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A Systematic Pharmacognostic and Antimicrobial Assessment of *Abelmoschus moschatus* (Latakasturi) Seed Extracts

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Abstract
Abelmoschus moschatus Medik. (Latakasturi) is an aromatic medicinal plant belonging to the Malvaceae family, traditionally valued in herbal medicine for its diverse therapeutic applications. However, comprehensive pharmacognostic, phytochemical, and pharmacological evaluations of its seeds remain limited. This study aimed to systematically investigate the pharmacognostic characteristics, physicochemical parameters, phytochemical profile, total phenolic and flavonoid content, and antimicrobial activity of *Abelmoschus moschatus* seed extracts prepared using different solvents. Standard pharmacognostic and physicochemical analyses were conducted as per WHO guidelines. The seeds were subjected to successive solvent extraction with petroleum ether, ethanol, and water, followed by qualitative phytochemical screening. Total phenolic and flavonoid contents were quantitatively determined using Folin-Ciocalteu and aluminum chloride colorimetric methods, respectively. The antimicrobial activity of the extracts against *Staphylococcus aureus* was evaluated using the agar well diffusion method. The physicochemical evaluation confirmed the quality and identity of the crude drug within acceptable limits. Phytochemical screening revealed ethanol as the most effective solvent for extracting a broad spectrum of phytoconstituents. Quantitative analysis demonstrated the highest total phenolic (63.44 ± 1.05 mg GAE/g) and flavonoid (41.32 ± 0.96 mg QE/g) contents in the ethanolic extract. Antimicrobial studies showed concentration-dependent inhibition, with the ethanolic extract exhibiting superior antibacterial activity (21 mm zone of inhibition at 50 mg/mL) compared to the aqueous extract. The findings validate the ethnomedicinal significance of *Abelmoschus moschatus* seeds, confirming the potent phytochemical richness and antimicrobial efficacy of its ethanolic extract. These results support its potential for further development as a natural antimicrobial and phytotherapeutic agent.

Keywords: *Abelmoschus moschatus,* Pharmacognostic, phytochemical

Introduction

Latakasturi, belonging to the family *Malvaceae*, is an aromatic and medicinal plant native to India, valued for its rich content of dietary fiber and traditional health benefits. Since ancient times, herbs have played a vital role in healing practices, with numerous plant-derived natural products forming the foundation of traditional medicine systems worldwide (Mukherjee PK 2006) [9]. Plants naturally produce chemical compounds to defend themselves against predators such as insects, fungi, and herbivorous animals and many of these bioactive compounds have been found to possess therapeutic potential in humans. Today, with the growing global demand for herbal remedies, extensive research is underway to explore plant materials for their medicinal applications (Christina AJ 2013) [2] (Cherniack EP 2001) [1]. Within this context, *Abelmoschus* is a genus of about 15 flowering plant species under the *Malvaceae* family, among which *Abelmoschus moschatus* is particularly cultivated in tropical regions of Asia, Africa, and South America. It is prized for its aromatic seeds used in fragrance extraction and traditional medicine. Phytochemical studies have revealed that the plant is a rich source of phenolic compounds, flavonoids, carbohydrates, proteins, sterols, tannins, fixed oils, and fats. Pharmacological investigations have confirmed a wide range of therapeutic properties, including diuretic, antioxidant, antiproliferative, antimicrobial, antilithiatic, hepatoprotective, memory-enhancing, antidiabetic, anti-ageing, antidepressant, anxiolytic, anticonvulsant, hypnotic, and muscle relaxant effects (Warrier PK 1994) [2] (CP. 2004) [3].

Botanically, *A. moschatus* is an erect, hispid, annual herb growing up to 1.6 meters tall with a slender tap root. Its polymorphous leaves are heart-shaped, alternate, hairy, and either ovate or palmately 3-7 lobed, while its bright yellow flowers, featuring a dark purple base, appear solitary and axillary. (Pullaiah T. Encyclopedia of World Medicinal Plants 2006) The plant bears ovate, hispid capsules measuring 6.5-7.5 cm in length, containing subreniform, black to grayish-brown, aromatic seeds with 8-9 concentric ribs. The plant blooms seasonally, with its flowers typically lasting a single day, synchronized with the timing of the wet season. Although *Abelmoschus moschatus* has been traditionally employed for a range of therapeutic applications, scientific validation of its pharmacognostic, phytochemical, and pharmacological properties remains limited (Kirtikar KR 2005) [6]. While certain studies have identified ambrettolide and other volatile components in the seed oil, comprehensive antioxidant, anti-inflammatory, and antimicrobial evaluations of its crude extracts and fractions are sparse. Furthermore, modern standardization parameters for Latakasturi remain inadequately defined. This necessitates a systematic investigation to establish the pharmacognostic identity and therapeutic potential of this valuable ethnomedicinal herb (Kutlu T 2014) [8] (Grenand P 2012) [4].

