

Original Article

A REVIEW ON PHYTOCHEMICAL CONSTITUENTS OF M.KOENIGII ROOTS: RUTACEAE

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ABSTRACT

In several ancient systems the developing countries used medicinal plants and their bioactive compounds for traditional health care. Herbs have always been the principal form of medicine in the world. Medicinal plants have curative properties due to the presence of many complex chemical substances of different composition that are found as secondary plant metabolites. The nature has given the cure of every disease in one way or another. Therefore, the researchers today are emphasizing on evaluation and characterization of various plants constituents against a number of diseases based on their traditional claims of the plants given in Ayurveda. The M.Koenigii roots are medicinally important herb mainly from Asian origin. The roots of the plant are use as tonic stomach and the juice of the roots is taken to relieve pain associated with kidney.

Aim of the review: The aim of this review is to afford an up to date and comprehensive overview of the chemical constituents, traditional uses, pharmacological activities and safety aspects of M.Koenigii roots. The purpose of the present review is to summarize the research related to chemistry and pharmacological studies of M. Koenigii roots.

Materials and Methods: The efficient review of the literature was carried out and the data under various sections were identified by using a computerized bibliographic search. All abstracts and full-text articles were examined. The most relevant articles were selected for screening and inclusion in this review.

Key findings: Variety of M.Koenigii roots extraction methods has been documented. Over the last decade, there has been a dramatic increase of interest in M. Koenigii roots as a medicinal and nutritional product due to its newly identified potential health effects.

Conclusion: The Ethnopharmacological relevance of M. Koenigii roots are fully justified by the most recent findings indicating that the roots are medicinally helpful for treating a extensive range of human disorders. Further investigations are going to recognize the mode of action of the active constituents and to explore M. Koenigii roots that prevent from diseases.

Keywords: Murraya Koenigii roots, Pharmacological activities.

INTRODUCTION

Plants are one of the most significant sources of medicine. *M. Koenigii* is the native to tropical Asia from Himalaya foothills of India to Srilanka, eastern countries through Myanmar, Indonesia, Southern china. In India it occurs in Foothills of Himalaya, Kerala, Tamil Nadu, Andhra Pradesh and Maharashtra (Narasimhan et-al 1999). India is one of the initiator in the discovery of herbal medicines for the treatment of various diseases. In recent years, many researches have been carried out under medicinal plants in all over the world. More effort to discover potent drugs from botanical species is being made by the phytochemists and botanists. These studies have culminated in the isolation, structure elucidation and synthesis of many biological studies of the compounds. The usages of synthetic drugs much emphasis is being given on herbal medicines because of their ready availability and minimum side effects. The reason in which crude drugs are more potent than the pure drugs is due to the synergetic action of the components present which not only enhance the biological activities but simultaneously cause only lower the toxic effect. Till date, the traditional herbal drugs remain the major sources of the healthcare for more than two-thirds of the world population. The WHO is strongly supporting wider acceptance and use of traditional medicine including Ayurveda and Unani (Barik et-al 1983). Curry plant is an important leafy vegetable. The leaves are widely used in Indian cooking for flavouring food stuffs. Curry plant is native to India. It is available from a large shrub to small tree. Curry leafs are used in many South Indian countries. Natural products and secondary metabolites formed by living systems from the plant origin have shown great potential in treating the human diseases such as cancer, heart diseases and infectious diseases.

Murrya Koenigii spreng in various languages

S.No	Languages	Name
1.	Botanical	Murraya Koenigii
2.	Synonyms	Bergia Koenigii, Chalcas Koenigii
3.	Tamil	Kariveppilei
4.	Telugu	Karapaku
5.	Hindi	Meetha Neem, karripatta
6.	Kannada	Karibevu
7.	Malayalam	Kariveppilei
8.	Sanskrit	Girinimba, Suravi

