ejpmr, 2024, 11(6), 147-151

SJIF Impact Factor 7.065

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Review Article

ISSN 2394-3211

EJPMR

A COMPREHENSIVE REVIEW ON ETHNOBOTANY AND PHARMACOLOGICAL ACTIVITIES OF SIMAROUBA GLAUCA

Drisya M. K.*, Revathi M., Barsha S. Babu, Hitha Ashok, Jannath Sherin, Nivethya Jayan

India.

***Corresponding Author: Drisya M. K.**

India.

Article Received on 06/04/2024 **Article Revised on 27/05/2024** **Article Accepted on 17/05/2024**

ABSTRACT

Simarouba glauca (S. glauca) commonly known as 'Laxmitaru' or 'Paradise tree' belongs to the Family Simaroubaceae, is a medicinal plant that is rich in bioactive chemicals with a variety of pharmacological effects. This review aims to provide an overview of the chemical constituents that is present in the crude drug of *Simarouba glauca*, with an emphasis on their pharmacological properties. Simarouba's bark and leaf extract exerts various pharmacological effects such as antiamoebic activity, antifungal properties, antimalarial activity, antiulcer activity, hepato protective property, anticancer effects and reduce patchy skin pigmentation. The active phytoconstituent responsible for the pharmacological actions of *Simarouba glauca* includes glaucarubin, quassinoids, ailanthinone, benzoquinone, holacanthone, melianone, simaroubidin, simarolide, simarubin, simarubolide, sistosterol. Further exploration of its bioactive constituents and therapeutic applications holds promise for addressing a wide range of health challenges.

KEYWORDS: Simarouba glauca, Laxmitaru, quassinoids, Pharmacological action.

INTRODUCTION

Since ancient time medicinal plant are used in the treatment of various disease conditions. Even so, it continues to be significant in the modern day as a source of primary healthcare for over 85% of the world's population and as a resource for drug discovery with 80% of synthetic medications are derived from them.[1]

The search for new bioactive substances in the field of natural products research has inspired researchers to investigate the unexplored potential of many plant species.[2] *Simarouba glauca* (S. glauca) commonly known as 'Laxmitaru' or 'Paradise tree' belongs to the Family Simaroubaceae.[3] The name glauca refers to the bluish green foliage which means covered with bloom and it is derived from the Greek word 'glaukos'. The bark, leaves, leaf litter, pulp from fruits, roots, seeds, shells, stems, and undesired branches of plants are uses as Food, fuel, fertilizer, wood, and medicinal products.[4]

Simarouba glauca has been identified as a valuable source of bioactive compounds with potent medicinal properties.[2] Traditionally, the bark of the plant has been used to treat Malaria. The Brazilian tribes have also found effective with S. glauca extract as a natural treatment for both acute and chronic diarrhoea.[3]

The pharmacological characteristics of Simarouba's bark and leaf extract, including its haemostatic, antihelmenthic, antiparasitic, antidysentric, antipyretic, and anticancer effects are widely recognized. Astringent emmenagogue, stomachic tonic, vermifuse, analgesic, antibacterial, and antiviral are only a few of the medical qualities of the bark, which is also used to treat fever, malaria, stomach and bowel diseases, hemorrhages, and ameobiasis. Crushed seeds are applied topically to prevent snakebite. The active phytoconstituent of the crude drug includes glaucarubin, quassinoids, ailanthinone, benzoquinone, holacanthone, melianone, simaroubidin, simarolide, simarubin, simarubolide, sistosterol.[5]

PLANT PROFILE

Common names

Malayalam	:	Lakshmi tharu Shorgum maram
Tamil	:	Luxmitaru
Hindi	:	Bitter ash, Bitter damson princess tree,
English	:	Simarouba, Paradise tree.
Spanish	:	Daguillo gavilan, Juan, Primero,
French	:	Laguilla, Olivio, Palo amargo.
Trade name	:	Bois amer, Bois blance, Bois frene, Bois negresse, Quinquina d Europe. Simarouba, Dysentry bark, Mountain Damson, Acituno[6]

Scientific Classification

Kingdom : Plantae
Order : Sapindales
Family : Simaroubaceae
Genus : Simarouba
Species : S. Glauca
Synonym : Simarouba medicinalis Endl. and Simarouba officinalis

