

Mochrus (*Bombax ceiba* Linn.): A Comprehensive Review on Pharmacology, Phytochemistry, and Ethnomedicinal Uses

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ABSTRACT

The medicinal plants are extensively used for curing variegated malady in day to day life. There is an emergent demand for plant based medicines, food supplements, health products, pharmaceuticals etc. Mochrus (*Bombax ceiba* Linn.) is one of the valuable medicinal plants used in Unani system of medicine since relic belongs to family *Bombacaceae*. It is a tall tree and widely distributed through India, Africa, Australia and tropical Asia. Many parts of the plant (root, stem bark, gum, leaf, prickles, flower, fruit, seed and heartwood) are used for the treatment of a variety of ailments. It is reported to possess *nafe sailanur reham* (beneficial in leucorrhoea), *mujaffif* (siccative), *muqawwi reham* (uterine tonic), *qabiz* (constipative), *muallide mani* (production of semen), *mumsik wa mughalliz mani* (increase consistency of semen), *dafe fasaad khoon wa safra* (purifies blood and bile) etc. It is used in asthma, diarrhoea, wound, leprosy, boils and many other skin diseases. Also possess some important pharmacological activities such as antioxidant, analgesic, antipyretic, antibacterial, diuretic, hepatoprotective, anticancer, hypoglycaemic and hypotensive etc. It is reported to contain phytoconstituents like polysaccharides, naphthoquinones, anthocyanins, lupeol and naphthol etc. This paper provides a compendium review on pharmacological, phytochemical properties and therapeutic benefits of the plant.

Keywords: *Bombax ceiba* Linn., Ethnobotanical uses, Phytochemistry, Pharmacological activities.

INTRODUCTION

Mochrus (*Bombax ceiba* Linn.) is an essential medicinal plant of subtropical and tropical India belongs to the family *Bombacaceae*. It is a deciduous tree attaining a height upto 40-50m and a girth more than 6 m, distributed throughout the hotter parts of the country about 1500m (Anonymous, 2007). Also found in Africa, Australia, temperate and tropical Asia. A lofty, deciduous, buttressed tree with stout hard prickles at base, the tree attains a height upto 40m and a girth upto 6m or more having a clear hole of 24-30m, buttresses are present only in trees of about 30 years age or more. Leaflets 5-7, lanceolate, glabrous. Flowers large, bright red. Capsules woody. Seeds enveloped in copious floss (Anonymous, 1997). It is commonly known as Simbal, Simul, Indian bombax or Red Silk cotton etc (Chakraborty et al., 2010). Semal has gummy resin which is obtained from the bark. It is dried and sold as 'semul-gum' or 'mocharas'. Almost every part of this plant is used as medicine for curing maximum number of ailments (Shadma W et al., 2014). It has number of traditional uses, and its medicinal usage has been reported in the Indian traditional systems of medicine. According to Ayurveda, it has stimulant, astringent, hemostatic, aphrodisiac, diuretic,

antidiarrheal, cardiogenic, emetic, demulcent, antidysenteric, and antipyretic properties (Williamson et al., 2005; Singh and Panda, 2005). It is reported to possess *nafe sailan reham* (beneficial in leucorrhoea), *mujaffif* (siccative), *muqawwi reham* (uterine tonic), *qabiz* (constipative), *muallide mani* (production of semen), *mumsik wa mughalliz mani* (increase consistency of semen), *dafe fasaad khoon wa safra* (purifies blood and bile) etc. It is used in asthma, diarrhoea, wound, leprosy, boils and many other skin diseases. Also possess some important pharmacological activities such as antioxidant, analgesic, antipyretic, antibacterial, diuretic, hepatoprotective, anticancer, hypoglycaemic and hypotensive etc. It is reported to contain phytoconstituents like polysaccharides, naphthoquinones, anthocyanins, lupeol and naphthol etc. This paper provides a compendium review on pharmacological, phytochemical properties and therapeutic benefits of the plant.

Synonyms

Bombax ceiba Linn. (Ghani N, 1971; Kirtikar and Basu, 1987; Anonymous, 1972)
B. malabaricum (Kirtikar and Basu, 1987; Anonymous, 1972)
Gosampinus malabarica DC. (Anonymous, 1972)

Taxonomical Classification (USDA Classification; Singh and Panda, 2005)

- Kingdom: Plantae
- Subkingdom: Tracheobionta
- Superdivision: Spermatophyta
- Division: Magnoliophyta

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- Class: Magnoliopsida
- Subclass: Dilleniidae
- Order: Malvales
- Family: Bombacaceae
- Genus: *Bombax* L.
- Species: *ceiba* L.

