Saraca asoca (Ashoka): A Review

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Abstract

Ashoka is the most ancient tree of India, generally known as a "ashok briksh", botanist known as a *Saraca asoca* (Roxb.), De.wild or *Saraca indica* belonging family *Caesalpinaceae*. Medicinal herbs are moving from fringe to mainstream use with a great number of people seeking remedies and health approaches free from side effects caused by synthetic chemicals. Saraca asoca is reported to contain glycoside, flavanoids, tannins and saponins. It is used as spasmogenic, oxytocic, uterotonic, anti-bacterial, anti-implantation, anti-tumour, anti-progestational, anti-estrogenic activity against menorrhagia and anti-cancer. This review contains the Pharmacognostical account of various parts of plant, Phytochemical constituent and different reported pharmacological activity.

Key Words: Saraca asoca, Pharmacognostical Feature, Phyto-chemistry, Analytical Parameter, Pharmacology.

Introduction

Herbal medicine has such an extraordinary influence that numerous alternative medicine therapies treat their patients with Herbal remedies, Unani and Ayurveda. Approximately 25 percent of all prescription drugs are derived from trees, shrubs or herbs. Nature has bestowed our country with an enormous wealth of medicinal plants therefore India has often been referred to as the medicinal garden of the world. So stand the medicinal plants Saraca asoca as one of the foremost plants utilized from antiquity till to date. Asoka or ashoka is a Sanskrit words which means "without sorrow" or which that gives no grief. Ashoka is one of the most legendary and sacred trees of India. Ashoka tree, universally known by its binomial Latin name *Saraca asoca* (Roxb.), De.wild or *Saraca indica* belonging family *Caesalpinaceae*.[1,2]. It is a evergreen tree called in english Asok tree. It is also known as Kankeli (Sanskrit), Ashoka (Assamese), Ashoka (Bengali) , Ashoka (Gujrati), Ashoka (Hindi), Ashokadamara (Kannada) , Ashok (Kashmiri), Asokam (Malayalam), Ashok (Marathi), Ashoka (Oriya), Ashok (Punjabi), Asogam (Tamil),

Ashokapatta (Telugu) [3]. It is found throughout India, especially in Himalaya, Kerala, Bengal and whole south region. Ashoka is one of the sacred plants of Hindus, and is especially sacred to the Hindu God of Love, Kamadeva, for whom it is worshipped every year on December 27; it is mentioned in Hindu mythology as the Ashoka tree, beneath which the Indian philosopher and founder of Buddhism, Gautama Siddhartha (c.563-483 B.C.) was said to have been born under this tree. The aim of the present study is to provide complete information about the medicinal & pharmacological importance of the *Saraca asoca*.

Classification **[4]**

Kingdom: Plantae
Divison : Magnoliophyta
Class : Mgnoliopsida
Order : Fabales
Family : Caesalpinaceae
Genus : Saraca
Species : Asoca

Adulterant

The drug is widely adulterated with the bark of Polyalthia longifolia.In Hindi and Bengali it is known as devdaru. It is cultivated throughout the hotter parts of India. Some time bark of Ashok mixed with Rohitaka bark (Afanamexis polystakis) and Sicalpinea pulchirena.Saraca asoca barks are differentiate from another bark according some old ayurvedic texts [5,6].

"Ashoko Hempuspasha Vanjulastamrapalavaa
Kankelee Pindpushpasha gandhpuspo natastha
Ashoka Seetalstitakto Grahi Varnya Kashayak
Doshapacchitrashadahkarmishoth Vishastrizith"