BOTANICAL DESCRIPTION

Simarouba is native to the tropical rainforests of Mexico, Cuba, Haita, and Central America. Its trunk diameter ranges from 50 to 80 cm, and it can reach a height of up to 20 meters. It produces tiny white flowers, yellow-reddish fruits, and brilliant green leaves that are 20 to 50 cm long.[13] Shallow roots make it ideal for soils found in mountains. The stem has a diameter of 40–50 cm and a maximum height of 9 m. Its exterior bark is finely fractured and grey in color, while the interior bark is creamy in hue. The pinnately complex leaves have 3–21 oblong leaflets that alternate in an even, bluish oily green color frequently with a smooth or notched apex. The terminal panicle of the inflorescence produces a dichasial cyme through its final branches. Flowers are small and bisexual, with a green calyx that is fashioned like a dome and has a varied number of sepals. There is a single whorl of white, greenish or yellowish-colored petals. The staminate flowers have a single ovule and gynophores but no carpel.[22] The S. glauca is regarded as polygamodioecious because of the wide range of variability in its floral features, noted flower variants, including andromonoecious form (tree with hermaphrodite blooms on multiple branches of the same tree), staminate form (male tree), and pistillate form (female tree) It is observed that the remaining flowers on trees are staminate, or male, and that only 50% of the trees are fruitful. When it reaches the age of 6 to 8 years, it begins to produce flowers. Every year, in the spring, flowers are made. They begin to bloom in December and last until the end of February. Numerous fruits are rectangular to oblong drupes that grow in clusters of two to five. The purple fruits have a pleasant, edible flesh that becomes somewhat astringent as they develop. After maturing, the 1.5–2 cm long seeds have a pinkish or yellowish blue.[23] Based on the color of the fruit, there are two varieties: one yields greenish white fruit, while the other produces violet to nearly black fruits.[24] Reactive oxygen species (ROS) are free radicals that can cause oxidative damage to cellular organelles and tissues. These radicals can be produced by anthropogenic activities as well as by regular cellular and/or metabolic processes. Oxidative stress is caused by changes in the cellular redox pair, either an increase or decrease.[25]

DISTRIBUTION

i. Global Distribution

Brazil, the West Indies, and Southern Florida are the native habitats of S. glauca DC. It is indigenous to the United States of America, the Bahamas, Costa Rica, Cuba, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, and Puerto Rico.[4,21] Although unusual for the Philippines, Myanmar, India, and Sri Lanka. In 1957, S. glauca was brought to Kenya and Burundi in Africa.[5]

ii. Distribution in India

The National Bureau of Plant Genetic Resources originally introduced it in 1966 at the research station in Amravati, Maharashtra, and in 1986 at the University of Agricultural Sciences, Bangalore.[5] It is grown in Orissa, Maharashtra, and other states in India, including Anand (Gujarat), Jodhpur (Rajasthan), Andhra Pradesh, Karnataka, Tamilnadu, West Bengal, and Bhubaneswar (Orissa) at the beginning stages of plantation.[4,5] The cultivation of S. glauca has now extended to other Indian states, including Gujarat, Tamilnadu, Maharashtra, Karnataka, and Andhra Pradesh, as well as semiarid, dry, and saline land areas. The S. glauca tree can thrive in dry areas with damaged soil or marginal wastelands.[5]

CHEMICAL CONSTITUENTS

The majority of the compounds that were isolated from S. glauca includes alkaloids with high cytotoxicity and quassinoids with potent antifungal effects. One of the most well investigated substances to be extracted from S. glauca seeds is glaucarubin which contains quassinoids such glaucarubol, glaucarubolone, and the two esters of glaucarubolone, ailanthinone and glaucarubinone. These quassinoids have shown promising antitumor properties.[19] In addition to these compounds scopoletin, canthin-6-one, and a canthin-6-one dimethoxy derivative were found in the plants. S. glauca extract identifies the presence of alkaloids, cardenolides, flavonoids, fixed oil, glycosides, phenolic chemicals, and saponins, sitosterol, simarubolide, simaroubidine, melianone, holacanthone, dehydroglaucarubinone, canthin, and benzoquinone.[20]

