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**Pharmacognostic Standards for *Mimusops elengi* Linn - A Review****Rakesh S Shivatare, Ramesh S. Deoda, Prasad V Kadam, Hanumant U Bhusnar, Nupura S. Narappanawar, Manohar J Patil****ABSTRACT**

Medicinal plants are nature's gift to human beings to make disease free healthy life, and play a vital role to preserve our health. They are believed to be much safer and proven elixir in the treatment of various ailments. Pharmacognostic studies of crude drug plays a very important role in identification, purity and quality of crude drugs. The *Mimusops elengi* Linn. commonly known Spanish cherry, belonging to Sapotaceae family. It is a large ornamental evergreen tree cultivated in India and generally reared in gardens for the sake of its fragrant flowers. The bark, fruit and seeds of *Mimusops elengi* possess several medicinal properties such as astringent, tonic, and febrifuge. Chemical studies have shown that, Bark contain tannin, triterpenoids and flower contain volatile oil as well as seeds contain fixed fatty oil. Through this review, the authors hope to attract the attention of natural product researchers throughout the world to focus on pharmacognostic standards of *Mimusops elengi* Linn. and it may be useful in developing new standards for *Mimusops elengi*.

**Keywords:** *Mimusops elengi*, Sapotaceae, Pharmacognosy, Standards.**1. Introduction**

Today sophisticated modern research tools for evaluation of the plant drugs are available but pharmacognostic method is one of the simplest and cheapest methods to start with for establishing the correct identity of the source materials [1]. Natural products are known to play an important role in Pharmaceutical biology. Plants have been an important source of medicine for thousands of years. Even today, the World Health Organization estimates that up to 80 percent of people still rely mainly on traditional medicines. In fact, many of the current drugs either mimic naturally occurring molecules or have structures that are fully or in part derived from natural motifs [2]. *Mimusops elengi* is considered as a sacred plant among Hindus and its fragrant flowers are celebrated in the Puranas and even placed amongst the flowers of the Hindu paradise. Krishna is said to have fascinated the milkmaids of Mathura on the banks of Yamuna by playing on his flute beneath a *Mimusops elengi* tree. Kalidasa has also included in his classical Sanskrit literature *Mimusops elengi* flowers as symbol of love and beauty [3,4]. It has made important contribution to the field of science from ancient times as also to modern research due to its large number of medicinal properties [5, 6, 7].

*Mimusops elengi* is a small to large evergreen tree, grows up to 15 meter high. Generally characterized by a short, dark and very rough trunk and wide spreading, the ends of which tend to rise and forms a thick globular head to the tree. The *Mimusops elengi* tree attains large dimensions in the moist evergreen forests of Western Ghats; in the Eastern Ghats, it is found in dry areas, often on laterite and is comparatively small in size (Fig. 1) [4, 5, 8].

**2. Aims and Objectives**

To standardize the plant *Mimusops elengi* Linn by compiling Pharmacognostic information including macroscopic and microscopical characters along with physico-chemical and phytochemical constituents.

**3. Botanical Origin** [8]*Mimusops elengi* Linn.**3.1 Taxonomical Classification** [7]

Kingdom: Plantae  
 Order : Ericales  
 Family : Sapotaceae  
 Genus : Mimusops  
 Species : *M. elengi* Linn.

**3.2 Sanskrit Names** [4, 7]

Bakula, Kesara, Madhugandha.

**3.3 Vernacular names** [5, 8]

English: bullet wood, Spanish cherry; Hindi: mulsari, sinha kasaraka Sanskrit: bakula, kesara, madhugandha Udumbara; Assamese: Gokui; Marathi: ovalli; Bengali: Bakul; Telugu: bogada, bogada-manu; Singali: minn-mal, muhulla, muhuna; Tamil: vagulam, magadam, muhunain; Oriya: kira kauli, baula.

