

Pharmacognostic, Physicochemical, and Preliminary Phytochemical Evaluation of Bael (*Aegle marmelos*) Fruit and Its Polysaccharide

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Abstract: Background: *Aegle marmelos* (Bael) is a traditionally used medicinal plant with reported antioxidant, anti-inflammatory, and gastrointestinal protective effects. Its fruit pulp is rich in polysaccharides and bioactive phytoconstituents, but comprehensive pharmacognostic evaluation is essential to standardize quality and ensure authenticity. **Objective:** The present study aimed to evaluate the macroscopic, microscopic, physicochemical, and preliminary phytochemical characteristics of Bael fruit and its polysaccharide, providing a foundation for its therapeutic and nutraceutical applications. **Materials and Methods:** Mature fruits of *Aegle marmelos* were collected, authenticated, and processed to obtain dried fruit pulp powder. Macroscopic and organoleptic parameters were recorded. Microscopic evaluation of powdered pulp was performed to identify parenchyma cells, starch granules, calcium oxalate crystals, oil globules, fibers, sclerenchyma, xylem vessels, and mucilage cells. Physicochemical parameters including loss on drying, total ash, acid-insoluble ash, water-soluble ash, and extractive values were determined. Preliminary phytochemical screening was carried out using standard qualitative tests to detect alkaloids, flavonoids, tannins, saponins, glycosides, phenolics, carbohydrates, proteins, steroids, and fixed oils. **Results:** Macroscopically, the fruit was globose to slightly oval, 5–15 cm in diameter, with thick woody pericarp and orange-colored, mucilaginous pulp. Microscopic studies revealed abundant mucilage-containing parenchyma, starch granules, prismatic calcium oxalate crystals, oil globules, and structural fibers. Physicochemical analysis indicated low moisture content and significant water-soluble and alcohol-soluble extractives. Phytochemical screening confirmed the presence of multiple bioactive compounds, including flavonoids, tannins, alkaloids, saponins, glycosides, and phenolics. **Conclusion:** The study established standardized pharmacognostic, physicochemical, and phytochemical parameters for Bael fruit and its polysaccharide. The results confirm its authenticity and support its potential applications in herbal formulations, nutraceuticals, and polysaccharide-based drug delivery systems.

Keywords: *Aegle marmelos*, Bael fruit, Polysaccharide, Pharmacognostic evaluation, Phytochemical screening, microscopic analysis.

