Review Article

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AYURVEDIC PHARMACOLOGICAL INSIGHTS AND PHYTOCHEMICAL CONSTITUENTS OF SHALA (*SHOREA ROBUSTA* GAERTN.): A NARRATIVE REVIEW

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ABSTRACT

Shorea robusta Gaertn. (Shala), A large deciduous tree of the family Dipterocarpaceae is one of the most ecologically and medicinally significant species of the Indian subcontinent. Widely distributed across India, Nepal, Bhutan, and Bangladesh, it plays a crucial role in maintaining forest biodiversity and ecological stability while also holding immense therapeutic value in Ayurveda. Classical texts describe Shala under the categories of Vednasthapan, Udardaprashman mahakashaya, and Eladigana, highlighting its efficacy in wound healing, fracture management, and the treatment of skin diseases. As per Ayurvedic classics, it is in Vrana shodhana and ropana, Dhagdha (burn), Krimighna, Kandughna, Yoniroga har, Karnaroga har, and Jwara, reflecting its broad spectrum of therapeutic applications. Phytochemical investigations have revealed the presence of triterpenoids, flavonoids, tannins, phenolic compounds, and essential oils that contribute to its diverse pharmacological activities, including anti-inflammatory, antioxidant, antimicrobial, analgesic, antipyretic, antiulcer, immunomodulatory, anti-obesity, and antidiabetic properties. Modern pharmacological studies validate many of these classical claims, underscoring the potential of *S. robusta* in integrative medicine. Additionally, its ecological significance in forest regeneration and soil conservation further emphasizes its multidimensional importance. This review bridges Ayurvedic knowledge and contemporary scientific evidence, highlighting *S. robusta* as a keystone species with promising applications in both healthcare and sustainable forest management.

Keywords: *Shorea robusta* Gaertn., Shala, Ayurvedic, Resin, pharmacological activities, Phytochemical Constituents, wound healing.

INTRODUCTION

Shorea robusta Gaertn., commonly known as Shala in Ayurveda texts, is a large, deciduous, resin-bearing tree belonging to the family Dipterocarpaceae. It is predominantly distributed in tropical regions of India, Nepal, Bhutan, and Bangladesh, forming one of the most important climax species of the Shala forests of the Indian subcontinent [1]. Shala forests constitute one of the most extensive and ecologically significant forest types in the Indian subcontinent, occupying an estimated 10 million hectares. As a dominant tree species, Shala plays a pivotal role in forest structure and dynamics while also being recognized for its exceptional timber value, which underpins its considerable economic importance.

The global distribution of Shala forests is geographically restricted to the latitudinal belt of 20°–32° N and the longitudinal range of 75°–95° E. Within this zone, their spatial occurrence is primarily governed by climatic parameters such as temperature and precipitation, alongside edaphic factors including soil composition and fertility. These environmental determinants collectively shape the ecological niche and natural range of Shala, highlighting the interplay between biophysical conditions and species distribution.[2]

In Ayurvedic literature, Shala is classified under Vednasthapan mahakashaya and is highly valued for its medicinal, ecological, and economic significance [3]. Ayurvedic classics, such as the Charaka Samhita, Sushruta Samhita, and Bhavaprakasha Nighantu, describe various parts of the tree, including the Sara (heartwood)[4].

Phytochemical studies reveal that *S. robusta* contains triterpenoids (e.g., dammarenolic acid, asiatic acid, and dipterocarpol), phenolic compounds, tannins, and essential oils, which are responsible for its documented pharmacological activities, including anti-inflammatory, analgesic, wound-healing, antimicrobial, antioxidant, and anti-ulcer effects.[5],[6]

Modern pharmacological research thus corroborates many of the therapeutic claims mentioned in Ayurvedic texts, highlighting its role as a bridge between traditional knowledge and contemporary medicine.[7] Moreover, beyond its medicinal value, *S. robusta* holds ecological importance in maintaining forest biodiversity and preventing soil erosion, making it a vital species for sustainable forest management.[8]

According to the references of Acharya Charaka and Sushruta, Shala niryasa was collected in two different seasons, Hemanta ritu (December-January) and Vasanta ritu (April-May). Analytical studies showed that the oleoresin obtained during Vasanta ritu contained higher amounts of tannins, resins, volatile matter, and phenolic compounds, which are the active constituents of the drug, compared to the oleoresin collected in Hemanta ritu.[9] The integration of Ayurvedic principles with modern scientific evidence offers a comprehensive understanding of this plant, paving the way for its wider application in the integrative healthcare system.

