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BAKULA (MIMUSOPS ELENGI): A COMPREHENSIVE REVIEW OF ITS MEDICINAL AND PHARMACOLOGICAL PROPERTIES

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ABSTRACT

Mimusops elengi (Bakula) is a medicinal plant widely utilized in traditional healing systems such as Ayurveda, Siddha, and Unani. This review explores its botanical characteristics, phytochemicals composition, therapeutic applications, and pharmacological properties. The plant contains bioactive compounds like flavonoids, tannins, Triterpenoids, saponins, and alkaloids, contributing to its medicinal benefits. Different parts, including the bark, leaves, flowers, fruits, and seeds, have been traditionally used to treat dental issues, inflammation, skin infections, fever, and respiratory ailments. Scientific studies support many traditional claims, highlighting its antimicrobial, anti-inflammatory, antioxidant, anti-diabetic, hepatoprotective, cardioprotective and anti-tubercular properties. The presence of gallic acid and polyphenols enhances its potential in developing anti-tuberculosis treatments. However, further clinical research and standardization is needed to confirm its safety and pharmaceutical applications. This review provides insights into the therapeutic value of *Mimusops elengi*, recent research findings, and future possibilities in drug development.

KEYWORDS: *Mimusops elengi, Bakula,* Gallic acid, *Mycobacterium tuberculosis, Sapotaceae, Mimusops, Bacillus thuringiensis.*

INTRODUCTION

Mimusops elengi (Bakula) is a medicinal tree from the *Sapotaceae family*, native to tropical regions like India, Sri Lanka, Thailand, and Malaysia. It has been widely used in Ayurveda, Siddha, and Unani medicine for various health conditions.

Its bark and leaves possess astringent and anti-inflammatory properties, beneficial for oral health. The fragrant flowers are used in cosmetics, while the fruit is valued for its nutrition. Extracts from the seeds and bark have traditionally treated skin issues, fever, asthma, and urinary disorders.

It is rich in bioactive compounds such as flavonoids, tannins, saponins, Triterpenoids, and alkaloids. The plant exhibits antimicrobial, antioxidant, anti-inflammatory, and hepatoprotective, cardio protective and anti-tubercular properties. The presence of gallic acid enhances its potential for tuberculosis treatment.

Although widely used in traditional medicine, further clinical research and standardization are necessary to confirm its efficacy and ensure safe pharmaceutical applications.

MIMUSOPS ELENGI [BAKULA]

Figure No. 1: Various parts of *Mimusops elengi.*

BOTANICAL DESCRIPTION

- **Family:** *Sapotaceae*
- **Genus:** *Mimusops*
- **Species:** *Mimusops elengi*
- **Habit & Size**
- An evergreen tree growing 15–25 meters tall, with a rounded canopy that provides shade.
- **Trunk & Bark**

Straight, sturdy trunk with thick, grayish-brown bark marked by horizontal cracks, becoming rough with age.

- **Leaves**

Simple, glossy, alternately arranged leaves, oblong or elliptical (8–15 cm long, 4–7 cm wide). Dark green above, paler below, with a leathery texture aiding drought resistance.

- **Flowers**

Small, fragrant, white to creamy-yellow flowers, growing in dense clusters. Each flower is about 1–2 cm in diameter, blooming mainly in warmer months.

- **Fruit**

A round to oval fleshy drupe (2–4 cm in diameter), turning yellow or orange when ripe. It contains a single seed surrounded by mildly sweet, fibrous pulp.

- **Root System**

Strong taproot with lateral roots, providing stability and deep water access.

- **Wood**

Dense, durable, and widely used in furniture-making and woodcraft.

- **Ecological Adaptation**

Thrives in tropical and subtropical regions, tolerates drought due to its deep roots and water-conserving leaves.[5]

MORPHOLOGICAL FEATURES

- **Tree Size:** Grows 20–30 meters tall with a sturdy trunk and a wide, dense canopy, offering ample shade.