Vernaculars (Anonymous, 1972; Dymock, 1976; Ghani N, 1971; Khan M.A, 1303; Khan A.R, 1290)

- Assam: Dumboil, Semul
- Andaman: Didu, Semul
- Sanskrit: Samali, rakta-pushpa, Kattu-Imbal, Karpushpa, Niryasaha (gum), Pachha (gum)
- Hindi: Semul, Shembal, Kaantisenbal, Mocharas (gum), Supari kaphul (gum)
- Bengali: Simul, Shembal, Simbal, Senur
- Bombay: Seml, Savara
- Marathi: Saur, Simlo, Samar, Ratoshemalo, Semul
- Gujrat: Sawar, Simalio, Shemalo
- Telgu: Booruga, Konda-booruga, Pula, Salmalai, Mocha-ras (gum)
- Tamil: Mullilavu, iilavam, Pula-maram, Mocha-ras (gum)
- Kannad: Booruga, Kempubooruga
- Malaya: Mullilavau, Mullila-pula, Mallu-buragamara
- Oriya: Bouro, Buroh
- English: Red silk cotton-tree, Cotton tree
- French: *Bombax de Malabar*
- Unani: Murghmocha, Sebhhal, Semal, Mochras (gum)
- Urdu: Sembhal, Mochra (gum), Sebhalkagond (gum)

Distribution

It is distributed throughout the hotter parts of India, Ceylon and Malaya. This plant is common in higher altitude up to 1350m-1500m throughout India. Also found from India and Southern China to Australia (Anonymous, 1972; Ambasta et al., 1986; Hussain A, 1992; Ghani N, 1971; Satyawati, 1976; Thakur et al., 1989)

Botanical Description

The plant is a lofty, deciduous, buttressed tree with stout hard prickles at the base, attaining a height up to 40 m and girth upto 6 m or more. The trees in full bloom present a striking blaze of colour and are grown in the avenues (Anonymous, 1972). At the end of winter season this tree is very remarkable object, being entirely destitute of leaves, and loaded with large flowers followed by capsules (Anonymous, 1972; Ambasta et al., 1986; Dymock, 1976; Thakur et al., 1989)

Stem: Base of the trunk is buttressed, the branches are in whorls (Anonymous, 1972; Ambasta et al., 1986; Dymock, 1976; Thakur et al., 1989)

Leaves: Leaves digitate and large, leaflets 3-7 in number entire, 7.5-18 cm long, glabrous, penninerved, reticulately veined, lanceolate or oval, cuspidate, acute at the base, petioles 20 cm long, glabrous, stipules small, triangular and caduceus (Anonymous, 1972; Ambasta et al., 1986)

Flowers: They are 10-15 cm in diameter, crimson (red) yellow or orange coloured and fleshy before new leaves appeared,

numerous, clustered at the end of branches, cup-shaped (Kirtikar and Basu, 1987; Anonymous, 1972; Dymock, 1976; Thakur et al., 1989)

Calyx: Thick usually 3-lobed, lobes are rounded, densely silky within, glabrous (Kirtikar and Basu, 1987; Anonymous, 1972; Dymock, 1976; Thakur et al., 1989)

Corolla: Bright red, tomentose on the outside, sparingly pubescent within, petals are elliptic-oblong, recurved with close parallel veins (Kirtikar and Basu, 1987; Anonymous, 1972; Dymock, 1976; Thakur et al., 1989)

Stamens: They are more than 60, arranged in 5 bundles of about 9-12 each, and in inner bundle the 5 innermost are longest, filaments are flattened, slightly pubescent and about more than half as long as the petals, connate only at the base of bundles (Kirtikar and Basu, 1987)

Ovary: Conical, glabrous, style little longer than stamen, stigma 5, linear, 6 mm long (Kirtikar and Basu, 1987)

Capsule: Egg shaped, green, containing brown seed (wt about 4-5th wt of a grain), and a quantity of fine silky cotton 20. Capsules are 100000000000-12.5 cm long, ovoid, dirty brown in colour, 5-valved, lined within with white silky hairs (Kirtikar and Basu, 1987; Thakur et al., 1989)

Roots: Young roots are yellowish white in colour when bark has been removed, soft mucilaginous (Dymock, 1976).

