Review Article

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Saraca asoca (Roxb.), De. Wild: An overview

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Abstract: *Saraca asoca* (Roxb.), De. wild (Family: Caesalpinaceae) is a vital indigenous plant with a numerous traditional significance commonly known as Ashoka. The word Ashoka means "without sorrow", a reference to reputation of its bark for keeping a woman healthy and youthful. The stem bark is chiefly used in medicines and it has been reported to contain chemicals such as glycoside, flavanoids, tannins, saponins, alkanes, esters and primary alcohols. *Saraca asoca* has been greatly used as traditional medicine for women related problems, such as menorrhagia, leucorrhoea, bleeding hemorrhoids, dysfunctional uterine bleeding etc. In this review, emphasis is lead upon research associated to therapeutic properties, phytochemistry and pharmacological profile of *Saraca asoca* (Roxb.), De. Wild.

Key Words: *Saraca asoca*, glycoside, menorrhagia, phytochemistry.

Introduction

Saraca asoca (Roxb.), De. wild or *Saraca indica* is one of the most ancient tree of India, frequently known as a "Ashok briksh", or "Ashoka" belonging to family Caesalpinaceae means "without sorrow" or which that gives no grief. Ashoka tree has been mentioned in some of the oldest Indian text apart from Ayurveda. Across India, Ashoka tree is believed to be sacred and apart from Ramayana, Ashoka tree is mentioned in Buddhism and Jainism as well. Charaka Samhita which is believed to have been composed in 1000 BC describes about Ashoka tree and its medicinal benefits[1,2,3].

The Ashoka is a rain-forest tree. It is found all over India, especially in Himalaya, Kerala, Bengal and whole south region. Its original distribution was in the central areas of the Deccan plateau, as well as the middle section of the Western Ghats in the western coastal zone of the Indian subcontinent. As a wild tree, the Ashoka is a vulnerable species. It is becoming rarer in its natural habitat, but isolated wild Ashoka trees are still to be found in the foothills of the central and eastern Himalayas, in scattered locations of the northern plains of India as well as on the west coast of the subcontinent near Mumbai[4].

The Ashoka is valued for its attractive foliage and fragrant flowers. It is a beautiful, small, erect evergreen tree, with deep green leaves growing in dense clusters. Its flowering season is around February to April. The Ashoka flowers come in heavy, lush bunches and are bright yellow which turns red before wilting[5].

Ashoka is one of the most significant Ayurvedic drug for the treatment of several feminine disorders especially in menorrhagia. Its bark for keeping a woman healthy and youthful. The natives and traditional healers of Chhattisgarh use Sita-Ashoka (the name given to *Saraca asoca*) mainly in treatment of gynecological disorders. Its bark is bitter, astringent and sweet in taste. It has stimulating effect on endometrial and the ovarian tissue. It is useful in internal bleeding, hemorrhoids, ulcers, uterine affections, menorrhagia especially due to uterine fibroids, meno-metrorrhagia, leucorrhoea and pimples. The plant possess several medicinal value and widely used in Ayurvedic formulation for treat number of disease like to treat painful conditions, improves complexion of the body, improves digestion and assimilation, alleviates excessive thirst, to kills all infectious agents, in blood disease, inflammation.

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Habitat

It is found all over Indian subcontinent. The tree is believed to have originated in the Western Ghats and Deccan plateau. It can also be found in central and Eastern Himalayas. It is known to grow at an altitude of 750 m above the sea level[6]. The plant grows to a height of about 9m in length. The plant generally grows in fertile and semi-fertile areas across India. The tree belongs to Caesalpinaceae family. This is a perennial plant which can range from dark green to grayish green in colour. The lenticels are circular and ridged opposing. The seeds generally are reddish brown with fibres.

Morphological characteristics

Leaves: It is a peripinnate, alternate, distichous and 7-30 cm long and its petiolule 0.1-0.6 cm long and opposite leaflets, 4-6 pairs, narrow elliptic-oblong or lanceolate, and its apex acute to acuminate, base acute to rounded or subcordate, glabrous, midrib raised above and tertiary nerves reticulate [7].

Bark: 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 and channeled, smooth with circular lenticles and transversely ridged [7]

Flowers: It is inflorescence dense corymbs, orange colour and sometimes white and fragrant.

Fruits: It is a pod, flat, oblong and apiculate.