Ecology and Distribution

Cultivation *[7]*

1. Soil and climate: The plant requires slightly acidic to neutral soils for good growth with medium to deep well drained fertile soils. It grows well in tropical to sub-tropical situations under irrigation.
2. Nursery raising and planting: The crop can be propagated by seeds and stem grafting. The seedlings are planted in the well manured field during the rainy season.
3. Thinning and weeding: Weeding and thinning of the plants may be done as and when required usually after 15-30 days for better growth.
4. Manures, fertilizers and pesticides: The medicinal plants have to be grown without chemical fertilizers and use of pesticides. Organic manures like, Farm Yard Manure (FYM), Vermi-Compost, Green Manure etc. may be used as per requirement of the species. To prevent diseases, bio-pesticides could be prepared (either single or mixture) from Neem (kernel, seeds & leaves), Chitrakmool, Dhatura, Cow's urine etc.
5. Irrigation: Normally grown as rainfed crop but for better yield irrigation may be done as per requirement (weekly/fortnightly).
6. Harvesting/ post harvesting operation: Bark is removed from about ten years or older tree and then it has to be sun dried.

Natural habitat

It is distributed in evergreen forests of India up to an elevation of about 750 meters. It is found throughout India. Specially in Himalaya, Kerala, Bengal and whole south region.In Himalaya it is found at Khasi, Garo and Lussi hills and in Kerala region it is found in Patagiri, Kaikatty & Pothundi of Palakkad district, Thrisur, Kollam and Kannaur districts [7].

Analytical parameter [7]

Description:	A. Colour	Brown
	B. Odour	Characteristic
	C. Taste	Characteristic
	D. Appearance	Free flowing powder

Identification: TLC method: Characteristic Chromatographic finger print

Solubility	: A. In water	NLT 60%w/w
	B. In Alcohol	NLT 40%w/w

PH (1% w/v solution):	5 to 7
Loss on drying:	NMT 5%w/w
Moisture Content by K.F.:	NMT 5% w/w
Ash Content:	NMT 5% w/w
Sulphated Ash Content:	NMT 5% w/w
Volatile oil content:	Do Not Available
Pesticide residue:	Do Not Available
Solvent residue:	Do Not Available

Assay of active principle by HPTLC / HPLC: Tannins NLT 30 % w/w

Microbiological analysis:

	A. Pathogens (E. coli, S. aureus)	Absent
	B. Total Bacterial Count (CFU/gm)	NMT 800 CFU/gm
	C. Total Fungal Count (CFU/gm)	NMT 500 CFU/gm
Heavy Metal:	A. Arsenic	NMT 1ppm
	B Lead	NMT 5ppm

Botanic description:

Saraca indica Or Saraca asoca is a small evergreen tree 7-10 cm high. It occurs the up to the altitude 750 meters. Leaves are parpinnate 15-20 cm long and the leaflets 6-12, oblong and rigidly sub-coriaceous. Leaves are narrowly lanceolate, cork like at the base and with a shot pestistipules are intra-petiolar and completely united. The bark is dark brown or grey or almost black with warty surface. Stem bark are rough and uneven due to the presence of rounded or projecting lenticles. Bark channeled, smooth with circular lenticles and traversely ridged, sometimes cracked. Fracture splinting exposing striated surface, a thin whitish and continuous layer is seen beneath the cork leaver. Flowers are fragrant . Flowers are Polygamous apetalous, yellowish orange turning to scarlet, in short laterally placed corymbose, axillary panicles, bract small, deciduous, calyx petaloid. Seeds are 4-8, ellipsoid-oblong and compressed [2, 8, 9-11].

Pharmacognostical features

Microscopical characters:

1. Bark: Transverse section of stem bark shows periderm consisting of a wide layer of cork, radially flattened narrow cork cambium, secondary cortex wide with one or two continuous layers of stone cells with many patches of sclereids, parenchymatous tissue contains yellow masses and prismatic crystals: secondary phloem consists of phloem parenchyma, sieve tubes with companion cells and phloem fibres occurring in groups, crystal fibres present[3] [*Figure: 1].

