



**ETHNOBOTANICAL, PHYTOCHEMICAL AND PHARMACOLOGICAL PROPERTIES
OF SARACA ASOCA BARK: A REVIEW**

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ABSTRACT

Ashok Chhaal is the bark of *Saraca asoca*. The plant is a medium sized evergreen tree. It is widely distributed throughout Indian Subcontinent in evergreen forests up to an elevation of about 750 meters. Its propagation is done by the seeds. It grows well in tropical and subtropical climate. The plant bark is valuable remedy for uterine and menstrual trouble. The plant has shown diverse biological and pharmacological activities. It has been used in Unani Medicine (*Tibb-e-Unani*) and other Traditional Systems of Medicine since a long time. Keeping in view the medicinal importance of the drug in Unani Medicine, an attempt has been made to review the available literature on traditional uses and pharmacological properties of the plant.

KEYWORDS: *Saraca asoca*, Ashok Chhaal.

INTRODUCTION

Ashok chaal is a bark of Ashoka tree *Saraca asoca* or *S. indica*, (F- Leguminosae). *Saraca indica* is religious and the most ancient tree of India. It has a number of medicinal properties hence used by physicians since centuries in Unani system of medicine along with Ayurveda by the same name i.e “Ashok Chhaal” (Kabiruddin, YNM). The tree is believed to be native of India (Kokate *et al.*, 2003).

Taxonomy

The taxonomy of the plant *Saraca asoca* is as follows:

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Order	:	Fabales
Family	:	Leguminosae
Sub family	:	Caesalpinaceae
Genus	:	<i>Saraca</i>
Species	:	<i>Asoca</i> .
Botanical name	:	<i>Saraca asoca</i>
Synonym	:	<i>Saraca indica</i>

(Pradhan *et al.*, 2009; Preeti *et al.*, 2012; Iyenger, 2009; Rangari, 2012; Purohit & Vyas, 2004).

Vernaculars

The plant is known by different vernacular names: *Asok*, *Asoka* (Bengali); *Thawgabo* (Burma); *Akshath* (Canarese); *Asoka Tree* (English); *Ashopalava* (Gujrati); *Ashok*, *Asok* (Hindi); *Hemapushpam* (Malayalam); *Ashoka*, *Jasundi* (Marathi); *Asok* (Punjabi); *Apashoka*,

Ashok, *Chitra*, *Doshahari*, *Gandhapushpa*, *Hemapushpa*, *Madhupushpa* (Sanskrit); *Diyaratamal* (Sinhalese); *Asogam*, *Asogu*, *Anagam* (Tamil); *Asukamu* (Telugu); *Osoko* (Oriya); *Ashok Chhaal* (Urdu) (Kabiruddin, YNM; Kirtikar & Basu, 1991; Purohit & Vyas, 2004; Rangari, 2012; Joshi, 2004; Kokate *et al.*, 2003).

Habit and Habitat

Saraca asoca is extensively found in Malayan Peninsula, Myanmar, Srilanka and Bangladesh. It is grown in Indonesia (Kokate *et al.*, 2003). In India it is commonly found in Khasi hills of Assam, hilly areas of West Bengal, Western Ghats of Maharashtra and Northern areas (Purohit & Vyas, 2004; Sivarajan & Balachandran, 1994). Its original distribution was in central areas of Deccan Platue as well as the central parts of Western Ghats in the Western coastal region of the Indian Subcontinent (Preeti *et al.*, 2012) also found in Andaman Islands (Kokate *et al.*, 2003). The tree is found in Central and Eastern Himalaya, Eastern Bengal, Western Peninsula, Burma and Malaysia (Ali, 2006). It is widely distributed throughout Indian Subcontinent in evergreen forests up to an elevation of about 750 meters. Its propagation is done by the seeds (Prajapati *et al.*, 2003). It grows well in tropical and subtropical climate (Kokate *et al.*, 2003). The plant prefers moist and well-drained soil. Red laterite alluvial soil is seen highly suitable for the growth of plant. It requires an annual rainfall ranging from 2000-4000 mm with a temperature of 35 to 40 degree Celsius. Deep and moist soil specially near water bodies favor good growth. It is susceptible to frost and fire. Its coppicing capacity is poor. It is a moderately

shade loving tree. Mature seeds develop on the plant in the month of February to April, which are collected from the ground on falling. The seeds are soaked in water for twelve hours and sown on elevated beds, seeds take about twenty days for germination. The plants which are half to one year old are used for field planting. Application of Farm Yard Manure at 10 kg/tree/year is good for the growth of plant. The plants are to be irrigated in hot season. Tree is cut at 20 years to remove the bark. It must be done at rainy season to promote sprouting (Purohit & Vyas, 2004).