Vernacular Names[9]

Sanskrit	Kankeli, Sita-Ashoka
Oriya	Ashoka
English	Ashoka
Assamese	Ashoka
Kashmiri	Ashok
Marathi	Ashok, Jasundi
Bengali	Ashoka, Oshok
Malayalam	Asokam
Gujrati	Ashoka
Hindi	Ashoka, Vand ichitrah
Kannada	Ashokadamara, Ashanke, Kenkalimara
Punjabi	Ashok
Tamil	Asogam
Telugu	Vanjulamu

Taxanomic Position[8]

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Fabales
Family	Caesalpinaceae
Genus	*Saraca*
Species	*asoca*

Phytochemistry[10]

Plant Part	Phytoconstituent
Flower	Oleic, linoleic, palmitic and stearic acidssitosterol,quercetin, kaempferol, quercetin, apigenin- 7-0-p-D-glucoside, Pelargonidin- 3, 5-diglucoside, cyanidin-3, 5- diglucoside, palmitic, stearic, linolenic, leucocyanidin and gallic acid.
Bark	Procyanidin, epicatechin, 11'- deoxypro**c**yanidin B, catechin, leucopelargonidin and leucocyanidin.
Dried bark	Glycosides, lyoniside, nudiposide, 5-methoxy- 9-β-xylopyranosyl, isolariciresinol, and schizandriside, and three flavonoids, epicatechin, epiafzelechin-(4β→8)-epicatechin and procyanidin B2, together with β-sitosterol glucoside
Seed and Pod	Oleic, linoleic, palmitic and stearic acids, catechol, (-) epicatechol and leucocyanidin.

Traditional Uses

Saraca asoca has been greatly used as traditional medicine for women related problems, such as leucorrhoea, menorrhagia, dysfunctional uterine bleeding, and bleeding hemorrhoids etc.[9] It is also effectively used in Ayurveda for clearing congestion from the Medas Dhatus and Mamsa, especially when there may be leucorrhoea, endometriosis, cysts, and fibroids from excess kapha and ama in the Artava Srotas .The Ashoka herb also has a nourishing effect on the circulatory system, thereby making it an effective remedy in arrhythmia and cardiac weakness. The Ashoka herb also helps in encouraging urine flow and thus helps in treating conditions that cause painful urination. The Ashoka herb benefits the endometrium and uterine muscles and this makes it effective as a uterine tonic for irregular menstrual cycles and miscarriage.

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) and eat it empty stomach. In 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 [11, 12, 13].

The specific analgesic properties present in Ashoka can used to calm the nerves when they have been aggravated by the Vata. The Ashoka herb is also said to improve the complexion of skin. This herb can be used to obtain relief from burning sensations on the skin. It also helps to get rid of the toxins from the body. The Ashoka herb is also effective in purifying the blood naturally and in preventing skin allergies.

Pharmacological Activity

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. *Saraca asoca* 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. *Saraca asoca* 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. The methanolic extracts of *Saraca asoca* 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. 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* . 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. Methanol and water extracts of *Saraca asoca* leaves exhibited good activity against *Bacillus subtilis, Pseudomonas aeruginosa* and *Salmonella typhimurium*. Both extracts showed marked activity against *Alternania alternate, colletotrichum gloesporioides* and *Drechlera specifera*. Bark extracts of *Saraca asoca* 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. 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 mosquito's 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.

Anti-inflammatory activity: The ethanolic extract of *Saraca asoca* leaves find out the anti-inflammatory activity. The leaves of *Saraca asoca* determined the anti-inflammatory activity against Carrageenan induce paw edema in animal is most suitable test procedure to screen anti-inflammatory activity. The ethanolic extract of *Saraca asoca* reduce the paw edema significantly ($P<0.01$). The plant extract at dose of 200 mg/kg showed significant anti-inflammatory activity. It caused 56.95% inhibition in increase paw volume, though of a short duration and intensity, as compare to that of 10 mg / kg diclofenec [14, 15].

Antimenorrhagic activity: Ashoka dried bark has been used for menorrhagia in India. In India *Saraca asoca* dried bark as well as flower is given 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. Ashoka bark in Sri Lanka used for menstrual disorder and menorrhagia. Ashoka 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. *Saraca asoca* bark, in Pakistan, employed for uterine affection and menorrhagia. *Saraca asoca,* in India, dried bark, used as an astringent in menorrhagia, to stop excessive uterine bleeding, also as a refrigent, demulcent, uterine disorders, regular menstrual pain in abdomen, used for uterine problems. 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[16, 17, 18, 19].

CNS depressant activity: The leaves of *Saraca asoca* shows CNS depressant activity in various solvent such as petroleum ether, chloroform, methanol and water respectively depending upon their polarity. The activity was evaluated using phenobarbitone induced sleeping time by using actophotometer. The extract of *Saraca asoca* significantly decreased the locomoter activity in mice by 67.33%. Thus we concluded that leaf of *Saraca asoca* possess CNS activity[20].

Antidiabetic activity: Dried powder of the plant *Saraca asoca* is taken with milk or decoction of Ashoka bark is taken twice a day for the treatment of diabetes [21].

