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Phytochemical Screening and antibacterial activity of leaves extract of Sterculia urens Roxb.

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Abstract
The leaves of Sterculia urens Roxb was studied for phytochemical screening and antimicrobial activity. The ethanolic solvent extract was used to screen the secondary metabolites and test the antimicrobial effect of extract on microorganisms. The phytochemical analysis showed the presence of phenols, tannins, flavonoids, steroids, terpenoids, alkaloids, volatile oils. The extracts were subjected for Antimicrobial test using agar well disc diffusion method showed the significant zone of inhibition that is comparable to standard antibiotic in terms of inhibition.

Key Words: Sterculia urens Roxb, Solvent extraction, Phytochemical screening, Antibacterial, Agar well diffusion

INTRODUCTION

Plants provide practically everything that ordinary people need in their daily lives, including food, housing, medications, clothes, and livelihood [1]. Man is fully reliant on indigenous flora in one form or another in the present era. As a source of medication, natural compounds have an advantage over synthetic counterparts. Plant secondary metabolites have a range of functions and can be utilised as medications. In recent years, plant-based secondary metabolites have been used in a variety of Ayurvedic and traditional treatments. Herbal treatments have become increasingly popular due to their perceived safety. Sterculia urens Roxb. was previously classified as a member of the Sterculiaceae family, but is now classified as a member of the Malvaceae (Sterculioideae) family [2] and commonly known as the cacao family, which is found all throughout the world [3].

Table 1 Sterculia urens Roxb.

Kingdom	: Plantae
Sub-kingdom	: Tracheobionta (Vascular plant)
Super-division	: Spermatophyta (Seed plant)
Division	: Magnoliophyta (Flowering plants)
Class	: Magnoliopsida (Dicotyledons)
Sub-class	: Dilleniidae
Order	: Malvales
Family	: Sterculiaceae (Cacao family)
Genus	: Sterculia
Species	: urens

The Sterculiaceae family is an angiosperm family that was named after the genus Sterculia. Because of the foul odour of some plant species' blossoms, the generic name was given in the Latin word "stercus," which truly means "manure or filth." Sterculia urens is a desert-adapted deciduous forest tree endemic to Asia, particularly the tropical Indian subcontinent, Northern and Central India, the Indian west coast, and the dry forest regions of Burma and Sri Lanka [4]. This tree can withstand harsh temperatures and grow in areas with limited water supplies, such as 10–40 °C and 500–1900 mm of annual rainfall, respectively [5]. Gulu, kadaya, karaya, katera, kuteera, teklej, semla katilo, kullo, mucara, ghost tree, kovela, tapsi, India gum, and so on are some of the traditional names for Stercilua urens. Classification system given by Cronquist [7] is given in table 1.

MATERIALS AND METHODS:

Collection of Sample

Fresh Sterculia urens leaves were collected in Kanppa, Taluka Nagbhid, District Chandrapur, Maharashtra, India's "Panzadi Forest." The plant materials were carefully cleaned with distilled water and shade dried until all water molecules had disappeared and the plant components were completely dry. Following drying, the plant material was ground into a fine powder using a mechanical blender and placed into airtight packages with adequate labelling for use.

Preparation of Extract

The Soxhlet device was set up according to the instructions [8]. Individual thimbles were filled with twenty-five grammes (25 g) of dried and fresh Sterculia urens leaves powder. In a separate round bottom flask, 250 mL ethanol was taken. The solvent-filled round bottom flask was positioned on the heating element or above the burner (with water bath). A syphon was installed in the mouth of the round bottom flask (containing lateral thimble). On or until the solvent in the extractor's syphon tube became colourless, a reflux condenser was connected. The leaves' extract was collected in a flask with a circular bottom. The extract was then placed in a beaker and heated at 30-40 degrees Celsius until all of the solvent had evaporated. The dried extract was stored at 40°C in the refrigerator for future use in phytochemical analysis and antibacterial properties, among other things.