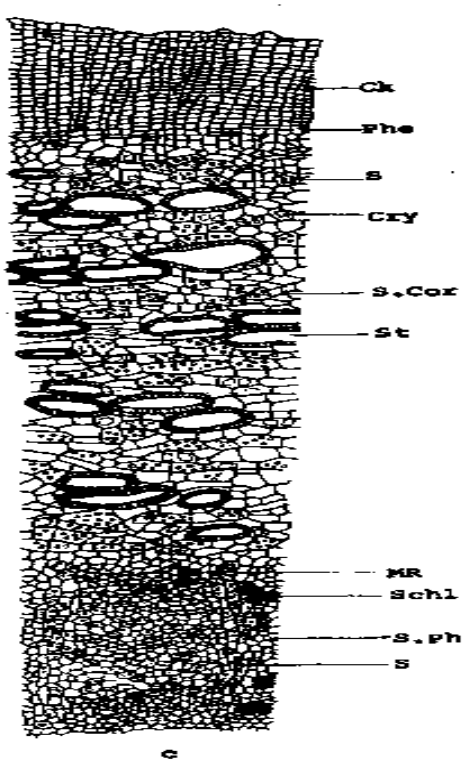

Figure: 1 A Enlarged Portion of T.S. of Bark of *Saraca asoca

This is the portion of T.S. of bark of Saraca asoca in which C: Cambium; Ck: Cork; Cor: Cortex; Cry: Crystal; M.r: Medullary ray; P: Pith; Phe: Phellogen; Per: Periderm; P.xy: Primary xylem; S: Starch grain; S.Cor: Secondary cortex; SchI: Schlerenchyma; Sph: Secondary phoelm; St: Stone cell ;S.xy: Secondary xylem; T: Tannin.

2. Stem: Transverse section of stem is circular. Small rounded to oval projecting lenticles are present on the surface. Epidermis is single layered with thin cuticle. Below the epidermis, 5-6 layers of cork are seen. Cortex is 12-16 layered. In the middle region of cortex, 3-5 layers of stone cells are clearly visible. Just above, the phloem region is very distinct and contains tannin cells. Cambium is very clear and is 2-3 layered. Xylem region is composed mostly of tracheids and a few vessels. Primary xylem is prominent. There is prominent pith, composed of thin walled parenchyma and many of the pith cells contain polygonal calcium oxalate crystals [3].
3. Root: In transverse section, the root appears somewhat circular in outline. The outermost zone is cork, composed of 8-10 layers of tangentially elongated thick walled cells. Phellogen is not distinct. Inner to the cork region, secondary cortex having two distinct zones are seen. The upper zone consists of 5-7 layers of thin walled parenchyma cells, some of them

containing few small rounded starch grains. Below this parenchymatous one, 3-5 layers of mechanical cells are distinctly seen, of these the outer layer is schlerenchymatous and the inner layers are stone cells. Following this supporting region is a broad zone of primary and secondary phloem. The cells are parenchymatous, thin walled and polygonal. 4-6 cambial layers are very prominent below the bast zone. In secondary xylem region tracheids, vessels and parenchyma cells are arranged in a peculiar manner, i.e., xylem parenchyma and tracheids are in alternating patches.