Botanical Description

Shorea robusta Gaertn. It is a tall deciduous tree (Figure a) that can grow up to 50 m in height, often bearing epicormic branches with a spreading or rounded crown (Figure b). The trunk may reach a girth of about 5 m, covered with thick, dark brown bark marked by longitudinal fissures, which become shallower in older trees. Its leaves are simple, glossy, hairless, and broadly oval at the base, measuring 10–25 cm in length, with the tip tapering into a pointed apex (Figure c). Newly emerged leaves are reddish, later turning light green and finally maturing to dark green. The flowers are small, yellowish-white, and arranged in large terminal or axillary racemose panicles. Fruits are ovoid capsules, about 1.3–1.5 cm long and 1 cm wide, bearing wings formed from five unequal sepals of varying lengths (Figure d). The seeds are fleshy and greenish and contain unequal cotyledons.[10] The plant bears young foliage and flowers in March-April; fruiting begins during the summer season. Generally, flowers appear in March and fruits in June.[11]

Figure a: Tree

Figure b: Stem and leaves

Figure c: Resin

Figure d: Fruits and flowers

Geographical Distribution

Shorea robusta Gaertn. (Shala tree) It is widely distributed across India, Nepal, and Bhutan. In India, its range extends from Himachal Pradesh to Assam, Tripura, West Bengal, Bihar, and Odisha, as well as the eastern districts of Madhya Pradesh and the Eastern Ghats of Andhra Pradesh. The species occurs predominantly in the plains and lower foothills of the Himalayas and is also common along valleys. Sal propagates naturally through both seed and coppice. Among artificial propagation methods, direct sowing is considered the most economical and effective. Other methods include stump planting, transplanting entire plants with soil balls, and planting container-grown seedlings.[12]

Vernacular Names

Sanskrit: Shala, Shalasara, Dhupavriksha
English: Shala tree
Hindi: Shala, Shakhu, Sakhua
Bengali: Sal
Malayalam: Karimaruthu
Tamil: Talura, Kungilium
Telugu: Jalarichettu
Gujrati, Marathi: Salvriksha[13]

Ayurvedic Pharmacodynamics

Rasa: Kashaya (twak/bark), Kashaya-madhura (rala/resin)
Guna: Ruksh
Virya: Shita
Vipaka: Katu
Prabhav: Vednasthapana
Karma: Pitta-kapha shamak

Formulations

Salasaradi Kwath
Sarjrasadi Malhar
Atasyadi Lepa

Classical Yoga

Kampillakadi tail
Khudagpadmak tail
Saindhavadi varti
Plashadi varti
Vipadikahar ghrita tail
Manahshiladi ghrita
Naladadi pralepa
Pinda tail
Bhagna sandhankar tail
Bala tail
Vrana ropan churna
Mahavajrak tail[14,15]

Classical Categorization

Charak Samhita: Vednasthapana, Udardaprashaman, Kashayaskanda, Ashavayoni vriksha
Sushrut Samhita: Salasaradi, Rodharadi
Bhavaprakash Nighantu: Vatadivarga
Dhanavantri Nighantu: Chandanadi varga
Astang Nighantu: Ashanadigana
Kaidev Nighantu: Aaushadi varga
Madanpal Nighantu: Vatadivarga
Raj Nighantu: Prabharadi varga
Rajvallabhabh Nighantu: Aaushadhasharaya paricheda
Saraswati Nighantu: Mahavriksha varga
Sushrutha Nighantu: Salasaradigana
Shodal Nighantu:Aamradigana
Shadchandrika: Vrikshadivarga [16]

Phytochemical Constituents

The results of the phytochemical analysis, as presented in Tables [1] and [2], revealed the presence of various bioactive compounds in *S. robusta*. The aqueous, methanol, and ethanol extracts contain tannins, saponins, flavonoids, phenolic compounds, reducing sugars, and steroids, with varying degrees of presence in each extract. These compounds have been linked to several medicinal uses, including the treatment of intestinal infections, anti-cancer properties, antimutagenic properties, antidiabetic properties, and anti-inflammatory activities. [17]

