocin diabetic rats showed the nephro protective effect. There was improvement in Serum glucose levels, body weight, urine volume, serum creatinine, and urinary albumin (UA) levels. *Murraya koenigi*i can be best utilized by promoting as preferable food adjuvant for diabetic patients. *Murraya koenigi*i treatment exerts a therapeutic protective nature in diabetes by decreasing oxidative stress and pancreatic beta-cell damage[18].

2.5.4. Hepatoprotective activity

The protective nature of *M. Koenigii* leaves extract was studied. The effect attributed to the combined effect of carbazole alkaloids Mahanimbine, Girinimbine, Isomahanimbine, murrayazoline, Murrayazolidine, Mahanine and ascorbic acid, α-tocopherol and mineral (Zn, Cu,Fe) contents of *M. Koenigii* leaves extract. This study proved *M. Koenigii* a promising and a rich source of free radical quenchers, which have been mediated through hepatocyte membrane stabilizing activity along with the reduction of fat metabolism. The normal morphology of cell was maintained after ethanolic challenge when aqueous extract containing tannins and carbazole alkaloids of *M. Koenigii* was given. Hepatoprotective activity was measured with respect to the different parameters studied and maintained normal morphology even after ethanolic challenge to the cells which was comparable to the protection offered by the standard drug L-ornithine-L-aspartate. The acetone extract of dried bark powder showed prominent protection of liver cells as compared with the control group and other solvents in CCl4-induced liver damage [20].

2.5.5. Antimicrobial and anti-fungal activity

Murrayanine, girinimbine and mahanimbine isolated form stem bark showed anti-fungal activity against human pathogenic fungi. 1- formyl-3 methoxy-6- methyl carbazole and 6,7-dimethoxy-1- hydroxy-3- methyl carbazole were reported to possess antibacterial and anti-fungal property Murrayanine, girinimbine and mahanimbine isolated form stem bark showed anti- fungal activity against human pathogenic fungi. 1- formyl-3 methoxy-6- methyl carbazole and 6,7-dimethoxy-1- hydroxy-3- methyl carbazole were reported to possess antibacterial and anti- fungal property. Extract containing murrayanol and or isomahanine is used as microbicide in variety of industries due to high safety, strong activity, little odor and without coloring effect [21].

2.5.6. Anticancer activity

Koenoline isolated form root bark exhibited cytotoxic activity against the KB cell culture test system. 9- formyl-3 methyl carbazole displayed weak cytotoxic activity against both mouse melanoma B 16 and adriamycin resistant P 388 mouse leukemia cell lines. The effects of extracts of *M. Koenigii* in in-vitro (short term incubation method and in-vivo (Dalton's ascitic lymphoma (DAL) anticancer models have been evaluated in male Swiss albino mice. The anti-carcinogenic potential of curry leaf using benzo (a) pyrene induced fore stomach and 7, 12 dimethyl benz (a) anthracene (DMBA) induced skin papillomas was studied. hemo protective responses were measured as decrease in tumor burden (papillomas/mouse) and % of tumor bearing c transferase and DT- diaphoresis were also measured. Antioxidant parameters (reduced glutathione, Super Oxide dismutase, catalases, glutathione peroxidase and glutathione reductase) were also elevated. The *in-vitro* anti-tumor promoting activity and antioxidant properties of Girinimbine isolated from the stem bark of *Murraya koenigi*i was studied.

2.5.7. Anti-inflammatory activity

The alcohol extract of stem bark (1 gm/kg body weight) is effective against carrageenan-induced inflammation. Crude root extract also showed anti-inflammatory activity. Ethanolic extract of *M. Koenigii* (EEMK) (300 and 400 mg/kg) showed antihistaminic actions in the histamine-aerosol protocol. The mast cell stabilization and antihistaminic effects of EEMK were suggested to be the probable mechanisms for its anti-inflammatory action [22].

2.5.8. Anti ulcer activity

Anti-ulcer activity was observed using aqueous extract at doses of 200 and 400 mg/kg. It produced significant inhibition of gastric lesion induced by non-steroidal anti-inflammatory drugs and pylorus ligation-induced ulcer. The extract

reduced ulcerative lesion, gastric volume and free and total acidity but raised the pH value of gastric juice in pylorus ligation model. The results obtained suggested that the extract possesses significant antiulcer activity[23].

2.5.9. Antidiarrhoeal activity

Two bioactive carbazole alkaloids, namely, kurryam and koenimbine obtained from fractionated n-hexane extract of the seeds of *M. Koenigii* exhibited significant inhibitory activity against castor oil-induced diarrhoea and prostaglandin E2-induced enteropooling in rats. These compounds also produced a significant reduction in gastrointestinal motility in the charcoal meal test in Wistar rats mahanimbine toxicity against the larvae of Culex quinquefasciatus[24].

2.5.10. Anthelmintic activity

Ethanolic and aqueous extracts from *M. Koenigii* leaves were investigated for their anthelmintic activity against *Pheretima posthuma*. Both the extracts exhibited significant anthelmintic activity at concentration of 100 mg/mL. The alcoholic extract produced more significant anthelmintic activity than petroleum ether extract.

3. Conclusion

*Murraya koenigi*i have numerous medical applications, modern drugs can be developed after extensive investigation of its bioactivity, mechanism of action, pharmaco therapeutics, toxicity - The available literature and wide spread availability of *Murraya koenigi*i in India thus makes it an attractive candidate for further pre-clinical and clinical research. . In the current globalization era, it is difficult to find a curry plant in majority of the houses and many diets has been dependent to synthetic agent as taste enhancer against curry leaves. It is very interesting to known the crude organic extract isolated from *murraya koenigi*i leaves, fruits and stem have been assessed for the few pharmacological activity. They have exhibited lipid lowering, anti-diabetic, anti-diarrhoeal, anti-oxidant, anti-microbial and aging properties. Further in future, there is a need to evaluate the isolated phytochemicals from the plant for the benefits of mankind.

Compliance with ethical standards

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Disclosure of conflict of interest

We have no conflicts of interest to disclose.

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