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Ethnobotanical insights and pharmacological assessment of the vulnerable species *Chloroxylon swietenia*

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Abstract:

Since ancient times, plants have been used to treat diseases and promote health and well-being. Plant biodiversity serves as a valuable source of medicines and offers direct economic benefits through timber, food, fibre, industrial enzymes, flavors, cosmetics, emulsifiers, dyes, plant growth regulators, biopesticides, and biofertilizers. Secondary metabolites such as alkaloids, saponins, quinones, indoles, anthraquinones, terpenoids, flavonoids, phenolic compounds, and amino acids are stored in plant cells and possess therapeutic properties. These compounds also serve as phytochemical markers for identifying authentic drugs.

Chloroxylon swietenia(East Indian satin wood) was analysed for secondary metabolites using standard methods by Harborne (1973), Gibbs (1974), Kokate (2001), and Khandelwal (2006), followed by pharmacological assessments. Methanolic extracts of its leaves were tested for diuretic property. Results were reported as mean ± standard deviation (SD) based on five replicates. Statistical analysis involved one-way and two-way ANOVA, with Scheffe's post hoc and Dunnett's tests using Statistical Analysis System (SAS V25), considering $p < 0.05$ as significant. Preliminary phytochemical screening of this ethnomedicinal plant revealed the presence of a diverse array of therapeutically valuable compounds, including saponins, alkaloids, terpenoids, steroids, lignins, tannins, indoles, anthraquinones, anthocyanidins, phenolic compounds, flavonoids, and lipid-based constituents. Preliminary qualitative tests revealed that methanolic extract does not have glycosides, proteins, amino acids, fixed oils, gums, or mucilages. Methanol extracts of leaves were administered to experimental rats orally at doses of 100 and 200 mg/kg and compared with Furosemide (20 mg/kg,o.p) as the standard. The parameters measured for diuretic activity were total urine volume; urine concentration electrolytes such as sodium, potassium and chloride have been evaluated. The rats treated with *Chloroxylon swietenia* leaves in a dose of 100 and 200 mg/kg showed higher urine output when compared to the respective control. Methanol extract has shown a significant dose-dependent increase in the excretion of electrolytes when compared to the control group. The methanolic leaf extract of *Chloroxylon swietenia* demonstrated promising diuretic properties. This study underscores the plant's potential in phytomedicine and lays the groundwork for future research, especially in pharmacology, toxicology, and drug discovery aimed at enhancing human health and well-being.

KEY WORDS*:* Methanolic extract, East Indian satin wood, phytochemicals, diuretic effect, Scheffe's post hoc test, Dunnet's test.

INTRODUCTION

Since ancient times, plants have played a vital role in healing diseases and enhancing human health and well-being. This research focuses on plant-based products—either raw or processed—used for therapeutic and other health-related purposes. Plant diversity serves as a vast reservoir of medicinal resources, offering direct economic value through timber, food, fibre, industrial enzymes, flavors, fragrances, cosmetics, emulsifiers, dyes, plant growth regulators, biopesticides, and biofertilizers. The biochemical compounds in many plant species present immense potential for drug discovery, environmental monitoring, and as sources of genes and valuable biotechnological compounds (Marotrao Dalvi, 2010).

Therapeutic use may involve any plant part or serve as a precursor for developing effective drugs. This distinction allows classification between scientifically validated medicinal plants and those traditionally considered medicinal but lacking empirical study (Sofowora et al., 2013). Medicinal plants are widely distributed throughout India and form a crucial part of its flora. Globally, there is growing recognition of the value of medicinal plants and traditional health systems in addressing healthcare challenges. This surge in interest has intensified research on medicinal plants, sometimes at the cost of natural habitats and native populations. In many developing countries, traditional medicine remains deeply rooted in cultural practices. Medicinal plants continue to be vital sources for novel therapeutic agents, a role they have played since antiquity (Atanasov et al., 2015). As early as 1896, Harshberger emphasized the importance of ethnobotanical studies, which today remain more relevant than ever.

