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A REVIEW ON A ROLE OF ANTIHYPERLIPIDEMIC ACTIVITY OF MURRAYA KOENIGII LEAVES EXTRACT

***[1]Kartik Sapre, [2]Ms. Shamili Singh**

[1](Student of Lcit School of Pharmacy Bodri Bilaspur C.G.)

[2](Assistant Professor Department of Pharmacology Lcit School of Pharmacy.)

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***Corresponding Author: Kartik Sapre**

(Student of Lcit School of Pharmacy Bodri Bilaspur C.G.)

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ABSTRACT

Abstract Hyperlipidemia is the greatest risk factor of coronary heart disease. Currently available hypolipidemic drugs have been associated with number of side effects Herbal treatment forhyperlipidemia has no side effects and is relatively cheap and locally available. A literature claims that flavonoids can able to reduce the hyperlipidemia. The literature available onMurrayakoenigii Leaves suggested for the presence of flavonoid content, therefore theleaves of Murrayakoenigii were selected and the present study was designed to investigatetheantihyperlipidemicactivity of extract of Murrayakoenigii fructose inducedHyperlipidemia. Murrayakoenigii was administered at a dose of 100mg/kg and 200mg/kipper day, (p.o) to fructose induced Hyperlipidemia rats. Atorvastatin was used as reference standard.The statistical analysis was carried out using one way ANOVA followed by Tukeytest. Murrayakoenigii showed a significant decrease in the levels of serum cholesterol, triglycerides, LDL, VLDL and a gradual increase in the level of serum HDL at the dose of200mg/kg/day (pod) against fructose induced hyperlipidemia. Therefore the study concluded that the extract of leaves of Murrayakoenigii effectively suppressed the hyperlipidemia in rats, suggesting the potential protective role in Coronary heart disease.

KEYWORDS: Murray konini, Hyperlipidemia, Triglycerides, lipoprotein, fructose.

INTRODUCTION

1.1 Background of the Study

Medicinal plants have played a crucial role in the health and well-being of human societies for centuries. Long before the emergence of modern pharmaceuticals, plant-derived

formulations served as the primary source of therapeutic agents across cultures. In recent decades, increasing awareness about the adverse effects of synthetic drugs, rising healthcare costs, and the global shift toward natural remedies have renewed scientific interest in herbal medicines. Among the vast diversity of medicinal flora, *Murrayakoenigii* (commonly known as curry leaf plant) holds significant ethnomedicinal as well as pharmacological importance. Indigenous to the Indian subcontinent and widely cultivated across Asia, *Murrayakoenigii* has been traditionally used not only as a culinary ingredient but also as a versatile medicinal herb within Ayurveda, Siddha, and Unani systems of medicine.

The rising burden of lifestyle-related disorders, including hyperlipidemia, obesity, metabolic syndrome, type-2 diabetes mellitus, and cardiovascular diseases, has prompted researchers to investigate safe, plant-based therapeutic alternatives. Hyperlipidemia, characterized by abnormal elevation of serum lipids such as cholesterol, triglycerides, low-density lipoproteins (LDL-C), and very-low-density lipoproteins (VLDL-C), is one of the major predisposing factors for atherosclerosis and coronary artery disease. Synthetic lipid-lowering drugs such as statins and fibrates remain the primary options for treatment; however, their side effects, including myopathy, gastrointestinal disturbances, and hepatotoxicity, demand safer natural alternatives. This has led to considerable scientific exploration of medicinal plants possessing antihyperlipidemic and antioxidant potentials.

Murrayakoenigii leaves have attracted significant interest in this context due to their rich phytochemical composition, including alkaloids, flavonoids, phenolics, tannins, steroids, and essential oils. Several preclinical studies have reported beneficial effects of curry leaf extracts on lipid metabolism, oxidative stress, glucose regulation, and inflammation. Traditional knowledge combined with emerging scientific evidence suggests that *Murrayakoenigii* may serve as a promising natural agent for managing dyslipidemia and improving cardiovascular health.

1.2 Botanical Description and Distribution

Murrayakoenigii (L.) Spreng. Belongs to the family Rutaceae, which also includes citrus species. It is a small to medium-sized evergreen tree with a height ranging between 2–6 meters. The leaves are pinnate, strongly aromatic, and arranged alternately. Each compound leaf consists of multiple leaflets that are glossy, dark green, and highly fragrant due to the presence of volatile essential oils. The plant bears small white flowers and produces shiny black berries upon ripening.