- **Leaves:** Oval to elliptic, dark green, glossy, and leathery (6–15 cm long), alternately arranged on branches.
- **Flowers:** Small, fragrant, white to cream-colored, clustered, with four petals, blooming in summer and pollinated by insects.
- **Fruits:** Round to oblong drupe (2–4 cm), turning yellow when ripe, containing a single seed, valued for medicinal use.
- **Bark:** Brownish, rough-textured, known for its medicinal properties, especially in treating inflammation and skin conditions.[6]

GEOGRAPHICAL DISTRIBUTION

Bakula is native to tropical and subtropical regions of Asia, particularly India, Sri Lanka, Bangladesh, Myanmar, and parts of Southeast Asia. It thrives in both coastal and inland areas, typically at elevations up to 1000 meters. In India, it is commonly found in the forests of the Western Ghats, the Deccan Plateau, and tropical dry forests. Additionally, it is cultivated in urban landscapes and gardens for its ornamental appeal.[7]

CULTIVATION AND GROWTH REQUIRMEANTS

Cultivation

- **Climate:** Thrives in tropical climates with temperatures of 25°C–35°C; not frost-tolerant.
- **Soil:** Prefers well-drained, fertile soil (pH 6-7), ideally sandy loam or loamy soil. Avoid water logging.
- **Watering:** Requires regular watering during early growth; drought-tolerant once established.
- **Sunlight:** Needs full sun (6-8 hours daily) for optimal growth and flowering.
- **Propagation:** Grown from seeds, cuttings, or grafting; cuttings benefit from rooting hormone.
- **Spacing:** Trees should be planted 10-12 feet apart for proper growth and airflow.

Growth Requirements

- **Nutrients:** Requires organic fertilizers; nitrogen boosts foliage, while phosphorus and potassium aid roots and flowering.
- **Pruning:** Regular pruning maintains shape, removes dead branches, and encourages growth, best done in the dormant season.
- **Pests & Diseases:** Susceptible to aphids and caterpillars; controlled with neem oil and proper drainage to prevent diseases.

- **Temperature Sensitivity:** Prefers warm climates but needs partial shade in extreme heat to prevent stress.
- **Mulching:** Helps retain moisture, suppress weeds, and regulate soil temperature, especially in dry seasons.[8]

PASTE AND DISEASE

Pest Management

- **Aphids:** Control with neem oil, insecticidal soap, or introduce ladybugs.
- **Caterpillars & Moths:** Remove manually or use *Bacillus thuringiensis* (BT) for targeted treatment.
- **Whiteflies:** Trap with yellow sticky traps and spray neem oil or insecticidal soap.
- **Leaf Spot (Fungal):** Remove affected leaves and apply fungicide if needed.

Disease Management

- **Root Rot:** Ensure well-drained soil and avoid overwatering.
- **Powdery Mildew:** Prune infected areas, apply fungicide, and improve air circulation.
- **Leaf Curl (Viral):** Remove infected leaves and control aphids to prevent spread.
- **Bacterial Wilt:** Discard infected plants and sanitize tools to prevent contamination.

General Preventative Tips

- **Soil Care:** Use well-draining soil to promote plant health.
- **Pruning:** Remove dead or diseased parts to improve airflow and reduce pests.
- **Natural Remedies:** Regular neem oil application helps prevent pests and diseases.[8]

MEDICINAL USES

- **Anti-inflammatory:** Helps reduce inflammation, useful for arthritis.
- **Antioxidant:** Protects cells from free radical damage.
- **Antimicrobial:** Effective against bacterial and fungal infections.
- **Wound Healing:** Speeds up the healing process.
- **Digestive Health:** Aids in treating diarrhea and dysentery.
- **Anti-TB Potential:** Contains bioactive compounds that may help combat tuberculosis.
- **Skin Care:** Used in remedies for acne and rashes.[2]

CHEMICAL COMPOSITION

- **Gallic Acid & Ellagic Acid:** Antioxidant, anti-inflammatory, antimicrobial.

- **Flavonoids (Quercetin, Kaempferol):** Supports cardiovascular health, antimicrobial.
- **Triterpenoids (Betulinic Acid):** Anti-inflammatory, anticancer, liver protective.
- **Saponins & Alkaloids:** Antimicrobial, anti-inflammatory, pain relief.
- **Tannins:** Astringent, wound healing, antimicrobial.
- **Essential Oils (Terpenes, Phenols):** Antibacterial, antifungal, calming.
- **Amino & Fatty Acids:** Support metabolism, skin health, and tissue repair.
- **Sterols & Carbohydrates:** Anti-inflammatory, energy source, cholesterol-lowering.