**3.4 Ayurvedic Properties** [6]

Rasa : Katu, Kashaya, Madhura  
 Guna : Guru, Snigdha, Vishada  
 Virya : Seeta  
 Vipaka : Katu  
 Doshaghanta : Kaphapittashamak  
 Rogaghata : Shirashoola, Pooyadanta, Atisara, Pravahika, Jwara, Shukrameha, Dantachala  
 Karma : Dantya, Stambhana, Grahi  
 Doses : Decoction (bark) - 50 to 100 ml; flower powder - 1 to 2 gm.

**3.5 Part Used** [5, 7]

Stem bark, leaves, flowers, fruit and seed.

**Fig 1:** Whole plant of *Mimusops elengi* Linn.**3.6 Distribution** [8, 9, 10]

*Mimusops elengi* Linn tree is the native of western peninsula. The tree is found in South India in dry evergreen forests from the Krishna southwards and in ravines in the hills up to 20 meter along western coast and lower ghats in moist evergreen forests. It is distributed in Andaman, Martaban, Tenasserim, Burma and the Western Ghats; in the Eastern Ghats it is found in dry areas, often on laterite and in comparatively small in size. It is mostly found in

Northwestern Himalayas, Eastern Ghats, Western Ghats, Central Deccan Plateau, East Coast, West Coast, Indo-Gangetic Plain, and Outlying Islands (Fig. 2).

**3.7 Cultivation and collection** [8, 11]

The tree is frequently cultivated in gardens chiefly for its fragrant flowers and ornamental foliage. It is also grown as an avenue or shade tree throughout the greater part of India. Before sowing seeds are soaked in Luke-warm water for 24 hours, after that water is drained out. Pre-treatment of seeds in 0.5 to 1.0% solution of thio-urea significantly improved the total germination to 77 and 72%, respectively. Treated seeds start germination from 9th day. Seeds are sown in shaded mother beds at a depth of 0.5 to 1.0 cm covering of beds with dry straw maintained the moisture and enhanced the germination. Germination starts after 12 to 15 days of sowing and seedlings are transplanted in polythene bags after one month of germination. The growth of seedlings at initial stage is slow and it takes about one and half year to become ready for field plantation. The rate of growth is slow. A handsome variety of this tree with variegated leaves is sometimes grown in gardens.

**Seed collection period February - March**

Number of seeds/kg	- 3950
Seed viability	- 3 months
Pre-sowing treatment	- Luke warm water
Germination percentage	- 68
Seedlings obtained/kg seeds	- 2,690.

**Fig 2:** Distribution of *Mimusops elengi* Linn in India**2. Pharmacognostic Studies****2.1 Macroscopic characters****2.1.1 Stem bark** [8]

The fresh bark is grayish black, channelled, occurs in pieces of 15-25 cm long and 10 -15 cm broad. Externally rough due to the presence of vertical lenticels, cracks and longitudinal fissures. The dried bark is black, curved, thin, fibrous and longitudinally striated fracture along with (Fig. 3).

**2.1.2 Fruit and Seed** [4, 6]

Berry ovoid, 2.5 cm long with. It turns yellow and it tastes astringent and sweet. Fruits occur in rainy season, when ripe containing 1, rarely 2 seeds. Seeds are grayish brown, solitary, ovoid, compressed, shining (Fig. 3).

**2.1.3 Leaves** [8]

The leaves are glossy and are dark green when old with 6.3 - 10 cm in long and 3.2 - 5 cm in wide. The new leaves mostly appear in

February when the trees often appear bright vivid green. Leaves are variable, elliptic, oblong or oblanceolate, short or long acuminate, margin undulate, closely but faintly veined. Petioles 1.2 - 2.5 cm

long, (Fig. 3) whereas the dried leaves are Blackish green in color.