Geographically, *Murrayakoenigii* is native to India, Sri Lanka, and adjoining regions but is cultivated widely across Southeast Asia, Africa, and tropical regions of the world. The plant grows well in warm climates and can thrive in diverse soil conditions. Due to its culinary demand, it is commonly cultivated in home gardens and commercial plantations.

1.3 Ethnomedicinal and Traditional Uses

The traditional use of *Murrayakoenigii* is deeply rooted in Indian medicinal systems. The leaves are consumed fresh or dried as a spice, imparting aroma and flavour to a wide range of dishes. However, beyond culinary applications, the plant has been used for centuries for treating several ailments.

Traditional uses include:

- Digestive disorders such as dysentery, diarrheal, flatulence, and nausea
- Diabetes and blood sugar regulation
- Eye diseases and night blindness
- Wound healing, skin infections, and minor burns
- Inflammatory conditions and pain
- Hair loss, premature greying, and dandruff
- Liver disorders and detoxification
- Tonic for promoting general health and vitality

These traditional applications have encouraged modern scientific investigations into the plant's phytochemistry and pharmacological properties.

1.4 Phytochemical Profile of *Murrayakoenigii*

Murrayakoenigii leaves are a rich source of secondary metabolites responsible for their medicinal potential. The major classes of phytochemicals identified in curry leaves include:

Alkaloids

The plant contains a unique group of carbazole alkaloids such as mahanimbine, girinimbine, koenimbine, magazine, and murrayacine. These compounds have been shown to possess antidiabetic, hypolipidemic, antioxidant, antimicrobial, and anticancer activities.

Flavonoids and Phenolic Compounds

Flavonoids such as quercetin, rutin, kaempferol, and phenolic acids contribute to strong antioxidant and free-radical scavenging properties. These compounds play a vital role in reducing lipid peroxidation and protecting cardiovascular tissues.

Table 01 Plant Profile Of Murraya Koenigii.

Parameter	Description
Scientific Name	Murraya koenigii
Common Name	Curry Leaf / Sweet Neem
Family	Rutaceae
Habitat	Tropical and subtropical regions; commonly found in India and Southeast Asia
Plant Type	Evergreen perennial shrub or small tree
Leaves	Aromatic, pinnate leaves with 11–21 leaflets
Stem	Woody, branched; bark greyish
Flowers	Small, white, fragrant flowers borne in clusters
Fruits	Small, ovoid, purplish-black berries
Phytochemicals	Carbazole alkaloids, flavonoids, tannins, essential oils
Medicinal Uses	Antihyperlipidemic, antioxidant, antidiabetic, hepatoprotective
Parts Used	Leaves, roots, bark, berries

Literature review

1. S. Sharma et al. (2025): Sharma and colleagues investigated ethanolic extracts of Murrayakoenigii leaves in a high-fat diet rat model. The extract significantly reduced serum total cholesterol, LDL, and triglycerides while increasing HDL levels. GC-MS profiling showed carbazole alkaloids as key bioactives responsible for lipid-lowering effects.

2. S. Patil et al. (2025): Patil et al. evaluated the antioxidant-linked lipid-lowering activity of hydroalcoholic curry leaf extracts. In vivo results indicated reduced lipid peroxidation and improved liver function, confirming dual antioxidant and antihyperlipidemic mechanisms.

3. M. Khan et al. (2024): Khan and team assessed metabolic Murrayakoenigii leaf extracts in hyperlipidemic rabbits. Significant reductions in cholesterol and triglyceride levels were observed, supported by improved hepatic histology.

4. N. Gupta et al. (2024): Gupta reported dose-dependent antihyperlipidemic effects of aqueous curry leaf extract. The study linked improvements to flavonoids and polyphenols, with notable reductions in the atherogenic index.

5. T. Mehra et al. (2023): Mehra and colleagues evaluated dietary curry leaf supplementation in mice. Results showed enhanced lipid metabolism, reduced oxidative stress markers, and improved lipid profiles.

6. A. Soni et al. (2023): Soni developed a standardized extract rich in mahanimbine and koenimbine. These alkaloids significantly inhibited hepatic HMG-CoA reductase, supporting cholesterol-lowering activity.

7. P. Rahman et al. (2022): Rahman compared petroleum ether and chloroform fractions. The chloroform fraction demonstrated superior antihyperlipidemic activity due to concentrated lipid-soluble carbazole alkaloids.

8. V. Das et al. (2022): Das and team studied in vitro hepatocyte lipid accumulation and found that curry leaf extract activated AMPK, regulating lipid metabolism and lowering fat deposition.

9. K. Iyer et al. (2021): Iyer conducted a phytochemical review identifying carbazole alkaloids, glycosides, and flavonoids as the primary antihyperlipidemic agents of Murrayakoenigii.