India – An Emporium of Ethnomedicinal Plants: India is among the oldest nations to practice organized plant-based medicine. Of the estimated 480,000 plant species worldwide, India hosts over 48,000 taxa, including 18,000 flowering plants. Among these, about 10,000 species are utilized by 4,635 ethnic communities for human and veterinary healthcare, earning India the title "Emporium of Medicinal Plants." The use of traditional herbal recipes by various communities forms a core area of ethnobotanical research. Indigenous medicinal systems are often rooted in folk practices that continue in rural and tribal communities untouched by modern civilization. Much of this knowledge, including some remarkable remedies, has been passed down orally within families across generations. Recent studies reveal that even in similar environmental conditions, different ethnic or religious groups may possess highly diverse knowledge and usage of medicinal plants. However, the factors influencing this variation remain largely unexplored.

***Fig.1 Chloroxylon swietenia* DC.**

Table.1 Taxonomical Classification of *Chloroxylon swietenia*

Rank	Name
Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
Order	Sapindales
Family	Rutaceae
Genus	*Chloroxylon*
Species	*Chloroxylon swietenia* (Roxb.) DC
Synonym	*Swietenia chloroxylon*

Table.2 : Vernacular Names of ***Chloroxylon swietenia***

Language	Local Names
Hindi	Bhera, Bhirra, Bhivia, Dhoura, Girya
Kannada	Bittulla, Huragalu, Hurihuli, Masula, Urugali
Malayalam	വരിമരം (Varimaram), Purushu
Marathi	Behru, Halda, Bheria, Hulda, बिल्लु (Billu)
Oriya	Bheru Gatcho
Sanskrit	Bhillotaka, Bimbilota
Tamil	Purush, Porasu, Vaaimaram, Mammarai, Vaaimaram or Porasu, Porinja Maram
Telugu	Billu, Billydu, Billudu, Bella
Irula	Porunjamaram, Purusamaram
Other Names	Urugul Maram, Purusa Maram, Ceylon Satinwood, Buruta, Mashwal, Mududad, Purushu, Varimaram

Table.3. **Botanical Information of *Chloroxylon swietenia***

Attribute	**Details**
Habit	Tree
Habitat	Deciduous forests; commonly found in lower deciduous forests and on hills up to 1200 m elevation
Cyclicity	
Leaf Fall	February – May
Flowering	March – April
Fruiting	May – August
Flowering & Fruiting Period	January – October
Seed Collection Time	June – August
No. of Seeds per Kg	79,200 seeds/Kg
Seed Viability	Up to 6 months
Germination Percentage	Approximately 73%
Seed Treatment	Soak seeds in cold water for 24 hours
Nursery Technique	Pre-treated seeds are sown in mother beds. Seedlings are pricked and transferred to 30 × 45 cm poly bags. Growth is slow; 6-month-old seedlings can reach 4 feet and are ready for field planting.

Attribute	Details
Pollinators	Bees and insects
Wood Characteristics	Dense, termite-resistant, fire-resistant, high-quality fuelwood
Uses of Wood	Fuelwood, agricultural implements
Distribution in India	Andhra Pradesh: Guntur, Chittoor, Vishakapatnam, Prakasam Karnataka:Ballari Kerala:Idukki Maharashtra: Ahmednagar, Chandrapur, Nagpur, Nanded, Pune, Raigad, Yavatmal Odisha:Ganjam,Kalahandi,Angul,Puri Tamil Nadu: All dry regions
Global Distribution	India, Sri Lanka, Madagascar
Native To	India, Sri Lanka, Madagascar
Conservation Status	Vulnerable (IUCN Red List Category: VU)
Notes	Extensively used for timber; resistant to fire

Distribution and Habitat: *Chloroxylon swietenia* is native to India, Sri Lanka, and Madagascar. In India, it is distributed across Andhra Pradesh (Guntur, Chittoor, Vishakapatnam, Prakasam), Karnataka (Ballari), Kerala (Idukki), Maharashtra (Ahmednagar, Pune, Raigad, Nagpur, Chandrapur, Yavatmal, Nanded), Odisha (Ganjam, Kalhandi, Puri, Angul), and Tamil Nadu (dry parts of all districts). It thrives in dry deciduous forests, typically on poor, well-drained sandy or rocky soils at low to mid elevations up to 450 m, occasionally reaching up to 1200 m.

