Int. J. Sci. R. Tech., 2026 3(5)
A Multidisciplinary peer-reviewed Journal
www.ijsrtjournal.com [ISSN: 2394-7063]

Original Article

Saraca Asoca: A Comprehensive Review Of Its Medicinal Properties And Therapeutic Potential

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ABSTRACT

Saraca asoca (Roxb.) De Wilde, which is referred to as Ashoka, is regarded as one of the most esteemed medicinal plants utilized in the Indian traditional medical system and belongs to the *Caesalpiniaceae* family. The plant is of great cultural, religious, and medicinal significance and has been elaborately described in classical texts of Ayurveda in connection with its numerous medicinal uses, especially in the management of gynecological problems. It is indigenous to the tropical rainforest regions of the Indian subcontinent and is now listed as a threatened species owing to destruction of its habitat and overutilization as a medicinal plant. The various parts of the plant contain several bioactive secondary metabolites including flavonoids, tannins, glycosides, phenolic acids, lignans, steroids, catechins and procyanidins, which are responsible for its pharmacological activity. Laboratory investigations indicate potent antimicrobial, anti-inflammatory, antioxidant, antidiabetic, analgesic, cardioprotective, antiurolithiatic, anticancer, CNS depressant, and uterine tonic actions. The bark extract of S. asoca has been found effective in the treatment of menorrhagia, dysmenorrhea, leucorrhoea, uterine hemorrhage and other female health issues. The current review offers an in-depth analysis of the botanical properties, taxonomical classification, geographic distribution, agronomic details, phytochemistry, traditional applications, and pharmacology of S. asoca. Moreover, the problem of contamination with other plant species as well as conservation of this medicinal plant is briefly touched upon. The scientific data gathered in the course of research corroborate the traditional claims about the health benefits associated with this plant and indicate the necessity for further clinical and pharmacological research to confirm its beneficial effects.

Keywords: *Saraca Asoca,* Medicinal Plants, Clinical, Pharmacological, Effects.

INTRODUCTION

Saraca indica or *Saraca asoca* (Roxb.), De. wild is considered to be one of the oldest trees of India and it is popularly known as an “Ashoka”, or “Ashok briksh” that belongs to the family Caesalpinaceae which stands for “which that gives no grief”. Ashoka tree has found its mention in several other older texts than just Ayurveda. Ashoka tree holds religious importance all over India; apart from its mention in the Ramayana, it also finds significance in Buddhist and Jain religion as well. According to Charaka Samhita that dates back to 1000 BC, there are several mentions about Ashoka tree.

Ashoka tree is the one that belongs to the rain forests. It is common throughout India and occurs mainly in Himalaya, Kerala, Bengal and entire southern part of the country. Originally, this tree existed in the central parts of the Deccan plateau and the mid Western Ghats region of the western coastal belt of the Indian subcontinent. As far as the Ashoka is a wild tree species, it is now considered to be a threatened one. In its natural habitat, this species is becoming rare; however, individual specimens of wild Ashoka trees can still be observed in the foothills of the central and eastern Himalayas as well as in the northern plains of India and in the western part of the subcontinent near the city of Mumbai[4]. This plant is popular due to its lovely leafage and sweet-smelling blooms. Indeed, Ashoka is a pretty and relatively small evergreen tree that grows straight and boasts dark-green leafage formed in dense bunches. Flowering time of Ashoka

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

is from February to April and their colour is bright yellow changing into red just before wilting[5].