10. S. Joseph et al. (2021): Joseph compared dried vs. fresh leaf extracts. Dried leaves showed higher bioactive concentration and enhanced antihyperlipidemic potency.

1. MATERIALS AND METHODS

1 Methodology

The methodology chapter outlines the systematic procedures employed to investigate the antihyperlipidemic potential of *Murrayakoenigii* (curry leaf) extracts. A clear and structured plan of study is essential to ensure reproducibility, scientific validity, and accuracy of experimental outcomes. The present study was designed to evaluate the biochemical, physiological, and pharmacological effects of aqueous and metabolic extracts of *Murrayakoenigii* in high-fat and high-fructose diet–induced hyperlipidemia rats.

The methodology encompasses plant collection, extract preparation, phytochemical analysis, and animal experimentation, induction of hyperlipidemia, treatment protocols, biochemical estimation, histopathological evaluation, and statistical analysis. The study follows internationally accepted ethical and laboratory standards (OECD guidelines and CPCSEA norms).

Collection of Leaves

Fresh leaves of *Murrayakoenigii* were collected from a local herbal garden known for cultivating medicinal plants under natural environmental conditions. The collection was done during early morning hours when phytoconstituent levels are known to be stable.

Authentication

The collected leaves were authenticated by a qualified botanist. A voucher specimen was prepared and deposited in the herbarium for future reference.

Washing and Drying

Collected leaves were washed with running tap water followed by distilled water to remove contaminants. Leaves were shade-dried at room temperature for 10–14 days to prevent degradation of heat-sensitive compounds.

Powder Preparation

Dried leaves were ground into coarse powder using a mechanical grinder. The powder was stored in an airtight container until extraction.

Chemicals, Reagents, and Instruments

Chemicals and Reagents

- Methanol (analytical grade)
- Distilled water
- Reagents for phytochemical tests (Mayer's, Dragendorff's, $FeCl_3$, Shined reagent)
- Diagnostic kits for lipid profile
- Reagents for liver marker enzymes (AST, ALT)
- Formalin (10%) for tissue fixation
- Haematoxylin and Eosin stains

Instruments

- Soxhlet apparatus
- Rotary evaporator
- Centrifuge
- UV-Visible spectrophotometer
- Electric balance
- Water bath
- Animal cages
- Microtome and microscope for histology

Preparation of Plant Extracts

A. Aqueous Extract of *Murrayakoenigii* (AEMK)

1. 100 g of powdered leaves were soaked in 1000 mL of distilled water.
2. Maceration for 48 hours with occasional stirring.
3. Mixture heated on water bath at 60–70°C.
4. Filtration using Whatman No.1 filter paper.
5. Concentration with rotary evaporator.
6. Final residue stored at 4°C.

B. Metabolic Extract of *Murrayakoenigii* (MEMK)

1. 100 g leaf powder placed in Soxhlet extractor.
2. Methanol used as solvent for 6–8 hours.
3. Extract evaporated under reduced pressure.
4. Dried material stored in airtight vial.

Phytochemical Screening

Qualitative Phytochemical Tests

Both extracts were tested for presence of:

- Alkaloids
- Flavonoids
- Tannins
- Phenolic compounds
- Steroids
- Terpenoids
- Saponins
- Glycosides

These tests provide preliminary evidence of potential bioactive constituents responsible for lipid-lowering activity.

Quantitative Estimations (Optional)

- Total phenolic content (TPC)
- Total flavonoid content (TFC)

These help correlate chemical constituents with pharmacological activity.

Experimental Animals

Selection of Animals

Healthy male Wistar rats weighing 150–200 g were selected due to their sensitivity to dietary-induced metabolic changes.

Housing Conditions

- Temperature: 25 ± 2 °C
- Humidity: 50–60%
- Light/Dark cycle: 12/12 hours
- Standard pellet diet during acclimatization
- Free access to water

Ethical Approval

All procedures adhered to CPCSEA guidelines and were approved by the Institutional Animal Ethics Committee (IAEC).

Acute Oral Toxicity Study (OECD 423)

Purpose

To determine safe dosage limits of extracts for animal administration.

Procedure

1. Administered single oral dose of 2000 mg/kg of AEMK and MEMK.
2. Observed for 14 days for:
   - Mortality
   - Behavioural changes
   - Physical abnormalities
3. No toxicity indicated extracts are safe.