The present study aims to perform a comprehensive pharmacognostic, phytochemical, and pharmacological evaluation of *Abelmoschus moschatus* seeds.

Materials and Methods

Materials

Abelmoschus moschatus (Latakasturi) was gathered from local vendors of Rohtak, Haryana and authenticated from Green Vibes Biotech, New Delhi. All the chemicals used in this study were obtained from HiMedia Laboratories Pvt. Ltd. (Mumbai, India). All other reagents used were of analytical grade.

Methods

Collection of Plant Material

The seeds of *Abelmoschus moschatus* Medik. (commonly known as Latakasturi) were collected in April, 2025 from the local herbal market of Rohtak, Haryana.

Drying and Powdering of Plant Material

The collected seeds were thoroughly washed with distilled water to remove dirt and other foreign materials and subsequently shade dried at room temperature (25-30°C) for 7-10 days until a constant weight was achieved. Proper care was taken to prevent exposure to direct sunlight, which could degrade sensitive phytoconstituents. The dried seeds were then coarsely powdered using a mechanical grinder and sieved through a mesh no. 60 to obtain a uniform powder. The powdered material was stored in airtight, amber-colored glass containers at room temperature until further use for extraction.

Physicochemical Properties

Standard physicochemical values were determined using standard procedures as per WHO guidelines to assess the purity and identity of the crude drug.

Parameters Determined:

- Loss on drying
- Total ash
- Acid-insoluble ash
- Water-soluble ash
- Alcohol-soluble extractive value
- Water-soluble extractive value

Total Ash value: About 2 g of powdered drug was accurately weighed into a pre-weighed silica crucible. The sample was incinerated gradually at a temperature not exceeding 450-600 °C in a muffle furnace until it became white, indicating the absence of carbon. The crucible was then cooled in a desiccator and weighed. The test is performed to determine the total amount of inorganic residue remaining after incineration of the crude drug (Khandelwal 2015) [5].

Total ash (%w/w) = [Weight of air-dried drug/ weight of air-dried ash] X 100

Acid Insoluble Ash value- To determine the portion of ash that is insoluble in dilute hydrochloric acid, which indicates the presence of siliceous (earthy) matter.

The total ash obtained was boiled with 25 mL of 2 N HCl for 5 minutes. The insoluble matter was collected on an ashless filter paper, washed with hot water until neutral, dried, and incinerated to a constant weight. The residue was cooled in a desiccator and weighed (Panda 2022) [10].

Acid insoluble ash (%) = [Total ash formed in the crucible with ashless filter paper/weight of sample] X 100

Water Soluble Ash- To determine the water-soluble portion of the total ash.

The total ash obtained was boiled with 25 mL of distilled water for 5 minutes. The insoluble matter was collected on an ashless filter paper, washed with hot water, dried, ignited, and weighed. The difference between the weight of total ash and the weight of the insoluble matter gave the weight of water-soluble ash

$$\text{Water-soluble ash (\% w/w)} = \frac{\text{Weight of total ash - Weight of water-insoluble ash} \times 100}{\text{Weight of air-dried drug}}$$

Foreign Matter- The foreign matter in plant drug sample is inspected visually and under a lens. After that foreign matter is separated and weighed. The percentage of foreign matter is then calculated based on the weight of the original sample.

$$\text{Percentage of foreign matter} = \frac{\text{Weight of separated foreign matter}}{\text{Weight of the original sample}} \times 100$$

Moisture Content

In a silica crucible, add 1.5 g weight of powdered crude drug sample. The crude drug was then subjected to dryness at 105°C in hot air oven. After that crucible was then transferred to a desiccator and dried. The weight of the sample was recorded again. If any weight loss after drying sample was recorded as moisture content.

% Loss on Drying =

$$\frac{\text{Initial weight of sample} - \text{Weight after drying}}{\text{Weight of the Initial weight of sample}} \times 100$$

Alcohol-Soluble Extractive Value

To determine the concentration of active constituents extracted with alcohol.

5 g of accurately weighed air-dried powdered drug was macerated with 100 mL of alcohol (95%) in a closed flask for 24 hours, shaking frequently during the first 6 hours, and allowed to stand for 18 hours. It was filtered rapidly, and 25 mL of the filtrate was evaporated to dryness in a tared flat-bottomed dish on a water bath. The residue was dried at 105 °C to a constant weight (Kokate 2014) [7].