Table 1: Phytochemicals of different parts of *Shorea robusta* Gaertn.[10]

Phytochemicals	Flower		Leaf		Seed		Bark	
	Aqua	EthOH	Aqua	EthOH	Aqua	EthOH	Aqua	EthOH
Amino acids	_-	+++	_-	-	-	-	-	-
Alkaloids	++	+++	-	+++	++	++	-	++
Anthraquinones glycosides	+	-	-	-	++	-	++	++
Anthraquinone	+	-	-	-	+	-	+	+
Anthocyanin	-	-	-	-	-	-	+	+
Carbohydrates	++++	++	+++	++	++++	+++	+++	+++
Cardiac glycoside	++	++	++	+	+	+++	+++	+++
Coumarin	+	++	++	++	-	+	-	-
Emodin	+	-	-	-	+	-	+	+
Flavonoids	+	++	++	+++	++	++	+++	++++
Fixed oils	-	-	-	-	-	-	-	-
Leucoanthocyanin	-	-	-	-	-	-	+	+
Phenols	+++	++++	+++	++++	++++	++++	+++	++++
Proteins	-	-	-	-	+	+	-	-
Phlobatannins	-	-	-	-	-	-	+	++
Quinone	+	+	-	-	++	+	+	+
Reducing sugars	++++	+++	+++	+	++++	+	+++	+++
Starch	-	-	-	-	-	-	-	-
Saponins	-	-	-	++	+	++++	++	++
Steroids	+	++	++	+	+	++	+++	++++
Tannins	+++	++++	+++	++++	++++	++++	+++	+++
Terpenoids	+	++	+	-	+	++	+++	++++

*(++++) Very high, (+++) high, and (++) moderate, (+) low, (-) nil

Table 2: Phytochemicals of *Shorea robusta* resin extracts[17]

Constituents	Aqueous	Benzene	Methanol	Petroleum ether
Anthocyanidins	-	-	-	-
Alkaloids	+++	-	+++	+
Coumarins	-	-	++	-
Catechols	+	++	+	-
Carboxylic acids	-	+	+	++
Fatty acids	-	+	+++	+
Flavonoids	+	++	+++	++
Fixed oils	+	-	+	+
Glycosides	+	+	+++	++
Proteins	+	-	-	-
Phenols	++	+++	++	+
Quinines	-	-	-	-
Resins	++	+++	++	+++
Saponins	+	+	++	+
Steroids	-	+	++	-
Triterpenoids	++	++	+++	+++
Tannins	+	+++	-	+
Volatile oils	+	-	-	+

*(-) not detected, (+) low concentration, (++) high concentration, (+++) very high concentration

Table 3: Ayurvedic and Evidence-based pharmacological actions

Ayurvedic actions	Reference	Pharmacological actions
Vrana (wound)	BPN.6/18, D.N.3/128, K.N.1/810	Wound-healing activities
Krimighna	BPN. 6/17	Anti-microbial
Bhadhirya (deafness)	BPN. 6/17	-
Yoniroga(vaginal- -disease)	BPN. 6/17	Antibacterial
Karnaroga(Ear- -disorders)	BPN.6/17, K.N.1/810	Antibacterial
Vishadibhuta hanta	D.N.3/129	-
Bhagnasandhana	D.N.3/129	Anti-inflammatory
Dhagdha(burn)	M.N.5/27	
Jawar(fever)	R.N.9/82	Antipyretic
Kandugna	R.N.9/82	-
Shiroraga	R.N.9/82	Analgesic
Grahi	M.N.5/27	-

*Bpn- Bhavaprakash Nighantu, *K.n.- Kaidev Nighantu, *D.n.- Dhanwantri Nighantu, *M.n.- Madanpal Nighantu, *R.n.- Raj Nighantu

