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Phytochemical Analysis And Anti-Microbial Screening Of Murraya Koenigii Leave Extract

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Abstract - Murraya koenigii (curry leaf), a member of the Rutaceae family, is widely used in traditional medicine due to its rich phytochemical composition and therapeutic properties. This review summarizes existing research on the phytochemical constituents and antimicrobial potential of M. koenigii leaves. Various studies have identified alkaloids, flavonoids, terpenoids, and phenolic compounds in its extracts, which contribute to its antibacterial, antifungal, and antioxidant effects. The antimicrobial activity of M. koeni gii has been tested against pathogens such as Staphylococcus aureus, Escherichia coli, and Candida albi cans, demonstrating significant inhibitory effects. This paper consolidates findings from multiple studies to highlight the plant's medicinal value and potential applications in pharmaceutical and food preserva tion industries. A comparative antimicrobial activity of dried leaf extracts of M. koenigii were evaluated against two gram negative bacterial strains namely Escherichia coli and Pseudomonas aeroginosa and two clinical fungal pathogens namely Candida albicans and Aspergillus niger by agar cup method. The leaf extracts of M. koenigii was found to have high antibacterial activity than anti fungal activity. The results suggest that the leaves are a rich source of valuable primary and secondary metabolites exhibiting the antimicrobial activity.

Keywords: Murraya koenigii, Phytochemicals, Antimicrobial Activity, Curry Leaf, Rutaceae

Introduction -Murraya koenigii; commonly called Curry leaves occurs throughout India up to an altitude of 1500 metres (Vats, M et al., 2011) [1]. The leaves of the plant are used as a natural medicinal as well as flavouring agent. Due to presence of natural antioxidants different extracts of this plant are utilized as; therapeutic drugs (Tamokou, J.D., et al., 2013 and Saafi-Ben Salah, E.B., et al., 2012) [2, 3], food preservatives (Preethi, R., et al., 2010) [4] and pharmaceuticals (Srivastava, A., et al., 2006) [5]. Herbal drugs are often used as antimicrobial, but the problem of bacterial resistance is growing rapidly. Recent interest in natural remedies has increased, especially in regard to alternative and natural products. Murraya koenigii, one of them, also plays a significant role because it possesses a number of therapeutic and pharmacological qualities that work directly against antibiotics and microbes. M. koenigii is a well-known leafy spice that's utilized in Asian-Indian dishes as a preservative. Because of its unique aroma, the smaller

quantity of M. koenigii is sufficient for usage (Das, A.K., et al., 2011) [6]. M. koenigii has also been found to have therapeutic potential in addition to its apparent usefulness in diet (Shruthi, S.D. et al., 2012). The leaves contain bioactive compounds such as carbazole alkaloids, flavonoids, and essential oils, which contribute to their pharmacological effects. Increasing antibiotic resistance has necessitated the search for natural antimicrobial agents, and M. koenigii presents a promising candidate. This review compiles existing literature on its phytochemical composition and antimicrobial efficacy.

PLANT PROFILE-

CURRY LEAVES

SCIENTIFIC CLASSIFICATION-

Kingdom:	**Plantae**
Clade:	**Tracheophytes**
Clade:	**Angiosperms**
Clade:	**Eudicots**
Clade:	**Rosids**
Order:	**Sapindales**
Family:	**Rutaceae**
Genus:	***Bergera***
Species:	***B. koenigii***

Murraya Koenigii commonly known as **curry tree**, **curry bush** or **sweet neem**, is a tree in the citrus family Rutaceae, first described by Carl Linnaeus in 1767. It is native to the Indian subcontinent, southern China and mainland Southeast Asia, and it has been introduced to other parts of southeast Asia and to Australia. Its leaves are used in many culinary dishes in India, Sri Lanka and Bangladesh.

Plant Collection and Processing-

in their Fresh leaves of *Murraya* were collected from local nursery. The collected leaves were shade-dried and pulverized into a fine powder using an electric blender. The powdered samples were stored in airtight containers until further use.

Preparation of leaves extracts –

Collected plant material was shadow dried; leaves were converted in the form of powder with the help of mortar and pestle. Powder was poured into the conical flask, where it was mixed with ethanol, methanol, and distilled water individually and kept for 1 week. Then Whatman's No. 1 filter paper was used to filter it. The extracts were concentrated in a water bath that was kept at 65°C until it had been reduced to 1/4 of its original volume. According to protocol, extracts were re suspended respective solvents (Sinha, A., et al., 2021)

Phytochemical Analysis-

Qualitative phytochemical screening of the methanolic extract was performed following the method described by . The following tests were conducted:

- **Test for Tannins:** To 2 ml of extract, 2 ml of distilled water and a few drops of ferric chloride solution were added. A blue-black or greenish colour indicated the presence of tannins.
- **Test for Saponins:** 3 ml of extract was mixed with 3 ml of distilled water and shaken vigorously. Formation of persistent foam upon heating indicated the presence of saponins.
- **Test for Flavonoids:** To 1 ml of extract, 1 ml of 10% lead acetate solution was added. No colour change was observed, indicating absence of flavonoids.
- **Test for Alkaloids:** 3 ml of extract was mixed with 3 ml of 1% HCl in a hot water bath. The solution was divided into two test tubes; 1 ml of Mayer's reagent was added to one. Formation of a buff-coloured precipitate confirmed the presence of alkaloids.
- **Test for Terpenoids:** 2 ml of extract was dissolved in 2 ml of chloroform and evaporated to dryness. Concentrated H_2SO_4 (2 ml) was added, and the mixture was heated for 2 minutes. No characteristic colour change was observed, indicating absence of terpenoids.
- **Test for Steroids:**
  - *Salkowski's Test:* 2 ml of extract was dissolved in 2 ml of chloroform, followed by addition of 2 ml concentrated H_2SO_4. Formation of a red colour in the chloroform layer indicated the presence of steroids.
  - *Liebermann's Test:* (details can be added if performed).
- **Test for Phenols:** 1 g of extract was dissolved in 5 ml of distilled water and treated with 5% ferric chloride solution. Formation of a dark green colour confirmed the presence of phenolic compounds.

