National Journal of Advanced Research
Online ISSN: 2455-216X; Impact Factor: RJIF 5.12
www.allnationaljournal.com
Volume 3; Issue 2; May 2017; Page No. 03-07

Ashoka (*Saraca indica*) as women friendly plant: A review

[1] Mohammad Abu Bin Nyeem, [2] Mohammad Sadul Haque, [3] Md. Obaydul Haq, [4] Mohammad Nuruzzaman, [5] Helal Uddin, [6] BM Rabiul Islam

[1-3] Department of Unani Medicine, Hamdard University, Bangladesh
[4-5] Govt. Unani & Ayurvedic Medical College, Bangladesh
[6] Department of Public Health, ASA University, Bangladesh

Abstract
Saraca indica (Ashoka) Linn is a rain-forest tree belongs to the family of Caesalpiniaceae. Ashoka is "without sorrow or sorrow-less tree", a reference to this bark's reputation for keeping women healthy and youthful. The aim of the present review focuses on the detail botanical description, phytochemical constituents, medicinal uses and pharmacological studies. *Saraca indica* is used in many pharmacological activities like anti menorrhagic, anti-cancer, anti oxytoxic, anti-inflammatory, antiulcer, anti–microbial activity and have extend uses in indigenous system of medicine. It mainly contains glycoside, flavanoids, tannins, saponins, esters and primary alcohols.

Keywords: *Saraca indica*, askok, women friendly plant, pharmacological activity, phytoconstituents

1. Introduction
The demand for herbal products increases all over the world and major pharmaceutical companies are currently conducting research on medicinal plants on large scale for their potential medicinal value. Plant medicine has been used for the treatment of various ailments throughout the world before the advent of modern synthetic drugs. *Saraca indica* is a rain-forest tree. It is found all over India, especially in Himalaya, Kerala, and 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 *Saraca indica* 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 [1].

Fig 1: *Saraca indica*

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 [2].
Saraca indica is one of the most significant Unani & Ayurvedic medicinal plants for the treatment of several feminine disorders especially in menorrhagia & gynecological disorders. Its bark is bitter, astringent and sweet in taste and keeping a woman healthy and youthful. 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 Unani & Ayurvedic system of medicine 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 and inflammation [3].

Classification

Kingdom	: Plantae
Division	: Magnoliophyta
Class	: Mgnoliopsida
Order	: Fabales
Family	: Caesalpinaceae
Genus	: Saraca
Species	: indica

Vernacular name

Ashoka (Urdu), Shabuqa (Arabic) Kankeli (Sanskrit), Ashokadamara (Kannada), Ashok (Kashmiri), Asokam (Malayalam), Ashoka (Gujrati), Ashoka (Hindi), Ashok (Marathi), Ashoka (Bengali), Ashoka (Oriya), Ashok (Punjabi), Asogam (Tamil), Ashoka (Assamese).

Chemical constituents

The bark of plant contain epicatechin, procyanidin p2, 11'-deoxyprocyanidin B, catechin, 24methyl-cholesta-5-en-3p-ol, 24-ethycholesta-5, 22-dien-33-ol, leucopelargonidin-3-O-p-Dglucoside, 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-3,5diglucoside, 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. Five lignan glycosides, lyoniside, nudiposide, 5-methoxy-9-β-xylopyranosyl-(−)-isolariciresinol, icariside E3, and schizandriside, and three flavonoids, (−)-epicatechin, epiafzelechin-(4β→8)-epicatechin and procyanidin B2, together with β-sitosterol glucoside, were isolated from dried bark [4].

Pharmacological activity

Antimenorrhagic activity

Saraca indica bark has been used for menorrhagia in Bangladesh. In India *Saraca indica* dried bark as well as flower is given as a tonic to ladies in case of uterine disorders. Its stem bark also used to treat all disorder associated with the menstrual cycle. Ashoka bark in Sri Lanka used for menstrual disorder and menorrhagia. *Saraca indica* 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 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, 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 [5-8].

Uterine tonic activity

Saraca indica is outstanding in indigenous system of medicine for its use as a stimulant to the endometrium and ovarian tissue. The estrogenic effect of U3107 (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 [9].

Antioxytocic activity

Oxytocic activity of the plant was seen in rat and human isolated uterine preparations. Estrogenprimed 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 indica* did not show oxytocic activity. S. indica has been tested twice previously with negative results and once with positive results [10].

Anticancer activity

The anticancer principle from *Saraca indica* 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 [11].

Anti-inflammatory activity

The ethanolic extract of *Saraca indica* leaves find out the anti-inflammatory activity. The leaves of *Saraca indica* determined the anti-inflammatory activities against Carrageenan induce paw edema in animal is most suitable test procedure to screen anti-inflammatory activity. The ethanolic extract of *Saraca indica* 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 [12-13].

Analgesic activity

Saraca indica 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 [14].

Antiulcer activity

The aqueous suspension of *Saraca indica* flowers are used against gastric ulcer in albino rats. The major constituent of *Saraca indica* flowers contains saracasin, saracadin, waxy substance, fatty acids and flavonoids etc. So the flowers of *Saraca indica* 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 [15].

Antidiabetic activity

Hypoglycemic effect of the methanolic bark extracts of *Saraca indica* Linn in normal and streptozotocin induced diabetic rats was evaluated. At dose of 400mg/kg through oral route the extract has shown a significant hypoglycemic activity [16].