These compounds contribute to Bakula's therapeutic properties, making it valuable in traditional and modern medicine.[4]

NUTRIATIONAL IMFORMATION

Although not a staple food, Bakula fruit contains essential nutrients:

- **Carbohydrates:** Provides energy through natural sugars like glucose and fructose.
- **Proteins:** Supports tissue growth and repair, though present in small amounts.
- **Fats:** Contains beneficial fatty acids (oleic and linoleic) for skin health and inflammation Control.
- **Fiber:** Aids digestion and regulates blood sugar levels.
- **Vitamins:** Rich in Vitamin C and Vitamin A, supporting immunity, skin, and vision.
- **Minerals:** Contains calcium, phosphorus (bone health), and iron (oxygen transport).
- **Antioxidants:** Flavonoids, phenols, and gallic acid protect against oxidative stress.
- **Amino Acids:** Includes glutamic acid and glycine, aiding metabolism and protein synthesis.

Bakula fruit contributes to energy, digestion, and overall health through its nutrient-rich profile.[9]

EXTACTION PROCESS

The maceration process is commonly used to extract the bioactive compounds from *Bakula* plant material. The steps include:

- **Plant Material:** Fresh or dried *Bakula* flowers, leaves, or bark (typically 100 grams).
- **Solvent:** Ethanol (70%) or water, depending on the compounds being extracted.
- **Maceration**: The plant material is soaked in the solvent for 24-48 hours to allow the extraction of active compounds.
- **Shaking:** The mixture is periodically shaken to enhance the extraction efficiency.

- **Filtration:** After the maceration period, the mixture is filtered to remove plant debris.
- **Concentration:** The solvent can be evaporated under low heat to concentrate the extract.[11]

Advantages of Maceration Extraction

- Simplicity
- Cost-effective
- Preservation of active compounds
- Suitable for heat-sensitive compounds
- Minimal solvent usage
- Scalable for different amounts

Disadvantages of Maceration Extraction

- Time-consuming
- Lower yield
- Requires frequent stirring
- Limited solvent efficiency
- Incomplete extraction
- Possible contamination[10]

PHARMACOLOGICAL EFFECTS

- **Anti-inflammatory:** Reduces pain and swelling, beneficial for arthritis and other inflammatory conditions.
- **Antibacterial:** Fights bacterial infections, including skin and wound infections.
- **Antioxidant:** Protects cells from oxidative stress, reducing the risk of chronic diseases.
- **Antifungal:** Helps combat fungal infections, particularly on the skin.
- **Wound Healing:** Speeds up tissue repair and promotes faster healing.
- **Digestive Support:** Aids in relieving diarrhea and other digestive issues.
- **Anti-tubercular Potential:** Shows promise in fighting tuberculosis due to its bioactive compounds.
- **Cardioprotective:** May support heart health by reducing oxidative damage and inflammation.[1]

SAFETY AND SIDE EFFECTS

Safety

- Generally safe when used correctly in traditional medicine.
- Minimal side effects when taken in recommended doses.
- Often used topically without major adverse reactions.
- Pregnant, breastfeeding individuals, or those with medical conditions should consult a doctor before use.

Side Effects

- **Allergic Reactions:** May cause itching, rash, or swelling in sensitive individuals.
- **Digestive Issues:** Overuse can lead to nausea, stomach discomfort, or diarrhea.
- **Toxicity:** High doses or improper use may cause harmful effects, though rare.

  Bakula is safe when used properly, but following dosage guidelines and monitoring for allergies is essential.[12]

CONCLUSION

Mimusops elengi is a highly valued medicinal plant with a wide range of therapeutic properties, including antimicrobial, anti-inflammatory, antioxidant, hepatoprotective, cardio protective and anti-tubercular effects. Its bioactive compounds, such as flavonoids, tannins, saponins, Triterpenoids, and gallic acid, contribute to its medicinal significance.

Although traditional and scientific studies highlight its potential, further research is needed to establish its clinical safety, efficacy, and proper dosage. Standardized extraction methods and toxicity studies are essential for its safe use in modern medicine. Additionally, exploring its potential in treating infectious diseases like tuberculosis could lead to new drug developments.

With continued scientific advancements, *Mimusops elengi* can play a crucial role in herbal medicine and pharmaceutical research. Future studies should focus on clinical trials, formulation development, and biotechnological applications to fully utilize its medicinal benefits.

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