In vitro antimicrobial activity of Murraya koenigii -The stock solutions for the leaves were prepared at a concentration of 300 mg/ml. Serial dilution was used to obtain concentrations of 300 mg/ml, 200 mg/ml,

100 mg/ml, 50 mg/ml, 25 mg/ml, 12.5 mg/ml, 6.25 mg/ml, 3.125 mg/ml, and 1.562 mg/ml. A spreader was used to equally distribute 25 to 50µl of each organism onto nutrient agar plates, which had been prepared. The inoculum was always freshly produced before the experiment began. Each plate was incubated for 24 hours at 37°C after 25µl of each of the aforementioned concentrations of leaves extract were added to each plate. After 24-48 hours, readings were taken of the clear zones of culture growth inhibitions surrounding the discs containing leaf extract of Murraya.

Antimicrobial Test

1. Preparation of Active Bacterial Cultures

A single colony of pure bacterial culture was inoculated into 50 mL of nutrient broth in a 150 mL conical flask and incubated for 8–12 hours at 37°C.

2. Preparation of Sample Concentrations

- **Powdered samples:** Dissolved in 1 mL of an appropriate solvent (water/methanol/DMSO, etc.), then aliquoted into different concentrations for MIC assay.
- **Liquid samples:** Used directly or diluted with water/solvent as required.

3. Antibacterial Assay

The **pour plate method** was used.

- 1% of active bacterial culture was mixed into autoclaved agar medium just before solidification and poured into plates.
- **Test organisms:** *Staphylococcus sp.* (Gram-positive) and *Escherichia coli* (Gram-negative).
- Wells were made using a sterile borer, and 100 µL of each sample was loaded. Plates were incubated at 37°C for 18–24 hours.

RESULTS & DISCUSSION-

Extractive value- Hydroalcoholic extract of *M. koenigii* L was prepared by adding 60 g powdered leaves in methanol and water (7:3) by maceration process. The extractive value came out to be 13.32 & w/w.

Preliminary phytochemical screening-

A variety of phytochemicals, including flavonoids, alkaloids, cardiac glycosides, carbohydrates, proteins and amino acids, phenols, saponin, terpenoids, and tannins, were screened in an aqueous extract of *M. koenigii* L leaves. Table 1 displays the findings of the qualitative phytochemical analysis of the aqueous extracts of *M. koenigii* L. Rashmi and Naveen observed similar findings about the presenceof phytochemicalssuchas carbohydrates,alkaloids,phenols,terpenoids,andtanninsintheaqueousextractsof *M.koenigii* L L(Rashmi & Naveen, 2016). The phytochemicals in the aqueous leafextract of *M. koenigii*L wereexamined by Farooq et al(Farooq et al, 2019), who reported the presence of flavonoids, carbohydrates, phenolic compounds, saponin, lipids, and fixed oils. Various phytochemicals were reported to be present in *M. koenigii* Lbya number of writers (Prabakaran et al, 2013; Pujan et al, 2019).

Table1: Phytochemical analysis of *Murraya koenigii* L leaves aqueous extract

Phytochemicals	Hydro alcoholic leaf extract
Alkaloids	+
Carbohydrates	+
Cardiacglycosides	-
Flavonoids	+
Phenol	+
Aminoacids&Proteins	+
Saponins	-
Tannins	+
Terpenoids	-

Anti microbial activity of *Murraya koenigii* L extract

The antimicrobial activity of the *M. koenigii* L extract was evaluated against *Pseudomonas aeruginosa* and *Staphylococcus aureus* bacteria by agarwell diffusionmethod. From the results itwas observedthatzoneof inhibition of *M. koenigii* L extractcame out to be27 mmat at a concentrationof100 mg/ml andthat ofthestandarddrugAmpicillinwas foundtobe18mmat a concentration of50 µg/mL.Extractsfrom*M.koenigii* Lhave shownantibacterialpropertiesagainstabroadrangeof microorganisms (Panghaletal,2011; Abuga et al, 2020). Several carbazole alkaloids found in theextracts of *M. koenigii* L are responsibleforthis characteristic(Jain et al, 2017; Verma, 2018).

Concentrationof extract (mg/ml)	Zoneofinhibition(mm)	
	P.aeruginosa	***S.aureus***
100	27	27
50	18	18
25	-	-
Control	-	-
Ampicillin(50µg/mL)	19	18

CONCLUSION-

The current studydemonstrated good antimicrobial and antioxidant efficacyof *M. koenigii* L. Polyphenols, alkaloids,flavonoids, and terpenoids are among the bioactive substances found in *M. koenigii* L leaf extract that may be in charge of inhibiting infections. *M. koeniigi* Lcan thus be used as an efficient antibacterial agent in novel medications to treat various bacterial infections brought on by *Staphylococcus aureus* and *Pseudomonas aeruginosa*. However, more research is required to understand the molecular mechanisms underlying the roles of different elements in antimicrobial inhibition and radical scavenging, as well as experimental studies on bioavailability and clinical investigation efficiency enhancement.

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