Classical texts such as Ashokahas have been referred to in Vedanasthapana mahakashaya and Kashayaskandha by aacharya caraka. [6] According to aacharya Sushruta, Ashoka belongs to the Rodhradigana. [7] It is well known that Ashoka is the best remedy in the treatment of Raktapradara, but its use in this disease is not found in ayurvedic text such as Caraka samhita, Sushruta samhita and Nighantus. Vrundamadhava was the first one to use Ashoka in the treatment of Raktapradara. [8]Ashoka is considered a very effective medicine in female diseases, however according to aacharya Sushruta there are many other uses of Ashoka in Kalyanaka lawana of Vatvyadhi chikitsa, in Tilvakasarpi, Vran avachoornan, krushabha agada, Dundubhiswaniya chapter, in eye diseases (especially pittakaphaj), in Mahakalyanaka ghruta. The general use of Ashoka in practice is the bark of the tree. The bark is bitter and acrid; cooling, astringent for the bowels, alexiteric, anthelmintic, demulcent, emollient; remedies dyspepsia, thirst, heat sensations, diseases of the blood, biliousness, effects of exhaustion, tumors, swelling of the abdomen, colic, piles, ulcers, bleeding from the uterus, menorrhagia; useful for bone fractures, improves complexion. The bark is extensively employed in women's ailments, especially menorrhagia. Seeds are helpful in disorders of the urinary system. [11]

Synonims:

Madhupushpa, Shoknashan, Pindapushpa, Raktapallava, Nata, Kankeli, Ashok, Smaradhivas, Vanjuldrum, Hempushpa, Gndhapushpa

Vernacular names: [12,13]

English	:	Asoka tree
Hindi	:	Ashoka, Anganpriya
Marathi	:	Ashoka
Sanskrit	:	Kankeli, Asoka, Gandhpushpa
Cannad	:	Asokada, Kankelimara
Telugu	:	Asok, Vanjulamu
Tamil & Mal.	:	Asogam
Panjabi	:	Ashok
Oriya	:	Ashoka
Assamese	:	Ashoka
Kannada	:	Ashokadamara, Ashanke, Kenkalimara

Ecology and Distribution Cultivation [14]

1. The. Climate for this Plant: This plant does well in soil that's a little bit acidic or neutral. It needs soil that's fertile and drains well. The plant grows well in warm weather like in tropical or sub-tropical places as long as it gets enough water.

2. Raising the Plant in a Nursery and Planting: You can grow this plant from seeds or, by grafting a piece of stem onto another plant. People usually plant the baby plants in a field that has a lot of manure during the season.

3. Getting Rid of Weeds and Thinning Out the Plants: You should pull out weeds. Give the plants some space to grow as needed. This is usually done about 15 to 30 days after planting the Plant so that the Plant can grow better.

4. Manures, fertilizers and pesticides: We need to grow plants without using chemical fertilizers and pesticides. We can use manures like Farm Yard Manure, Vermi-Compost and Green Manure depending on what the plants need. To keep the plants from getting diseases we can make bio-pesticides from things like Neem, Chitrakmool, Dhatura and Cows urine.

5. Irrigation: Usually medicinal plants are grown with the rain but if we want a better yield we can water them every week or every two weeks.

6. Post-harvesting: When the medicinal plants are ten years old we remove the bark from the trees and then dry it in the sun. We do this to the plants when they are old enough like around ten years old and then the bark, from the medicinal plants is dried.

Habitat:

The Ashoka tree is really important to Hindus. You can see it a lot along the roads in Eastern Bengal,

South India, Aracan and Tenasserium. It is also near Kumaon in U.P. People even grow the Ashoka tree in gardens over India because it has very pretty flowers.[12]

The Ashoka tree is found everywhere in India up to a height of 750 meters in the Central and Eastern Himalayas and the Khasi, Garo and Lushai hills. You can also find the Ashoka tree in the Andaman Islands.[14]

In the Kerala region the Ashoka tree is found in places like Patagiri, Kaikatty and Pothundi in the Palakkad district. Also in Thrisur, Kollam and Kannur districts. The Ashoka tree is really common, in these areas.[15]

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

Table 1: Scientific Classification [16]

Plant description/morphology:

Botanical Description[17-20]

The Habit of this tree is that it is a tree that grows in a rain forest and it is always green. This tree can grow up to 6 to 9 meters in height.