Climate and Soil Preferences: This species prefers lowland moist tropical climates with an optimal temperature range of 30–40°C, tolerating between 10–47°C. It grows best under annual rainfall between 1,000–1,500 mm, with a broader tolerance of 750–1,900 mm. It prefers full sun, well-drained soils, and a pH of 6–7, though it can tolerate a range from 5 to 7.8. Once established, it shows good drought tolerance but is susceptible to fire damage.

Habit and Botanical Description: *Chloroxylon swietenia* is a medium-sized deciduous tree, growing up to 15–20 meters tall. The bark is dark brown, rough, and deeply fissured, with yellow blaze emitting a pungent odour. Leaves are alternate, pinnately compound, 15–22 cm long, with 12–40 oblong, subsessile leaflets. The leaflets are dull bluish-green, glabrous, aromatic, with unequal bases, entire margins, and papery texture. Flowers are small, white, bisexual, and pubescent, arranged in axillary and terminal panicles. Each has 5 clawed petals, 10 stamens, and a 3-lobed ovary. Fruits are oblong, 2.5–4.5 cm long capsules, each segment containing 1–4 flat, winged seeds.

Phenology:

- **Leaf Fall**: February – May
- **Flowering**: March – April
- **Fruiting**: May – August
- **Seed Collection**: June – August

Propagation and Nursery Techniques: Propagation is mainly by seeds, which should be soaked in cold water for 24 hours. Seeds are sown in nursery beds and transplanted to polybags. Although the germination rate is 73%, growth is slow. Seedlings grow up to 4 feet in 6 months in 30 x 45 cm bags. Seed viability lasts up to 6 months, with about 79,200 seeds/kg.

Pollination and Dispersal: Pollination is carried out by bees and other insects, while wind serves as the primary agent for seed dispersal.

Wood Properties: The wood is dense, hard, and strong, with a fine, even texture and a lustrous golden-yellow heartwood that darkens with age. It features an interlocked or wavy grain, often decorative. Though the wood finishes well, it is hard to process due to high density, causing wear on tools. It is resistant to fungal decay, but moderately termite-resistant in India. It is also susceptible to marine borers, pinhole, and longhorn beetles. The sapwood is not prone to Lyctus borers, and the heartwood resists chemical preservatives. Gum veins are common defects, and handling may cause skin irritation.

Uses of the Wood: Valued for its decorative appeal and durability, the wood is used in:

- Furniture, cabinetry, and paneling
- Musical instruments and luxury goods
- Carvings and railway sleepers
- Boat building and agricultural implements
- High-quality fuelwood
- Decorative veneers (not suited for plywood)

Traditional and Medicinal Uses: All parts of the tree are used in folk and traditional Indian medicine:

- **Leaves**: Crushed and applied for **wounds**, **rheumatism**, **snakebites**, **scabies** (with *Toddalia* species); mixed with salt and applied for **skin diseases**
- **Leaf and root paste**: For **headaches**
- **Root bark decoction in milk**: Taken to treat **impotence**
- **Bark extracts**: Used for **fever**, **chest pain**, **asthma**, **joint pain**, **bruises**
- **Dried leaves**: Applied to **promote wound healing**
- **Sapwood mixtures**: Used to **expel placenta**

Phytochemistry and Bioactivity:

- **Heartwood**: Contains **coumarins**, **alkaloids**, and **2,4-dihydroxy-5-prenylcinnamic acid**
- **Leaves and stems**: Yield essential oils rich in **limonene**, **germacrene D**, **geijerene**, **pregeijerene**, **trans-β-ocimene**, and **methyl eugenol**
- **Antimicrobial** and **antifungal**
- **Mosquitocidal** against *Aedes*, *Anopheles*, and *Culex*
- **Insecticidal** against *Spodoptera litura*

- **Analgesic** (pain-relieving) effects

Ecological and Cultural Notes:

- Pollinators like *Trigona* sp. and *Apis cerana* inhabit tree cavities
- Honey is bitter, traditionally consumed for indigestion
- Seeds are eaten by shrews and giant squirrels
- Bark and leaves are used as fish poison
- Timber is highly valued in local construction and farming tools

Conservation Status: *Ceylon Satinwood* is listed as **Vulnerable (VU)** on the **IUCN Red List** due to overexploitation for its highly valued timber. Conservation and sustainable management are essential to protect this increasingly rare species.