Phytochemical Screening:

Using standardised methodologies for phytochemical analysis of plant extracts, a quantitative assay for the presence of plant primary and secondary metabolites was performed [9].

Test for Phenols

A.$FeCl_3$ test: Crude extract was mixed with 2mL of 2% solution of $FeCl_3$. A blue-green or black coloration indicated the presence of phenols [10].

B.Liebermann's test: Small amount of extract and few crystals of sodium nitrite were taken in a dry test tube and heated gently for a minute. It was cooled and slowly at 0.5 mL conc. H_2SO_4 was added properly. A deep green or blue color was developed. The mixture was diluted with distilled water. The solution turned red. Then the excess of dilute NaOH solution was added. The mixture again became green or blue indicating the presence of phenols.

Test for Tannins

A. Gelatin Test: 5 gm powdered plant material was extracted by boiling in 100 mL of distilled water. The extract was filtered after 30 min. 2 mL of 2% gelatin was added to 5 ml of filtrate. Curdy white precipitate foam indicated the presence of tannin [11].

B. Ferric Chloride Test: To the filtrate, 5 drops of 5% ferric chloride solution was added. The formation of black or green-black coloration indicated the presence of tannin.

C. Potassium Iodide Test: To the filtrate, few drops of a saturated solution of potassium iodide were added if pink color forms which changes to brown on standing, indicating the presence of tannin like gallic and ellagic acid.

Test for Flavonoids

A. Shinoda Test: Crude extract was mixed with few fragments of magnesium ribbon and concentrated HCl was added dropwise. The pink scarlet color appeared after a few minutes which indicated the presence of flavonoids [12].

B. Alkaline Reagent Test: Crude extract was mixed with 2mL of 2% solution of NaOH. An intense yellow color was formed which turned colorless with the addition of a few drops of diluted acid which indicated the presence of flavonoids.

Test for Steroids

A. Salkowski's Test: Extracts were treated with chloroform and filtered. The filtrates were treated with a few drops of conc. Sulphuric acid, shaken, and allowed to stand. The appearance of the golden yellow color indicated the presence of triterpenes [13].

B. Liebermann Burchard's Test: Extracts were treated with chloroform and filtered. The filtrates were treated with a few drops of acetic anhydride, boiled, and cooled. Concentrated sulphuric acid was added carefully along the sides of the test tube. The formation of a brown ring at the junction indicated the presence of phytosterols.

Test for Terpenoids

Terpenoids are a group of the complex compound composed of 5-carbon units called isoprene. The crude extract was dissolved in 2mL of chloroform and evaporated to dryness. To this, 2mL of concentrated H_2SO_4 was added and heated for about 2 minutes. A grayish color indicated the presence of terpenoids [14].

Test for Alkaloids

A. Mayer's Test: Filtrates were treated with Mayer's reagent (Potassium Mercuric iodide). Formation of a yellow cream precipitate indicated the presence of alkaloids [15].

B. Wagner's Test: Filtrates were treated with Wagner's reagent (Iodine in potassium iodide). The formation of a brown or reddish-brown precipitate indicated the presence of alkaloids.

Test for Volatile Oil

The presence of volatile oil was tested in petroleum ether. 2 mL of extract was evaporated on a porcelain dish. The aromatic smell of residue indicated the presence of volatile oil [16].

RESULTS AND DISCUSSION:

Preliminary Phytochemical Screening

Table 2 shows preliminary phytochemical screening of ethanolic extract. Phenols, flavonoids, steroids, alkaloids, volatile oils, and other compounds were discovered in an ethanolic extract of Sterculia urens leaves.

Table 2: Phytochemical screening of crude ethanolic extract of *Sterculia urens* leaves.

Phytochemicals	Ethanolic extract
Phenols	+ve
Tannins	-ve
Flavonoids	+ve
Steroids	+ve
Terpenoids	-ve
Alkaloids	+ve
Volatile oils	+ve

Where + shows presence and - shows absence of phytochemical activities.

