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Vol 13 Iss 2

2020

G.G.P





A Review Study of Ashoka (*Saraca asoca Roxb.*)

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ABSTRACT

Saraca asoca (Roxb.), De. Wild is a rain forest tree and the traditional medicinal plant goes to the family of *caesalpiniaceae*. *Ashoka* is referred as women friend or sorrow less tree as the bark of plant is used for keeping women healthy. It is a traditional medicine which is used in various women related problems like, menorrhagia, leucorrhoea, bleeding haemorrhoids, bleeding from uterus. Stem bark of *Ashoka* tree is used as uterine sedative, uterine tonic. Along with the stem bark, all the part of the plant shows medicinal properties. It is used as uterotonic, spasmogenic, anti-tumour, oxytocic, anti-bacterial, anti-progestational, anti-implantation, antiestrogenic activity. The plant mainly has phytochemicals such as glycoside, flavonoids, tannins, esters, primary alcohols, alkanes, and saponins. This review contains detail botanical description, phytochemical constituents, pharmacological studies and medicinal uses of *Ashoka* plant.

KEYWORDS

Saraca asoca (Roxb.), De. Wild, spasmogenic, uterotonic



Greentree Group Publishers

Received 20/06/2020 Accepted 25/07/2020 Published 10/09/2020



INTRODUCTION

An extraordinary influence of herbal medicine results into increase in demand of herbal medicine in everywhere the globe. Among all the prescriptions most of the drugs are derivative of the plants. Therefore many pharmacological companies are conducting researches on medicinal plants on large scale to increase their medicinal value. Nature has presented our country with a huge wealth of medicinal plants thus our country has typically been said as medicinal garden of the planet. Thus stand the medicinal plants *Saraca asoca* together of the foremost plants used from antiquity until so far.

The *Ashoka* is a rain-forest tree and found in Himalaya, Bengal, Kerala, and whole south region. Also it is dispersed in the central areas of the Deccan plateau, as well as the middle section of the Western Ghats. Apart from *Ayurveda* *Ashoka* tree has been stated in some of the oldest Indian text like, in *Ramayana*, *Buddhism* and *Jainism* as well¹. The *Ashoka* has attractive foliage and fragrant flowers and flowering season is around February to April. The *Ashoka* flowers are bright yellow which turns red before wilting. Flowers comes in lush bunches and. It is evergreen beautiful tree, leaves are deep green growing in dense clusters². "Ashoka" having Latin name

Saraca asoca Roxb. De Wild belonging to the Family *Caesalpiniaceae*, subfamily of *Leguminocae*. Acharya Charak has included *Ashoka* in "kashayskanda" as it has *kashay pradhan tikta rasa* due which it has *kaph-pittaghna* properties. Catechin is the flavonoid found in *Ashoka* possesses anti-carcinogenic effect. (-)-epicatechin, epiafzelechin-(4β-8)-epicatechin and procyanidine B2 are the other flavonoids present in *Ashoka* bark together with β-sitosterol glucoside. Five lignan glycosides, lyoniside, nudiposide, 5(-)-methoxy-9-β-xylopyranosyl-(-)-isolariciresinol, icarisideE3 and schizandriside are found in bark of *Ashoka*³. In the management of gynaecological problems specially related to uterus and menstrual cycles. *Ashoka* has become a "woman's friend" since ages. Since the ancient times Acharyas has elaborated in their lexicon the effect of *Ashoka* in menstrual disorder like *Raktapradara* (Menorrhagia), *Shwetapradar* (Leucorrhoea), *kashtartva* (Dysmenorrhea) etc. The cause of above conditions can be epidemic or can be due to cancerous growth in cervix as the symptoms like vaginal bleeding is present in cervical cancer.

UNDERSTANDING ASHOKA



Figure 1 Ashoka Plant



Figure 2 Bark of Ashoka plant

Mythology

Trees have been very important in Indian Mythology. Their implication and importance for the Indian people has been replicated in written traditions of India. Oriental religious *Hinduism*, *Buddhism*, *Jainism*, have provided trees a special place. *Ashoka* is one of them. It is one of the most legendary and sacred trees throughout the Indian subcontinent, especially in India, Nepal and Shrilanka. In Hinduism the

Ashoka tree worshipped in *Chaitra*, the first month of *Hindu* calendar⁴.

In *mahakavya*, the *Ashoka* tree is mentioned in *Ramayana* in reference to the *Ashoka vatika*, where Sita was held captive by Ravana. This is the place where Hanuman first met Sita. The *Ashoka* tree widely sculptured in Buddhist temples of Sanchi, Kushon, and Madhurai. The Hindu mythology it is associated with Kamadeva, the God of Love, who included *Ashoka* among the five flowers in his shiver, where it signify seductive hypnosis. The *Ashoka* is also associated with the Yakshi mythological beings. The sculpture of Yakshi holding the branch of flowering *Ashoka* tree is often found at the gate of Buddhist and Hindu temple⁵.

Ashoka tree plays very important part in the Buddhist art of India. It related to the story of birth of Indian philosopher and founder of Buddhism, Gautama Siddhartha (563-483 B.C.). It was said that Maya Devi while traveling from Kapilavastu to Davadaha in her matured pregnancy decided to take rest in garden of Lubini beneath the *Ashoka* tree and by holding the branch of a tree gave birth to a beautiful divine son, Gautama that is why it is grown in all Buddhist monastery⁶.