Pharmacological Activities

Wound-Healing Activity

The effectiveness of *Shorea robusta* roots in healing burn wounds has been investigated, and findings indicate that the roots possess significant anti-inflammatory properties, supporting their potential use as a therapeutic agent in cutaneous burn wound recovery. Compared to conventional medicines, *Shorea robusta* roots have demonstrated enhanced wound-healing capacity, better spreadability, and greater therapeutic effectiveness. These reports suggest that topical application of *Shorea robusta* roots could serve as a more effective alternative to traditional dermal creams for burn treatment. Several studies indicate that the triterpene-rich fraction and essential oil of *Shorea robusta* exhibit the strongest wound-healing activities, thereby validating its traditional use in treating wounds. Topical administration of ethanolic extract of *Shorea robusta* resin (10% and 30% w/w) has been reported to enhance wound healing in rats by promoting dose-dependent wound contraction and increasing hydroxyproline content as well as tensile strength.[18,19]

Antioxidant Activity

Extant literature indicates that diverse extracts derived from the Shorea genus exhibit potent antioxidant activity. Investigations by Mathavi *et al*. demonstrated that ethanolic extracts of *S. robusta* leaves possess in vitro antioxidant efficacy in a concentration-dependent manner, an effect plausibly attributed to their constituent bioflavonoids. In a parallel study, Ramasamy *et al.* determined that both acetone and methanol extracts from *S. roxburghii* stem bark also function as robust antioxidants. This body of research substantiates the pronounced free-radical scavenging capacity of these plants, which is ascribed to their high concentration of phytochemicals such as flavonoids and polyphenols. Consequently, these botanical sources present considerable therapeutic potential for mitigating pathologies precipitated by oxidative stress.[20]

Analgesic and Anti-inflammatory Activity

A study reported that the ethanolic extract (70%) of *Shorea robusta* resin (SRE) exhibited notable anti-inflammatory and antipyretic activities. Acute inflammation was induced by carrageenan-induced hind paw edema, while subacute inflammation was evaluated using the cotton pellet-induced granuloma model in male Wistar rats. The anti-inflammatory potential of SRE was determined by the percentage reduction in paw edema volume and inhibition of granuloma formation. The findings indicated that *S. robusta* resin possesses significant anti-inflammatory and antipyretic properties, thereby supporting its traditional use in the management of painful inflammatory disorders. Another investigation evaluated the anti-inflammatory action of different root extracts of *S. robusta*. The results revealed a dose-dependent effect, with the order of efficacy being aqueous > ethanolic > petroleum ether extracts. Among these, the aqueous root extract demonstrated the most potent activity ($P < 0.001$) when compared with the standard treatment.[21]

The extract exhibited pronounced analgesic efficacy, operating via both central and peripheral mechanisms. Its therapeutic potential was substantiated across a range of validated nociceptive models. The extract significantly increased pain response latency in thermal stimulation assays, such as the hot plate and tail flick tests, and diminished visceral nociception in the acetic acid-induced writhing model. Furthermore, it effectively attenuated pain-related behaviors in the formalin test and elevated the pain threshold in established models of both inflammatory and post-surgical hyperalgesia, confirming its broad-spectrum antinociceptive activity. [22]

Antipyretic activity

A study was reported to validate the traditional use of *Shorea robusta* resin (SRE) in the management of fever. Researchers investigated the antipyretic effects of its 70% ethanolic extract using a Brewer's yeast-induced pyrexia model in rats. The animals were organized into five groups of five: a control group received a vehicle solution, three groups received oral SRE doses of 30, 100, and 300 mg/kg, respectively, and a final group received the standard drug etoricoxib (10 mg/kg). The extract exhibited significant fever-reducing activity, confirming its therapeutic potential.[23]

Antiulcer Activity

Experimental research on the resin of *Shorea robusta* has been scientifically validated for its ability to protect the stomach lining. In laboratory studies on rats with ulcers caused by ethanol and pyloric ligation, the resin demonstrated a powerful shielding effect. When administered orally, a water-based extract of the resin, at concentrations of 150 and 300 mg/kg, decreased stomach damage by more than 62%. This result was statistically comparable, and sometimes even more effective than the standard prescription drug, omeprazole. This potent gastroprotective activity is largely credited to the high concentration of polyphenols and flavonoids naturally found in the plant.[12,24]