NUTRITIVE VALUE

S. glauca is a good source of proteins, lipids, fatty acids, and carbohydrates. While seeds contain oil (up to 60% weight/weight), the kernels provide edible fat consisting of palmitic (12.5%), oleic (56%) and stearic (27%) acid. The essential amino acids valine, lysine, and leucine are abundant in the kernel. Furthermore, 51.8g/100g of protein is the typical amount. The food supply contains phenolics, phytic acids, calcium, sodium, triterpenoid aglycone, alkaloids, and saponins. The leaves contain flavonoids (0.14 to 0.18%), phenolics (250-400µg/mg), and tannins (67-200µg/mg) that are beneficial in combating against a number of illnesses, including diabetes and cancer.[3]

PHARMACOLOGICAL USES

Antiamoebic Activity

Crystalline glycosides extracted from the S. glauca demonstrated its activity against Entamoeba histolytica in in vitro studies, as well as its amoebicidal properties. The glaucarubin exhibited an amoebicidal property when tested on laboratory animals and in vitro.[7]

Antibacterial Activity

S. glauca leaf extract may possess both Gram-positive and Gram-negative antibacterial qualities. Fresh and dried leaf extracts of Simarouba Glauca and Psoralea corylifolia (Babchi) suppress microorganisms including Bacillus subtilis (BS), Escherichia coli (EC), Pseudomonas aeruginosa (PA), and Staphylococcus Aureus (SA).[8] The ethanol and methanol extracts of fresh and dried S. glauca leaves were previously recorded using Soxhlet equipment. According to research by Jungle et al. (2012), extracts of S. glauca were only mediocrely effective in suppressing BS, EC, PA, and SA.[9] According to Ganesh et al., the growth of BS, SA, PA, and EC was suppressed by crude methanol and ethanol extracts prepared from fresh and dried S. glauca leaves.[10] Numerous investigations have confirmed the antibacterial properties of various plants. As a result, research on Laxmi Taru antibacterial activity was limited to the antimicrobial properties of specific bacteria.[11]

Anti-tumor Activity

Some species belonging to the Simaroubaceae family exhibit significant anticancer action. S. glauca includes substances that have antitumor activity. Ailanthinone, Glaucarubinone, Dehydroglaucarubinone, and Holacanthone are the four Quassinoids that have been connected to the herbs antileukemic and anticancer properties.[12] Numerous components of Quassinoids S. glauca seeds have been demonstrated to be cytotoxic in vitro to KB cells, including glaucarubin, glaucarubinone, glaucarubol, and glaucarubolone. The potent Quassinoids with this type of anticancer effec t include glacarubinone, simili kalctone D, brucea ntinol, and bruantin.[13]

Antifungal Properties

S. glauca antifungal qualities against a variety of fungi. However, it was shown that extracts from this plant were more effective against Aspergillus parasiticus than those from Fusarium oxysporum. Compared to methanol extracts from fresh leaves, ethanolic extracts from fresh leaves are reported to be more efficient against the growth of fungus through the agar well diffusion process.[14]

Antimalarial Activity

Three powerful quassinoids in S. glauca have been demonstrated to have antimalarial activity against malaria both in vitro and in vivo. Chloroquine-resistant Plasmodium falciparum strains have been shown to be strongly inhibited by some quinoids in S. glauca.[15] Key antimalarial production quassinoids have been identified as 6α- tigloyloxychaparrinone, ailanthone, eurycomanone, isobrucein B, orinocinolid,

neosergeolide, pasakbumin B and C, and simalikalactone D.[4]

Antioxidant Activity

Antioxidant properties are present in S. glauca leaves Antioxidants have been found to be associated with S. glauca leaf extract. All forms of H2 O2 scavenging could be concentrated using S. glauca chloroform extract. Extracts were quite successful at scavenging free radicals, such as DPPH and chelating radical iron. Additionally, the extracts may have displayed antioxidant properties.[16]

Reducing Patchy Skin Pigm entation

According to a US Patent issued October 14, 1997, the chemicals in S. glauca extract have the ability to reduce uneven skin pigmentation. observed that the water extract of S. glauca extract improves skin differentiation and enhances moisture and health.[12]