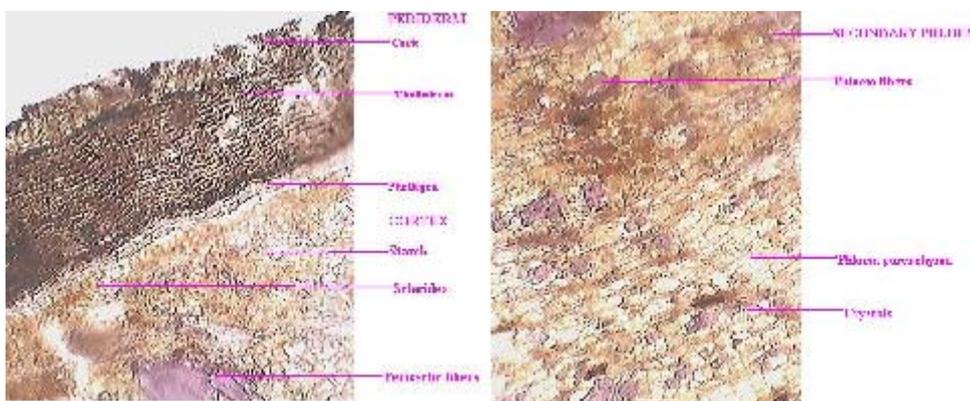
**Fig 3:** Bark, Leaves, and Fruits of *Mimusops elengi* Linn

**2.2 Microscopical characters**

**2.2.1 Stem bark** [3, 8, 12]

Transverse section of bark shows 5-6 layers of cork cells, 2-3 layers of phellogen, 2-3 layers of phelloderm followed by cortex. The cork originates in the sub epidermis or second layer of cortex. Pericycle is represented by a discontinuous ring consisting of thick

walled fibers and parenchyma. The secondary phloem is a wide zone of tissue composed of sieve tubes, companion cells, phloem parenchyma, alternating with strands of phloem fibers transverse by phloem rays which are filled with latex. Secretary cells are present, they are elliptical in shape and lined by epithelial cells (Fig. 4).



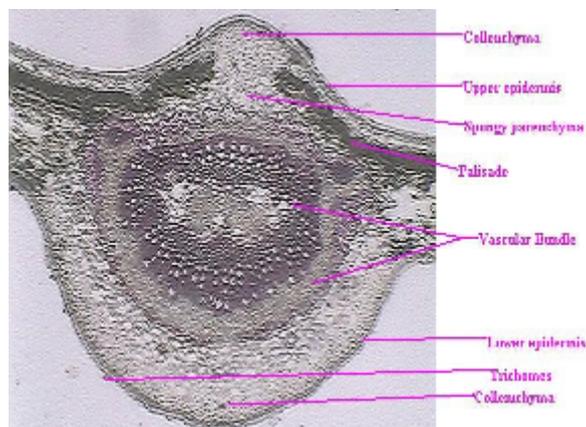
**T.S. OF BARK**

**Fig 4:** T.S of *Mimusops elengi* Linn Bark

**2.2.2 Leaf** [6, 13]

Transverse section of leaf shows a dorsiventral structure, heavily thickened and strongly striated with ridged cuticle on both surfaces. The stomata, present on the lower surface, are ranunculaceous or rubiaceous and striations emanate from the sides of stomata. The glands are present only on upper surface. Trichomes are always two armed, each arm being pointed. Mesophylls consist of 2-3 layers of

palisade tissues and 5-6 layers of spongy parenchyma. The hypodermal cells are thick walled. Vascular bundle is capped by sclerenchymatous fibers. Laticiferous cells containing latex, solitary crystals of calcium oxalate, tannin and brownish contents are present. Stomatal index- 10.36, palisade ratio- 5, vein islet number- 11, vein termination number-12 (Fig. 5).