MORPHOLOGY

Macroscopic: The gum of *Salmalia malabarica* (DC) Schott & Endl. is amorphous, opaque, solid, brick-red to black in colour. The pieces are irregular and of different sizes varying from 2.5-5.0 cm long. The surface is quite smooth and shiny and sometimes a small portion of bark is attached. The odour is slightly pungent and taste is acrid. Fracture is hard, difficult to break but brittle.

Microscopic: The powder of the crude drug shows the presence of abundant brick-red granules of different sizes. During the investigation different tissues are also reported. Among these fragments of tissues, cork cells are found in abundance. In surface view the cork cells are hexagonal to polygonal or oval with slightly thickened wall containing reddish brown contents and they are of 54.00-94.50 x 18.00-54.00 micron in size. These cells show the presence of tannins with ferric chloride solution. The fibres are also studied but lesser in number and they are large and usually found fragmented. They occur singly or occasionally in groups of two or three. Individual fibres are fusiform with bluntly pointed ends; the walls are straight, thickened and lignified with somewhat uneven lumen and few inconspicuous pits and of 288.00-738.00 x 10.00-18.00 micron in size. The starch grains are numerous, oval to round, simple, 4.00-9.00 micron in length and are found singly or in groups (Anonymous, 1997)..

PHYTOCHEMISTRY

The chemical compounds have been secluded from different

parts of *B. ceiba*. These belongs to steroids, flavonoids, phenolics, sesquiterpenoids, neolignans and naphthoquinones.

Root bark	8 compound
Stem bark	3 compound
Heart wood	3 compound
Leaves	2 compound
Flowers	78 compound
Seeds	19 compound
Gum	11 compound

So many compounds have been isolated from its various parts, out of which some of them are bombamalosides, shamimicin, bombasin, bombamalones, bombasin 4-o-glucoside, and bombalin which have been isolated first time from any plant species (Jain and Verma, 2012). In a preliminary phytochemical study, roots have shown the presence of flavonoids, tannins, saponins, steroids, cardiac-glycosides, and phenols besides carbohydrates and amino acids (Jain V et al., 2011). The stem-bark contains Shamimicin, a flavanoid which was screened for its hypotensive activity in animal model (Saleem R et al., 2003). Methanolic extract of leaves has demonstrated presence of steroids, carbohydrates, tannins, triterpenoids, deoxy-sugar, flavonoids, and coumarin glycosides (Hossain E et al., 2011). Flowers have been shown to contain the β -d-glucoside of β -sitosterol, free β -sitosterol, hentriacontane, hentriacontanol, traces of an essential oil, kaempferol, and quercetin (Gopal and Gupta, 1972). Gum of *B. ceiba* contains a mixture of various sugars and gallic and tannic acids (Bose and Dutta, 1963).

Mizaj (Temperament): Cold ² Dry ³ (Hakeem M.A, 2002). Cold ³ Dry ³ (Ghani N,1971; Kabiruddin, 1955).

Hissa Mustamela (Parts Used): Gum, root stem-bark, fruits, heartwood (Hakeem M.A)

Miqdare Khurak (Therapeutic Dose): 4-6gm (Hakeem M.A), 3-5gm (Kabiruddin, 1955)

Mazarrat (Advere Effects): It increases Yabusat (dryness) (Hakeem M.A, 2002; Hakeem, 2009; Nabi, 2007). Muwallide Khilt Ghaleez (Procreator of thick humour)

Musleh (Correctives): followings are used as its correctives
Roghan gul (*Rosa damascena* oil) (Hakeem M.A, 2002)
Darchini (*Cinnamomum zeylanicum*) (Hakeem M.A, 2002; Nabi, 2007; Kabiruddin, 1955)
Shakar (Sugar) (Hakeem M.A, 2002; Nabi, 2007; Kabiruddin, 1955)
Roghan badam (*Prunus dulcis* oil) (Hakeem M.A, 2002; Nabi, 2007; Kabiruddin, 1955)

Badal (Substitute): Samage Dhaak (*Butea monosperma*) (Hakeem M.A, 2002; Nabi, 2007)
Mastagi (*Pistacia lentiscus*) (Hakeem M.A, 2002; Hakeem, 2009)
Post Darakhte Anar (*Pomegranate Bark*) (Anonymous, 1972)

Murakkabat (Compound Formulations): Majoon Mochras, Sufoof Sailan (Hakeem M.A, 2002; Hakeem, 2009)