Alcohol-soluble extractive value of the sample (%w/w) =

$$\frac{\text{Weight of extract residue}}{\text{Weight of crude drug}} \times 100$$

Water-Soluble Extractive Value

To determine the concentration of water-soluble constituents. 5 g of accurately weighed air-dried powdered drug was macerated with 100 mL of distilled water in a closed flask for 24 hours, shaking frequently during the first 6 hours, and allowed to stand for 18 hours. It was filtered rapidly, and 25 mL of the filtrate was evaporated to dryness in a tared dish on a water bath. The residue was dried at 105 °C to a constant weight.

Water soluble extractive value of the sample (%w/w) =

$$\frac{\text{Weight of extract residue}}{\text{Weight of crude drug}} \times 100$$

Preparation of Extract

A weighed quantity of 100 g of the dried, powdered seeds was subjected to successive solvent extraction using a Soxhlet apparatus. The extraction was carried out with solvents of increasing polarity starting with petroleum ether (60-80°C) followed by ethanol and finally distilled water to ensure exhaustive extraction of phytoconstituents. Each extraction was continued for 6-8 hours until the solvent in the siphon tube became colorless. The extracts obtained were concentrated under reduced pressure using a rotary vacuum evaporator and subsequently dried in a desiccator. The percentage yield of each extract was calculated, and the dried extracts were stored in airtight glass vials at 4°C for further phytochemical and pharmacological studies (Kokate 2014) [7].

$$\text{Percentage yield} = \frac{\text{Weight of extracts obtained}}{\text{Weight of material taken}} \times 100$$

Phytochemical Screening

1. Test for Alkaloids

- **a) Dragendorff's Reagent test**: Add 1ml of Dragendorff's reagent (potassium bismuth iodide solution) in one ml of extract solution. Presence of prominent buff colored precipitate showed the presence of alkaloids.
- **b) Mayer's test**: Add one ml of Mayer's reagent (potassium mercuric iodide solution) to the test tubes containing one ml of test extracts. Presence of white or cream-colored precipitate showed the presence of alkaloids. (Kokate 2014) (Z. Arshad 2014)
- **c) Hager's test**: Add one ml of Hager's reagent (saturated aqueous solution of picric acid) in the test tubes containing one ml of test extracts. Presence of yellow colored precipitate indicated the presence of alkaloids.
- **d) Wagner's test**: Add 2ml of Wagner's reagent (iodine in potassium iodide) in one ml of test extract. Presence of reddish-brown precipitates indicated the presence of alkaloids.

2. Test for Glycosides

- **a) Legal test:** In few ml of extract, added pyridine and made alkaline by adding freshly prepared sodium nitroprusside solution. Formation of pink to red color indicates the presence of steroidal glycoside.
- **b) Baljet test:** In one ml of the test extract added with one ml of sodium picrate solution. Formation of yellow to orange color showed the presence of steroidal glycoside.
- **c) Borntrager's test:** In one ml of the test extract added few ml of dilute sulphuric acid, then boiled, filtered the mixture. Add few ml of chloroform to the filtrate. Separate the Chloroform layer and treated with one ml of ammonia. Presence of red color indicates of anthraquinone glycosides.

3. Tests for Carbohydrates

- **a) Molisch's Test:** In 2ml of the extract, add two drops of Molisch's reagent (alcoholic solution of α-napthol). Shake the mixture well in test tube. Slowly add 1 ml of concentrated sulphuric acid along the sides of the test tube. Appearance of purple or reddish violet color at the junction of the two liquids showed the presence of carbohydrates.
- **b) Fehling's test**: Add 1 ml of each of Fehling solutions A and B. Added 1 ml of the extracts to above solution and heat it. Appearance of red precipitate indicated the presence of sugars.
- **c) Barfoed's test**: In 5 ml of Barfoed's solution, add 1ml of extract solution. Heat the above mixture till boiling. Formation of ed precipitate of copper oxide confirmed the presence of carbohydrates.

4. Test for Steroids and Sterols

- **a) Liebermann Burchard's test**: In few ml of the extract, add 2 ml of chloroform. Add few drops of acetic anhydride and also add two drops of concentrated sulphuric acid. The above mixture showed red, then blue and finally bluish green color which indicated the presence of steroids.
- **b) Salkowski test:** In few ml of extract, added 2 ml of chloroform and equal volume of concentrated sulphuric acid. The appearance of bluish red to cherry red colour in Chloroform layer and acid layer assuming marked green fluorescence represents the steroid and sterol.