Antimicrobial Activity

The aqueous, methanolic, petroleum ether, and benzene extracts of *Shorea robusta* oleoresin were evaluated for their antimicrobial activity. All extracts exhibited inhibitory effects against the tested microorganisms, though with varying potencies. The aqueous extract showed significant activity against *Bacillus coagulans, Escherichia coli*, and *Bacillus cereus*; moderate inhibition against *Salmonella typhi* and *Bacillus subtilis*; and weaker activity against *Proteus vulgaris* and *Pseudomonas fluorescens*. The ethanolic extract demonstrated marked activity against *Staphylococcus aureus*, *Staphylococcus epidermidis*, and *E. coli*, along with moderate inhibition of *Candida albicans* and *B. coagulans*. Among all extracts, the methanolic extract exhibited the most pronounced antimicrobial effect. In contrast, petroleum ether and benzene extracts showed comparatively lower activity. Petroleum ether extract was active against *E. coli, Aspergillus flavus*, and *C. albicans*, whereas benzene extract inhibited *Bacillus licheniformis, B. cereus*, and *A. flavus*. Overall, these findings suggest that *S. robusta* resin possesses a strong and broad-spectrum antimicrobial potential against a variety of pathogenic microorganisms.[24]

Immunomodulatory activity

Adlakha *et al.* investigated the pharmacological potential of *Shorea robusta* bark and reported its antinociceptive, anti-obesity, and immunomodulatory activities using a formalin-induced paw-licking model in rats. Intraperitoneal administration of the bark extract at a dose of 300 mg/kg/day produced a significant antinociceptive effect along with stimulation of immune responses. In a related study, Kalaiselvan *et al*. evaluated the immunomodulatory activity of *S. robusta* bark extract by employing sheep red blood cells (5×10^9 cells/ml) for immunization. Parameters such as humoral antibody response (hemagglutination antibody titers and immunoglobulin levels), cell-mediated immunity (delayed-type hypersensitivity and phagocytosis), nitroblue tetrazolium reduction, total lymphocyte count, and differential count were assessed. Their findings demonstrated that the bark extract at 300 mg/kg/day (i.p.) significantly enhanced immunomodulatory activity, supporting its potential as a natural immunotherapeutic agent. [25]

Antibacterial activity

The antibacterial activity of plants is commonly assessed by measuring zones of inhibition against pathogenic microorganisms. The methanolic extract of *Shorea robusta* resin exhibited effective inhibitory action against both Gram-positive and Gram-negative bacteria. The observed inhibition zones for Gram-positive strains were *Staphylococcus aureus* (12–16 mm) and *Bacillus subtilis* (10–12 mm), while for Gram-negative strains they were *Pseudomonas aeruginosa* (10–13 mm) and *Escherichia coli* (12–15 mm). Overall, the methanolic extract of *S. robusta* resin demonstrated strong antibacterial activity against all tested pathogens, with inhibition profiles comparable to those of the standard antibiotic ciprofloxacin.[26]

Anti-obesity activity

Supriya *et al*. investigated the anti-obesity potential of the hydro-alcoholic leaf extract of *Shorea robusta* Gaertn. in monosodium glutamate (MSG)-induced obese albino rats. Obesity was first induced by administering MSG along with a normal diet for 7 days. Thereafter, for the following 41 days, obese rats received oral doses of *S. robusta* extract at 200, 400, and 600 mg/kg. Physical parameters such as body weight and fat tissue weight, along with biochemical markers including triglycerides, total cholesterol, LDL-C, HDL-C, VLDL-C, serum glucose, atherogenic index, SGPT, and SGOT, were evaluated and compared with normal and obesity control groups. The results demonstrated that the hydro-alcoholic leaf extract of *S. robusta* significantly ameliorated obesity and improved lipid profiles, supporting its potential therapeutic role in obesity management.[27]