Antibacterial activity [17] of the ethanol extract and silver nanoparticles from the leaf of S. urens

The antibacterial activity of S.urens dry powdered leaves ethanol extracts has a higher zone of inhibition in Staphylococcus aureus (26 mm) and a similar zone of inhibition in Pseudomonas aeruginosa (25 mm). In vitro experiments showed that ethanolic extracts of Strculia urens leaf had inhibitory action against both gram positive and gram negative bacteria. The findings suggest that chemical components found in ethanolic extracts of Sterculia urens leaf have antibacterial action. The ethanolic leaf extract of Sterculia urens exhibited promising results against all bacteria tested in this study. The ethanolic leaf extract of Sterculia urens showed significant antimicrobial activity (Table 3).

Table 3. Zone of inhibition of extract of leaf of S. urens

	Microorganisms	Zone of Inhibition (ZI) (In mm)
		100 ul
1.	Escherichia coli	21 mm
2.	Staphylococcus aureus	26 mm
3.	Salmonella typhae	19 mm
4.	Pseudomonas aeruginosa	25 mm
5.	Proteus mirabilis	23 mm

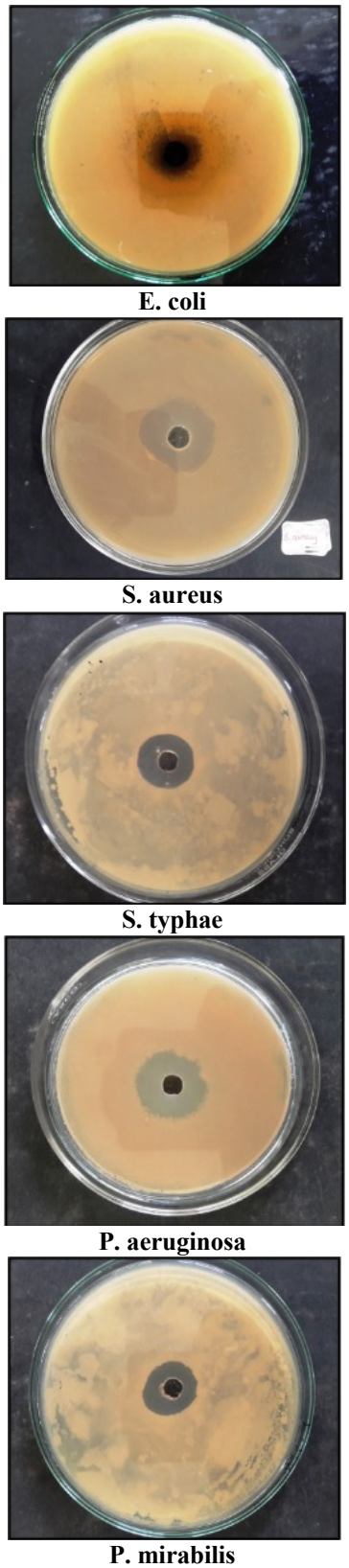

Figure 1. Showing zone of inhibition of ethanol extract of the leaf of S. urens against various microorganisms

CONCLUSION:

The findings demonstrated that the Sterculia urens tested contained medicinally significant components. Antimicrobial testing revealed a considerable zone of inhibition comparable to that of a typical antibiotic. Natural products have long attracted the interest of the world due to its fewer side effects, lower cost, and superior medicinal properties. As a result, extracts from these plants could be considered a promising source of therapeutics. Traditional medicine is strongly recommended for these plants, and it is urged that more research be done to extract, purify, and define the active ingredients responsible for the activity of these plants' metabolites. Furthermore, deeper research into the likely mechanism of action of these extracts is urged. As a result, future research should focus on utilizing this plant as one of the greatest medicinal plants for managing pathogenic microorganisms.

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