Ethnobotanical Description

Macroscopic

Saraca asoca is a medium sized evergreen tree. Crown is dense with horizontally spreading branches (Tyagi, 2005; Prajapati *et al.*, 2003). It is a 6 to 9 meter high tree with glabrous branches. Leaves are abruptly pinnate, rigidly coracious (Hooker, 1879). The genus which is therapeutically define having fragrant flowers numerous in number, in dense axillary corymbs 7.5 to 10 cm across; peduncles stout; pedicels 8-13 mm long, red, glabrous; bracts ovate, subacute; bracteoles 2, appearing like a calyx, 4 mm long, spatulate-oblong subacute, ciliolate, amplexicaul, coloured. Calyx is passing from yellow segments 4, oblong or obovate-oblong, 1cm long. Stamens are 7 or 8, anthers are purple. Ovary is pubescent, especially on the sutures; style curved into a ring. Pods black, 10-25 by 4.5-5 cm, linear oblong, tapering to both ends, compressed, glabrous. Seeds 4-8, ellipsoid-oblong, 3-8 cm long, slightly compressed (Kirtikar & Basu, 1991). The bark is dark brown to gray or black with a warty surface, fresh cut ends are pale yellowish red (Prajapati *et al.*, 2003). The Bark is collected by making suitable transverse and longitudinal incisions (Qadry, 2005).

Bark Size: In commerce varying but usually occurs in pieces up to 40 cm in length, 3-6 cm wide and 5-8 mm thick. Outer surface: Rough with watery protuberances and due to exfoliation rusty brown in colour. Inner surface: Smooth, soft and reddish brown. Smoothed transverse surface shows radially elongated but irregularly running medullary rays of varying width (Qadry, 2005).

Microscopic

Bark: Transverse section of stem bark shows periderm consisting of wide layer of cork, radially flattened narrow cork cambium, secondary cortex wide with 1 or 2 continuous layers of stone cells with many patches of sclereids, parenchymatous tissue contains yellow masses and prismatic crystals: secondary phloem consist of phloem parenchyma, sieve tubes with companion cells and phloem fibres occurring in groups, crystal fibres present (Pradhan *et al.*, 2009).

Stem: Transverse section of stem is circular. Projecting lenticles are present on the surface. Epidermis is single layered below which 5 to 6 layers of cortex are seen.

Cortex is 12 to 16 layered. 3 to 5 layer of stone cells are clearly visible (Pradhan *et al.*, 2009).

Root: In transverse section the root is somewhat circular in outline. The outermost zone is cork; composed of 8 to 10 layers of tangentially elongated thick walled cells. Secondary cortex has 2 distinct zones of parenchyma below which sclerenchymatous stone cells are present (Pradhan *et al.*, 2009).

Afa'ul (Action)

In classical Unani literature, various actions of bark of the plant *Saraca asoca* have been described such as Anti-menorrhagic, *Dafe Atash* (Refrigerent), *Qaatil-e-Deedan* (Vermicidal) *Dafe Bawasir* (Anti-haemorrhoid) *Muqawwi-e-Aasaab* (Neural Tonic) (Tariq, 2010); *Muqawwi-e-Rahem* (Uterine Tonic), *Dafe Isqaat* (Anti-Abortive), *Musakkin* (Sedative), *Mohallil-e-Auram* (Anti-inflammatory) (Ramlubhaya, YNM); *Qabiz* (Astringent) and *Haabisuddam* (Ali, 1999).

Istemaal (Uses)

Ashok Chhaal has been described to be useful in various ailments. It is used in many uterine diseases due to its strong haemostatic property and astringent effect on uterine muscles. It is specially used in *Kasrat-e-Haiz* (menorrhagia). It is used in *Zofe-Rahem* (Uterine debility), *Sailanur Rahem* (Leucorrhoea) and *Ikhtenaqur Rahem* (Hysteria) due to its tonic effect on uterus. The powdered bark 10 gm is mixed with milk 10 ml, then water 500 ml is added and the mixture is boiled till all the water is evaporated. The remaining solution is divided into three doses (Tariq, 2010). *Ashok Chhaal* in a dose of 10 gm is also used as a decoction (Kabiruddin, YNM; Tariq, 2010). Extract of *Ashoka* flower is useful in haemorrhoid and dysentery. Liquid extract of *Ashok Chhaal* can be used in a dose of 20-60 drops. For above purpose, powder of *Ashok Chhaal* in a dose of 3-5 gm can also be used (Tariq, 2010; Kabiruddin, YNM). This powder should be consumed along with milk for good results, twice or thrice a day (Ali, 1999).

