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Review Article

**PRELIMINARY AND PHYTOCHEMICAL SCREENING OF
AEGLE MARMELOS LEAF****Richa Kashiv^{*1}, Anjali Gour², Anshika Dagor², Anshu Rajput², Anshul Suryavanshi²,
Arun Kumar Verma², Arun Pandey², Rahul Mathur¹ and Jagdish Chandra Rathi³**¹Associate Professor, NRI Institute of Pharmaceutical Sciences, Bhopal²Student, NRI Institute of Pharmaceutical Sciences, Bhopal³Principal, NRI Institute of Pharmaceutical Sciences, Bhopal**Abstract:**

Study presents a comprehensive pharmacognostical and phytochemical evaluation of two medicinally significant plants: Murraya koenigii and Aegle marmelos. Fresh leaves of Murraya koenigii were collected from mature, healthy specimens in their natural habitat, authenticated, and processed into fine powder for analysis. Macroscopic and microscopic characterizations were conducted to document key morphological traits and internal anatomical features, including oil glands, glandular trichomes, and stomatal types, which are vital for accurate identification and quality assurance. Physicochemical parameters such as ash value and moisture content were assessed to determine the purity and storage stability of the crude drug. In parallel, aqueous extraction of Aegle marmelos leaves was performed using traditional maceration techniques, yielding 13.91% extract rich in bioactive compounds. Preliminary phytochemical screening revealed the presence of alkaloids, flavonoids, glycosides, and other secondary metabolites, confirming the plant's therapeutic potential. The results underscore the pharmacognostical distinctiveness and medicinal relevance of both species. Aegle marmelos, in particular, demonstrated promising antioxidant, anti-inflammatory, and antidiabetic properties, supporting its traditional use in treating various ailments. This study advocates for further research into standardized extraction methods and clinical validation to harness the full potential of these botanicals in modern healthcare

Keywords: Aegle marmelos, Pharmacognosy, Macroscopic, Microscopic, Physicochemical, Morphology, Bael**Corresponding author:****Richa Kashiv,**Associate Professor,
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INTRODUCTION:

Aegle Marmelos is a valuable medicinal plant commonly known as bael in hindi, maha vilvam in tamil and bilva in Sanskrit is a medium size aromatic tree belonging to family *Rutaceae* is a much known plant for the people of any part of India, as it is related to the Hindu Religious¹. It has been utilized for over 5000 years by ethnic populations living in the Indian subcontinent². It is widely used in traditional Indian medicine³. Bael is a holy tree commonly found in Sacred groves from kanyakumari to kashmir in the fort hills⁴. It is indigenous plant and also used in folk medicine. Bael are the Sthalavirusham of the most of the shiva temples in India and leaves are offered in prayer to Shiva and Parvati since ancient time⁵. Its various part including the leaves, fruit, and bark are utilized for a range of medicinal and other purposes. Even though all the parts of the plant are useful the leaves are mostly used to cure almost all common ailments of the human being⁶. The bael leaves symbolize devotion and purity. *Aegle Marmelos* is found in subtropical and tropical regions and in deciduous forest⁷.

Bael patra leaves contain various bioactive compounds, including flavonoids, alkaloids, tannins, coumarins (such as marmesin), terpenoids (like aegeline), volatile oils (such as cineole and limonene), phenolics, steroids, proteins, and glycosides⁸. While a specific structure for "Bel patra" isn't a single compound, these components contribute to the leaf's medicinal properties, with structures of individual compounds like aegeline and furocoumarins being documented in scientific literature⁹. *Aegle Marmelos* (L.) Corr., commonly known as Bael or Bel, belongs to the family Rutaceae. Its leaves, fruits, bark, and roots have long been used in Ayurvedic, Unani, and Siddha systems of medicine for the treatment of various ailments such as diarrhea, dysentery, diabetes, asthma, and inflammation¹⁰. The phytochemical analysis of Bel patra leaves helps in understanding its medicinal potential and provides a scientific basis for its traditional uses.

The main aim of this study is to know the Phytochemical parameters, traditional uses and innovative application of *A. marmelos* linn. It included chemicals, pharmacognostical study and Phytochemical screening using extract of *A. marmelos* leaves.

MATERIALS AND METHODS:**Collection of plant materials**

Fresh leaves of *Murraya koenigii* were collected from healthy, mature plants in their natural habitat and authenticated by a qualified botanist. The collected plant materials were thoroughly washed,

shade-dried, and pulverized into fine powder for further analysis.

Macroscopic characterizations

Macroscopic characterization was performed to document the morphological features of the leaves, including their shape, size, color, texture, and distinctive aroma, which are essential for proper identification and quality assurance.