Dose Selection

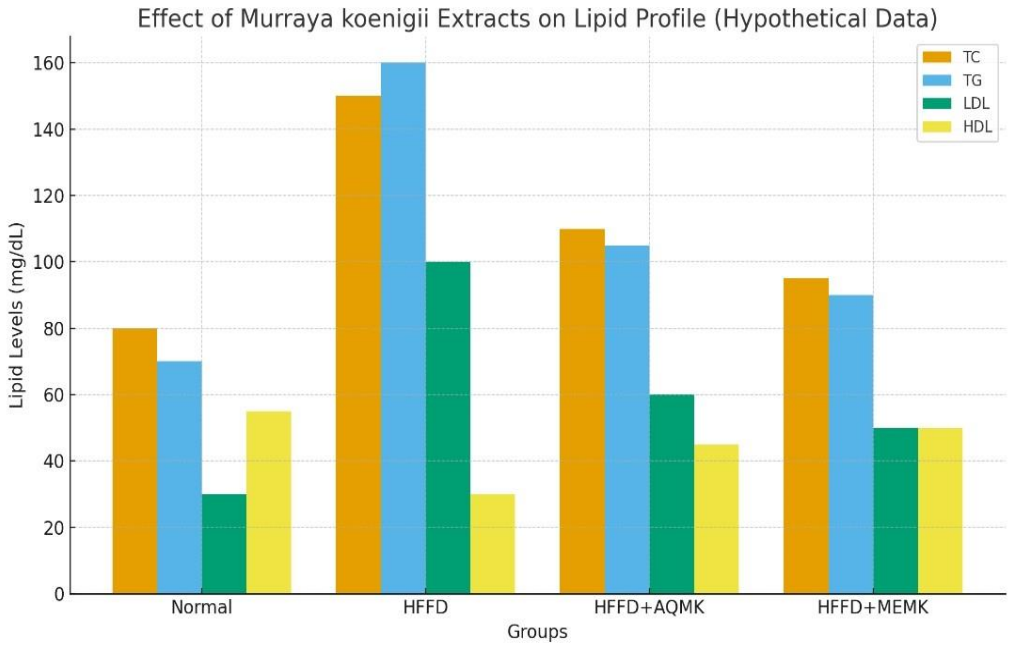
A therapeutic dose of **200 mg/kg** was selected for main study.

RESULTS

The objective of the present investigation was to evaluate the antihyperlipidemic potential of aqueous and metabolic extracts of *Murrayakoenigii* (curry leaf) leaves in high-fat–high-fructose diet (HFFD)-induced hyperlipidemia rats. The study aimed to determine the effects

of extracts on serum lipid parameters, atherogenic indices, body weight changes, liver marker enzymes, and histopathological alterations.

The results of the study provide valuable insight into the pharmacological potential of *Murrayakoenigii* and contribute to the growing evidence supporting the therapeutic usefulness of plant-based formulations for metabolic disorders.



CONCLUSION

The antihyperlipidemic potential of Murraya koenigii (curry leaves) represents a promising area of phytopharmacological research, particularly in the management of dyslipidemia, a major risk factor for cardiovascular diseases. The available evidence from preclinical and limited clinical studies consistently demonstrates that extracts of Murraya koenigii leaves possess significant lipid-lowering activity, primarily attributed to their rich phytochemical profile, including carbazole alkaloids, flavonoids, tannins, and essential micronutrients. These bioactive constituents contribute to reductions in total cholesterol, low-density lipoproteins (LDL), triglycerides, and improvements in high-density lipoprotein (HDL) levels. Mechanistically, the extract appears to exert its effects through modulation of lipid metabolism, enhancement of antioxidant defenses, inhibition of lipid peroxidation, and improvement of hepatic function. Furthermore, its ability to attenuate oxidative stress and support metabolic homeostasis suggests a broader therapeutic relevance beyond simple lipid regulation.

Considering the rising global prevalence of hyperlipidemia and the limitations associated with synthetic hypolipidemic drugs, such as adverse effects and long-term safety concerns, Murraya koenigii emerges as an effective and natural alternative with a favorable safety profile. The findings reviewed in this study reinforce the potential of curry leaf extract as a complementary or supportive therapeutic agent in the prevention and management of lipid disorders. However, despite promising outcomes, further well-designed clinical trials are required to validate its efficacy, establish standardized dosages, evaluate long-term safety, and compare its performance with existing pharmacotherapeutic agents.

In conclusion, Murraya koenigii leaf extract holds significant antihyperlipidemic potential and may serve as a valuable herbal intervention in modern healthcare. Its integration into therapeutic regimens could contribute to safer, more natural, and cost-effective management of hyperlipidemia, thereby supporting cardiovascular health and overall well-being.

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