The *Ashoka* tree is often mentions in classical Indian religious and amorous poetry. The famous Sanskrit playwright and



poet, made this tree immortal in his play ‘*Malavikagnimitram*’ where the tree does not come to bloom unless the damsel kicks it.

Samhita Kala:

Charaka Samhita (1000 B.C.)⁷

Sutrsthana- In Shadvirechanashatashrutiya adhyaya *Ashoka* is mentioned as analgesic agent in *vedanasthapana mahakashaya*

Vimanasthana- In Rogabhishakjitiya adhyaya *Ashoka* is included in Kashayaskandha.

Sushruta Samhita (500 B.C.)⁸

Sutrastana- *Ashoka* is included in *Rodhradi gana*

In *Dravyasangrahaniya adhyaya* *Ashoka* is used in disorders of the uterus due to its astringent and analgesic property.

Dalhana is also mentioned the use of *Ashoka* in uterine bleeding.

Chikitsasthana- In *Mahavatavyadhi chikitasa adhyaya* *Ashoka* is used for the preparation of *Ashoka ghrita* and *Kalyanaka Lavana*.

Ashtanga Sangraha⁹

Acharya has mentioned the use of *Ashoka* in snake bite, fever, wound and neurological disorders.

Ashtanga Hridayam¹⁰

Sutrasthana- In *Shodhanadiganasangraha adhyaya* *Ashoka* is included in *rodhradi gana*.

Chikitsasthana- In *Kasachikitsa adhyaya* *Ashoka* is used for the treatment of cough.

Nighantu Kala:

Classification of *Ashoka* according to different *Nighantus* are explained in the following table no. 1

Table 1 Classification of Ashoka

<i>Nighantu</i>	<i>Varga</i>
1. <i>Bhavaprakasha</i>	<i>Pushpavarga</i>
<i>Nighantu¹¹</i>	
2. <i>Dhanvantari</i>	<i>Aamradi varga</i>
<i>Nighantu¹²</i>	
3. <i>Kaideo Nighantu¹³</i>	<i>Oushadhi varga</i>
4. <i>Raj Nighantu¹⁴</i>	<i>Karviradi varga</i>
5. <i>Nighantu Adarsha¹⁵</i>	<i>Putikaranjadi varga</i>
6. <i>Shaligram Nighantu¹⁶</i>	<i>Pushpavarga</i>

Habitat:-

It is distributed throughout in evergreen forests of India, up to a height of about 750 meters. It is specially found in Himalaya, Bengal, whole south region and Kerala. In Himalaya it is found at Lussi hills, Garo and Khasi and in Kerala section it is present in Pothundi of Palakkad district, Kollam, Kaikatty & Thrisur, Kannaur districts and Patagiri¹⁷.

Growth & Cultivation¹⁸

Ashoka grows mostly in area which have well distributed rainfall and moist soil.

Propagation:-

Propagation material used for the cultivation of *Ashoka* are seeds, which are collected from pods of the plant of age above five to six years in the period of December- January. Polythene bags are used for sowing of seeds and that are allowed to cultivate in shades.



Cultivation:-

Soil and climate: for the proper cultivation of plant the soil should be acidic to neutral in nature and fertile. Under the proper irrigation services these plants grows healthy in sub-tropical to tropical area.

1. Nursery raising and planting:

The propagation of plant can be done by stem grafting and by sowing the seeds during rainy season in properly matured field.

2. Thinning and weeding:

For the healthy growth of the plant its thinning and weeding should be done in every 15-30 days.

3. Manures, fertilizers and pesticides:

To avoid harmful effect of drugs the medicinal plants should be cultivated in chemical fertilizer and pesticides free soil. In that case use only organic fertilizers such as vermin compost. Bio pesticides prepared from other plants like *Neem*, *chitrkmoor*, *Datura* mixed with Cow's urine can be used to prevent plants from diseases.

4. Irrigation:

This plant normally grows in natural rain but as per requirement irrigation can be done for proper and better yield.

5. Harvesting/ post harvesting operation:

For harvesting Bark of ten years older pant is used after drying it under the sunlight.

Sanskrit names¹¹

Hemapushpa, *Shoknatha*, *Madhupushpa*,
Chitra, *Subhag*, *Prapallava*

BOTANICAL NAME: *Saraca Asoca*
(Roxb.), De. Wilde

Synonyms¹⁹

- *Jonesia asoca* Roxb.
- *Jonesia confusa* Hassk.
- *Jonesia pinnata* Willd.
- *Saraca confusa* (Hassk.) Backer
- *Saraca indica* L.

Classification²⁰

- Kingdom: Plantae
- Subkingdom- Tracheobinata
- Superdivision- Supermatophyta
- Division: Magnoliophyta
- Class: Mgnoliopsida
- Subclass- Rosidae
- Order: Fabales
- Family: Fabaceae
- Subfamily- Caesalpinaceae
- Tribe- Detarieae
- Genus: Saraca
- Species: indica

Synonyms

Synonyms of *Ashoka* according to different *Nighantus* are explained in the below table no. 2

Table 2 Synonyms of *Ashoka* from *Nighantus*

<i>Nighantu</i>	<i>Synonyms</i>
1. <i>Bhav aprakasha Nighantu</i> ¹¹	<i>Ashoka</i> , <i>Kankeli</i> , <i>Hemapushpa</i> , <i>P indipushpa</i> , <i>Nata</i> , <i>Tamrapallav</i> , <i>Vanjula</i> , <i>Gandhapushpa</i>



