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Research Paper

Phytochemical, Pharmacognostic and Pharmacological Evaluation of *Madhuca longifolia* (Koen.) Flowers for Diuretic Activity

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ABSTRACT

Background: Medicinal plants are widely used in traditional healthcare systems. *Madhuca longifolia* is traditionally known for its therapeutic applications including urinary disorders. Objective: The present study aimed to evaluate pharmacognostic parameters, phytochemical constituents, antioxidant potential, chromatographic profile, and diuretic activity of ethanolic extract of *Madhuca longifolia* flowers. Methods: Shade dried flowers were subjected to physicochemical evaluation, Soxhlet extraction, qualitative and quantitative phytochemical screening, TLC/HPTLC fingerprinting, in-vitro antioxidant studies, and in-vivo diuretic activity using Lipschitz model in Wistar rats. Results: The extract showed significant presence of flavonoids, tannins, phenolics, alkaloids and saponins. Dose dependent increase in urine volume and electrolyte excretion was observed. Conclusion: The study scientifically validates traditional claims and supports the use of *Madhuca longifolia* as a potential natural diuretic agent

INTRODUCTION

Medicinal plants form the backbone of traditional systems of medicine across the world. Diuretics are drugs that increase urine output and are commonly prescribed for hypertension, edema, congestive heart failure and renal disorders. Synthetic diuretics often produce adverse effects such as electrolyte imbalance and dehydration,

necessitating safer alternatives. *Madhuca longifolia* (Mahua) is an important Indian medicinal tree belonging to family Sapotaceae. Flowers of this plant are traditionally used for urinary complaints, inflammation and metabolic disorders.

2. Literature Review

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Various researchers have reported significant pharmacological activities of *Madhuca longifolia*. Study 1 demonstrated presence of flavonoids, phenolic compounds and triterpenoids which are responsible for antioxidant and diuretic properties. Previous studies also indicate nephroprotective, anti-inflammatory and hypoglycemic potential of the plant extract.

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3. Materials and Methods

3.1 Plant Material and Authentication

The flowers were procured from certified supplier and authenticated by a qualified botanist. Voucher specimen was deposited for future reference.

3.2 Physicochemical Evaluation

Moisture Content was determined using standard pharmacopoeial procedures.

Total Ash was determined using standard pharmacopoeial procedures.

Acid Insoluble Ash was determined using standard pharmacopoeial procedures.

Water Soluble Ash was determined using standard pharmacopoeial procedures.

Alcohol Soluble Extractive was determined using standard pharmacopoeial procedures.

3.3 Extraction Procedure

Shade dried powdered flowers were subjected to Soxhlet extraction using ethanol for 6–8 hours. The extract was concentrated under reduced pressure and stored in desiccator.

3.4 Phytochemical Screening

Presence of Alkaloids was confirmed using standard qualitative chemical tests.



Presence of Flavonoids was confirmed using standard qualitative chemical tests.

Presence of Tannins was confirmed using standard qualitative chemical tests.

Presence of Phenolics was confirmed using standard qualitative chemical tests.

Presence of Saponins was confirmed using standard qualitative chemical tests.

Presence of Steroids was confirmed using standard qualitative chemical tests.

Presence of Glycosides was confirmed using standard qualitative chemical tests.

3.5 Quantitative Estimation

Total Phenolic Content (Folin-Ciocalteu) was performed using UV-Visible spectrophotometry.

Total Flavonoid Content (Aluminium Chloride Method) was performed using UV-Visible spectrophotometry.

Total Tannin Content (Folin-Denis Method) was performed using UV-Visible spectrophotometry.

Total Alkaloid Content (BCG Method) was performed using UV-Visible spectrophotometry.

Total Carbohydrate (Phenol Sulphuric Acid Method) was performed using UV-Visible spectrophotometry.

3.6 TLC and HPTLC Fingerprinting

Chromatographic separation was carried out using silica gel plates with Toluene: Ethyl acetate: Formic acid (5:4:1) as mobile phase. R_f values were recorded and densitometric scanning was performed at 254 nm.

3.7 In-vitro Antioxidant Activity

DPPH Radical Scavenging Assay was performed to evaluate antioxidant potential of the extract.

Ferric Reducing Power Assay was performed to evaluate antioxidant potential of the extract.

Hydrogen Peroxide Scavenging Assay was performed to evaluate antioxidant potential of the extract.

3.8 Pharmacological Evaluation – Diuretic Activity

Diuretic activity was evaluated using Lipschitz model in Wistar rats. Animals were divided into five groups (n=6). Control received saline, standard received furosemide (15 mg/kg), and test groups received extract (100, 200, 400 mg/kg). Urine volume and electrolyte excretion were measured over 7 hours.

4. Results

Organoleptic Evaluation

The organoleptic evaluation demonstrated significant findings indicating quality, purity and pharmacological potential of the plant extract. Data showed dose dependent response in experimental models.

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TLC/HPTLC Profile

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Antioxidant Activity

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Diuretic Activity

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DISCUSSION

The findings of the present investigation correlate with previous reports indicating presence of bioactive flavonoids and phenolics. Section 1 discusses possible mechanisms involving modulation of renal transporters, RAAS pathway and antioxidant mediated protection.

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CONCLUSION

The ethanolic extract of *Madhuca longifolia* flowers demonstrated significant diuretic and antioxidant activity. The presence of secondary metabolites justifies its traditional use. Further clinical studies are recommended.

FUTURE SCOPE

Future research should focus on isolation of active constituents, detailed mechanism of action studies,



toxicity evaluation, and clinical validation for development of standardized herbal diuretic formulation.

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1. The present study entitled “Phytochemical Analysis and Pharmacological Evaluation of *Madhuca longifolia* for its Potential Diuretic Activity” was carried out to evaluate the diuretic activity of *Madhuca longifolia*.
2. The introduction describes the kidney, diuretics, types, mechanisms, adverse effects, and the need for herbal diuretics. The plant profile of *Madhuca longifolia*, its traditional uses, and phytoconstituents were reviewed.
3. Morphological and microscopical evaluation of *Madhuca longifolia* was performed. Preliminary phytochemical screening revealed the presence of proteins, carbohydrates, phenols, flavonoids, tannins, alkaloids, and steroids.
4. Quantitative estimations confirmed significant amounts of flavonoids, tannins, phenols, carbohydrates, and alkaloids.
5. TLC fingerprinting showed distinct spots confirming the presence of flavonoids.
6. HPTLC analysis of *Madhuca longifolia* extract showed multiple clear spots with distinct R_f values, confirming the presence of various Flavonoids. This provides a fingerprint profile for its standardisation and quality control.
7. The *Madhuca longifolia* extract showed moderate to strong antioxidant activity in DPPH, ferric ion reduction, and H₂O₂ assays. Its free radical scavenging potential supports renal protection and overall therapeutic efficacy.
8. Pharmacological evaluation indicated that ethanolic extract of *Madhuca longifolia* exhibited significant diuretic activity by increasing urine volume and electrolyte

excretion (Na⁺ and K⁺) in experimental Wistar rats, comparable to standard drug furosemide.

9. The diuretic activity may be attributed to the presence of polyphenolic compounds, especially flavonoids and phenolics, supporting the traditional claim of *Madhuca longifolia* as a diuretic agent.

Future scope

1. Isolation of phytoconstituents HPTLC with various marker
2. Formulation of suitable dosage form
3. Standardization of formulation.

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