5. Test for Saponins: In one ml of extract added 20 ml of distilled water. Shake the above mixture in a graduated cylinder for 15 minutes. Appearance of foam about one cm indicated the presence of saponins.

6. Test for Proteins and Amino acids

- **a) Biuret test:** In 1 ml of the extract added 1ml of 40% sodium hydroxide solution and add 2 drops of 1% copper sulphate solution. The formation of violet color indicated the presence of protein.
- **b) Ninhydrin test:** In 2 drops of freshly prepared 0.2% Ninhydrin reagent, add the prepared test extract

solution and heat it. The formation of purple color during cooling suggests the presence of amino acids.

7. Tests for Flavonoids

a) **Shinoda test:** In 1ml of the extract added magnesium turnings and add 1-2 drops of concentrated hydrochloric acid. Formation pink or red color showed the presence of flavonoids.

b) **Ferric chloride test:** In 1 ml of extract solution, added 3-4 drops of 10% $FeCl_3$ solution in a test tube. Appearance of a greenish-blue to a violet color indicated the presence of flavonoids.

c) **Sodium hydroxide test:** In 1 ml of the extract solution, added 2 ml of 10% NaOH solution into a test tube. The yellow color of the solution disappeared upon when dilute Hydrochloric acid was added, indicated the presence of flavonoids.

8. Test for Tannins and Phenolic Compounds

a) **Ferric chloride test:** To the extract, added ferric chloride solution. Appearance of dark blue or greenish black color showed the presence of tannins.

9. Test for Acidic Compounds: The extract solution was treated with sodium bicarbonate and produced effervescence. The above preparation then treated with warm water and filtered. To check the acidic compounds filtrate was tested with litmus paper.

10. Test for Mucilage: The test extract solution was treated with ruthenium red solution and appearance of pink color indicated the presence of mucilage.

11. Test of fixed oils and volatile oil

a) **Spot test:** The small quantity of extract was pressed between two filter papers. Presence of oily stain indicates presence of fixed oil and no appearance of stain indicates the presence of volatile oil.

b) **Sudan Red IV Test**: Dark red Sudan IV (a common dye) is added to a solution. Extract is dyed as red color in presence of fixed oils.

Quantitative Analysis

i) Total Phenolic Content (TPC)

Methods

The total phenolic content of different extracts of *Abelmoschus moschatus* seeds was determined using the Folin-Ciocalteu colorimetric method, with slight modifications.

Procedure

- A stock solution of 1 mg/mL of each extract was prepared in methanol.
- 0.5 mL of the extract solution was mixed with 2.5 mL of 10% (v/v) Folin-Ciocalteu reagent.
- After 5 minutes of incubation at room temperature, 2.0 mL of 7.5% (w/v) sodium carbonate solution was added.
- The mixture was incubated at room temperature in the dark for 30 minutes.
- The absorbance was measured at 765 nm using a UV-Visible spectrophotometer against a blank (methanol in place of sample).

Standard Calibration Curve

- A standard curve was prepared using Gallic acid at concentrations of 20, 40, 60, 80, 100 and 120 µg/mL following the same procedure.
- The TPC was expressed as mg of Gallic Acid Equivalents (GAE) per gram of extract (mg GAE/g).

Formula

$$\text{Total phenolic content (mg GAE/g)} = \frac{C \times V}{M}$$

Where;

C = concentration of gallic acid from standard curve (mg/mL)

V = volume of extract (mL)

M = mass of extract used (g)

ii) Total Flavonoid Content (TFC)

Methods

The total flavonoid content was estimated using the Aluminum chloride colorimetric method.

Procedure

- A stock solution of 1 mg/mL of each extract was prepared in methanol.
- 0.5 mL of extract solution was mixed with 1.5 mL of methanol, 0.1 mL of 10% aluminum chloride, 0.1 mL of 1 M potassium acetate, and 2.8 mL of distilled water.
- The mixture was incubated at room temperature for 30 minutes.
- The absorbance was recorded at 415 nm using a UV-Visible spectrophotometer against a reagent blank.