CNS depressant activity

Saraca indica leaves extract in various solvent such as petroleum ether, chloroform, methanol and water shows CNS depressant activity depending upon their polarity. Phenobarbitone induced sleeping time by using actophotometer method was used to determine this activity. *Saraca indica* leaves extract significantly decreased (67.33%) the locomoter activity in mice [17].

Immunomodulatory Activity

Saraca indica seed integument induces apoptosis in human Tlymphocytes. Saracin is a lectin found in the seed integument of *Saraca indica*. Saracin has been found to be mitogenic for human lymphocytes. Saracin has a higher affinity for the CD8 (+) than CD4 (+) T cells as revealed by fluorescence-activated cell sorting (FACS) analysis. Saracin found to be an interesting immunomodulator for the mammalian immune system [18].

Antipyretic activity

Saraca indica seed was studied for antipyretic activity using Brewer's yeast induced pyrexia in Wistar rats at oral doses of 300 mg/kg and 500 mg/kg. Both the dose levels of the research drug and standard drug aspirin (100 mg/kg) showed significant ($P<0.01$) antipyretic activity when compared to the control group. The dose 500mg/kg showed the highly significant antipyretic [19].

Cardioprotective activity

Cardioprotective activity of alcoholic extract of *Saraca indica* bark was investigated against cyclophosphamide induced cardiotoxicity. Treatment with *Saraca indica* significantly ($p<0.05$) reversed the status of cardiac biomarkers, ECG, oxidative enzymes and lipid profile in cyclophosphamide induced cardiotoxicity. The histopathology reports, biochemical and ECG support the cardioprotective effect of *Saraca indica* which could be attributed to antioxidant activity [20].

Anthelmintic activity:

Saraca indica 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 seem to be accountable phytochemical constituent for signifying anthelmintic activities of ethanolic and methanolic extract [21-22].

Antioxidant activity

Many herbs and spices have been shown to impart antioxidant effects in food. There are several reports that the extracts (ethanolic, hydroalcoholic and acetone) of *Saraca indica* bark showed the antioxidant activity. Panchawat and Sisodia studied in vitro antioxidant activity of *Saraca indica* roxb. De wilde stem bark by using DPPH (1, 1, diphenyl-2 picryl hydrazyl) in-vitro model) and reported that the antioxidant property of the various extracts may be due to high phenolic component [23]. Evaluation of antioxidant and antihyperglycemic activity of the petroleum ether, chloroform and methanolic extract of *Saraca indica* De wild leaves by streptozotocin induced model in mice and in vitro DPPH and H2O radical scavenging model. They concluded that the oral administration of the extract caused a significant reduction in blood glucose level in diabetic mice and showed significant antioxidant activity [24]. Comparative study of the *Saraca indica* and Pterospermum acerifolium with ascorbic acid in dose dependent manner on the basis of antioxidant activity by in vitro DPPH model was carried out. They determined that the processed *Saraca indica* and pterospermum acerifolium exhibited potential antioxidant properties [25]. Cardioprotective effect of *Saraca indica* against cyclophosphamide induced cardiotoxicity in rats and determined that the free radical generated during treatment with cardioprotective cause membrane injury. The biochemical, ECG and histopathology reports supported the cardioprotective effect of *Saraca indica* which could be attributed to antioxidant activity [26].

Larvicidal activity

Ether extract of the *Saraca indica* leaf and the chloroform extracts of the bark were evaluated for larvicidal activity. The pet ether extracts of leaves and chloroform extract of the bark of *Saraca indica* showed significant larvicidal activity [27].

Antifungal activity

Traditionally fungal infections have been attributed to compromised immune response of an individual and not posing a very serious danger to the population at large;

however, there have been increasing incidences of fungal disease outbreaks in the past. Finding new antifungal agents is therefore a priority of the clinical microbiology community. The antifungal activity of methanolic and hot aqueous extracts of *Saraca indica* leaves, flowers and bark against Alternaria alternata, Colletotrichum gloeosporioides, Drechlera specifera, Alternaria cajani, Helminthosporium sp., Bipolaris sp., Curvularia lunata Aspergillus flavus, A. fumigates and Fusarium sp. have been reportedly shown by various groups [28-30]. These could be subjected to further detailed investigations for uncovering the bio-active principles.

Dermato protective

The root, bark and seed extracts of *Saraca indica* find several uses in the treatment of skin complications such as eczema, psoriasis, acne, dermatitis, herpes-kushta/ visarpa, pruritis, scabies, tinea pedis and skin cancer [31-32]. The flower extracts of *Saraca indica* which contains flavonoids, has been shown to reduce skin tumours induced by 7, 12-dimethyl benzanthracene40. It is also known to rejuvenate skin complexion, induce quick healing of skin injuries, and reduce freckles and external inflammations of the skin14. Seed extracts have been reported to be effective against dermatophytic fungi [33].

Conclusions

The medicinal importance of the tree as discussed above evidently prove that *Saraca indica* is one of the most important medicinal plant which possess a lot of therapeutic values specially for female disorders. The stem bark is chiefly used in medicines and it has been reported to contain chemicals such as glycoside, flavanoids, tannins, saponins, esters and primary alcohols. *Saraca indica* has been greatly used as traditional medicine for women related problems, such as menorrhagia, leucorrhoea, bleeding hemorrhoids, dysfunctional uterine bleeding etc.

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