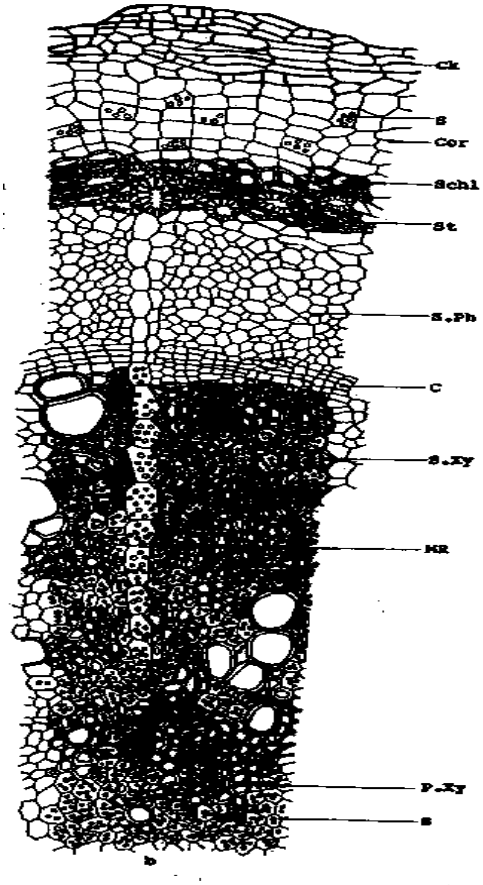

Figure: 2 A Enlarged Portion of Root of T.S. of *Saraca asoca

This is the portion of T.S. of bark of Saraca asoca in which C: Cambium; Ck: Cork; Cor: Cortex; Cry: Crystal; M.r: Medullary ray Phe: Phellogen; P.xy: Primary xylem; S: Starch grain; Schi: Schlerenchyma; St: Stone cell; S.ph: Secondary phloem; S.xy: Secondary xylem

The ray cells in the secondary xylem region are filled with starch grains. Exarch primary xylem groups are seen towards the centre which are in a line with the medullary rays [3] [*Figure: 2]

Powder characters:

Ashoka bark powder brown in colour, under microscope it contain some tracheids,large quantity of fibres, stone cells, parenchyma cells, sieve tube fragments and many unidentified cells [8].

Properties and action [3]

Rasa	:	Kasaya, tikta, madhura
Guna	:	Guru
Virya	:	Usna
Vipaka	:	Katu
Karma	:	Kaphapittashamaka, varnya, swarya, visa, sothaghna, kusthagahna, pramehaghna, vrsya, krimighna, stambhna, artavjannan, rasayan, sonitsthapna

Phytochemistry

The Phytochemical study show in the bark of plant presence of (-) epicatechin, procyanidin p2,11'-deoxypro**c**yanidin B, (+) catechin, (24, £)- 24- methyl-cholesta-5-en-3p-ol (22 E, 21£)-24-ethycholesta-5,22 dien-33-ol,(24 £)-24- ethylcholesta-5-en-3-p-ol,leucopelargonidin-3-O-p-D-glucoside,leucopelargonidin and leucocyanidin.The flower part of plant contain Oleic, linoleic, palmitic and stearic acids,P-sitosterol, quercetin, kaempferol- 3-0-P-D- glucoside, quercetin- 3-0-P-D-glucoside, apigenin- 7-0-p-D-glucoside, pelargonidin- 3, 5- diglucoside, cyanidin-3, 5-diglucoside, palmitic, stearic, linolenic, linoleic, p and y sitosterols, leucocyanidin and gallic acid. Seed and Pod contains oleic, linoleic, palmitic and stearic acids, catechol, (-) epicatechol and leucocyanidin [2,10,11,12]. Five lignan glycosides, lyoniside, nudiposide, 5-methoxy-9-β-xylopyranosyl-(−)-isolariciresinol, icariside E_3, and schizandriside, and three flavonoids, (−)-epicatechin, epiafzelechin-(4β→8)-epicatechin and procyanidin B_2, together with β-sitosterol glucoside, were isolated from dried bark [13].

Biological and pharmalogical activity of *Saraca asoca*

Antimicrobial Activity

Saraca asoca was subjected to antibacterial activity (ethanol : water, 1:1) on agar plate with different organisms such as *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhosa*, *Staphylococcus aureus*, (plant pathogen). *Agrobacterium tumefaciens* showed negative activity[14] *Saraca indica* dried flower buds tested against antibacterial activity of methanol extract on agar plate against *Salmonella viballerup*, *Shigella boydii*, *Escherichia coli*, *Vibro cholera*, *Shigella flexneri* and *Shigella dyserteriae* showed active [15]. Saraca indica leaves tested against antibacterial activity of ethanol(95%) and water extract on agar plate Escherichia coli, Staphylococcus aureus. Escherichia coli were found active whereas tested against Staphylococcus aureus gave negative result [16]. The methanolic extracts of *Saraca indica* was assayed against Alternaria cajani, Helminthosporium sp., Bipolaris sp., Curvularia lunata and Fusarium sp. at different concentrations (1000, 2000, 3000, 4000 and 5000 µg/ml). The extracts exhibited good inhibitory activity against A. cajani, while it effective at lower concentrations against other fungi also [17]. Four different extract of Saraca asoca bark tested antibacterial activity against Escherichia coli, Salmonella typhi, Pseudomonas aeruginosa, Staphylococcus aureus, Bacillus cereus, K. aerogenes, Sh. Boydis, P. vulgaris [18]. Different extract of *Saraca asoca* bark were screened against the enteric pathogen isolates, namely, Escherichia coli, Shigella sonnei and Salmonella enteritis. All the extracts other than aqueous extract showed antimicrobial activity with the methanol extract having the highest percentage of activity [19]. Methanol and water extracts of *Saraca asoca* leaves exhibited good activity against Bacillus