Standard Calibration Curve

- A standard curve was prepared using Quercetin at concentrations of 10, 20, 30, 40,50 and 60 µg/mL following the same procedure.
- The TFC was expressed as mg of Quercetin Equivalents (QE) per gram of extract (mg QE/g)

Formula

$$\text{Total phenolic content (mg QE/g)} = \frac{C \times V}{M}$$

Where:

C = concentration of quercetin from standard curve (mg/mL)

V = volume of extract (mL)

M = mass of extract used (g)

Antimicrobial Activity of *Abelmoschus moschatus* Extracts

The antimicrobial activity of ethanol, and methanol extracts of *Abelmoschus moschatus* seeds was evaluated against Gram-positive *Staphylococcus aureus* using the agar well diffusion method. The bacterial strain was procured from and maintained on nutrient agar slants. For experimental use, a loopful of *S. aureus* was inoculated into Luria Bertani (LB) broth and incubated at 37°C for 18-24 hours in a shaking incubator to obtain an actively growing culture. The turbidity of the bacterial suspension was adjusted to match 0.5 McFarland standard, equivalent to approximately 1.5 ×

10^8 CFU/mL. Mueller Hinton Agar (MHA) plates were prepared by pouring 20 mL of molten sterile MHA into sterile Petri plates and allowed to solidify. The surface of the agar plates was then uniformly inoculated with the prepared bacterial suspension using a sterile cotton swab. Wells of 8 mm diameter were made in the agar medium using a sterile cork borer. Into each well, 100 µL of extract solution at various concentrations was carefully loaded. DMSO (100 µL) served as a negative control, while Ampicillin (50 ug/mL) was used as a positive control.

The plates were incubated at 37°C for 24 hours in an upright position. After incubation, the plates were observed for the formation of clear zones of inhibition around the wells. The diameters of the inhibition zones, including the well diameter, were measured in millimeters (mm) using a digital Vernier caliper. Each test was performed in triplicate, and the results were expressed as mean ± standard deviation (SD).

Results and Discussion

Physicochemical Evaluation

The physicochemical evaluation of *Abelmoschus moschatus* seeds revealed a loss on drying of 5.32 ± 0.14% w/w, indicating acceptable moisture content and good shelf stability. The total ash value was 6.80 ± 0.21% w/w, reflecting the total inorganic content, while the acid-insoluble ash value of 1.02 ± 0.09% w/w suggested minimal siliceous impurities. The water-soluble ash was 3.60 ± 0.18% w/w, indicating the presence of water-soluble inorganic components. Extractive values showed higher water-soluble extractives (12.85 ± 0.35% w/w) compared to alcohol-soluble extractives (9.45 ± 0.20% w/w), confirming a greater proportion of water-soluble phytoconstituents. The foreign matter content was low (0.85 ± 0.05% w/w), ensuring good purity of the crude drug sample. These findings confirm the quality and identity parameters within acceptable limits for herbal drug standards.

Table 1: Physicochemical Evaluation of *Abelmoschus moschatus* seeds

Parameter	Observed Value (% w/w)
Loss on Drying	5.32 ± 0.14
Total Ash	6.80 ± 0.21
Acid-Insoluble Ash	1.02 ± 0.09
Water-Soluble Ash	3.60 ± 0.18
Alcohol-Soluble Extractive Value	9.45 ± 0.20
Water-Soluble Extractive Value	12.85 ± 0.35
Foreign Matter	0.85 0.05

Percentage Yield

The percentage yield of *Abelmoschus moschatus* (Latakasturi) seed extracts varied notably with the type of solvent used for extraction. Among the three extracts, the ethanol extract exhibited the highest yield of 12.45 ± 0.26% w/w**,** reflecting ethanol's superior efficiency in extracting a wide range of phytoconstituents, including both polar and moderately polar compounds such as alkaloids, flavonoids, tannins, and glycosides. The aqueous extract yielded 9.76 ± 0.19% w/w, indicating water's strong affinity for highly polar constituents such as carbohydrates, mucilage, proteins, and tannins. In contrast, the petroleum ether extract showed the lowest yield of 3.12 ± 0.08% w/w, consistent with its non-polar nature, selectively extracting lipophilic compounds like steroids, sterols, and fixed oils. These results suggest that the yield of bioactive compounds from Latakasturi seeds is strongly influenced by the polarity of the extraction solvent, with ethanol proving to be the most effective medium for comprehensive phytochemical extraction.

Table 2: Percentage Yield of Latakasturi Extracts

Extract	Percentage Yield (% w/w)
Petroleum Ether Extract	3.12 ± 0.08
Ethanol Extract	12.45 ± 0.26
Aqueous Extract	9.76 0.19

Phytochemical Screening

The phytochemical screening of *Abelmoschus moschatus* (Latakasturi) seed extracts revealed a varied distribution of constituents based on solvent polarity. The petroleum ether extract contained steroids, sterols, and fixed oils, indicating the presence of non-polar compounds. The ethanol extract demonstrated a broad phytochemical profile, rich in alkaloids, flavonoids, tannins, glycosides, and saponins, confirming its effectiveness in extracting both moderately polar and polar constituents. The aqueous extract showed abundant polar phytoconstituents, including alkaloids, carbohydrates, tannins, and mucilage, highlighting water's ability to extract hydrophilic compounds.