The 14th global species belonging to the genus *M. Koenigii* only two are available in India *Murraya Koenigii spreng* (Kritikar et-al 1993). The extensive works have been carried out on *M. Koenigii* that is major important and popular for Indian species. An intensive search of the literature has exposed that the roots are the potential sources of carbazole alkaloids. Phytomedicines gain greater importance when compared to synthetic drugs. Plant based drugs are considered to be less toxic and free from adverse effects in comparison to modern allopathic medicine. Ethnobotanical information suggests that about 800 medicine plants possess hypoglycaemic or antibiotic potential and glycosides, alkaloids, terpenoids, carotenoids and flavonoids are effective antidiabetic drugs both in preclinical and clinical studies. Moreover, the clinical efficiency of many existing antibiotics is also being endangered by the emergence of multidrug-resistant pathogens. Therefore, there has been a tremendous increase in the demand for the drugs from natural sources (Ito et-al

2000). Carbazole alkaloids are the major constituent of the plant are known to possess cytotoxic, antioxidative, antimutagenic and antiinflammatory activities (Manfred et-al 1985). The literature review suggests that the plants used in Indian system of medicine treats various disorders like antibacterial, antidiabetic, anticancer etc., (Wealth India CSIR-2003). In the present investigation attempt made to investigate the chemical structure and pharmacological activities of *M.Koenigii* roots. Therefore, the present review summarizes the available literature till date on phytochemical constituents and biological activities. The *M.Koenigii* roots and powder are given in fig.1 (A) and (B) respectively.



Fig. 1: (A) *Murraya Koenigii* roots



(B) *Murraya Koenigii* roots powder

Bioactivities of *Murraya Koenigii* Roots Extract

The *M.Koenigii* roots are broadly used in the treatment of diabetes, obesity, piles, vomiting, diarrhoea, indigestion, dysentery, nausea, to relieve kidney pain etc., Few reports are available on the scientific problem to validate the pharmacological properties of *M.Koenigii*. Some constituents of *M.Koenigii* roots are reported to have anti-fungal activity (Das et-al 1965). Anti-spasmodic and anti-amoebic activity reported by (Kong yang Cheung et-al 1986). Anti-microbial activity was reported by (Ramsewak et-al 1999). Anti-trichomonal activity was reported by (Adewale et-al 2004). Anti-trichomonal, biochemical and toxicological activities of methanolic extract and some carbazole alkaloids are isolated from the leaves of *M.Koenigii* growing in Nigeria. The carbazole alkaloids from *M.Koenigii* in human myeloid cancer cell line HL-60 have been reported (Roy et-al 2004, Ito et-al 2000). The positive ionotropic effect of *M.Koenigii* root extracts reported by (Shah et-al 2010). Since ancient times, plants have been an ideal source of drugs and medicines. Ayurveda and other Indian literature mentioned the use of plants in the treatment of various disorders. India has about 45,000 plant species and among them, several thousand plants have been claimed to possess medicinal properties. Many researches have been conducted in last few years on plants which is mentioned in ancient literature and they are used traditionally for diabetes have shown experimental or clinical anti-diabetic activity.

Traditional Medicinal Uses

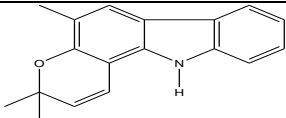
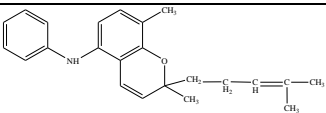
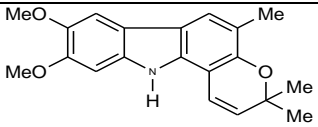
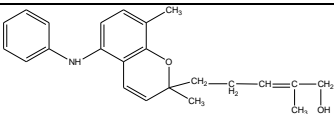
Curry plants are generally used in compensating the calcium deficiency and benefits both the young and old generation. Women who suffer from calcium deficiency, osteoporosis etc., can find the ideal natural calcium supplement in curry leaves. Roots are used as a stimulant and externally to cure eruptions and bites of poisonous animals. Green leaves are eaten rawly for the cure of dysentery, diarrhoea and vomiting. Roots are used traditionally as bitter, curing piles, analgesic, inflammation, anthelmintic, itching and are useful in leucoderma and blood disorders. Fresh leaves, dried leaf powder and essential oil are widely used for flavouring soups, curries, fish dishes, meat dishes, eggs dishes and traditional curry powder blend are used for seasoning, other food preparations etc., The essential oil of curry leaves is also utilized by soap and cosmetic aromatherapy industry. Excellent hair tonic for retaining natural hair tone and stimulating hair growth has been gained by boiling curry leaves with coconut oil till they are reduced to blanket residue.