subtilis, Pseudomonas aeruginosa, Salmonella typhymurium. Both extracts showed marked activity against Alternania alternate, colletotrichum gloesporioides and Drechlera specifera [20]. Bark extracts of *Saraca asoca* (Roxb.) de Willde were investigated for in vitro antibacterial activity against Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Proteus vulgaris, Bacillus aureus and Klebsiella pneumoniae at 4 mg/ml using agar well diffusion method. The ethanol and distilled water extracts showed significant broad spectrum antibacterial activity[21]. The crude extracts of leaves, flowers, and bark of Saraca asoca were screened for larvicidal activity for 24-48 h at an initial concentration of 1,000 ppm against early IV instar larvae of the vector mosquitoes viz., C. quinquefasciatus, A. aegypti, and A. stephensi. The petroleum ether extract of S. indica/asoca leaves and chloroform extract of the bark exhibited more than 50% larval mortality against C. quinquefasciatus larvae at an exposure period of 48 h [22].

Anticancer Activity

The anticancer principle from Saraca asoca flowers indicated 50 percent cytotoxicity (in vitro) in Dalton's lymphoma ascites and Sarcoma-180 tumour cells at a concentration of 38 mug and 54 mug respectively, with no activity against normal lymphocytes but preferential activity for lymphocytes derived from leukemia patients [23].

Antimenorrhagic Activity

Saraca asoca dried bark has been used for menorrhagia in India [24,25]. In India Saraca asoca dried bark as well as flower is givan as a tonic to ladies in case of Uterine disorders. Saraca asoca stem bark also used to treat all disorder associated with the menstrual cycle [26,27]. Saraca asoca bark in Sri Lanka used for menstrual disorder and menorrhagia [28,29]. Saraca asoca bark in India, used as a uterine sedative and hot water extracts administered to human adult female stimulates the uterus similar to ergot, but without producing tonic contraction. Also employed in menorrhagia, as an emmenagogue,uterine sedative, uterine affections as well as used in several preparations related to female troubles [30,31,32,33]. Saraca indica bark, in Pakistan, employed for uterine affection and menorrhagia. *Saraca indica*, in India, dried bark, used as an astringent in menorrhagia, to stop excessive uterine bleeding [34], also as a refrigent, demulcent, uterine disorders, regular menstrual pain in abdomen, used for uterine problems [35,36,37]. Aqueous extract of the bark is reported to contain active principles, one stimulating and the other relaxing the plain muscle of the ileum of the guinea pig. The drug is reported to stimulate the uterus, making the contraction more frequent and prolonged. The crystalline glycoside substance is also reported to stimulate uterine contraction [9].

Antioxytocic Activity

Oxytocic activity of the plant was seen in rat and human isolated uterine preparations. Estrogen-primed or gravid uterus was more sensitive to the action of the alcoholic extract. Pentolinium bitartrate completely blocked the oxytocic action. Seed extract is found effective against dermatophytic fungi. In vitro tests on rat uterus preparation, extracts of *S. asoca* did not show oxytocic activity. *S. asoca* has been tested twice previously with negative results and once with positive results [25].