Microscopic characterizations

Microscopic examination involved preparing slides of powdered leaf samples to observe internal structures such as oil glands, glandular trichomes, and stomatal types, aiding in pharmacognostical profiling.

Physicochemical study

Physicochemical parameters, including ash value and moisture content, were determined using standard procedures to assess the purity, mineral composition, and storage stability of the crude drug.

Extraction of Bel Patra (*Aegle Marmelos*) Leaves

The extraction of Bel Patra (Bael leaves) is commonly done to isolate bioactive compounds such as alkaloids, flavonoids, tannins, essential oils, and phenolics, which contribute to its medicinal properties (antimicrobial, anti-inflammatory, antidiabetic, etc.)

Maceration in water

Imple, traditional method for crude extraction using solvents at room temperature.

- Take 100 gm dry powder in closed vessel
- Menstrum (solvent) is added to it
- Allowed to stand for 7 days with shaking it occasionally.
- Filter with whatman no. 1 filter paper
- Take filtrate and concentrate
- Collect extract



Figure 1: Maceration of Bel Patra

Phytochemical study

Preliminary phytochemical screening was conducted using qualitative chemical tests to identify major secondary metabolites such as alkaloids, flavonoids, and tannins, which contribute to the plant's therapeutic potential.

RESULTS AND DISCUSSION:

Macroscopic characterizations

- **Leaf:** Compound leaf; usually trifoliate with 3-5 leaflets.
- **Petioles:** Petiole is relatively long (2-4 cm) lateral leaflets have short or almost no petiole ; the terminal leaflet often has a longer petiole.
- **Shape:** Ovate to lanceolate
- **Size:** Lateral leaflets 4-7 cm long $\times$ 2-4.2 cm wide; terminal leaflet a bit larger (up to 7.5×4.8 cm) in some forms.
- **Margin:** Shallowly toothed or nearly untoothed
- **Apex:** Acute to tapering, pointed
- **Base:** Rounded or slightly wedge in some leaflet.
- **Colour:** Young leaves are light green in colour, Adult leaves are dark green in colour
- **Odour:** Leaves are aromatic; mature leaves when bruised produce a disagreeable odour. Also, presence of resinous or oil glands gives fragrance.



Figure 2: Leaves of Bel Patra

Microscopic characterizations

The slides of T.S of leaf were prepared and subjected to microscopical examination. The T.S of marmelos leaves showed group of fibres with calcium oxalate crystals and also exhibit outer and inner epidermis with round to oval cells, covered with striated cuticle. The leaves show paracytic stomata, more in number on upper epidermis and lesser in lower epidermis. Multilayered strip of collenchyma and it also composed of xylem and phloem arranged in an arc. It contains number of covering trichomes and calcium oxalate crystals.

- **Stomatal Number:** Number of stomata per square mm of epidermis Abaxial surface (lower) 20 25/mm² Adaxial surface (upper) Few or absent.
- **Stomatal Index:** % of stomata compared to total epidermal cells
- **Palisade Ratio:** Average number of palisade cells beneath one epidermal cell.
- **Vein Termination Number:** Number of vein endings per mm² 6-10 vein terminations/mm²
- **Vein Islet Number:** Number of small areas (islets) of mesophyll enclosed by veins per mm² 10 15 vein islets/mm²