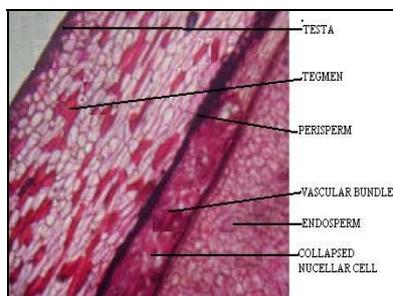


**Fig 5:** T. S. of *Mimusops elengi* Linn LEAF

**2.2.3 Fruit and Seed** [3, 8, 14]

Transverse section of seed shows pericarp which is composed of exocarp, mesocarp and a hard endocarp; presence of secretory canals lined with 5-7 epithelial cells is a characteristics. The mesocarp consist of a broad parenchymatous zone, most of the cells of which are filled with masses of rubber like substances.

Numerous vascular bundles are scattered in the mesocarp region. The endocarp cells are thick walled. The seed lies enclosed within the endocarp. The testa is 1-1.5 mm thick and is distinguished into five distinct concentric regions. Thin perisperm separates the testa from endosperm. The endosperm and cotyledonous cells are thin walled (Fig. 6).



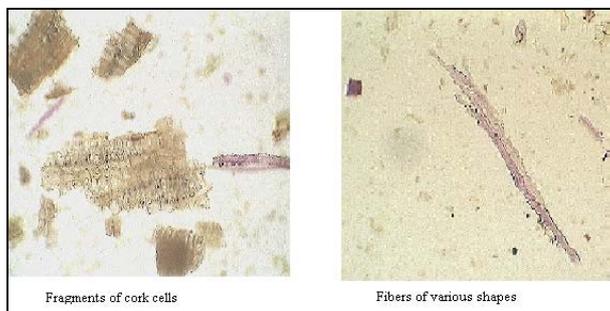
**Fig 6:** T. S. of *Mimosops elengi* Linn SEED

**2.3 Powder characteristics**

**2.3.1 Stem bark** [8, 12]

Powder bark is brown, non-aromatic, astringent. The microscopic

examination of the powder shows fragments of cork cells, fibers of various shapes and thickness, tannin cells, Laticiferous cells, stone cells, solitary crystals and other cell contents (Fig. 7).



**Fig 7:** Powder Microscopy of Bark

**2.3.2 Leaf** [8, 13]

Powder leaf is green, non-aromatic, bitter, and astringent. On microscopic examination the powder shows fragments of

epidermis, palisade cells, hairs, some xylem vessels and stomata (Fig. 8).

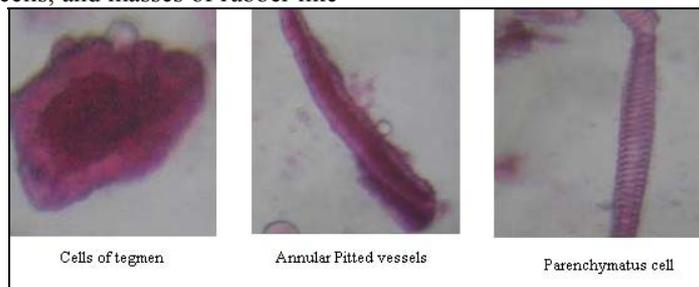


**Fig 8:** Powder microscopy of Leaf

**2.3.3 Fruit and Seed** [8, 14]

On microscopic examination the powder shows cells of tegmen, fragments of fibers, sclerides, stone cells, and masses of rubber like

bodies, parenchymatus cells, spiral and scalariform vessels (Fig. 9).



**Fig 9:** Powder microscopy of Seed

**2.4 Physical constant** [12, 13, 14, 15]

Physical constant like ash value, extractive values of bark, leaf,

fruit, seed are given in table 1.