Pharmacological Actions

The drug bark of *Saraca asoca* is described in detail in ethnobotanical and scientific literature and various actions have been reported to possess by it. Some pharmacological actions and therapeutic uses are as follows:

The bark of the plant acts as astringent, haemostatic refrigerent, alexiteric, anthelmintic, antibacterial, demulcent, diuretic (Kirtikar & Basu, 1991; Prajapati *et al.*, 2003; Joshi, 2004). They also used as anti-estrogenic, anti-inflammatory, anti-implantation, antioxidant, anti-tumour, oxytocic, anti-progestational, CNS depressant (Pradhan *et al.*, 2009; Preeti *et al.*, 2012). It has also been described to be constipative, stomachic, uterine tonic (Prajapati *et al.*, 2003). It also possesses anti-cancer (Anonymous, 2004) and antimicrobial activity (Rangari, 2012; Yadav *et al.*, 2013).

Therapeutic Uses

The plant bark is valuable remedy for uterine and menstrual trouble, particularly in uterine haemorrhage (Purohit & Vyas, 2004). The *Ashoka* bark is reported to have a stimulating effect on the endometrium and ovarian tissue and is used in the treatment of menorrhagia (Qadry, 2005; Ali, 2006; Joshi, 2004; Kirtikar & Basu, 1991; Iyengar, 2009) and uterine fibroid (Rangari, 2012). It is used in menorrhagia from fourth day of menses till bleeding stops (Nadkarni, 1954). It is also used in leucorrhoea, internal bleeding, haemorrhoids and haemorrhagic dysentery (Rangari, 2012; Kirtikar & Basu, 1991; Iyengar, 2009). In India, *Saraca asoca* dried bark as well as flower is given as a tonic to ladies in uterine disorders. Its stem bark also used to treat all disorders associated to menstrual cycle (Pradhan *et al.*, 2009). It is used also in uterine debility and hysteria (Ali, 1999). It shows astringent effect on uterine muscle fibers (Tariq, 2010). It is a popular uterine tonic and sedative. As the bark is astringent used in uterine affections, biliousness, dyspepsia, dysentery, colic, piles, ulcers, pimples (Ali, 2006). Decoction of bark is used in treating uterine infections and gynaecological problems. The flowers are used in the treatment of dysentery (Tyagi, 2005; Purohit & Vyas, 2004). The bark is bitter, acrid and refrigerant. It cures dyspepsia, thirst, burning sensation, diseases of the blood, biliousness, effects of fatigue, tumours, enlargement of abdomen. It is also useful in fracture of the bones. It beautifies the complexion. The seeds are useful in urinary discharge (Kirtikar & Basu, 1991; Joshi, 2004). Flowers pounded and mixed with water are used in retention of urine (Joshi, 2004). Flowers are also useful in scabies in children and other skin diseases. It is heart tonic, gives charm to the skin and cures renal stones and diarrhoea (Purohit & Vyas, 2004). For ethnobotanical survey of the plants various plants are used for management of diabetes. Dried flower powder of the plant *Saraca indica* is taken with milk or honey and ashoka bark decoction is taken twice a day for the treatment of diabetes (Jaykumaret *et al.*, 2010).

Phyto-chemistry

The Phytochemical study shows the presence of various chemical constituents of *Saraca indica* plant. Bark contains catechols, sterol, tannins, flavonoids, glycosides, leucopetargonidin and leucocyanidin (Yadav *et al.*, 2013), (-) epicatechin, procyanidin p2, 11'deoxyprocyanidin B, leucoperalgonidin and leucocyanidin. Dried bark contains five lignin glycosides, lyoniside, nudiposide, 5-methoxy-9- β -xylopyranosyl(-) isolariciresinol, icariside E3 and schizandriside and three flavonoids epicatechin, epiafzelechin-(4 β →8)-epicatechin and procyanidin B2, together with β -sitosterolglucoside (Pradhan *et al.*, 2009). The bark also contains 24-methylcholest-5-3n-3B-ol, 24-ethylcholest-5, 22-dien-3B-ol and 24-ethylcholest-5n-3B-ol (Joshi, 2004). The bark extract contains gallic acid, beta guanine, indolylmethyl glucosinolate, trimethyl apigenin, tyramine, beta