PHARMACOLOGICAL ACTIONS

- Mulattif (Demulcent) (Anonymous,1972; Ambasta et al.,1986; Dymock,1976; Hussain, 1992; Satyawati, 1976; Thakur, 1989)
- Habissudam (Haemostatic) (Anonymous,1972; Hussain, 1992; Ghani N, 1971; Kabiruddin, 1955; Satyawati, 1976)
- Qabiz (Astringent) (Anonymous,1972; Hussain, 1992; Ghani N, 1971; Kabiruddin, 1955; Satyawati, 1976; Dymock,1976)
- Muqawwi (Tonic) (Kirtikar and Basu, 1994; Nadkarni, 1994; Anonymous,1972; Ambasta et al.,1986; Hussain, 1992)
- Mubaddil (Alterative) (Kirtikar and Basu, 1994; Anonymous,1972; Hussain, 1992; Hakeem,2002)
- Muqawwi Bah (Aphrodisiac) (Kirtikar and Basu, 1994; Nadkarni, 1994; Hussain, 1992; Ghani,1971)
- Qabize Urooq Damviya (Styptic) (Kirtikar and Basu, 1994; Nadkarni, 1994; Ambasta et al.,1986)
- Mulayyan (Laxative) (Hussain,1992)
- Muwallide Mani (Semen Procreator) (Hakeem, 2002)
- Mumsik Mani (Hakeem, 2002, Ghani N, 1971; Kabiruddin, 1955)
- Mujaffif (Siccative) (Ghani N,1971)
- Muqawwi Rehm (Uterine Tonic) (Ghani N,1971)
- Mughallize Mani (Semen Viscositor) (Hakeem, 2002, Ghani N, 1971; Kabiruddin, 1955)
- Habise Tams (Amenorrhoeic) (Nabi,2007)
- Muqawwi Asnan wa Lissa (Tonic to teeth) (Hakeem, 2002; Nabi,2007)
- Dafe Fasad Khoon wa Safra (Purifies blood and bile) (Hakeem, 2002; Nabi,2007)
- Muharrik (Stimulant) (Anonymous,1972)

THERAPEUTIC USES

- Ishaal (Diarrhoea) (Kirtikar and Basu, 1994; Nadkarni,1994; Anonymous, 1972; Dymock, 1976)
- Zaheer Muzmin (Chronic Dysentery) (Kirtikar and Basu, 1994; Nadkarni,1994; Anonymous, 1972; Dymock, 1976)
- Sailan-ur-Rehm (Vaginal Discharge) (Kirtikar and Basu, 1994; Nadkarni,1994; Anonymous, 1972; Dymock, 1976)
- Qulaud Dahn (Stomatitis) (Kirtikar and Basu, 1994; Hakeem,2002)
- Hirkatul Baul (Burning Micturition) (Kirtikar and Basu, 1994; Hakeem, 2002; Kabiruddin M,1955)
- Amraze Fasad Balgham wa Safra (Diseases of Bile and Phelgm) (Kabiruddin M,1955)
- Nafsud Dam (Haemoptysis) (Anonymous,1972)
- Baul Fil Firash (Bed Wetting) (Kabiruddin M,1955)
- Sulsul Baul (Dribbling of Urine) (Kabiruddin M,1955)
- Kasrate Tams (Menorrhagia) (Kabiruddin M,1955)
- Jiryaae Mani (Spermatorrhoea) (Ghani,1917)
- Tahreeke Dandaan (Loosen Tooth) (Kabiruddin M,1955; Kabiruddin M,1955)
- Lissae Damia (Bleeding Gums) (Ghani,1917)

- Amraze Dam (Blood Diseases) (Kirtikar and Basu, 1994)

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PHARMACOLOGICAL STUDIES

- Antimicrobial activity (Hussain, 1992)
- Antibacterial activity (Hakeem,2002)
- Antioxidant activity (Hakeem,2002; Nabi,2007; Ghani N,1971; Khan M.A, 1303; Nadkarni, 1994)
- Cancer cell growth inhibition (Kabiruddin,1955)
- Antiobesity (Yu YG et al, 2011)
- Antiachne activity (Tundia R et al., 2014)
- Analgesic activity (Dar A et al., 2005)
- Cardioprotective activity (Lin CC et al., 1992)
- Aphrodisiac (Surveswaran S et al., 2007)
- Antihyperglycemic and Antihyperlipidemic Activity (Thakur R.S., 1989)
- Hepatoprotective Activity (Satyawati, 1976)
- Antiangiogenic Activity (Khan A.R, 1290)
- Cytotoxicity (Patanakar SP, 2005)
- Antipyretic (Saleem R et al., 1999)
- Hypotensive and Hypoglycemic activity (Kumar NS, 2011)

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CONFLICT OF INTEREST

The authors have no conflicting financial interests.

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