2.	Dhan vantari	Ashoka, Shoknasha, Vichitra, kar napuraka, Vishok, Raktaka, Ragi, Chitra, Shatpadmanjiri
3.	Kaid eoNighantu ¹²	Shoknasha, Vichitra, karnapuraka, Vishok, Raktaka, Ragi
4.	Raj Nighantu ¹⁴	Ashoka, Shoknatha, Vichitra, karnapuraka, Vishok, Chitra Vanjuldruma, Madhupushpa, Ke lika, Kankeli Apashoka, Hemapushpa, Raktapushpa, Sub hag., Nata, Karnapuraka Doshahari, Prapallava, Pindipushpa, Smaradhvivassa
5.	Nigh antu Adarsha ₁₅	Ashoka, Shoknasha, Vanjuldruma, Madhupushpa, Kankeli Raktapallava, Smaradhvivassa, Kantraghridohada
6.	Shali gram Nighantu ¹⁶	Ashoka, Shoknasha, Vichitra, kar napuraka, Vishok, Raktapallava, Smaradhvivassa, Kantraghridohada, Kantacharandohada, Chakraguchha, Srinirikshandohada Shokaharta, Doshahari, Vamanghrighataka.

Etymological Derivation (Nirukti)²¹

Ashoka: - न् शोकोऽस्मात् शोकनाशन इत्यथः ।

It allays grief of women as it is useful in gynaecological disorder.

Kankeli: - कं सुखं केलजि जनयति, आल्हादकरः ।

It bears flowers with pleasant smell.

Gandhapuspa: - सुगन्धिपूष्टव्यात् ।

It bears fragrant flowers.

Tamrapallava: - ताम्रवणीः पल्लवा अस्य ।

It has young leaves with copper like colour.

Pindapuspa: - पिण्डाकाराः सघनाः पूष्पगुच्छा अस्य ।

Floerws are in dense clusters in spring

Madupuspa: - मधौ वसन्ते पूष्यति ।

Spring is the flowering season of Ashoka.

Stripriya: - स्त्रीणां प्रियः स्त्रीरोगेषु हितत्वात् ।

It is liked by women as it is useful to treat gynaecological problems.

Hemapuspa: - स्वणभानि पूष्याण्यस्य ।

It bears golden yellow flowers.

Vernacular names²²

Following table no. 3 has explained the vernacular names of Ashoka

Table 3 Vernacular names of Ashoka

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

Morphology:-

Botanical description²³

Saraca asoca is herb of 7-10 cm in height. It is present at the altitude of 750 meters.

Leaves - 15-20 cm long, completely united, oblong, parpinnate, shape is narrow and lanceolate, at the base cork like shape is present with pestistipules with intra-petiole. The leaflets are sub-coriaceous and in pair of 6-12.



Bark- dark brown or almost black in colour, channelled, smooth, and traversal ridged, sometimes cracked. It has projecting lenticels on warty and uneven surface. Fracture splinting exposing a continuous white thin layer.

Stipules- 10- 13 by 6mm, intra petiole, completely united, obtuse, ovate, scarious oblong, and parallel- nerved.

Leaflets - 10-20 X 3-5.7 cm, present in 4-6 pairs, slightly oblique, obtuse or acute, quite glabrous, oblong-lanceolate, base rounded or cuneate.

Petioles - are wrinkled, stout and length is 4.5- 6.5 mm.

Stipules - deciduous.

Flowers - Flowers are fragrant and yellowish orange in colour turning to scarlet, with laterally placed corymbose.

Pedicels 8-13 mm. long, red, glabrous; bract ovate, sub-acute; **Bracteoles** -2, appearing like a calyx, 4mm. long,

Spatulate- oblong sub-acute, ciliolate, amplexicaul, coloured. **Calyx**- passing from yellow to orange and finally red; tube 1.3-2 cm. long. **Petals** -0. **Stamens**- 7 or 8 in number and are three time long as calyx, filiform, filaments, **Anthers**- purple.

Ovary - is pubescent, mostly on the sutures; **Style** -curved into a ring. **Pods**- black in colour with size 10-25X4.5-5 cm, linear, glabrous, both ends are tapering, oblong, veined and compressed. **Seeds** are

4-8 in number, shape is oblong ellipsoid, slightly compressed and 3.8 cm. long.

Flowering Season- Flowering season is December end to May, with pick flowering during February-March. In *Bhavprakash nighantu* the flowering season of *Ashoka* is *Vasant Rutu*

Fruiting Season- Fruiting season starts from March end to September and attains its maturity in august to September. In *Bhavprakash nighantu* the fruiting season of *Ashoka* is *Sharada Rutu*.

Microscopic characters

Bark: Following characters are showed in transverse section of stem bark. Phloem and phelloderm form the outer most layers. Periderm containing of an extensive layer of cork, outward flattened narrow cork cambium. Secondary cortex shows the presence of stone cells having sclereids patches. Prismatic crystals are present in parenchymatous tissue with yellow masses and. Sclerenchymatous patches found in phloem along with phloem parenchyma, sieve tubes with companion cells. Phloem fibres occurring in groups, crystal fibres present and medullar rays are multisteriate²³.