xanthine, gallic acid hexoside, hypophyllanthin, phloridzin, lignin, galloyl-isorhamnetin, myoinositol, cellotriase, 17-Decarboxy betanin, lyoniside, procyanidin gallate (Yadav *et al.*, 2015). The wax obtained from bark contains n-alkanes (C20-C35), esters (C34-C60) and primary alcohols (C20-C30) and n-octacasanol is also isolated (Joshi, 2004; Rangari, 2012; Yadav *et al.*, 2013).

The stem contains quercetin, amyrine, ceryl alcohol and beta sterol (Anonymous, 2004). Bark and stem found to contain quercetin, quercetin-3-O- α -l-rhamnoside, kaempferol 3-O- α lhamnoside, amyrine, ceryl alcohol and β -sitosterol (Yadav *et al.*, 2013).

Flower contains oleic, linoleic, palmitic and stearic acids, P-sitosterol, quercetin, kaempferol-3-O-P-D-glucoside, apigenin-7-O-p-D-glucoside, Pelargonidin-3, 5-diglucoside, cyanidin-3, leucocyanidin and gallic acid (Yadav *et al.*, 2013). Four anthocyanin pigments are isolated from flowers; beta and alpha sitosterol are isolated from fixed oil of flowers (Rastogi & Mehrotra, 1999). Seed and Pod contains oleic, linoleic, palmitic and stearic acids catechol, (-) epicatechol and leucocyanidin (Yadav *et al.*, 2013).

Parts Used: Bark, leaves, flowers and seeds

Mizaj: Barid Yabis (Cold and Dry)
(Kabiruddin, YNM).

Barid Moatadil Yabis 2° (Ramlubhaya, YNM).

Dose (Miqdar-e-Khorak):

Safoof: 5 gm with milk (Ali, 1999).

Sharbat: 20-40 ml (Raml Lubhaya, YNM).

Decoction: 10-20 gm (Raml Lubhaya, YNM).

Compounds: Mastureen by Hamdard (Tariq, 2010).

Pharmacological Studies

A number of studies have been carried out on *Saraca asoca* in recent years showing that it possesses diverse pharmacological effects. Some of the important pharmacological effects are as follows:

Acetylcholine like Activity

The non-phenolic extract of *Saraca asoca* contains glycoside and has parasymphatho mimetic (acetylcholine like) activity (Qadry, 2005).

Analgesic

The aqueous and alcoholic extracts of *Saraca indica* bark skin was evaluated for its analgesic activity in swiss albino rats. It shows significant activity at 300mg/kg body weight as compared with control rats. The analgesic activity might have been attributed to the presence of alkaloids and steroids in this plant (Mohod *et al.*, 2014).

Anthelmintic

Saraca indica extract has been used for anthelmintic activity, the extractions were prepared to obtain 1, 2.5 and 5% concentration of the standard anthelmintic drug

like Piperazine citrate. Experiments showed that the ethanolic extracts were relatively more potent as an anthelmintic agent due to presence of alkaloids. The methanolic extracts are effective probably due to the involvement of glycosides, tannin, flavonoids and terpenoids seems to be the accountable phytochemical constituent for signifying anthelmintic activities of extracts (Sarojini *et al.*, 2011).

Anticancer

The anticancer principle from *Saraca asoca* indicated 50 percent cytotoxicity (*in vitro*) in Dalton's lymphoma ascites and Sarcoma-180 tumour cells at a concentration of 38 µg and 54 µg respectively, with no activity against normal lymphocytes but percentile activity for lymphocytes derived from leukemia patients (Anonymous, 2004).

Anti-inflammatory

The ethanolic extract of *Saraca indica* shows the anti-inflammatory activity. The plant extract at the dose of 200 mg/kg showed significant anti-inflammatory activity. It reduced the paw edema significantly, though of short duration and intensity as compared to that of 10 mg/kg diclofenac (Shelar *et al.*, 2010; Mujumdar *et al.*, 2000).