Anthelmintic activity: *Saraca asoca* leaves extract has been used for anthelmintic activity, for this we used both maceration and Soxhlet method of extraction by using solvent like ethanol and methanol. Each extract was tested for its anthelmintic activity by standard method. The suspension obtained from both maceration and Soxhlet, was prepared in DMSO to obtain 1, 2.5 and 5 % conc. of the standard anthelmintic drug like Piperazine citrate (as positive control) were also prepared as negative controls. Two mililitre of each conc. of both methanolic & ethanolic fraction and Piperazine citrate were diluted to 10ml independently with normal saline and pour into petridishes. Nine group of approx. equal extent of earthworms, consisting of six in number in each group were released into each petridish. Found that the ethanolic as well as methanolic extract were tougher than the positive control as much as anthelmintic activity. Glycosides, alkaloids, tannin, flavonoids and terpenoids seems to be accountable phytochemical constituent for signifying anthelmintic activities of ethanolic and methanolic extract[22, 23].

Uterine tonic activity: *Saraca asoca* is outstanding in ayurvedic medicine for its use as a stimulant to the endometrium and ovarian tissue. The estrogenic effect of U-3107 (1mg/kg p.o) was considered in normal and overiectomised rats. U-3107 was administered as an aqueous suspension for a period of 21 days. The management of overiectomised rats did not any expand on uterine weight. U-3107 holds estrogenic activity only in the presence of functional ovary and is devoid of any progestational activity. U-3107 is herbal preparation formulated with different plant extract which are useful in a variety of menstrual disorders such as puberty, menorrhagia, Dysmenorrhagia, premenstrual syndrome, abnormal bleeding and threatened abortion[24].

Analgesic activity: *Saraca asoca* leaves extracts are accountable for analgesic activity. The leaf extracts like petroleum ether, chloroform, methanol and water were investigated for Phytoconstituents like sterols, glycosides, saponins, carbohydrates alkaloids, flavonoids, tannins, protein etc. The analgesic activity above extract was evaluated by using tail immersion method and formalin induced pain method in albino mice. Analgesic activity of petroleum ether, chloroform, methanol and water extracts create dose dependent analgesic activity, formalin test is one of the principle analgesic models to compare with clinical pain. In the early phase of formalin test pain arise due to the direct stimulation of the sensory nerve fibers by formalin while in the late phase pain was due to inflammatory

maditors like histamine, prostaglandins, serotorin and bradykinins [25].

Larvicidal activity: *Saraca asoca*, the pet ether extract of the leaf and the chloroform extracts of the bark where effective against the larva of c. quinquefasciatus with respective LC50 value. The Larvicidal bioassay follow the WHO standard protocols for experimental treatment, 1ml of plant extract dissolved in absolute ethanol was added to 99 ml of distilled water in 150 ml disposable wax coated paper cup, which was shaken lightly to ensure a homogeneous test solution. Then 25 early fourth Inster larve of vector mosquito were transfer to each experiment was performing in four replicates with a final total of 100 larve for each concentration. The test containers were held at 27+/-2c, 80-90% relative humidity and photoperiod of 12h dark. After 24h exposures larval mortality was recorded. The experiments were repeated twice. The pet ether extracts of leaves of *Saraca asoca* showed Larvicidal activity with LC50 and LC90 values of 228.9-458.3 ppm respectively. The chloroform extract of the bark of *Saraca asoca* also show larvicidal activity with LC50 and LC90 values of 291.5 and 499.3 ppm respectively [26].

Antiulcer activity: The aqueous suspension of *Saraca asoca* flowers are used against gastric ulcer in albino rats. The major constituent of *Saraca asoca* flowers contains saracasin, saracadin, waxy substance, fatty acids and flavonoids etc. So the flowers of *Saraca asoca* suspension exhibit an antiulcer potential activity through at least one or more possible mechanism including inhibition of basal gastric secretion, stimulation of mucus secretion and endogenous gastric mucosal prostaglandin synthesis [27, 28].

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 [25].

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 *Saraca asoca* did not show oxytocic activity. Ashoka has been tested twice previously with negative results and once with positive results[23].

Conclusion

The medicinal importance of the tree as discussed above evidently prove that Saraca asoca is one of the most promising botanical which possess a lot of therapeutic values. Several mechanisms are likely to account for the observed pharmacological effects, the most important being the antimicrobial, antidiabetic, anthelmintic, CNS depressant, antimenorrhagic, uterine tonic, analgesic, anti-inflammatory, anti ulcer, anti cancer, larvicidal, antioxytocin activity. In future the standardization and stabilization studies on Saraca asoca can be carried out which can help in proving it to be a promising source in pharmaceutical industry.