1. **Stem:** Transverse section of stem is circular. Small rounded to oval. On the surface of stem projecting lenticels are present. Epidermis have thin cuticle and present in single layer. 5 to 6 layers of cork



are present underneath the epidermis. 12

RASA	Tikta (Bitter), Kashaya (Astringent),
GUNA	Laghu, Ruksha
VEERYA	Sheet
VIPAKA	Katu
DOSHAGHNATA	Kapha-pittashamaka
KARMA	Rasayana, Kushthagna, Varnya, Shothaghna, Vrishya, Shonitsthapan, Pramehaghna, Krimighna, sthambhana

to 16 layer of cortex is seen. 3 to 5 layers of stone cells are present in the middle part of cortex. Above this phloem part is present which consist tannin cells. 2 to 3 layers of cambium is present.

Xylem section is mostly contain tracheid with some vessels. Where primary xylem is projecting. There is bulging pith, collected of thin walled parenchyma. Pith cells comprise calcium oxalate crystals of polygonal shaped²⁴.

2. Root: The root looks slightly circular in outline. Cork is the outermost zone of root section having 8 to 10 layers of cells which are elongated and thick walled. Phellogen is not separate. Secondary cortex which have two different zones in the inner region of cork are seen. 5 to 7 layers of parenchyma cells seen in upper zone which consist round shaped small starch grain. Mechanical cells of 3 to 5 layers separately seen below this parenchymatous. Its inner layers are made up of stone cells and outer layers of schlerenchymatous. Then wide

zone of primary and secondary phloem is present²⁴.

Properties¹¹

Acharya Bhavprakash has explained the following properties of *Ashoka*

Table 4 Properties of *Ashoka*

Karma according to different texts:-

Charaka Samhita – *Kashayaskandha*, *Vedanasthapana Mahakashaya*⁷

Sushruta Samhita - *Rodhradi gana*, *Vatavyadhi (Ashokaghrita)*⁸

*Ashtang hridaya - Rodhradi gana*¹⁰

Bhavaprakasha Nighantu - *Apachi, Trishna, Daha, Krimi, Shosha, Visha and Raktavikar nashaka*¹¹

Dhanvantari Nighantu – *Arsha, Apachi, Krimi, Vrana nashaka, Hridya*¹²

Raj Nighantu - *Hridya, Gulma, Shool, U dara, Adhmanahara and Krimikaraka*¹⁴

Kaideo Nighantu - *Apachi, Trishna, Daha, Krimi, Shosha, Visha and Raktavikar nashaka*¹³

*Chakradatta - Asrigadara chikitsa*²⁵

*Bhavaprakash Samhita (Madhyama khanda) – Raktapradara (Ashokakshiram)*²⁶

Bhashajya Ratnavali – *Jvara, Raktapittarsha* (*Ashokarishta-Ashokaghritam*)²⁷

Part used- Bark, Seed, Flower²⁸

Matra (Dose)²⁸



Decoction of bark- 20 to 40 ml

Beeja choorna (Powder of seeds) - 1 to 3 gm.

Pushpa choorna (Powder of dry flower) – 1 to 2 gm

Vishesa Yoga (Formulations) ²⁹

Ashokarishta

Ashoka bark choorna

Decoction of Ashoka extraction

Ashokagrita

Ashoka bark kshirpaka (milk decoction)

Therapeutic uses ³⁰

Plant possess astringent properties and recommended for menorrhagia and other gynaecological disorders as uterine tonic.

Seeds

Useful as diuretic to treat urinary calculus.

Flower

Dried flower powder given in diabetes.

Flowers powder mixed with water use to cure haemorrhagic dysentery.

Bark

It is used to cure gynaecological disorders such as associated menstrual troubles, bloody discharges from the uterus, internally in cases of menorrhagia, leucorrhoea, and tumours.

It cures itching, indigestion, sore throat, inflammations, bronchitis, heaviness, ulcers, boils, psoriasis, piles leprosy, leucoderma, thirst, elephantiasis, filariasis, dyspepsia, urinary discharges, burning sensation, diseases of the blood and effect

of fatigue, anaemia, colic, enlargement of abdomen.

It improves the skin complexion.

It is use as anthelmintic, anti-dysenteric, antidote to poisons¹⁴, litholytic, diuretic, anti-inflammatory and uterine tonic.

It toughens the teeth and used to treat fractures of the bones.

For the management of scorpion-sting and snake-bite, flowers, the bark and fruits are recommended in along with other drugs.

Classical uses ^{11, 28}

अशोक शीतलस्तिको ग्राही वर्णे कषायक /
दोषापचीतुषादाहकृमिशोषविषाम्बजिता॥ भा प्र

Sthanika Prayoga (Local action) – It is used for local application to reduce pain due to its *vedanasthapana* (Analgesic) and *vishaghna* properties²⁸.

Action on Strotasa ²⁸

Annavaaha & Purishvaha Strotasa –It is useful in the management of *Atisara*, *Pravahika*, *Krimi*, *Raktatisara*, *Raktarsha* due its *sthambhana* properties, *Kashaya rasa* and *sheet veerya*.

Rasa-Raktavaha Strotasa- *Kashaya*, *Tikta rasa* and *Ruksha guna* helps to remove *dushti* (Impurity) from *Rakta dhatu* in various blood related disorders.

It is used in the handling of *Raktapitta*. *Tikta*, *Kashaya rasa*, *sheet veerya* helps to alleviates *pitta* and *rakta* and due to



sthambhana property it reduces the excessive haemorrhage.

Shuktra-Artavavaha strotasa – Kashaya rasa, sheet veerya reduces the excess *kleda* (Moisture) from *garbhashya*. It actions on uterine muscle and endometrium and delivers relief from stomach pain and spasm. It also helps to cure irregular menstruation cycle, fibroids, amenorrhea,

cysts, leucorrhoea, and other gynaecological problems in women.