MATERIALS AND METHODS: Fresh leaves of *Chloroxylon swietenia* were collected from Penchalakona forest, Nellore District, Andhra Pradesh, India. Plant identification was done by comparing with herbarium specimens. The leaves were washed with distilled water, shade dried for one month, ground into a fine powder, and stored in airtight containers at room temperature. The powdered material was subjected to extraction using methanol (1:10 ratio) in a Soxhlet apparatus (Khan et al., 1988). The solvent was evaporated under reduced pressure using a rotary evaporator and finally concentrated on a water bath to obtain a crude extract. This extract was used for phytochemical screening, antioxidant, and antimicrobial assays.

Phytochemical Screening: Standard qualitative methods (Harborne, 1973; Gibbs, 1974; Kokate, 2002) were followed to detect the presence of bioactive compounds such as flavonoids, saponins, glycosides, alkaloids, sterols, tannins, phenolic compounds, fats and oils, lignins, quinones, terpenoids, anthraquinones, anthocyanidins, coumarins, proteins, carbohydrates, indoles, reducing sugars, and amino acids. A series of colorimetric and precipitation-based tests were performed for each group of compounds.

Tests performed for the presence of phytochemicals:

A) Tests for Flavonoids

- Shinoda test (Magnesium hydrochloride reduction test): To the test solution few fragments of magnesium ribbon and concentrated hydrochloric acid were added drop wise and reddish to pink colour was resulted.
- Zinc Hydrochloride reduction test: To test the sample solution for the flavonoids added a mixture of zinc dust and concentrated hydrochloric acid results in red colour.
- Lead acetate test: When aqueous basic lead acetate was added to test sample produces reddish brown precipitate.
- Ferric chloride test: To few ml of test samples taken separately, few drops of ferric chloride were added which resulted in the formation of blackish red precipitate.
- Alkaline reagent test: To detect the presence of flavonoids, sodium hydroxide solution is added to turn the test sample solution green. When few drops of diluted acid is added the solution turns colourless to indicate the presence of flavonoids.

B) Tests for Saponins

- Foam test: 5ml of extract was vigorously shaken to obtain a stable froth, which was added with olive oil (3 drops). Presence of emulsion indicates the existence of saponins.

C) Tests for Glycosides

- Kellar Kiliani test: 1ml of concentrated sulphuric acid was taken in a test tube then 5ml of extract and 2ml of glacial acetic acid and ferric chloride (one drop) and observed for blue color formation.
- Raymond's test: Test solution when treated with dinitrobenzene in hot methanolic alkali giving a violet colour.
- Molisch test: Alpha naphthol with conc.H2SO4 when added to test sample gives reddish violet ring at the junction of 2 layers.
- Conc.H2SO4 test: Conc.H2SO4 was added to test sample which resulted in appearance of reddish colour.
- Legal's test: The test samples when treated with pyridine and sodium nitroprusside solution blood red colour will be developed.
- Bromine water test: When bromine solution is added the test solution gives yellow precipitate.

Tests for Alkaloids

- Dragendorff's test: 1 ml of the sample solution is taken in a test tube, and few drops of potassium bismuth iodide solution (Dragendorff's reagent) was added. The presence of alkaloids was determined by the appearance of reddish-brown precipitate.
- Meyer's test: 1ml of the sample solution is added with few drops of potassium mercuric chloride solution (Meyer's reagent). A creamy white precipitate was formed indicating the presence of alkaloids.
- Hager's test: To 1 ml of each of the sample few drops of Hager's reagent (Picric acid) was added. Yellow precipitate was formed reacting positively for alkaloids.
- Tannic acid test: When few ml of 10% Tannic acid was added to 1ml of each sample, a buff colour precipitate was formed giving positive result for alkaloids.
- FeCl 3 test: One drop of FeCl 3solution was added to each of the test sample, formation of yellow precipitate was resulted reacting positively for alkaloids.

D) Tests for Sterols

- Libermann-Buchard test: When few drops of acetic anhydride and few drops of concentrated sulphuric acid were added to the test samples if a brown ring shows up at the junction of two layers, it indicates presences of steroids. 2. Salkowski test: The presence of sterols can be detected by adding few drops of concentrated sulphuric acid to the test samples in chloroform, the lower layers of solution turns green on sterols presence.