Antiulcer Activity

In albino rats, ethanol-induced stomach ulcers were inhibited by the chloroform extract of S. glauca in a dose-dependent manner, providing 82.63% protection at 400 mg/kg and 53.48 The study conducted by Sharma and Sriram (2014) revealed that the chloroform extract of S. glauca exhibited dose-dependent inhibition of indomethacin-induced gastric lesions in albino rats. This resulted in 62.65% protection at 400 mg/kg and 54.86% protection at 200 mg/kg. The extract from S. glauca leaves also reduced acidity and increased mucosal secretions, indicating S. glauca's antiulcer activity.[17]

Hepatoprotective Activity

Chloroform and ethanol extracts show hepatoprotective effects of S. glauca. According to some studies,an innovative hepatoprotective treatment may be made using S. glauca leaf extract.[18]

Others

Leaves and barks of S. glauca has been used as a natural remedy. Bark of S. glauca leaves is used for treatment of malaria and dysentery. Barks are also used to avoid bleeding, tonic to deal with fever. It can also be used for wounds and cuts. The boiled S. glauca bark is used as a strong astringent and is also used to cleanse skin and to treat blood bleeding and internal bleeding. Apart from being medicinal, S. glauca is a dioecious oil crops plant having a production capacity of 2000-2500 kg of oil/ha/year. S. glauca seeds are rich in edible fat which is used for cooking in tropical countries.[18]

CONCLUSION

In conclusion, Simarouba glauca is a significant medicinal plant with various pharmacological properties. The plant's bioactive constituents, including quassinoids, alkaloids, and flavonoids, contribute significantly to its medicinal potential. These compounds have been extensively investigated for their efficacy in combating various diseases. The bark and leaf extract of Simarouba is well known for its different types of pharmacological properties such as haemostatic, antihelmenthic, antiparasitic, antidysentric, antipyretic and anticancerous. The bark is used to cure fever, malaria, stomach and bowel disorders, haemorrhages, ameobiasis as well as leaf, fruit pulp and seeds are possessing medicinal properties such as analgesic, antimicrobial, antiviral.

REFERENCE

1. Fitzgerald, M., Heinrich, M., & Booker, A. Medicinal plant analysis: A historical and regional discussion of emergent complex techniques. *Frontiers in pharmacology*, 2020; *10:* 423244.
2. Pandhari, R. M. R., & Taranath, T.C. Pharmacognostic Evaluation of Simarouba glauca DC Bark. *European Journal of Medicinal Plants*, 2023; *34*(9): 60-83.
3. Jose, A., Kannan, E., Kumar, P. R. A. V., & Madhunapantula, S. V. Therapeutic potential of phytochemicals isolated from Simarouba glauca for inhibiting cancers: A review. *Systematic Reviews in Pharmacy*, 2019; *10*(1): 73-80.
4. Hussain, M. S., & Khan, M. D. Pharmacological Uses of Simarouba glauca: A Review. *Plant Archives (09725210)*, 2021; *21*(1).
5. Manasi, P. S., & Gaikwad, D. K. A critical review on medicinally important oil yielding plant laxmitaru (Simarouba glauca DC.). *Journal of pharmaceutical Sciences and Research*, 2011; *3*(4): 1195.
6. Antony, J., Thomas, A., & Gnanasekaran, D. Review study on pharmacological importance of Simarouba glauca. *International Journal of New Technology and Research*, 2016; *2*(10): 263412.
7. Del Pozo, E. C. Mechanism of pharmacological actions of scorpion venoms. *Publ A Assoc Advance Sci.*, 1956; *44:* 123-129.
8. Rajurkar, B. M. A comparative study on antimicrobial activity of Clerodendrum infortunatum, Simarouba glauca and Psoralea corylifolia. *Int J Res Rev Pharm Appl Sci.*, 2011; *1:* 278-82.
9. Jangale, B. L., Ugale, T. B., Aher, P. S., Toke, N. R., Shivangikar, A. N., & Sanap, N. T. Antibacterial activity of Simarouba glauca leaf extracts against food borne spoilage and pathogenic microorganisms. *International Journal of Pharmaceutical Sciences and Research*, 2012; *3*(2): 497.
10. Hussain, M. S., Singh, M., Kumar, B., Tewari, D., Mansoor, S., & Ganesh, N. Antimicrobial activity in ethanolic extracts of Bixa orellana L., Simarouba glauca DC, and Ocimum tenuiflorum L. collected from JNCH herbal garden. *World Journal of Pharmaceutical Research*, 2020; *9*(4): 650-663.
11. Karthikeyan, B., Kumaresan, G., & Sedhupathi, K. Antimicrobial activity of laxmitaru (Simarouba glauca) against certain bacterial species, 2019.