Antimicrobial

Alcoholic extract of the bark shows significant antimicrobial activity against a wide range of bacterias and aqueous extract has been found to enhance the life span of mice infected with carcinoma (Rangari, 2012). The flower and flower buds of ashoka plant extract were reported antimicrobial activity against enterobacteria. *Saraca indica* or *Asoka* was subjected to antibacterial activity on agar plate with different organisms such as *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhosa*, *Staphylococcus aureus*. Four different extracts of *Saraca indica* bark tested antibacterial activity against *Escherichia coli*, *Salmonella typhi*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Bacillus cereus*, *K. aerogenes*, *Sh. boydis*, *P. vulgaris*. Different extracts of *Ashok chhaal* were screened against the enteric pathogens isolates, namely *Escherichia coli*, *Shigella sonnei* and *Salmonella enteritis*. All the extracts showed antimicrobial activity with the methanol extract having the highest percentage of activity by giving maximum zone of inhibition (Acharya *et al.*, 2009).

Bark extracts of *Saraca indica* were investigated for *in vitro* antibacterial action against *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Proteus vulgaris*, *Bacillus aureus* and *Klebsiella pneumonia* at 4 mg/ml using agar well diffusion method. *Saraca indica* also evoked strong bactericidal activity against *V.cholerae* and hydrophila with MBC ranging from 1-5 mg/ml (Acharya *et al.*, 2009). Seed extract is found effective against dermatophytic fungi (Pradhan *et al.*, 2009).

Anti-oxytocic

Oxytocic activity of the plant was seen in rat and human isolated uterine preparations. Estrogen-primed or gravid uterus was more sensitive to the alcoholic extract. Pentolinium bitartrate completely blocked the oxytocic action (Bhandary *et al.*, 1995).

Antiulcer

The aqueous suspension of *Saraca indica* flower used against the gastric ulcer in albino rats. The aqueous suspension treatment significantly reduced basal gastric secretion and causes stimulation of mucous secretion and endogenous gastric mucosal prostaglandin synthesis; hence prevent the occurrence of acute gastric mucosal lesions in rats (Maruthappan *et al.*, 2010; Melo *et al.*, 2006).

CNS Depressant

Saraca indica leaves extracts successfully with petroleum ether, chloroform, methanol and water possessed CNS depressant activity. Methanol extract of *Ashoka* leaves (400mg/kg) produced highest activity by prolonging the sleep duration. Other three extracts also produced dose dependent CNS depressant activity in albino mice by decreasing the locomotor activity by 67.33% (Verma *et al.*, 2010; Yadav *et al.*, 2013).

Larvicidal

The petroleum ether extract of *Saraca indica* leaves and the chloroform extract of the bark were effective against the larvae of *C. quinque fasciatus* with respective LC-50 values, 228.9 and 291.5 ppm, which follows the WHO standard protocols (Mathew *et al.*, 2009).

Uterine Tonic

Saraca indica stimulates the endometrium and ovarian tissue. The oestrogenic effect of U-3107 a herbal uterine tonic using *in vivo* and *iv vitro* experimental ovariectomised rats shows oestrogenic activity is devoid of any progestational activity (Yadav *et al.*, 2015). It is useful in disorders such as menorrhagia, dysmenorrhoea, premenstrual syndrome, abnormal bleeding and threatened abortion (Mitra *et al.*, 1999).

Toxicity Study

Extraction of different solvents like petroleum ether, chloroform, methanol and water extract when administered up to 2000 mg/kg body weight, none of the extracts produced any toxic symptom of mortality (Verma *et al.*, 2010). Different doses of *Saraca indica* extract were administered in randomly selected healthy rats in a dose of (500, 1000, 1500 and 2000 mg/ kg body weight) and rats were observed for toxicity then the vital organs of rats were removed and taken for macroscopic examination. Toxicological evaluation of *Saraca indica* bark extracts are promising and indicate that, this herbal preparation may have a potential to be used as a complimentary medicine (Yadav *et al.*, 2015).

CONCLUSION

Saraca indica has been in use since times immemorial to treat wide range of indications. It has been subjected to quite extensive phytochemical, experimental and clinical investigations. Experimental studies have been demonstrated its analgesic, antispasmodic, anthelmintic, anticancer, anti-oxytocic, anti-oxytocic, CNS depressant, larvicidal, and uterine tonic effects. The scientific studies have proved most of the claims of traditional medicines. However, further detailed clinical research appears worthwhile to explore the full therapeutic potential of this plant in order to establish it as a standard drug.

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