The Bark of this tree is grey and brown in colour. It is smooth. Has lines going across it. Sometimes you can see white lichens growing on the bark.

The Leaves of this tree are special because they are made up of smaller leaves. These leaves are 15 to 25 centimeters long. The Leaves of this tree have 4 to 6 pairs of leaves on them. Each of these leaves is 8 to 15 centimeters long and about 3 centimeters wide. The Leaves of this tree are thick and smooth on both sides. They are shaped like a lance. Have a sharp point at the top. The base of the Leaves of this tree is round or shaped like a wedge. The veins on the Leaves of this tree are like a net. You can see the main vein clearly. The stem that attaches the Leaves of this tree to the tree is smooth and a bit corky, at the base. The stem is 5 to 6 centimeters long. The Leaves of this tree also have stipules where the leaf meets the stem.

The flower of this plant is really something. It has a lot of flowers that smell very good. These flowers are found in clusters at the end of the branches and in the corners where the leaves meet the stem. These clusters are pretty big, 7.5 to 10 centimeters across. At the base of the flower there are four colored parts called bracts. These bracts are a bit overlapping 5 millimeters long and 3 millimeters wide and they are orange in color. They also have some hair on the edges. The part that covers the flower called the calyx is bright orange and smooth. This flower does not have any corolla, which's the part that people usually think of as the petals. The stamens, which are the parts of the flower are long and thin and they are a pinkish purple color. There are 6 to 8 of them. The style, which is the part of the flower is curved and about 1.6 to 1.8 centimeters long.

The fruit of this plant is a kind of pod. It is. Curved, kind of like a crescent moon shape. It gets to be 10 to 20 centimeters long and 2.5 to 3 centimeters wide. When it is not ripe it is reddish, in color. When it is fully ripe it turns black. Inside each pod there are 4 to 10 seeds.

Plant Part	**Phytoconstituents**
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'- deoxyprocyanidin 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.

Table 2: Phytochemistry [21]

Rasa	Kashaya, tikta
Veerya	Sheeta
Vipaka	Katu
Guna	Laghu, Ruksha
Karma	Kaphapittashamaka (alleviates kapha and pitta), varnya (improves complexion of skin), sothaghna (anti-inflammatory), kusthagana (cure skin diseases), rasayan (rejuvenating), stambhana (astringent), shonitsthapana (anti-haemorrhages), vrsya(aphrodisiac), artavjannan(improve ovulation), krimighna(anti helmintic), pramehaghna(anti-diabetic).

Table 3: Properties and action [15 ,22]

Part used:[22]

Bark, Seed, Flower.

Externally – The drug is used as a local application for pain and in various types of poisoning.[15] Internally – It is indicated in painful condition of viscera. [15]

Systemic: [15]

i. Gastro-intestinal tract – In diarrhea, dysentery, worm infestation and thirst.

ii. Cardiovascular system – The flower is indicated in edema and haemorrhages.

iii. Reproductive system – In menorrhagia, dysmenorrhoea, leucorrhoea and other uterine disorders.

iv. Urinary system – Powdered seed is used in dysuria and stones in the urinary tract.

Adulterant:[15]

Due to destructive extraction and no organized cultivation programme, the availability of the crude drug is diminishing and this has resulted in the sale of adulterants. The most common adulterant is the bark of Polyaithia longifolia Benth & Hook belonging to family Annonaceae. In marathi it is called as „Khota ashoka' whereas in hindi & bengali it is called as Devdaru. Also ashoka bark is mixed with bark of Rohitaka(Afanamexis polystakis) & Sicalpinea pulchirena. S. V. Lal in 1953 reported that both the plant Saraca indica & Polyalthia longifolia contains two pharmacologically active fractions which has similar action on pain muscles, though the mode of action of the stimulant fractions is quite different in each case; Thus he concluded that the stimulant

fraction of Saraca indica acts by liberation of acetyl choline, that of polyalthia longifolia acts directly on the plain muscle fibre.