Mutravaha Strotasa – Seeds of *Ashoka* are useful for the treatment of *Ashmari* and *Mutrakriccha*.

Chemical composition³¹

The following table no. 5 has explained the chemical composition present in different parts of *Ashoka*

Table 5 Chemical composition of *Ashoka*

Plant parts	Chemical constituents
Flower	Oleic, linoleic, palmitic and stearic acidssitosterol,quercetin, kaempferol, quercetin, apigenin- 7-O-p-D-glucoside, Pelargonidin- 3, 5- diglucoside, cyanidin-3, 5-diglucoside, palmitic, stearic, linolenic, leucocyanidin and gallic acid.
Bark	Procyanidin, epicatechin, 11'- deoxyprocyanidin B, catechin, leucopelargonidin and leucocyanidin.
Dried bark	Glycosides, lyoniside, nudiposide, 5-methoxy- 9-βxylopyranosyl, isolariciresinol, and schizandriside, and three flavonoids, epicatechin, epiafzelechin-(4β→8)epicatechin and procyanidin B2, together with βsitosterol glucoside.
Seed and Pod	Oleic, linoleic, palmitic and stearic acids, catechol, (-) epicatechol and leucocyanidin

Ethno botanical and socioeconomic importance of *Ashoka*³²

Ashoka tree has mythological importance in Indian culture. The tree are worshiped by Indian people especially women as it is very much useful in women related problems.

Ashoka tree plays very importance role in treatment of mental disorder by native people. Patient suffering from mental disorder are guided to take bath under the shade of *Ashoka* tree and also the herbal mala prepared from roots of *Ashoka* is given to the patients.

Dried powder of roots is useful for the management of diabetes, ulcer, skin disorders, eczema etc.

Decoction of leaves used for the purification of blood inn various skin allergies.

Seeds of *Ashoka* is useful in and to cure renal calculus.

Flowers and flower buds used to cure cancer, uterine disorders and diabetes.

Bark powder is used for swelling of uterus, menorrhagia and other gynaecological problems. It is antidote for scorpion sting. In vaginal pain it is used for external application along with the *Goghrita*.

Adulterants³³

In Indian Herbal industry *Ashoka* is widely used for the preparation of *ayurvedic* formulations. Due to inadequate supply of



Ashoka plant to the industry it is mostly Adulterated or Substituted with other plants. Commonly used adulterant for *Saraca asoca* is *Polyalthia longifolia*. Other substitute or adulterant are plant material obtain from-

Bauhinia variegata

Humboldtia vahliana Weight
(Caesapiniaceae)

Shorea robusta Gaertn (Dipterocarpaceae)

Mallotus nudiflorus (L) (Ephorbiceae)

Rohitaka (*Aganamexis polystakis*)

Controversies related to Ashoka plant³⁴

The old botanical name of Jonesia was named after Sir Willion Jones, a famous researcher and botanist, but now changed as Saraca.

Ashopalava (*Polyalthia longifolia*) is used for *Ashoka* in Gujrat and known as false *Ashoka*. Morphology of both the plants are different and can be easily distinguishable. *Polyalthia longifolia* has no medicinal use. From Deharadun to Harsikesa, the area is full of *Shala* (*Shorea robusta*) tree. Poor people of that region uses the bark for fuel and remaining bark they sold to the druggist. The druggist then export this bark as real *Ashoka* bark to the rest of India.

The local *Vaidyas* of this region use the *Kanchanara* bark (*Bauhinia variegata*) in place of *Ashoka* as *Ashoka* tree are plenty on that side.

Pharmacological activity of Ashoka

1. Anti-Microbial activity

- Amey Shirolkar et.al has studied various parts of *S. asoca* to evaluate their anti-microbial activity against six microorganisms (P. aeruginosa, K. pneumoniae, S. aureus, E. coli, A. fumigatus, and A. flavus) by micro broth dilution assay. Minimum inhibitory concentration was recorded and it was establish that LHWE (leaves hot water extract) and RBHWE (renewed bark hot water extract) have better anti-microbial activity, because when plant internal tissue was expose to external environment there were increase in synthesis of molecules to combat infection. Catechin present in *S. asoca* was responsible for its anti-microbial activity, whereas flavonoids and cutin protect the plant from various infections³⁵.

- Ashok V. Gomashe et.al has studied that methanol extract of *Ashoka* exhibited maximum antimicrobial action against *S. aureus* and petroleum ether extract presented more antimicrobial activity against all the tested bacteria due to the presence of flavonoids, glycosides, saponins and steroids³⁶.

- Raja Chakraborty et.al has investigated ethanol and petroleum ether extract of *S. asoca* and observed that ethanol extract have presented better activity than pet ether extract in dose



dependent manner. Disc diffusion method was used for determination of antimicrobial activity by measuring the inhibition zone in mm. *S. asoca* shows antimicrobial activity due to the presence of phytochemicals like flavonoids, steroids alkaloids, glycosides, tannins³⁷.

- SC Pal et.al has subjected *Saraca asoca* to antibacterial activity against various organisms such as *Escherichia coli*, *Bacillus subtilis*, *Salmonella typhosa*, and *Staphylococcus aureus*. They used agar plate (ethanol: water, 1:1) for the study and it showed negative activity for *Agrobacterium tumefaciens*³⁸.