Table 3: Phytochemical Screening of *Abelmoschus moschatus* seeds

Phytoconstituent	Petroleum Ether Extract	Ethanol Extract	Aqueous Extract
Alkaloids	-	+	+
Glycosides	-	+	+
Carbohydrates	-	+	+
Steroids & Sterols	+	+	-
Saponins	-	+	+
Proteins & Amino acids	-	+	+
Flavonoids	-	+	+
Tannins & Phenolics	-	+	+
Acidic Compounds	-	+	+
Mucilage	-	-	+
Fixed & Volatile Oils	+	-	-

Quantitative Analysis

Total Phenolic Content

The total phenolic content of *Latakasturi* (Abelmoschus moschatus) seed extracts varied significantly with the solvent used. The ethanol extract exhibited the highest phenolic content (63.44 ± 1.05 mg GAE/g extract), indicating its strong capacity to extract phenolic compounds due to its intermediate polarity. The aqueous extract contained a moderate phenolic content (45.60 ± 0.88 mg GAE/g), reflecting the solubility of polar phenolics in water. In contrast, the petroleum ether extract showed minimal phenolic content (8.75 ± 0.22 mg GAE/g), as non-polar solvents are generally less effective in extracting phenolic constituents. These findings confirm ethanol as the most suitable solvent for extracting phenolic-rich fractions from Latakasturi seeds.

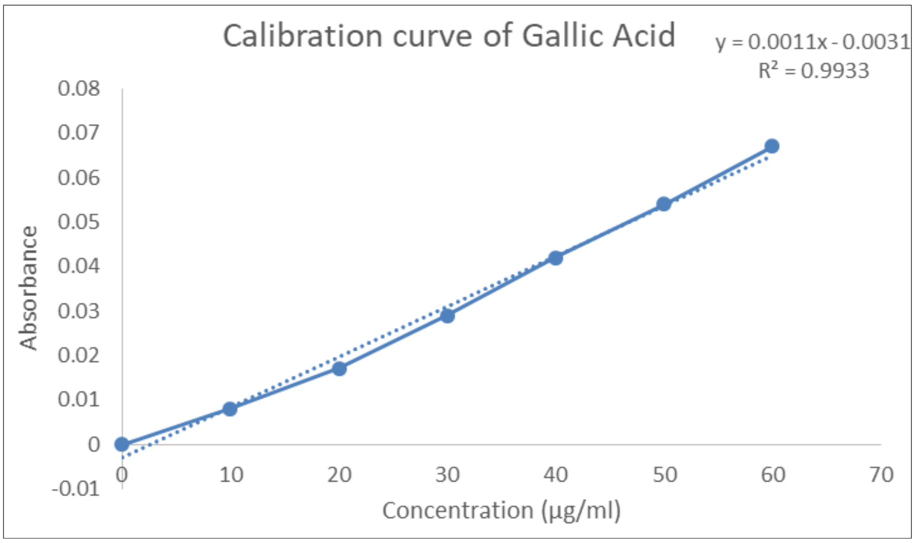

Fig 1: Calibration curve of Gallic Acid

Table 4: Total Phenolic Content of Latakasturi Extracts in Different Solvents

Extract	Total Phenolic Content (mg GAE/g extract)
Petroleum Ether Extract	8.75 ± 0.22
Ethanol Extract	63.44 ± 1.05
Aqueous Extract	45.60 ± 0.88