Medicinal uses:

Ashoka is a common medicinal herb in Ayurveda where a range of conditions relating to the reproductive system are said to be especially helpful. Bark is antifungal, antibacterial, anti-inflammatory, antioxidant, astringent, demulcent, diuretic, powerfully hemostatic, oxytococcal, neural tonic, cold, sedative, vermicide, uterine tonsillitis, it is used to treat many conditions, particularly those affecting the urinary system and is considered a very effective treatment under all kinds of women's reproductive system conditions.23-24

It has a powerful effect on the muscles of the uterus and is particularly helpful for the treatment of uterine hemorrhage.25-26 It is highly astringent and has a desirable effect on the uterine and ovarian tissues, Blossoms are diuretic.

Pharmacological activity:

Antimicrobial activity:

Saraca asoca has antibacterial activity (ethanol: water, 1:1) on agar plate with different organism such as Bacillus subtilis, Salmonella typhosa, Staphylococcus aureus, (plant pathogen). Agrobacterium tumefaciens showed negative activity [27] Ashoka dried flower buds are tested against antibacterial activity of methanol extract on agar plate against Shigella boydii, Escherichia coli, Salmonella viballerup, Shigela flexneri, Vibro cholera and Shigella dyserteriae showed positive result [28]. *Saraca asoca* leaves tested against antibacterial activity of ethanol (95%) and water extract on agar plate Escherichia coli and Staphylococcus aureus. Escherichia coli found active whereas tested against Staphylococcus aureus showed negative result [29]. The methanolic extract of *Saraca asoca* was tested against Alternaria cajani, Helminthosporium sp., Bipolaris sp., Curvularia lunata and Fusarium sp., at different concentrations (1000, 2000, 3000, 4000 and 5000 ug/ml).The extracts exhibited good inhibitory activity against A. Cajani, also it effective at lower concentrations against other fungi[30].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[31].different extract of *Saraca asoca* bark were tested against the enteric pathogen isolates namely Escherichia coli, Shigella sonnei and Salmonella enteritis.All the extract except aqueous extract showed antimicrobial activity and highest percentage of activity was observed with the methanol extract[32].Methanol and water extract of Ashoka leaves having good activity against Bacillus subtilis, Pseudomonas aeruginosa and Salmonella typhimurium also both the extract showed marked activity against Alternania alterate, Colletotrichum gloesporioodes and Drechlera specifera[33]. Bark extract of *Saraca asoca* were investigated for in vitro antibacterial activity against Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Proteus vulgaris, Bacillus aureus and Klebsiella pneumonia at 4 mg/ml using agar well diffusion method. The ethanol and distilled water extract showed significant broad spectrum antibacterial activity [34].

Anti-inflammatory activity

Chronic Arthritis and Cardiovascular diseases mostly occur due to Inflammation, a response mediated by Pro-inflammatory cytokines. The Ethanolic and Methanolic extract of the leaf, bark and root of *Saraca asoca* has Anti-inflammatory properties which significantly inhibited the binding of different Transcription factors (NF- kb, AP-1, GATA-1, etc) on their Target DNA sequences hence reducing the amount of Pro-inflammatory cytokine.[35].*Saraca asoca* extract decreases the level of Pro-inflammatory cytokines IL-1 & TNF- α.[36].The leaves of Saraca asocahave anti-inflammatory activity on Carrageenan induced paw oedema in animals. The Ethanolic extract of *Saraca asoca* reduces the paw oedema significantly thus causing 56.95 % inhibition increase paw volume, albeit of a short duration and intensity as compared to that of 10mg/kg diclofenac. [37, 38]

Uterine tonic activity:

In Ayurvedic medicine *Saraca asoca* is a drug of choice for its stimulant activity on the endometrium and ovarian tissue. The estrogenic effect of U-3107 (1mg/kg p.o) was considered in healthy and overiectomized rats. U-3107 was administered as an

aqueous suspension for a period of 21 days. The management of overiectomized rats did not any expand on uterine weight. Only in the presence of functional ovary U-3107 perform the estrogenic activity and is devoid of any progestational activity. U-3107 is a herbal preparation which is formulated by using various plant extract and is useful in variety of menstrual disorders like puberty, menorrhoea, Dysmenorrhoea, premenstrual syndrome, abnormal bleeding and threatened abortion.[39]

Antimenorrhagic activity:

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 & menorrhagia. Ashoka bark in India, used as a uterine sedative & hot water extracts are 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 & used in several preparations related to female troubles. *Saraca asoca* bark, in Pakistan, employed for uterine affection & 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 & the other relaxing the plan muscle of the ileum of the guinea pig. The drug is reported to stimulate the uterus, making the contraction more frequent & prolonged. The crystalline glycoside substance is also reported to stimulate uterine contraction40,41,42,43.

Anti- cancer activity:

Flowers of *Saraca asoca* possess an anti-cancer principle (a flavonoid fraction), proved to prevent 2 stage skin carcinogenesis and is indicated 50% cytotoxicity (in vitro) in Dalton's lymphoma ascites and sarcoma 180 tumor cells at a concentration of 38 mug and 54 mug respectively , while being nontoxic to normal lymphocytes but having preferential activity against lymphocytes derived from leukemia patients.[44] The ethanolic extract of Saraca indica was shown to inhibit the breast cancer.[45]. Recently "Saracin" the lectin isolated from the seed integument has been reported to induce apoptosis in human T-lymphocytes in an in vitro assay.[46].

CNS depressant and brain tonic:

The petroleum ether, chloroform, methanol and aqueous extracts of leaves of *Saraca asoca* shows CNS depressant activity depending upon their polarity out of which the methanol extract shows maximum CNS depressant activity in albino mice. The activity was examined by using phenobarbitone induced sleeping time with the help of actophotometer. The extract of *Saraca asoca* significantly reduces the locomoter activity in mice by 67.33%. The mechanism of the depressant activity can be associated with activation of γ- aminobutyric acid (GABA) receptors in the CNS by glycosides, flavonoids, saponins and tannins present in the plant extract which culminates in anxiolysis, muscle relaxation and sedation[47, 48-50].

Cardio protective activity:

Cardio protective activity of alcoholic extract of Saraca indica bark was investigated against cyclophosphamide induced cardio toxicity. 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.[51]

Antidiabetic activity:

Both normal and diabetic rats induced using streptozotocin have been used in studies on the hypoglycemic activity of the bark extract from the Saraca indica Linn in methanolic form. When taken at a dose of 400 mg/kg orally, it demonstrates a high hypoglycemic effect [52]. In treating diabetes, either the powdered form of the plant, when mixed with milk, or the decoction of Ashoka bark is taken two times daily.

Antioxytocic Activity:

The oxytocic effect of the plant was found in rat and human isolated uteri. The estrogenized or pregnant uterus was more responsive to the action of the

alcoholic extract of the plant. Pentolinium bitartrate completely inhibited the oxytocic effect of the extract. Seed extract has activity against dermatophytic fungi. In vitro studies on rat uterus preparation, the extracts of S. asoca have no oxytocic effect. Two previous studies with S. asoca showed negative results while one study showed positive results [54].

Analgesic activity:

The experiment utilized Swiss albino rats to determine the efficacy of water and alcohol extracts of the skin of the bark of Shorea robusta (Shal) and Saraca indica (Ashoka). When compared with the control subjects, the extracts of both Shorea robusta and Saraca indica reduced pain considerably when administered at a dosage of 300 mg/kg body weight. There might be plant constituents present in the plants that exhibit analgesic action such as alkaloids and steroids. From the findings of the study, Ashoka and Shal appeared to possess analgesic properties.