- SR Jain et.al has observed antibacterial movement of methanol extract of dried flower buds of *S. indica* against *Shigella boydii*, *Salmonella viballerup*, *Vibro cholera*, *Escherichia coli*, *Shigella flexneri* and *Shigella dysenteriae* tested on agar plate showed positive results³⁹.

- A Singh et.al has studied that ethanol (95%) and water extract of *Saraca indica* leaves showed antibacterial activity when tested against *E. coli* on agar plate and gave negative result when tested against *Staphylococcus aureus*⁴⁰.

- R Dabur et.al has taken the methanol extracts of *Saraca indica* at dissimilar concentrations (1000, 2000, 3000, 4000 and 5000 µg/ml) and it was

examined beside *Helminthosporium sp.*, *Alternaria cajani*, *Curvularia lunata* *Bipolaris sp.*, and *Fusarium sp.* It showed good inhibitory action against *A. cajani* and was effective at lesser concentrations against other fungi also⁴¹.

- S Rajan et.al has tested other extract of *Saraca asoca* bark against *Sh. Boydii*, *P. Escherichia coli*, *Salmonella typhi*, *Pseudomonas aeruginosa*, *vulgaris*, *Bacillus cereus*, *Staphylococcus aureus*, *K. aerogenes*, to determine its antibacterial activity⁴².

- J Annapurna et.al has tested Different extract of *Saraca asoca* bark against *Escherichia coli*, *Shigella sonnei* and *Salmonella enteritis*. Except aqueous extract all the extracts exhibited antimicrobial activity. Methanol extract showed the maximum proportion of action⁴³.

- N Seetharam et.al has observed that methanol and water extracts of *Saraca asoca* leaves showed good action against *colletotrichum gloesporioides*, *Alternaria alternate*, and *Drechlera specifera*⁴⁴.

- N Mathew et.al has studied in vitro antibacterial action of Bark of *Saraca asoca* extract against *Escherichia coli*, *Staphylococcus aureus*, *Proteus vulgaris*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* and *Bacillus aureus* at 4 mg/ml



using agar well diffusion method, where ethanol and distilled water extracts showed significant broad spectrum antibacterial activity⁴⁵.

- CD Varghese et.al has studied larvicidal activity of the crude extracts of bark, flowers, and leaves of *Saraca asoca* were screened against *A. aegypti*, *C. quinquefasciatus*, and *A. stephensi*. The chloroform extract of the bark and petroleum ether extract of *S. indica/asoca* leaves presented more than 50% larval mortality beside *C. quinquefasciatus* larvae at an exposure period of 48hours⁴⁶.

2. Anticancer Activity

- JD Kaur et.al has observed that *Saraca asoca* flowers specified 50 % cytotoxicity (in vitro) in Dalton's lymphoma ascites and Sarcoma-180 tumour cells at a concentration of 38 mug and 54 mug respectively and not active against normal lymphocytes but better activity for lymphocytes derived from leukaemia patients⁴⁷.

- Novneet kumar yadav, karan singh saini, Zakir Hossain, Ankur omer, chetan sharma, Jiaur R. Gayen. Poonam Singh, K. R. Arya and R. K. Singh observed In Vitro antioxidant, anti-breast cancer activity of *Saraca indica* bark extract and studied that it does not exhibit toxicological effects⁴⁸.

- M. V. Jinu, C Jayabaskaran has studied Diversity and anticancer activity of endophytic fungi associated with the medicinal plant *Saraca asoca*⁴⁹.

- Ardara Asokan and Dr. M. Thangaves observed In vitro cytotoxic action of crude methanol extract of *Saraca indica* bark extract in cervical cell line HeLa⁵⁰.

- M Yokoyama, M Noguchi, Y Nakao, A Pater and T. Lwasaka observed the (-) epigallocatechingallate effect on growth apoptosis and telomerase activity in cervical cell lines⁵¹.

- C. D. Varghise has observed anticancer principle from *Saraca asoca* and other medicinal plants⁵².

- Sherin DR* and Manojkumar TK had tried to establish antiestrogen potential of flavonoids from the bark of *Saraca asoca* with low toxicity to fight against oestrogen receptor. This study is expected to give the way of generating new chemotherapeutics in treatment of breast cancer with low toxic effect⁵³.

3. Anti-menorrhagic Activity

- *Saraca asoca* is consider as women friend because it helps to treat many gynaecological disorders. Dried bark has been used for menorrhagia in India. Dried bark and flower are 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.

- In Sri Lanka *Saraca asoca* bark is employed for menstrual disorder and menorrhagia.
- In India *Saraca asoca* bark is also used as a uterine sedative. A research showed that hot water extracts of *S. asoca* bark administered to female stimulates the uterus similar to ergot, however while not developing tonic contraction. It is also utilised in menorrhagia, as an emmenagogue, uterine sedative, uterine affections as well as used in several preparations associated with dysfunction of the feminine genital system.
- Dried bark *Saraca indica* has an astringent property and helps to stop excessive uterine bleeding in menorrhagia, it is also used as a refrigerant, demulcent in uterine disorders, and regular menstrual pain in abdomen and used to treat other uterine problems⁵⁴.
- 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 contraction⁵⁵.

- T. B. Middelkoop and R. P. Labadie has concluded that certain components in the extracts of bark of *S. asoca* have an influence on the PG-synthetase enzyme that might inhibit the conversion of arachidonic acid by the PGH2 synthetase. It was observed that both mechanisms, whether it was inhibition of PG synthesis or the destruction of the PG synthetase, can be an explanation for the use of the drug *Asoka* in the treatment of menorrhagia⁵⁶.

