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DALBERGIA SISSOO ROXB: MONOGRAPH

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ABSTRACT: In traditional medicinal trees, *Dalbergia sissoo* is a popular species around the world. It has been used for the therapeutic purpose from thousands of years, and now there is a growing demand for plant-based medicines, health products, pharmaceuticals, and cosmetics. *Dalbergia sissoo* is a widely growing plant which is used traditionally as anti-inflammatory, antipyretic, analgesic, anti-oxidant, anti-diabetic and as an antimicrobial agent. Several chemical constituents have been isolated and identified from different parts of the plant belonging to the category of alkaloids, glycosides, flavanols, tannins, saponins, sterols and terpenoids. Compounds isolated from *Dalbergia sissoo* like an isoflavone, biochanin is a potent chemotherapeutic cancer preventive agent with a distinct estrogenic activity. *D. sissoo* possesses several pharmacological activities; however, it is essential that more clinical and pharmacological studies should be conducted to investigate the unexploited potential of this plant. A review of plant description, phytochemical constituents present, traditional uses and pharmacological activities of *Dalbergia sissoo* are given in the present article.

INTRODUCTION: *Dalbergia sissoo*, commonly known as Indian Rosewood, is a deciduous tree, also known as sisu, Sheesham, tahli and Tali. It is native to the Indian Subcontinent and Southern Iran. *Dalbergia sissoo* is the state tree of Punjab state (India) and the provincial tree of Punjab province (Pakistan). It is found growing along river banks below 900 meters (3,000 ft) elevation but can range naturally up to 1,300 m (4,300 ft).

It can withstand average annual rainfall up to 2,000 millimeters (79 in) and droughts of 3-4 months. It prefers soils from pure sand and gravel to rich alluvium of river banks. Shisham can grow in slightly saline soils. Seedlings are intolerant of shade ¹.

Taxonomical Classification: ²

Kingdom:	Plantae
Division:	Magnoliophyta
Phylum:	Tracheophyta
Class:	Magnoliopsida
Order:	Fabales
Family:	Fabaceae
Genus:	<i>Dalbergia</i>
Species:	<i>D. sissoo</i>

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Binomial Name: *Dalbergia sissoo* DC.

Synonyms: *Amerimnon sissoo* (Roxb.) Kuntze, *Coroya* Pierre, *Amerimnon* P. Browne, *Ecastaphyllum* P. Browne, *Miscolobium* Vogel, *Triptolemea* Mart.³

Common Names: Sanskrit (Shinshapa, aguru), English (Indian Rosewood, Bombay Blackwood), Hindi (Shisham, sissu, sisam), Tamil (Sisso, gette), Bengali (Shishu), French (Ébénier juane), Arabic (Arabic)³.

Botanical Description: *Dalbergia sissoo* is a medium to large size deciduous tree. It is of about 25 meters high with grey-yellow trunk, longitudinal

crack, and downcast twig. Leaves are leathery, pinnately compound, alternate leaflets, petiolated leaf stalk, measures about 15 cm long, each leaflet most comprehensive at the base, to 6 cm long with a fine pointed tip. Flowers are whitish to pink, fragrant, nearly sessile, and in dense clusters. Pods are oblong, flat, thin, strap-like 4–8 cm long, 1 cm wide and light brown **Fig. 1** and **2**. They contain 1–5 flat bean-shaped seeds 8–10 mm long. It has a long taproot and numerous surface roots which produce suckers. Young shoots are downy and drooping; stems have light brown to dark grey bark up to 2.5 cm (0.98 in) thick, shed in narrow strips, large upper branches support a spreading crown **Fig. 1** and **2**¹.



FIG. 1: LEAVES AND PODS OF DALBERGIA SISSOO



FIG. 2: FLOWERS OF DALBERGIA SISSOO

Geographical Distribution: *Dalbergia sissoo* is found in tropical to subtropical climates in natural and planted forests, very widely distributed in Pakistan, India, Bangladesh, Israel, Afghanistan, Persia, Iraq, Kenya, US and Tanzania⁴.

Phytochemical Constituents: Isoflavone-O-glycoside, Biochanin A, tectorigenin, 7, 4 dimethyl tectorigenin and 7-O- methyl tectorigenin, Mesoinisitol, 7-O- methyl tectorigenin and 4'-rhamnoglucoside, Isocaviumin, tectorigenin, dalbergin, caviunin and tannins, Dalberginone, Dalbergia, methyl Dalbergia and dalbergichromene, Dalbergin, nordalberginones, dalbergichromene, fixed oil and essential oils. Compounds isolated from *Dalbergia sissoo* like an isoflavone, biochanin is a potent chemotherapeutic

Cancer preventive agent with a distinct estrogenic activity. Two rare glycosides kaempferol and quercetin rutinosides are also isolated^{5,6}.

Traditional Uses: Its leaf juice is used for eye ailments. Wood and bark act as abortifacient,

anthelmintic, antipyretic, aphrodisiac, expectorant, and refrigerant also used in anal disorders, blood diseases, burning sensations, dysentery, dyspepsia, leucoderma, skin ailments, blood disorders, burning sensations, eye and nose disorders, scabies, scalding urine, stomach problems, and syphilis, boils, eruptions, leprosy and nausea.