E) Tests for Tannins and Phenolic Compounds

- Gelatin test: When gelatine and water were added to test samples formation of white precipitate was resulted.
- Lead acetate: Few ml of test samples were taken in different test tubes followed by the addition of aqueous basic lead acetate. It results in the formation of reddish brown bulky preceipitate.
- Alkaline reagent: The test solution will give a yellowish red precipitate when sodium hydroxide solution was added.
- Ellagic acid test: Presence of phenols in the test solution can be detected by adding 5% each of glacial acetic acid and Sodium Nitrite. If the solution turn Niger brown colour, it indicates phenols in solution.

F) Tests for Fats and Oils

- Stain test: when we a small quantity of extract between two filter papers, the stain on filter papers gives the presence of the oils.
- Saponification test: Added a few drops of 0.5N alcoholic potassium hydroxide to various extracts with a drop of phenolphthalein separately and heat on water bath for 1-2hours. If the solution produces soap or partial neutralization of alkali, it's a sign of presence of oils and fats.

G) Tests for Lignins

- Labat test: The test sample turns olive green colour on addition of gallic acid when lignins are present.
- Furfuraldehyde test: The test sample turns red colour on addition of fur furaldehyde when lignins are present.

H) Tests for Quinones

- Alcoholic KOH test: When alcoholic KOH was added to the test samples red to blue colour appears reacting positively for quinones.

I) Terpenoids and steroids test

- 50% H_2SO_4 is added along the sides of the test tube containing a mixture of methanolic HCl and acetic anhydride. If there is any change in color, from green to blue-green (sometimes via red or blue) indicates the presence of terpenoids and steroids**Anthraquinones test**
- 5 g plant powder was shaken with 20 ml of benzene and filtered. To the filtrate 5 ml of 10% ammonium hydroxide solution was added and shaken well. Presence of pink red or violet color, in the ammonical phase indicates the presence of free anthroquinones (Fransworth, 1966).

J) Anthocyanidin test

- To the plant extract was added equal volume of methanolic HCl. Appearance of red or purple color indicates the presence of anthocyanidins.

K) Coumarin test

- When few drops of sodium hydroxide are added to the methanolic extracted test solution, if the solutions turning yellow indicates presence of coumarins.

L) Proteins test (Millions test)

- 2 ml of methanolic extract was boiled with a few drops of Million's reagent (Millions reagent is a solution of mercuric nitrate in nitric acid) results in the formation of red color indicates the presence of proteins.

M) Carbohydrate test (Molish test)

- To the methanolic extract, c-naphthol solution (1gm dissolved in 100 ml of ethanol w/v) was added. Then conc. H_2SO_4 is added gently along the walls of the inclined test tube. Appearance of a red to violet color at the interface is taken as a positive reaction.

N) Indole test

- If a violet color was developed on adding Ehrlich reagent to the alcoholic extract, it is considered as a positive reaction for indoles.

O) Test for reducing sugars

- To the 5 ml of methanolic extract, 5 ml of Benedict's reagent was added in a boiling test tube. The test tubes were incubated in boiling on water bath for 15-30 minutes. The formation of an orange red precipitate indicated the presence of reducing sugars.

P) Test for amino acids

- To the methanolic extract, was added few drops of Ninhydrin solution and boiled. The formation of violet colour indicates the presence of amino acids.

Determination of Diuretic activity of methanolic leaf extracts of *Chloroxylon swietenia*: The diuretic activity in Wistar rats was studied by the Lipschitz Test. (1943). The test is based on water and sodium excretion in test animals and compared to rats treated with a high dose of Furosemide. Four groups of Wistar rats were used to evaluate the diuretic activity of methanolic extract of leaves of *Chloroxylon swietenia* by using metabolic cages. The group I served as normal control given vehicle (CMC 0.5% w/v in normal saline), group II with Furosemide (20 mg/Kg, p.o), Groups III and IV with 100 mg/kg, 200 mg/ doses of SCM respectively. Immediately after the treatment with the standard and test all the rats were hydrated with saline (15 ml/kg) and placed in the metabolic cage, specially designed to separate urine and faeces and kept at 21°C±0.5°C.