**Table 1:** Physical constant

Sr. No.	Parameters	Bark	Leaf	Fruit	Seed
<b>Ash Values (% w/w)</b>					
1.	Total ash	12.5	8.9	3.4	6.0
2.	Acid insoluble ash	7.0	2.3	0.79	3.5
3.	Water soluble ash	2.0	-	-	2.2
4.	Sulfated ash	9.0	-	-	10.3
<b>Extractive values (% w/w)</b>					
5.	Alcohol soluble extractive value	66.73	17.00	33.00	17.00
6.	Water soluble extractive value	71.73	30.83	36.33	15.66
7.	Chloroform soluble extractive value	51.10	-	-	19.76

**2.5 Fluorescence characters** [8]

Fluorescence characters of the powdered drug observed under ultra violet light are given in table 2.

**Table 2:** Fluorescence characters

S.N.	Treatment	Stem Bark	Leaf	Fruit	Seed
1.	Drug+nitrocellulose in amyacetate	Black	Yellowish green	No change	Black with greenish tinge
2.	Drug +1N NaOH in methanol	Black with greenish tinge.	Black with greenish black	Black with greenish tinge.	No change
3.	Drug +1N NaOH dried + nitrocellulose in amyacetate	Black with greenish tinge.	Blackish green	Black	Dirty black
4.	Drug + 1N HCL	Dark green	Dirty green	Green	Greenish black
5.	Drug + 1N HCL dried + nitrocellulose in amyacetate	Green	Yellow green	Light green	No change
6.	Drug + 1N NaOH in water	Bright green	Olive green	Black with greenish tinge	Greenish black
7.	Drug + 1N NaOH in water dried + nitrocellulose in amyacetate	Green with black tinge	Black tinge	Deep violet with greenish tinge	Blackish green
8.	Drug + HNO <sub>3</sub> diluted with equal volume of water	Olive green	Olive green	Brown with greenish tinge.	Black with greenish tinge.
9.	Drug + H <sub>2</sub> SO <sub>4</sub> diluted with equal volume of water	Blackish	Blackish green	Black with greenish tinge.	No change
10.	Drug as such	Green	Dirty green	Grayish green	Blackish grey

**2.6 Phytochemical Composition****2.6.1 Active constituents** [8, 10, 11, 12]

A preliminary phytochemical test on stem bark, leaves and root shows the presence of following constituents which are specified in table 3.

**Table 3:** Preliminary phytochemical test

Sr. No.	Reagent	Bark	Leaf	Root
1.	Petroleum ether	Sterols(0.79)	Sterols, reducing sugar(1.95)	Sterols(0.73)
2.	Benzene	Sterols(0.46)	Sterols, reducing sugar(0.69)	Sterols(0.32)
3.	Solvent ether	-----(0.33)	Reducing sugar(3.82)	-----(0.29)
4.	Chloroform	-----(0.32)	Reducing sugar(0.43)	-----(0.21)
5.	Ethanol 95 %	Alkaloid, carbohydrates, glycosides, reducing sugar, saponins, tannin.(28.90)	Reducing sugar, saponins(6.09)	Carbohydrates, glycosides, reducing sugar, flavonoid, saponins, protein.(11.40)
6.	Water	Alkaloid, carbohydrates, glycosides, reducing sugar, saponins, tannin.(6.30)	Reducing sugar, saponins, tannin.(8.70)	Alkaloid, carbohydrates, glycosides, saponins.(16.50)

## 2.7 Phytoconstituents

### 2.7.1 Stem bark

Taraxerone, taraxerol, betulinic acid and spinasterol, sodium salt of betulinic acid and ursolic acid, Fatty acid esters of alpha-spinasterol was isolated from the bark.<sup>[16]</sup> A new farnane-type pentacyclic triterpene, farnan-2-one-3 beta-ol (mimusopfarnanol), was isolated along with the known triterpenoids, farnan-3-one, and olean-18-en-2-one-3-ol and lup-20 (29)-en-3 beta-ol.<sup>[17]</sup> A new triterpene 3 $\beta$ -hydroxy-lup-20(29)-ene-23, 28-dioic acid, beta amyryn, lupeol<sup>[18]</sup> also obtained from bark. Steam distillation of bark sample yielded 0.18% of volatile organic matter. The major constituents were alpha cadinol, tau muurolol, hexadecanoic acid, diisobutyl phthalate, octadecadienoic acid.<sup>[19]</sup> New gallic acid esters, characterized as phenyl propanoxyl gallate.<sup>[20]</sup>