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References

1. Anonymous, Indian Medicinal Plants-A Compendium of 500 Species, vol 5, Orient Longman Pvt Ltd, Chennai, 2006.

2. Nadkarni AK, Dr. K.M. Nadkarni's, Indian Materia Medica, vol 1., Bombay Popular Prakashan, Mumbai, 2005.

3. Kashyapa K, Chand R, The Useful Plants of India, National Institute of Science Communication and information Resources, CSIR, New Delhi, 2006.

4. Pradhan *et al.*, *Saraca asoca* (Ashoka): A Review, Journal of chemical and pharmaceutical research, 2009, vol.1, pp. 62-71.

5. Sharma PC, Yelne MB, Dennis TJ, Database on medicinal Plants used in Ayurveda, Central Council for Research in Ayurveda and Siddha,

Department of ISM&H, Ministry of Health and Family Welfare (Govt. of India), New Delhi, 2005, p. 3, 76-8

6. Warrier PK, Nambier VPK, Ganpathy PM, Some important medicinal plants of the western ghats, India : A Profile, International Development Research Centre, New Delhi, 2000, 343-360.

7. Pradhan *et al.*, *Saraca asoca* (Ashoka): A Review, Journal of chemical and pharmaceutical research, 2009, vol.1, pp. 62-71.

8. Biswas TK, Debnath PK, Ind J Hist Sci, 1972, 7(2), 99-114.

9. http://www.saracaindica.com/Ayurvedic Pharmacopoeia of India. 2001. Vol. I; Part-I: 17-18

10. Dhawan BN, Patnaik GK, Rastogi RP, Singh KK, Tandon JS, *Indian J Exp Boil.,* 1977, 15, 208-219.

11. M Ali, Pharmacognosy, CBS Publishers & Distributors, New Delhi, 2008, 668-669.

12. http://www.herbalcureindia.com/herbs/asoka.htm

13. http://ayurveda-foryou.com/ayurveda_herb/ashok.html

14. Nayak S, Sahoo AM, Chakarbarti CK, Haque Ml, Antibacterial study of Saraca indica leaves extract, IJPRD, 2011, 3(3), 160-163.

15. Acharyya S, Patra A, Prasanta KB, Evaluation of the antimicrobial activity of some medicinal plants against enteric bacteria, Tropical journal of pharmaceutical Research, 2009, 8(3), 231-237.

16. Middelkoop TB, Labadie RP, *Int* J Crude Drug Rec., 1986, 24(1), 41-44.

17. Bhandary MJ, Chandrasekhar KR, Averiappa KMK, J Ethnopharmacol, 1995, 47(3), 149-158.

18. Kumar Y, Haridasan K, Rao RR, Bull Bot Surv India., 22 ¼, 1980, 161-165.

19. Middelkoop TB, Labadie RP, Naturforch Ser., 1985, 40(6), 855-857.

20. Verma A, Houtem KRJ, Raja, Sen S, Sachan S, Mishra A, pharmacological evaluation of Saraca indica leaves for CNS depressant activity in mice J Pharm sci, Res. vol. 2010, 2(6), 338-343.

21. Dhawan BN, Patnaik GK, Rastogi RP, Singh KK, Tandon JS, Screening of Indian plants for biological activity: part VI, Indian J Exp Biol, 1977, 15, 208-219.

22. Nayak S, Sahoo A, Manjiri, Chakraborti CK, Phytochemical Screening and Anthelmintic Activity Study of *Saraca indica* leaves extracts, IRJP, 2011, 2(5), 194 – 197.

23. Manjunath KP, Shivakumar H, Prakash T, Patil KS, Veeranagouda A, Jayakumarswamy BHM, Venkatesh, Nagendra Rao R, Anthelmintic activity of roots of *Swertia chirata*, Ind.J. Nat. Prod, 2006, (1), 8 – 10.

24. Mitra SK, Gopumadhavan S, Venkatarangana MV, Sharma DNK and Anturlikar SD. uterine tonic activity of U-3107 (even care), a herbal preparation in rats, Indian journal of pharmacology, 1999, 31, 200-203.

25. Verma A et al., Analgesic activity of various leaf extracts of *Saraca indica* Linn., Der Pharmacia Lettre, 2010, 2, 352-357.

26. Mathew N, Anitha MG, Bala TSL, Sivakumar SM, Narmadha R, Kalyanasundaram M, larvicidal activity of *Saraca indica* extracts against three mosquito vector species springerverlay, 2009, 104, 1017-1025.

27. Maruthappan V, Sakthi SK, Antiulcer activity of aqueous suspension of *Saraca indica* flower against gastric ulcers in albino rats.

28. Njar VCO, Adesanwo JK, Raji Y, Methyl A, The antiulcer agent of the stem back of Entandrophrarma angolense, Planta Med, 1995, 61, 91-92.

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