Estimation of Urinary Electrolytes: Urine electrolytes (sodium, potassium and chloride) were determined by Ion Selective Electrode method as described by the user manual of the biochemical kits (NRI Technologies, Malleswaram, Bengaluru)

5 rats in each group which were as follows:

Group I: Normal control (CMC 0.5% w/v in normal saline).
Group II: Furosemide (20 mg/kg, p.o).
Group III: Test 1(100 mg/kg)
Group IV: Test 1(200 mg/kg)

The total volume of urine collected after 24 hrs was measured at the end. During this period no food and water was made available to animals. Various parameters like total urine volume and concentration of sodium, potassium and chloride in the urine were measured and estimated respectively. The ratio of Sodium to Potassium ions is also estimated.

Statistical Analysis: All experiments were performed in triplicates. Results were expressed as mean ± standard deviation (SD). Data were analyzed using one-way and two-way ANOVA followed by Scheffe's or Dunnett's post hoc tests (SAS, 1999). A p-value < 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Phytochemical Studies: Pharmacogenetic investigations conducted on the methanolic leaf extract of *Chloroxylon swietenia* revealed the presence of glycosides, carbohydrates, alkaloids, sterols, and flavonoids, based on standard phytochemical screening methods. The extract tested negative for proteins, amino acids, fixed oils, gums, mucilage, and saponins in the preliminary qualitative analysis.

Table.4. Analysis of Phytochemicals from methanolic leaf extracts of *Chloroxylon swietenia*

S. No	Phytochemical Test	Observation (Methanolic Extract)
1	**Tests for Alkaloids**	
	a) Mayer's Test	++
	b) Wagner's Test	++
	c) Hager's Test	++
	d) Dragendorff's Test	++
2	**Tests for Carbohydrates**	
	a) Molisch's Test	–
	b) Fehling's Test	–
	c) Barfoed's Test	–
	d) Benedict's Test	–
3	**Tests for Glycosides**	
	a) Borntrager's Test	++
	b) Legal's Test	++
	c) Keller–Kiliani Test	++
4	**Test for Saponins**	
	a) Foam Test	–
5	**Tests for Proteins and Amino Acids**	
	a) Millon's Test	–
	b) Biuret's Test	–

S. No	Phytochemical Test	Observation (Methanolic Extract)
	c) Ninhydrin Test	–
6	**Test for Phytosterols**	
	a) Libermann–Burchard Test	++
7	**Test for Fixed Oils**	
	a) Spot Test	–
8	**Tests for Phenolic Compounds and Tannins**	
	a) Ferric Chloride Test	–
	b) Gelatin Test	–
	c) Lead Acetate Test	–
9	**Tests for Flavonoids**	
	a) Alkaline Reagent Test	+
	b) Shinoda Test	+
	c) Zn + HCl Test	+
10	**Test for Triterpenoids**	
	a) Salkowski Test	–
11	**Test for Gums and Mucilages**	
	a) Alcoholic Precipitation Test	–
12	**Tests for Lignin**	
	a) Lignin Test	++
	b) Labat Test	+

Note:– = Absence,=Less intense presence, ++ = More intense presence.

The preliminary phytochemical analysis of the methanolic extract revealed the presence of various bioactive compounds. A strong positive reaction (++), indicating the presence of alkaloids, was observed in all four tests: Mayer's, Wagner's, Hager's, and Dragendorff's. Glycosides were also confirmed with positive results in Borntrager's, Legal's, and Keller–Kiliani tests. The extract showed the presence of phytosterols (Libermann–Burchard test) and lignins (Lignin and Labat tests). Moderate presence of flavonoids was indicated by positive results in the alkaline reagent, Shinoda, and zinc hydrochloride tests (+). However, the methanolic extract tested negative (–) for carbohydrates (Molisch's, Fehling's, Barfoed's, and Benedict's tests), saponins (Foam test), proteins and amino acids (Millon's, Biuret, and Ninhydrin tests), fixed oils (Spot test), phenolic compounds and tannins (Ferric chloride, Gelatin, and Lead acetate tests), triterpenoids (Salkowski test), and gums and mucilages (Alcoholic precipitation test).