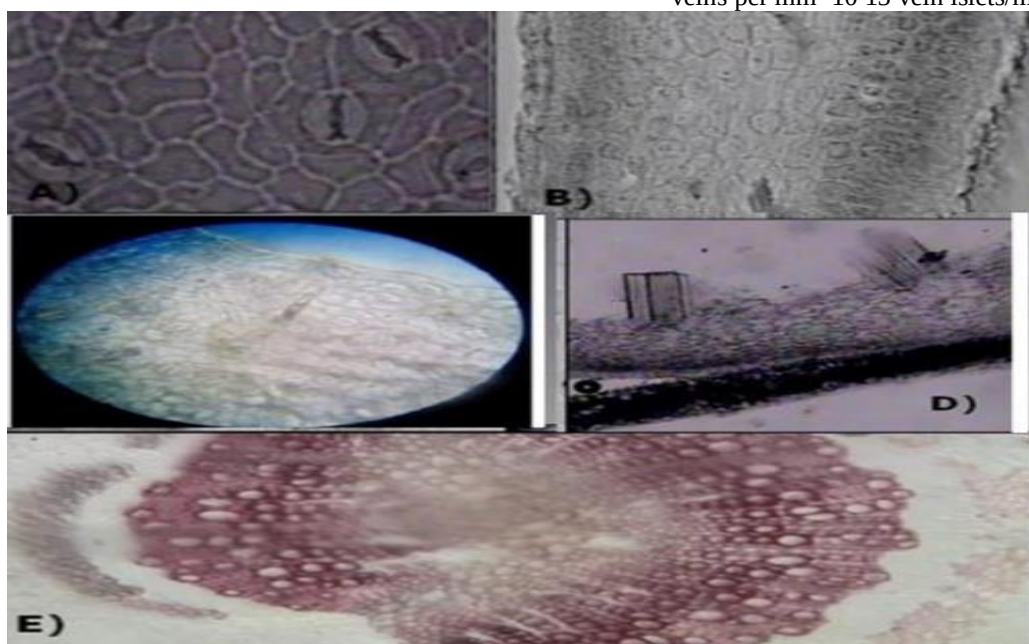


Figure 3: Microscopic study of Bel Patra

Physicochemical study

- **Ash value:** The ash was dissolved in 2N hydrochloric acid in the beaker. Stirred well for the digestion of ash and filtered through whatmann filter paper number 40. The residue remains after filtration is ignited in clean silica crucible by gradually increasing temperature up to 500 °C. The crucible with the residue was cooled in desiccators and weighed. The residue remains after ignition was calculated as acid insoluble ash in percentage.
- **Total ash value:** 4.7% Acid
- **insoluble value:** 2.7%
- **Acid soluble value:** 1.6%

Extraction of Bel Patra (*Aegle Marmelos*) Leaves

The yield of aqueous extract of Bel Patra (*Aegle Marmelos*) Leaves was 13.91%.

Phytochemical study**Test for Alkaloids**

- **Mayer's Test:** To 2 mL of extract, add a few drops of Mayer's reagent (potassium mercuric iodide).
Result: Positive, a creamy white precipitate indicated alkaloids.
- **Wagner's Test:** To 2 mL of extract, add a few drops of Wagner's reagent (iodine in potassium iodide).
Result: Positive, Reddish-brown precipitate confirmed the presence of alkaloids.
- **Dragendorff's Test:** Add a few drops of Dragendorff's reagent to the extract.
Result: Positive, Orange or reddish-brown precipitate confirms alkaloids.

Test for Glycosides

- **Keller-Killiani Test (Cardiac glycosides):** To 5 mL of extract, add 2 mL of glacial acetic acid containing 1 drop of ferric chloride solution. Carefully add 1 mL of concentrated sulfuric acid down the side of the test tube.
Result: Positive, a reddish-brown ring at the junction of two layers confirmed cardiac glycosides.

Legal's Test

- To 2 mL of extract, add pyridine and a few drops of sodium nitroprusside. Make it alkaline with sodium hydroxide.
Result: .Positive, A pink to red color indicated glycosides.

Tannin Test

- **Ferric Chloride Test:** Prepare an extract of Bel Patra leaves using water or ethanol. Take 2 mL of the extract in a test tube. Add a few drops (3–4) of 1% ferric chloride (FeCl₃) solution.
Result: Negative, blue-black or greenish-black precipitate was not formed

Flavonoids Test:

- **Shinoda Test:** (Magnesium + HCl)
Procedure: Take 2 mL of alcoholic extract. Add a small piece of magnesium ribbon. Add a few drops of concentrated hydrochloric acid (HCl).
Result: Positive, Development of pink, red, or orange coloration indicated flavonoids.

DISCUSSION:

The pharmacognostical and phytochemical screening of *Aegle Marmelos* highlights the plant potential as a valuable resource in both traditional and modern medicine. The identification of its morphological and microscopic features along with the presence of various bioactive compounds underscores its therapeutic significance.

The distinct features of Bael patra such as trifoliate leaf with long petiole that were play a role in its identification and traditional uses. Understanding these characteristics is crucial for the correct harvesting and application of the plant.

The microscopic analysis reveals essential information about the plants cellular structure. The presence of unicellular trichomes and specific type of stomata that can provide insights into the plants ability to adapt to its environment and its potential medicinal properties.

The Ash content reflects the mineral composition of the plant indicating its nutritional value. The moisture content analysis is crucial for determining the self life and storage condition for dried Bael products.

Various bioactive compounds were identified, including flavanoids, alkaloids, phenolic acid, tannins, steroids, coumarins and terpenoids. These contributed to the plants antioxidant, anti-inflammatory, respiratory problems and anti-diabetic activities.

CONCLUSION:

Aegle Marmelos stands out as a valuable resource in both traditional and modern medicine, owing to its diverse therapeutic applications. The presence of numerous bioactive compounds support its use in managing various health conditions including inflammation, diabetes, infection and respiratory

conditions. Future Research should focus on standardizing extraction method, conducting clinical trials to validate health claims and promoting sustainable harvesting practices to ensure the long term availability of this important plant. Give its significant potential, *Aegle Marmelos* good play a crucial role in enhancing health and well being, particularly in resource limited settings

CONFLICTS OF INTERESTS

There are no conflicts of interests.

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