Leaf extract has been used to treat sore throats, heart problems, dysentery, syphilis, and gonorrhea. In India and Nepal, rural people use *Dalbergia sissoo* leaves to treat animals suffering from non-specific diarrhea. People use twigs of the tree to clean their teeth⁷.

Reported Pharmacological Activities:

Anti-Inflammatory Activity: Anti-inflammatory activity of ethanolic extract of *Dalbergia sissoo* bark was evaluated. It can be concluded that the ethanolic extract at 1000 mg/kg showed the most potent anti-inflammatory activity compared to the other groups (300 and 500 mg/kg) throughout the observation period⁸.

Anti-Termite Activity: The anti-termite activity of heartwood of *Dalbergia sissoo* was evaluated. It was concluded that the plant extracts could be used as an alternative for synthetic pesticides for the control of termite in buildings⁹.

Anti-Diabetic Potential: Pankaj Singh Niranjana et al., conducted a study in 2010 to evaluate the anti-diabetic activity of ethanolic extract of *Dalbergia sissoo* leaves in alloxan-induced diabetic rats. They concluded that the ethanolic extract of the leaves is 12% more effective in reducing the blood glucose level compared to standard Glibenclamide¹⁰.

Analgesic and Antipyretic Effects: Phytochemical, analgesic and antipyretic activities of ethanol extract of *Dalbergia sissoo* seeds were evaluated. It was concluded that *Dalbergia sissoo* seeds extract has moderate analgesic and remarkable antipyretic activities¹¹.

Anti-Helminthic Potential: The anti-helminthic activity of *Dalbergia sissoo* was determined. The study showed the potential usefulness of *Dalbergia sissoo* against helminthic infections¹².

Antioxidant Potential: The stem bark of *Dalbergia sissoo* was evaluated for its antioxidant potential. Finally results shown, among the different extracts of stem bark of the plant, chloroform extract exhibited marked antioxidant activity, whereas methanolic extract showed moderate activity in different *in-vitro* anti-oxidant assays¹³.

Antimicrobial Property: In a study, a herbal preparation containing *Dalbergia sissoo* and *Datura stramonium* was evaluated for its antibacterial potential against pathogenic strains of gram-positive (*Staphylococcus aureus* and *Streptococcus pneumoniae*) and gram-negative (*Escherichia coli*, *Pseudomonas aeruginosa*, and *Klebsiella pneumoniae*) bacteria. Antibacterial effect was compared to standard antibiotic drugs, i.e. Chloramphenicol (30 mcg), Ampicillin (10 mcg), Nalidixic acid (10 mcg) and Rifampicin (30 mcg). An extract was found to be most active against both gram-positive as well as gram-negative bacteria. A clinical isolate of *S. aureus* showed higher sensitivity towards both extract than standard strains and inhibited growth on most administrative levels such as inhibition of protein, DNA, RNA,

and peptidoglycan synthesis. The results of the study show that the extract of *Dalbergia sissoo* and *Datura stramonium* may be used as a potent antiseptic preparation for the prevention and treatment of chronic bacterial infections¹⁴.

Antinociceptive Activity: The antinociceptive activity of ethanolic extract of the plant bark of *Dalbergia sissoo* was evaluated using tail flick method on Wistar rats. Three different dose levels (300, 500, and 1000 mg/kg) in 0.5% carboxymethyl cellulose were administered. The antinociceptive extract activities of all doses were compared with that of the standard drug aspirin (300 mg/kg). The results were found to be significant ($P < 0.01$). At the above doses, the extract possesses significant dose-dependent antinociceptive activity. Phytochemical investigation of the ethanolic extract showed the presence of carbohydrates, proteins, amino acids, phenolic compounds, and flavonoids. The antinociceptive activity of the bark extract may be due to the presence of phytochemical constituents such as flavonoids¹⁵.

Osteogenic Activity: One new isoflavone glucoside, caviunin 7-O-[β -D- apiofuranosyl-(1 \rightarrow 6)- β -D-glucopyranoside] and a new itaconic derivative, (E)- 4-methoxy- 2- (3,4-dihydroxy benzylidene)-4-oxobutanoic acid along with series of isoflavones and flavonols with their glucosides, and a lignan glucoside was isolated from the ethanolic extract of *Dalbergia sissoo* leaves and were assessed for osteogenic activity in primary calvarial osteoblast cultures. The result showed that compounds exhibited significant osteogenic activity¹⁶.

CONCLUSION: In recent years, medicinal plant studies have received much attention as this brings to light the numerous little known and unknown medicinal virtues especially of plant origin which needs evaluation on modern scientific lines such as phytochemical analysis, pharmacological screening and clinical trials.

Dalbergia sissoo possesses a variety of pharmacological activities as discussed in the present review article. However, it is essential that more clinical and pharmacological studies should be conducted to investigate the unexploited potential of this plant.

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CONFLICT OF INTEREST: Nil

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