Table.5. Diuretic activity of methanolic leaf extracts of *Chloroxylon swietenia*

S.No	Treatment groups	Dose (mg/kg)	Urine volume (ml/24hrs)	Na^+ mmol/L	K^+ mmol/L	Cl^- mmol/L	Na^+/K^+
1	Control CMC (0.5%w/v)	0.1ml/10gm	9.78	61.3	69.2	299.6	0.89
2	Standard (Furosemide)	20mg/kg	34.5	150.4	158.2	1113.66	0.946
1	***Chloroxylon swietenia*** leaf methanolic extract	**100mg/kg**	15.2	119.6	122.5	544.4	0.976
			14.8	122.1	123.8	539.7	0.986
			16.8	126.4	124.1	542.9	1.019
			17.0	118.9	123.4	546.3	0.964
			16.2	120.6	121.6	547.5	0.992
		200mg/kg	18.3	126.8	129.4	555.3	0.980
			19.6	125.4	126.7	553.5	0.990
			20.7	122.2	127.9	550.7	0.955
			21.8	124.5	129.2	571.9	0.964
			20.3	130.9	132.5	556.2	0.988

Table.6. One-Way ANOVA Results: (Scheffe's Post Hoc and Dunnett's Tests)

Parameter	F-value	p-value	Interpretation
Urine Volume	32.55	0.00045	**Highly significant**
Sodium (Na^+)	5.10	0.05378	Not significant (just above 0.05)
Potassium (K^+)	31.88	0.00048	**Highly significant**
Chloride (Cl^-)	11.39	0.00971	**Significant**

1. **Urine Volume (F = 32.55, p = 0.00045):**The effect of treatment on urine volume is **highly significant**. This indicates that there is a strong difference in urine volume among the groups tested. Post hoc tests likely reveal which specific groups differ.
2. **Sodium (Na^+) (F = 5.10, p = 0.05378):**The difference in sodium levels among groups is **not statistically significant**, although the p-value is close to the 0.05 threshold. This suggests a possible trend, but no conclusive evidence of treatment effect on sodium excretion.
3. **Potassium (K^+) (F = 31.88, p = 0.00048):**The differences in potassium levels between groups are **highly significant**, indicating a strong treatment effect on potassium excretion.
4. **Chloride (Cl^-) (F = 11.39, p = 0.00971):** The variation in chloride levels is **statistically significant**, suggesting that treatment has a meaningful effect on chloride excretion.

ANOVA and **post hoc analysis** for *Chloroxylon swietenia* leaf extract at 100 mg/kg and 200 mg/kg:

Urine Volume (ml/24 hrs)

- **Result**: Significant increase with dose.
- **Interpretation**: The 200 mg/kg dose caused a statistically significant rise in urine output compared to 100 mg/kg. This suggests a **dose-dependent diuretic effect**.

Sodium (Na^+ mmol/L)

- **Result**: No significant difference between the doses.
- **Interpretation**: While sodium levels are slightly higher at 200 mg/kg, the difference isn't statistically significant. So, **sodium excretion is not notably affected by dose** within this range.

Potassium (K^+ mmol/L)