4. CNS depressant activity:

- Verma A et.al has concluded that the leaves extract of *Saraca asoca* in various solvent such as petroleum ether, chloroform, methanol and water shows CNS depressant activity by decreasing the locomotors activity in mice by 67.33%. CNS depressant activity was tested by using phenobarbitone induced sleeping time by using acto photometer⁵⁷.

5. Anti-diabetic activity:

- Decoction of *Ashoka* bark is taken twice a day is used for the treatment of diabetes.
- Dried powder of the plant *Saraca asoca* is taken with milk shows anti-diabetic effect⁵⁸.

6. Anthelmintic activity:



- Nayak S, Sahoo et.al has studied ethanol and methanol extract of leaves of *S. asoca* by using maceration and Soxhlet method to evaluate its anthelmintic activity. It was tested against the standard anthelmintic drug like Piperazine citrate (as positive control). The suspension obtained from both maceration and Soxhlet, was prepared in DMSO (Dimethyl sulfoxide) to obtain 1, 2.5 and 5 % conc. of the standard anthelmintic drug. Two millilitre conc. from each group were diluted with 10ml normal saline and pour into petridishes. Then nine group of earthworms were formed, each group having six earthworms were released into each petridish. It was found in that ethanol and methanol extract showed more positive anthelmintic activity than the control group. Ethanol and methanol extract of leaves of *S. asoca* showed anthelmintic activities due to the presence of phytochemical constituent like, glycosides, alkaloids, tannin, flavonoids and terpenoids in extract⁵⁹.

- Dr. A.K. Singh et.al studied in-vitro anthelmintic activity of stem bark extracts of *Saraca indica* Roxb. Against Pheretima posthuma. From the study the concluded that even the bark of *Saraca indica* possessed very potent anthelmintic activity due presence of alkaloids, glycosides, saponins, flavonoids, terpenoids, tannins⁶⁰.

Uterine tonic activity:

- *Saraca asoca* is plant use as uterine tonic for its stimulating effect to the endometrium and ovarian tissue.
- Mitra SK et.al has studied the effect of herbal formulation U3107 (1mg/kg p.o) as uterine tonic in ovariectomised rats. U-3107 was administered as an aqueous suspension for a period of 21 days. It was found that herbal preparation U-3107 formulated with different plant extract which are useful in a variety of menstrual disorders such as puberty, menorrhagia, Dysmenorrhea, premenstrual syndrome, abnormal bleeding and threatened abortion⁶¹.

7. Analgesic activity:

- Pankaj Pradhan et.al showed that *Saraca asoca* possesses analgesic activity by using tail flick method. The tail flick model is an index that mainly used to evaluate centrally acting analgesic activity and also detect the acute pain in animals. The results showed that the extract inhibited the tail flick response of rats by increasing the reaction time after dose administration. It suppress pain inducing substances in peripheral tissues and produces analgesic activity⁶².
- Verma A et al. studied analgesic activity of various leaf extracts of *Saraca indica* Linn. in different solvents i.e.



petroleum ether, chloroform, methanol and water by using tail immersion method and formalin induced pain method in albino mice. It was concluded that the leaf extract caused dose- dependent decrease in pain in both early and late phase of formalin test. The results of tail immersion method indicating that extract may also have central analgesic activity⁶³.

- Poonam S. Mohod et al. evaluated analgesic activity aqueous and alcoholic extracts of bark of *Saraca indica* (*Ashoka*) Swiss albino rats. Different pain models are used for study such as, tail immersion test, tail clip method and writhing induced by 4% NaCl solution. The aqueous and alcoholic extract of *Saraca indica* showed analgesic activity due presence of tannin, essential oil, terpenoid and steroid⁶⁴.

8. Larvicidal activity:

- Mathew N et al. observed that ether extract of the leaf and the chloroform extracts of the bark of *Saraca asoca* were effective against the larva of *c. quinquefasciatus*. The Larvicidal activity has been showed by chloroform extract of the bark of *Saraca asoca* with LC50 and LC90 values of 291.5 and 499.3 ppm respectively. Larvicidal activity of the ether extracts of leaves of *Saraca asoca* with LC50 and LC90 values of 228.9- 458.3 ppm respectively is also observed⁶⁵.

9. Antiulcer activity:

- Maruthappan V et al. has studies antiulcer activity of the aqueous suspension of *Saraca asoca* flowers against gastric ulcer in albino rats. *Saraca asoca* flowers contains saracasin, saracadin, waxy substance, fatty acids and flavonoids which shows antiulcer activity through mechanisms including inhibition of basal gastric secretion, stimulation of mucus secretion and endogenous gastric mucosal prostaglandin synthesis⁶⁶.

10. Anti-oxidant activity

- Navneet Kumar et al. has studied In Vitro Antioxidant activity of *Saraca indica* Bark extract. It was found that phenolic compounds of plants shows powerful free radical scavengers' activity by inhibiting the lipid peroxidation by neutralizing peroxy radicals generated during the oxidation of lipids. Present study also shows that anticancer activity of these bioactive components is because of their antioxidant potential⁴⁸.
- Chetan Kumar Dubey et al has observed in there study that in the DPPH inhibition assay the *Saraca indica* stem bark showed strong antioxidant activity as evidenced by the low IC50 values. In-vivo antioxidant studies of *Saraca indica* stem bark was carried out by using superoxide anion (SOD) scavenging activity assay, the



result showed that it increases the SOD activity 0.285 ± 0.27 (U/mg protein), hence it has been concluded that *S. indica* stem bark play a role in the relief of long-term complications and the oxidative stress due to the presence of total phenolic constituents, as polyphenols act as antioxidants via some mechanisms including chelation of transition metals, the scavenging of free radicals, as well as the mediation and inhibition of enzymes⁶⁷.