Anti-nephrolithiatic and Antiurolithic Activity:

The methanolic extract of the bark of Saraca indica has an antiurolithic effect in an ethylene glycol-induced hyperoxaluria model in Wistar male rats. This is evidenced by the significant reduction and inhibition of stone formation, assessed using criteria like serum markers (creatinine and uric acid), tissue homogenate markers (calcium, oxalate, and phosphate), urinary markers (calcium, oxalate, phosphate, uric acid, and magnesium), and urine output. The property of S. asoca root in dissolving kidney stones of oxalic acid nature is widely known. This herb has also been used for dissolving kidney stones obstructing the urinary system [56,57-59].

Class of compounds	Extraction solvent	Plant organ	Biological function	References
Flavonols	Hexane, benzene, chloroform, methanol, water, hot water	Seed, pod, bark, leave	Antimicrobial, antioxidant, anti-inflammatory.	[60]
Phenolic acids	Ethyl acetate	Bark, flowers, leaves	Anticancer, hypolipidemic, antidiabetic, antioxidant.	[61,62]
Alkaloids	Chloroform, ethanol, methanol, water	Leaves	Antioxidant	[63,64]
Flavanol glycosides	Ethanol, methanol, water	Bark, flowers	Antioxidant, anti inflammatory, antidiabetic	[65,66]
Fatty acids	Hexane, chloroform	Leaves, stem	Anti-inflammatory, cardioprotective	[67]
Terpenoids	Methanol	Bark	Antioxidant	[68]
Tannins	Acetone	Leaves	Antioxidant	[69]
Steroids	Hexane, chloroform methanol, water, hot water	Leaves, stem	Hypolipidemic, antioxidant, antidiabetic	[70,71]

Steroidal glycosides	Methanol	Bark	Antioxidant	[72,73]
Lignan glycosides	Methanol	Bark, flowers, leaves	Antioxidant	[74]

Table 4: Using a variety of extraction solvents, the major classes of bioactive chemicals reported from several *S. asoca* organs

Uses of Asoka in Ayurveda [75-79]

1. Asoka decoction/cold extract milk decoction of asoka in the morning in the treatment of asragdara.

2. Milk decoction of asoka bark for the treatment of excessive uterine bleeding.

3. Ashoka bark powder with honey in the treatment of pradara/asragdara (excessive menstrual flow/ bleeding)

4. Asokarishta in the treatment of hemorrhage, hemorrhoids, loss of appetite, edema, fever, etc.

5. Asokaghrita in the treatment of backache, uterine pain and anemia.

6. In case of dysuria/anuria due to formation of stones in the urinary tract, asoka seed can be used with cold water.

7. Asoka bark decoction and Asokaghrita in the treatment of uterine diseases. It acts as good uterine tonic and keeps menses free from troubles. During pregnancy, Asokaghrita does not cause abortion.

8. Asoka bark decoction and Asokaghrita in the treatment of painful menses (Dysmenorrhea).

9. External application-Medicinal ghrita prepared from herbs containing asoka as the chief ingredient is used in treating gulma (abdominal lump/tumor).

10. Enteral administration – Asoka in association with other drugs is useful in the treatment of diseases like kaphaja gulma, kapha vata janya vibandha (constipation due to vitiation of kapha vata), kustha (skin ailments), pliha (hypertrophy of spleen), udara roga (inflammation of the abdomen), and yoni roga (genital disorders).

11. Asoka is also an effective remedy for the disease cough.

12. It may be used for the reduction of meda (body fat) and kaph

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HOW TO CITE: Shubhangi Bhadane*[1], Devika Gondhale[1], Bhavana Gaware[1], Kiran Kotade[1], Sangita Bhandare[1], Amol More[2], Saraca Asoca: A Comprehensive Review Of Its Medicinal Properties And Therapeutic Potential, Int. J. Sci. R. Tech., 2026, 3 (6), 1014-1024. https://doi.org/10.5281/zenodo.20728063