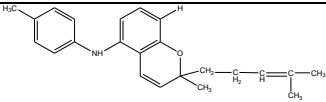
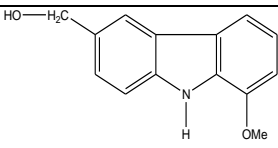
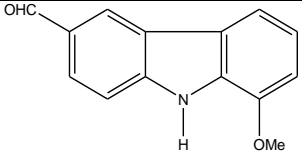
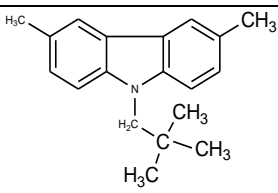
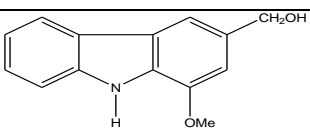
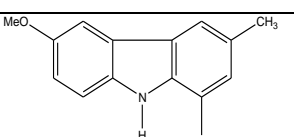
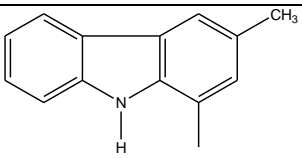
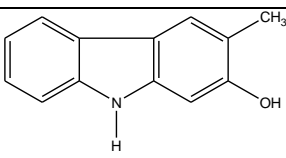
It is traditionally used as a whole or in parts as anti-emetics, anti-diarrheal, febrifuge, blood purifier, anti-fungal, depressant, anti-inflammatory, body aches, for kidney pain and vomiting. Kidney pain can be cured by using the juice of *M. Koenigii* roots. It can be used in preventing premature greying of hair. The *M.Koenigii* roots juice also provides relief from renal pain.

Phytochemical Constituents of *M.Koenigii* Roots

The maximum of hot water soluble extractive 33.45% and 30 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 reviews the constituents of *M.Koenigii* roots extract (Eloff 1998). In this literature review *M. Koenigii* roots extract are indicated the possible structure, melting point and plant part are given in the Table 1.

Table1: Major Compounds isolated from *M. Koenigii* roots

S. No	Name of the compound	Molecular formula	Mol. Wt.	Possible structure	Melting Point	References	Plant Part
1.	Girinimbine	C ₁₈ H ₁₇ NO	263		174° C	Joshi et-al 1970 Adesina et-al 1994 Kureelet-al 1970 Rao et-al 1980 Resisch et-al 1994	Roots
2	Mahanimbine	C ₂₃ H ₂₇ NO	333		94-95 °C	Narasimhan et-al 1975	Roots
3	Koenidine	C ₂₀ H ₂₁ NO ₃	343		142°C	Roy et- al 1974, Narasimhan et-al 1976	Roots
4	Mahanimboline	C ₂₃ H ₂₇ NO ₂	349		170- 172°C	Tachibana et-al 2001	Roots

5	Isomahanimbine	$C_{23}H_{25}NO$	331		142 ⁰ C	Roy et-al 1979	Roots
6	Mukoline	$C_{14}H_{13}NO_2$	227		115-120 °C	Tachibana et-al 2001	Roots
7	Mukolidine	$C_{14}H_{13}NO_2$	227		152-155°C	Bhattacharyya et-al 1989	Roots
8	3,6-dimethyl-1-isopentenyl carbazole	$C_{19}H_{21}N$	283		168 °C	Begam et-al 2005	Roots
9	Koenoline	$C_{14}H_{13}NO_2$	227		130 °C	Fiebig et-al 1985	Roots
10	Glycozoline	$C_{14}H_{13}NO$	231		182-183°C	Adesina et-al 1988	Roots
11	3-methyl Carbazole	$C_{13}H_{11}N$	181		204-206°C	Chakraborty et-al 1997	Roots
12	2-hydroxy-3-methyl carbazole	$C_{13}H_{11}NO$	197		185 ⁰ C	Bhattacharyya et-al 1986	Roots