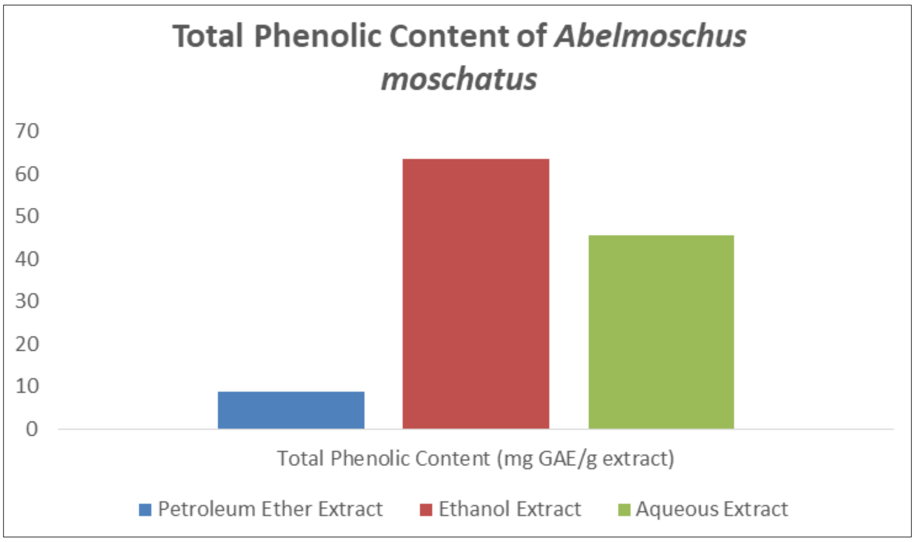

Fig 2: Histogram of *Abelmoschus moschatus* in Different Solvents

Total Flavonoid Content (TFC)

The total flavonoid content of *Latakasturi* (*Abelmoschus moschatus*) seed extracts demonstrated notable variation depending on the extraction solvent. The ethanol extract exhibited the highest flavonoid content (41.32 ± 0.96 mg QE/g extract), reflecting ethanol's strong efficiency in solubilizing flavonoid compounds due to its intermediate polarity. The aqueous extract showed a moderate flavonoid content (28.65 ± 0.71 mg QE/g), indicating the presence of water-soluble flavonoids. In comparison, the petroleum ether extract displayed the lowest flavonoid concentration (6.50 ± 0.20 mg QE/g), consistent with its limited ability to extract polar phytoconstituents. These results suggest that ethanol is the most suitable solvent for obtaining flavonoid-rich fractions from Latakasturi seeds.

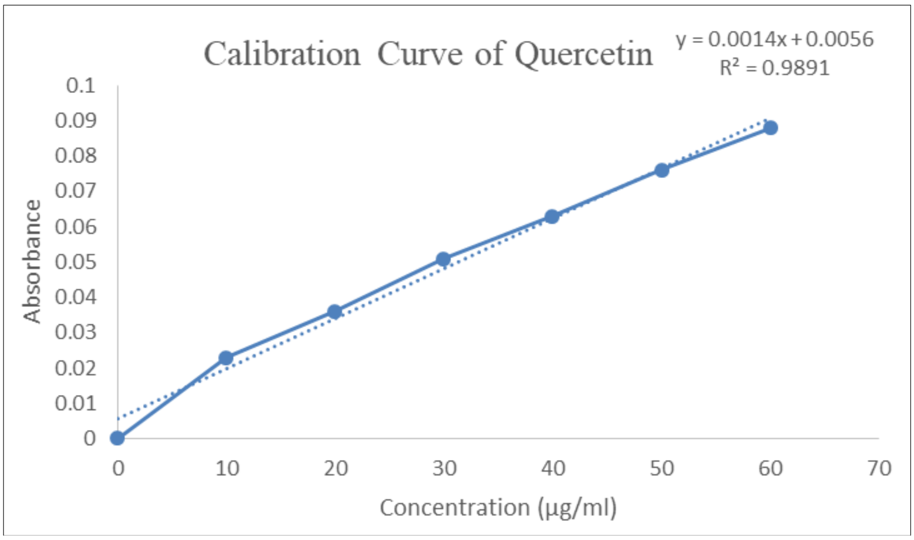

Fig 3: Calibration curve of Quercetin

Table 5: Total Flavonoid Content of Latakasturi Extracts in Different Solvents

Extract	Total Flavonoid Content (mg QE/g extract)
Petroleum Ether Extract	6.50 ± 0.20
Ethanol Extract	41.32 ± 0.96
Aqueous Extract	28.65 ± 0.71