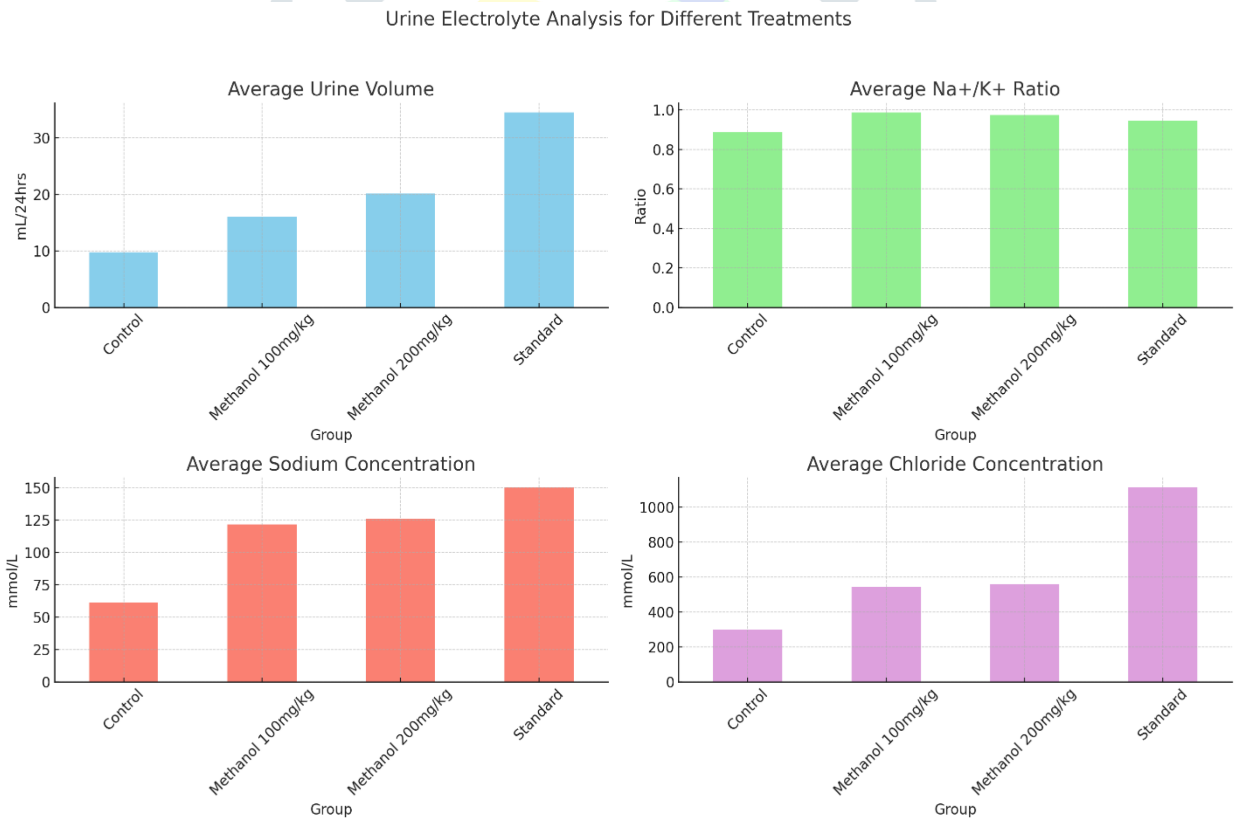
- **Result**: Significant increase with dose.
- **Interpretation**: The higher dose significantly increases potassium excretion, indicating a **potassium-wasting effect** at 200 mg/kg.

Chloride (Cl^- mmol/L)

- **Result**: Significant increase with dose.
- **Interpretation**: The 200 mg/kg dose significantly raises chloride excretion. This supports a **stronger electrolyte-clearing effect** at higher doses.

Na^+/K^+ Ratio:

- The Na^+/K^+ ratio **may decrease** at higher doses due to the greater rise in potassium excretion.
- A **lower Na^+/K^+ ratio** could imply a **mild risk of electrolyte imbalance** if continued long-term.



Graphical representation of Diuretic effect of *Chloroxylon swietenia*

CONCLUSION

Given the traditional use of medicinal plants in treating a wide range of diseases among tribal and rural communities, the bioactive potential observed in this species warrants further investigation. Future research should aim to isolate and characterize the specific therapeutic compounds responsible for the observed biological activities, potentially leading to the development of novel drugs.

Chloroxylon swietenia leaf extract shows significant diuretic and electrolyte-clearing effects in a dose-dependent manner. The 200 mg/kg dose is more effective, especially in increasing urine output and clearing potassium and chloride. However, potassium loss should be monitored, as it may impact electrolyte balance over time.

Phytochemical screening of this ethnomedicinal plant revealed the presence of a diverse array of therapeutically valuable compounds, including saponins, alkaloids, terpenoids, steroids, lignins, tannins, indoles, anthraquinones, anthocyanidins, phenolic compounds, flavonoids, and lipid-based constituents. These compounds contribute to the plant's broad medicinal applications and underline its pharmacological and economic potential.

The methanolic leaf extract of *Chloroxylon swietenia* demonstrated promising diuretic properties. Therefore, isolating and characterizing these active constituents is essential to explore their potential applications as therapeutic agents. This study highlights the plant's potential in phytomedicine and paves the way for further research, particularly in the fields of pharmacology, toxicology, and drug discovery for human health and well-being.

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