Pharmacological Activities of M.Koenigii Roots

The pharmacological activities of M.Koenigii roots are reported the extract and their different action and also a number of compounds have been isolated from the part of M.Koenigii roots. A few of them have been studied for their biological activities is given below

1.Antimicrobial activity

Manvi Malwal et-al 2011 reported that in-vitro antimicrobial activities were evaluated against seven pathogenic micro-organism gram positive. The antimicrobial activities of roots of *M. Koenigii* are due to the carbazole alkaloids. In vitro antimicrobial activity extracts against pathogens that justifies the folk medicinal use of curry roots for the treatment of diarrhoea, dysentery and skin eruptions.

2. Antibacterial activity

Darvekar et-al 2011 reported that the essential oil from *M. Koenigii* roots showed antibacterial effect against *B. subtilis*, *Staphylococcus aureus*, *C. pyogenes*, *P. vulgaris* and *P.asteurella multivida*. The pure oil was active against the first three organisms even at a dilution of 1:500. The acetone extract of the roots of *M. Koenigii* on fractions gives three bioactive carbazole alkaloids named as mahanimbine, murrayanol and mahanine which are shown mosquitocidal, anti-microbial and topoisomerase I and II inhibition activities.

3. Antiinflammatory activity

Mahur et-al 2011, Verma et-al 2011 and Gupta et-al 2010 reported that the crude roots extract of *M.Koenigii* shows anti-inflammatory activities. The ethanolic extract of *M.Koenigii* (EEMK) is the most cell stabilization, anti-histaminic effects of EEMK were suggested to suitable mechanisms for its anti-inflammatory action. The ethanolic extract shows significant anti-inflammatory effects as compared with petroleum ether and chloroform extracts.

4. Cytotoxic Activity

Manfred et-al 1985 and Ito et-al 2006 reported the alkaloid koenoline isolated from the roots bark of *M.Koenigii* is found to exhibit cytotoxic activity against KB cell culture system. Carbazole alkaloids isolated from the stem are found to effects the growth of the human leukemia cell line HL-60. Mahanine, Pyrafoline-D and Murrafoline-I Carbazole alkaloids showed significant cytotoxicity effect against HL-60 cells and also induced loss of mitochondrial membrane potential.

5. Anthelmintic Activity

Muhammad lateef et-al 2003, Satyavati et-al 1990, Joshi et-al 2000, Kothari et-al 2000, Ghosh et-al 1985, Krishnamurthy et-al 1981, Vidyarthi et-al 1967 and Martin et al 1985 reported that ethanolic and aqueous extracts from the *M.Koenigii* roots were investigated for their Anthelmintic activity against *Eudrilllus eugeniae*. Several concentrations of each extract were tested in the bioassay, which involved in the determination of paralysis and at the time of death of the worms. Albendazole is the standard reference and normal saline as control. Sample for the Anthelmintic activity was prepared by dissolving the dried extract in 1% gum. Five groups approximately equal size earthworm consisting of six worms in each group were released in 50 ml of desired formulation normal saline.

CONCLUSION

M. Koenigii roots exhibit a high and magnificent gained a wide acceptance for their pharmacological activities. The *M.Koenigii* roots extract is prevalent in a variety of cultures to cure common disorders without any consideration to its phytochemical profile, toxicological limit, safety verification and clinical are needed prior to its pharmacological exploitation by modern medicine. The extensive work has been carried out on *M.Koenigii* roots that are major important and popular for Indian species. An intensive search of the literature has revealed that the roots are the potential sources of carbazole alkaloids. These results show that the roots extract can be used to formulate bioactivity compositions.

However, further investigation with purified fractions is required to the specific molecules which are responsible for the biological activity and also used in the synthesis of *M. Koenigii* roots.

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