### 2.7.2 Fruit and seed

Fruit and seed of bakula showed presence of Quercitol, ursolic acid, dihydroquercetin, quercetin,  $\beta$  - d glycosides of  $\beta$  sitosterol, alpha-spinasterol after Saponification<sup>[21]</sup>. Two new Pentacyclic triterpene acids were isolated as mimusops acid and mimusops acid, possessing the novel migrated oleanane skeleton, mimusopane<sup>[22]</sup> along with mimusopgenone and mimugenone<sup>[23]</sup>. Pentacyclic triterpenes 3beta, 6beta, 19alpha, 23-tetrahydroxy-urs-12-ene and 1beta-hydroxy-3beta-hexanoyllup-20 (29)-ene-23, 28-dioic acid have been isolated<sup>[24]</sup>. Two novel triterpenoid saponins, mimusops and mimusops were isolated from the seeds of *Mimusops elengi*<sup>[25]</sup> and minor triterpenoid saponin mimusin was isolated along with two known triterpenoid saponins, Mi-saponin A and 16 alpha-hydroxy Mi-saponin A<sup>[26]</sup>. In addition taxifolin, alpha-spinasterol glucoside, Mi-glycoside 1, two new triterpenoid saponins mimusops A and B were also isolated<sup>[27]</sup>. Six New saponins were isolated from the seed kernel<sup>[28]</sup>. Bakul fruit are reported to contain moisture (79.27 %), protein (1.29%), fat (2.76 K Cal), reducing sugar (8.9%), Non reducing sugar (6.3%), Total sugar (15.2%), Fiber (1.13%), Vitamin C (3.27 mg / 100 gm), Mineral content (0.32%), Iron (0.59 mg / 100 gm) , Sodium (5.16 mg / 100 gm) , Potassium (98.54 mg / 100 gm)<sup>[29]</sup>.

### 2.8 Leaves, heartwood and roots

Hentriacontane, carotene and lupeol from the leaves, heartwood and roots were isolated. A new steroidal saponins, 5 alpha-stigmast-9(11) en-3-o-beta-D-glucopyranosyl (1-5)-o-beta-D-xylofuranoside was isolated from the roots of *Mimusops elengi*.<sup>[30, 31, 32]</sup>

The part of this plant made very important contribution to the field of science from ancient times as also to modern research due to large number of Chemical constituent isolated from different part of the plant.

## 3. Conclusion

*Mimusops elengi* linn has been used since the Sushrut Samhita (200 BC) Period for different therapeutic uses.<sup>[33]</sup> By looking the high traditional use of the plant, standardization is essential measure for quality, purity and sample identification. Macroscopy and microscopy along with the Quantitative analytical microscopy is one of the simplest and cheapest methods to start with for establishing the correct identity of the source material. Quite a significant amount of research has already been carried out during the past few decades in exploring the phytochemistry and pharmacognostic study of different parts of *Mimusops elengi*.<sup>[32]</sup>

This plant is a unique source of various types of compounds having diverse chemical structures.<sup>[32]</sup> Transverse section of stem bark showed the wide zone of tissue i.e. secondary phloem. Secretary cells are elliptical in shape and lined by epithelial cells. Leaf is dorsiventral and has rubiaceous stomata. Fruit showed the presence of secretory canals lined with 5-7 epithelial cells. Phytochemically fruit mainly contains saponins including mimusops, mimusops and mimusin and other parts contain steroids, pentacyclic triterpenoids and flavonoids. This reported information will be helpful for further pharmacological and therapeutical evaluation along with the standardization of plant material.

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