12. Jach, M. E., Laureysens, I., & Ceulemans, R. Above-and below-ground production of young Scots pine (Pinus sylvestris L.) trees after three years of growth in the field under elevated CO 2. *Annals of Botany*, 2000; *85*(6): 789-798.
13. Polonsky, J., Varon, Z., Jacquemin, H., & Pettit, G. R. The isolation and structure of 13, 18-dehydroglaucarubinone, a new antineoplastic quassinoid from Simarouba amara. *Experientia*, 1978; *34:* 1122-1123.
14. Mikawlrawng, K., Kaushik, S., Pushker, A., Kumar, S., Kameshwor, M., & Sharma, G. Comparative in vitro antifungal activities of Simarouba glauca against Fusarium oxysporum and Aspergillus parasiticus. *J. Med. Plant Studies*, 2014; *2:* 1-7.
15. Fernández-Calienes Valdés, A., Mendiola Martínez, J., Scull Lizama, R., Vermeersch, M., Cos, P., & Maes, L. In vitro anti-microbial activity of the Cuban medicinal plants Simarouba glauca DC, Melaleuca leucadendron L and Artemisia absinthium L. *Memorias do Instituto Oswaldo Cruz*, 2008; *103:* 615-618.
16. Umesh, T. G. In-vitro antioxidant potential, free radical scavenging and cytotoxic activity of Simarouba gluaca leaves. *International Journal of Pharmacy and Pharmaceutical Sciences*, 2015; *7*(2): 411-6.
17. Sharma, D. S., & Sriram, N. Anti-Ulcer activity of Simarouba glauca against Ethanol and Indomethacin induced ulcer in rats. International Journal of Research in Pharmacology & Pharmacotherapeutics, 2014; 3(2): 85–89.
18. John, P. P., Jose, N., & Carla Sr, B. Preliminary pharmacological screening of Simarouba glauca DC leaf extracts for hepatoprotective activity. *World J Pharm Pharmaceut Sci.*, 2016; *5:* 1714-24.
19. Mathew, S. E., Ramavarma, S. K., Babu, T. D., Kuzhivelil, B. T., & Raghavamenon, A.C. Preliminary assessment on phytochemical composition, cytotoxic and antitumor efficacy of Simarouba glauca DC. Leaf methanolic extract. *Ann. Phytomed*, 2019; *8*(2): 121-126.
20. Dinesh, S., Sasikumar, D. S. N., Girija, B., Panicker, L. V., Kumar, P. V., Preetha, S., & Sarma, S. S. Pharmacological evaluation of endophytic Penicillium pimiteouiense SGS isolated from Simarouba glauca DC. *Journal of Applied Pharmaceutical Science*, 2017; *7*(9): 142-147.
21. Manasi, P. S., & Gaikwad, D. K. A critical review on medicinally important oil yielding plant laxmitaru (Simarouba glauca DC.). *Journal of pharmaceutical Sciences and Research*, 2011; *3*(4): 1195.
22. Osagie-Eweka, S. D. E., Orhue, N. J., & Ekhaguosa, D. O. Comparative phytochemical analyses and in-vitro antioxidant activity of aqueous and ethanol extracts of Simarouba glauca (Paradise Tree). *European Journal of Medicinal Plants*, 2016; *13*(3).
23. Biswas, P. K. Personal communication Drought tolerant tree for water shed. *The Hindu, Jan*, 2007; *20:* 2002.
24. Zoratti, L., Karppinen, K., Luengo Escobar, A., Häggman, H., & Jaakola, L. Light-controlled flavonoid biosynthesis in fruits. *Frontiers in plant science*, 2014; *5:* 109012.
25. Osagie-Eweka, S. D. E., Orhue, N. J., & Ekhaguosa, D. O. Comparative phytochemical analyses and in-vitro antioxidant activity of aqueous and ethanol extracts of Simarouba glauca (Paradise Tree). *European Journal of Medicinal Plants*, 2016; *13*(3).