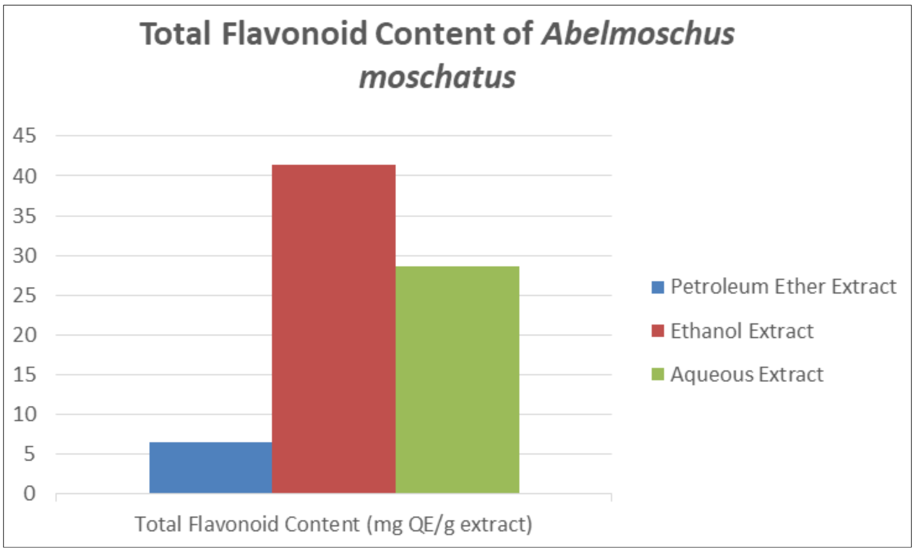

Fig 4: Histogram of *Abelmoschus moschatus* in Different Solvents

Antimicrobial Studies

The antimicrobial activity of *Abelmoschus moschatus* (Latakasturi) seed extracts against *Staphylococcus aureus* revealed concentration-dependent inhibition zones. The ethanolic extract exhibited superior antibacterial activity, producing a maximum zone of inhibition of 21 mm at 50 mg/mL, which gradually decreased to 19 mm at 25 mg/mL and 10 mm at 12.5 mg/mL. In comparison, the aqueous extract showed moderate activity, with a maximum inhibition zone of 18 mm at 50 mg/mL, reducing to 16 mm at 25 mg/mL and 9 mm at 12.5 mg/mL. No zone of inhibition was observed with the control (DMSO), while the standard antibiotic Ampicillin displayed a 30 mm inhibition zone. These results indicate that the ethanolic extract possesses significant antimicrobial potential, likely due to its higher concentration of phenolic and flavonoid constituents, and is more effective than the aqueous extract against Gram-positive bacteria.

Table 7: Antimicrobial Activity of Latakasturi Extracts in Different Solvents

Extract Concentration	Zone of Inhibition	
	Abelmoschus moschatus (Ethanolic Extract)	*Abelmoschus moschatus* (Aqueous Extract)
50 mg/mL	21	18
25 mg/mL	19	16
12.5 g/mL	10	9
control	-	-
Ampicillin	30	30

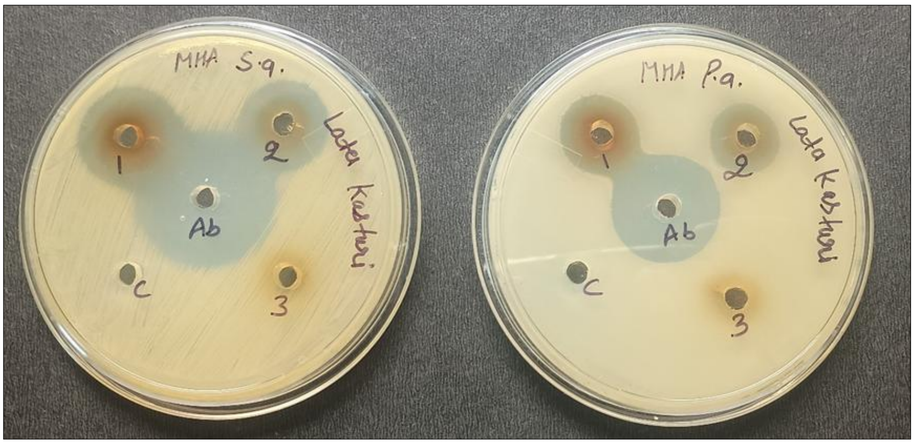

Fig 5: Antimicrobial Activity of *Abelmoschus moschatus* Extracts in Ethanol & Aqueous

Conclusion

The present study provides a comprehensive pharmacognostic, phytochemical, and pharmacological evaluation of *Abelmoschus moschatus* (Latakasturi) seeds. The physicochemical parameters were found within acceptable limits, ensuring the quality and identity of the crude drug. Successive solvent extraction revealed ethanol as the most efficient solvent for extracting a broad range of bioactive compounds. Quantitative analysis confirmed the highest phenolic and flavonoid contents in the ethanolic extract, correlating with its notable antimicrobial activity against *Staphylococcus aureus*. These findings scientifically validate the traditional uses of *Abelmoschus moschatus* seeds and underscore their potential as a natural source of antimicrobial and phytotherapeutic agents. Further *in vivo* and mechanistic studies are recommended to substantiate its therapeutic applications.

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