Indications

Dried root is used in paralysis, hemiplegia and visceral numbness. nervous system causing temporary delirium. It acts as a vulnerary and hastens healing time of skin trauma and broken bones. Paste of roots is useful in freckles and external inflammations, ulcers and skin diseases. Specifically used to clean, cool and clear the blood. Used for itching in eczema, psoriasis, dermatitis, and herpes-kushta/visarpa. It is a favorite herb to help relieve Pruritis. Also used in scabies and Tinea pedis. Externally it also benefits this conditions- use as a wash or in a cream. It rejuvenates the complexion and skin tone may be applied in discoloration or loss of pigmentation. Root is also used in obstruction of urinary passage and ammenorhea. It is drunk after delivery to procure copious lochial discharge. It is capable enough to dissolve oxalic tones present in kidney. Useful in signs of congested uterus and pain, painful periods, fixed pain, clots and ammenorhea, endometriosis. Decoction is useful in rickets, delayed bone consolidation and calcium deficiency [38, 39, 40].

Ayurvedic actions [41]

Vedana sthapana- Useful in management of all painful conditions.
Varnya- *Ashoka* improves complexion of the body.
Grahi- *Ashoka* improves digestion and assimilation.
Trishanashnam- *Ashoka* alleviates excessive thirst.
Daha shamanam- *Ashoka* alleviates burning sensation.
Krimighna- *Ashoka* kills all infectious agents.
Shothajit- *Ashoka* is useful in management of all edematous conditions.
Vish asrajit- *Ashoka* is useful in toxicities and all blood disease.
Apachijit- It useful in management of inflammation of lymph nodes.
Asrigdara nashanam- In management of excessive bleeding during menstruation

Home remedies

In Pradara Roga of females, Ksheerapaka of its 6 gm bark powder should be taken. it is so effective in all types of abnormal discharges per vagina. Ksheerapaka is also beneficial in uterine inertia, uterine pain, urinary calculus, dysurea. In pain, its paste of bark should be applied on that site. The womenfolk of Chhattisgarh boil the bark of *Ashoka* in cow's milk, add sugar and consume it once a day for three days and repeat the course after three months to prevent gynecological disorders. In India married Hindu women eat the flower buds of *Saraca asoca* on the "Ashok Shasthi day" to guard their children against grief and sorrow. The persons suffering from mental disorder are advised to take bath under the shade of Ashok tree. For mental piece, the natives prepare special Herbal Mala using root pieces of Sita Ashok and give it to the patients. The patients are advised to put the powdered seeds inside the Pan (Betel vine) and eat it empty stomach. It is general recommendation by the healers to boil the bark with cow’s milk and take the milk (after removing the bark). For taste, sugar can be added. The healers suggest every female native to take this milk once in a day, upto three days, in every 3 months, as preventive to gynecological troubles. In case of menorrhagia, the healers boil the bark in water and prepare a decoction. In this decoction many other herbs are added. This decoction is given every morning (empty stomach) to the patients. Many healers boil the bark in milk also. The decoction is also used externally for washing. In case of Safed Pani (Leucorrhoea), the healers boil the bark in

mixture of milk and water. When water evaporates, the combination is given to the patients [9,41,42].

Formulation and dosage [43]

Ashokarishta	:	15 - 30 ml b.i.d. / t.i.d.
Ashokkwath	:	15 - 30 ml b.i.d.
Seed powder	:	1 - 3 gm b.i.d.
Flower powder	:	1 - 3 gm b.i.d.
Ashokghrita	:	5 gm b.i.d.

Conclusion

Saraca asoca is highly regarded as an universal panacea in the ayurvedic medicine .it is one of the universal plant having medicinal activities .This versatile plant is the source of various types of compounds. In the present scenario many plant are used to treat many diseases. But *Ashoka* is ancient and reliable source of medicine so Ashoka is used in many pharmacological activities like anti cancer , anti menorrhagic , anti oxytoxic , anti –microbial activity and have extend uses in ayurveda , unani and homeopathy. It have many uses like to treat skin infections, CNS function, genitor-urinary functions .as the global scenario is now changing towards the use of nontoxic plant product having traditional medicine use, development of modern drug from *Saraca asoca* should be emphasized for the control of various diseases.

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