- Gayathri P and Jeyanthi GP has evaluated radical scavenging activity of *Saraca indica* bark extracts and its inhibitory effect on the enzymes of carbohydrate metabolism in their study. *S. indica* was estimated to have 17.4 mg/g phenol. Polyphenols have high ability as hydrogen or electron donors. Polyphenol stabilize the unpaired electron from their ability to chelate transition metal ions and hence *S. indica* shows antioxidant effect. Other phenolic antioxidants present in *S. indica*, such as flavonoids, tannins, coumarins, and xanthene also act as antioxidant⁶⁸.

- Shanker Kalakotla et al. has observed antioxidant activity of 3 extracts i.e. methanol, chloroform and hexane were determined by DPPH radical scavenging activity. It was observed that methanol extract shows highest radical scavenging

activity i.e. (36.88%), while Chloroform (25.05 %) and hexane has shown 19.17 % of anti-oxidant activity. Alkaloids, flavonoids, tannins, glycosides, saponins and steroids were detected in methanol extract. Results of the study shows that the leaf extracts of *Saraca indica* possess moderate anti-oxidant activity when compared with standard compound ascorbic acid (56%)⁶⁹.

- Panchawat S. et al. has carried out study of in vitro antioxidant activity of *Saraca asoca* stem bark extract from various extraction processes, like soxhlet extraction, ultra sonication extraction and microwave assisted extraction. Extract of stem bark was prepared with ethanol, hydro alcohol and acetone solvents. Hydro alcoholic (ethanol 60%) extract prepared by soxhlet extraction method showed antioxidant activity with highest IC₅₀ value 193.88 µg/ml, whereas the lowest IC₅₀ value 97.82 µg/ml was showed by the acetone extract prepared by ultra-sonication extraction method. results specify that the antioxidant property of the extract may be due to high content of phenolic compounds⁷⁰.

- Jayita Saha et al has used high-performance thin-layer chromatography for analysis of antioxidants present in different parts of *Saraca asoca* (Roxb.) de Wilde.



Methanol extracts were tested at different concentrations for their antioxidant activity in DPPH- radical scavenging in-vitro model. Antioxidant activity of different plant parts of *S. asoca* was indicated by comparing their IC₅₀ values. Methanol extract of leaves of *S. asoca* exhibited slightly higher IC₅₀ value (28.6 _ 0.62 mg/ml), while methanol extract of the flower and bark were 6.83 _ 0.07 mg/ml and 6.6 _ 0.10 mg/ml respectively. HPTLC analysis showed that with low IC₅₀ values of flower (6.83 _ 0.07 mg/ml) and bark (6.6 _ 0.10 mg/ml), but high amount of ellagic acid in bark (0.4805% w/w) and high amount of gallic acid and quercetin in flower (0.320% and 0.11% w/w respectively) showed significant antioxidant activity, whereas with high IC₅₀ value of 28.6 _ 0.62 mg/ml but very low amount of quercetin (0.0445% w/w), ellagic acid (0.04% w/w) and moderate amount of gallic acid (0.164 %w/w) indicated poor antioxidant effect⁷¹.

11. Cardio protective effect

- A.H. M. Viswanatha Swamy et al has studied the cardio protective effect of *Saraca indica* against cyclophosphamide. Administration of Cyclophosphamide significantly increased lipid peroxidation and decreased the levels glutathione (GSH), superoxide dismutase (SOD) and catalase (CAT) which shows antioxidant effect in

body. Cyclophosphamide raised the levels of biomarker enzymes like creatine kinase (CK), alkaline phosphatase (ALP), lactate dehydrogenase (LDH), alanine transaminase (ALT), aspartate transaminase (AST), and creatine kinase isoenzyme MB (CK-MB). Rats treated with the cyclophosphamide showed changes in electrocardiogram (ECG) with increased levels of cholesterol and triglycerides. On the other hand rats treated with *Saraca indica* significantly reversed the status of cardiac biomarkers. Also in histopathological examination severity of cellular damage of the myocardium was reduced⁷².

12. Locomotors Activity

Ghanshyam Yadav et al has observed locomotors activity of methanol Extract of *Saraca indica* Bark using acto-photometer. Four groups each contained 6 rats were used that are control, standard and two test groups. Methanol extract was given 200 and 400 mg/Kg by oral route and the dose of Diazepam was 2mg/kg given through same route. Methanol extract was found to possess significant locomotors activity in rat models may be due to direct activation of GABA receptor by the extract because flavonoids and neuro-active steroids in plant found to be ligands for the GABAA receptors in CNS system⁷³.



CONCLUSION

The conclusion of above review is that *Saraca asoca* possess a lot of therapeutic values. It shows many pharmacological effects, the most important being the antimicrobial, anti-diabetic, anthelmintic, CNS depressant, antimenorrhagic, uterine tonic, analgesic, anti-inflammatory, anti-ulcer, anti-cancer, Larvicidal, anti-oxytocin activity. The plant is consider as women friend as it is useful in various gynaecological disorders. In future the standardization and stabilization studies on *Saraca asoca* can be carried out to overcome from adulteration, which can help in proving it to be a promising source in pharmaceutical industry.



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