Anti-obesity and Hypolipidemic Activity

In a study, the ethanolic bark extract of *Shorea robusta* Gaertn. f. (Dipterocarpaceae) was evaluated for its antidiabetic and antihyperlipidemic effects in alloxan-induced diabetic rats. Administration of alloxan (120 mg/kg, i.p.) significantly increased serum glucose, urea, triglycerides (TG), total cholesterol (TC), low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), malondialdehyde (MDA), and aspartate aminotransferase (AST) levels, while decreasing protein, hemoglobin (Hb), plasma insulin, high-density lipoprotein (HDL), and reduced glutathione (GSH). Treatment with *S. robusta* bark extract (500 mg/kg b.w.) markedly restored these parameters toward normal, showing effects comparable to the standard drug glibenclamide (600 mg/kg b.w.). These findings suggest that *S. robusta* bark extract possesses significant antidiabetic and antihyperlipidemic properties, which may be closely interrelated. [28]

DISCUSSION

The pharmacological activities of *S. robusta* validate its Ayurvedic indications. Its Vranaropaka karma correlates with experimentally proven wound-healing effects, while antimicrobial and anti-inflammatory actions support its Krimighna and Shothahara uses. Phytochemicals like triterpenoids, flavonoids, and tannins act synergistically in multiple therapeutic areas. Despite promising results, standardization of extracts and clinical validation remain necessary for translational application.

The pharmacological potential of *Shorea robusta* resin extract (SRRE) has been evaluated in 3-nitropropionic acid (3-NP)-induced Huntington's disease (HD) in rats. The neuroprotective effects of SRRE (285.7 and 666.7 mg/kg, p.o., for 14 days) were assessed in 3-NP (10 mg/kg)-treated rats by examining body weight, behavioral outcomes such as neurological scoring, motor coordination, spatial memory, and depression-like behavior, along with neurochemical parameters including gamma-aminobutyric acid and acetylcholinesterase levels, as well as oxidative stress markers in brain tissue. Histopathological evaluation of the rat brain was also performed. SRRE treatment (285.7 and 666.7 mg/kg) significantly restored body weight, improved motor coordination, preserved mitochondrial enzyme complex I activity, and alleviated memory deficits compared to the 3-NP group. In addition, SRRE administration enhanced antioxidant enzyme activity in brain tissue and reduced histopathological alterations induced by 3-NP. These findings suggest that the neuroprotective action of SRRE in 3-NP-induced HD is mediated through attenuation of oxidative stress, supporting the therapeutic potential of *Shorea robusta* in the management of HD.[29]

Ecological studies from the Terai region of Nepal have shown that the regeneration of *Shorea robusta* is strongly influenced by canopy gap size, with smaller gaps (<200 m²) favoring higher seedling density and recruitment. Since *S. robusta* is also widely distributed across central and eastern India, similar regeneration patterns are expected in Indian Shala forests. This ecological resilience is particularly relevant for ensuring the sustainable availability of the species, which is important given its widespread ethnomedicinal use among tribal communities in India. Thus, integrating ecological knowledge with pharmacological evidence further emphasizes the dual significance of *S. robusta* as both a keystone forest species and a valuable source of therapeutic compounds. [30]

A bioactivity-guided investigation of *Shorea robusta* young leaves led to the isolation of two compounds, bergenin and ursolic acid, which were evaluated along with crude extracts and fractions in different wound models in rats. Topical application of these formulations significantly improved wound contraction, reduced epithelialization time, and enhanced tensile strength, granulation tissue weight, and hydroxyproline content. Histological studies further confirmed complete epithelialization and increased collagen deposition, findings that were comparable to the standard drug povidone–iodine. These results provide the first experimental evidence supporting the traditional use of *Shorea robusta* young leaves for wound healing among tribal communities in India. The observed wound healing effect may be attributed to the ability of the extract and its isolated compounds to modulate inflammatory mediators and cytokines, thereby validating their potential for development as effective wound care agents.[31]

In Ayurvedic texts, Shala (*Shorea robusta*) is described with multiple therapeutic properties. According to Kaiyadeva Nighaṇṭu, Shala is kaṣhaya (astringent) and grahya (absorbent), useful in asṛgddhar (bleeding disorders), ruk (alleviating pain), kaphajit (Kapha pacifying), and dhimaḥ (intellect promoting). It is also mentioned as karṇarogahara (beneficial in ear diseases), ruchi (improves appetite), viṣhahahar (antidote to poisons), and vraṇashodhana (wound cleanser).

In Sushruta Saṃhita (Sutrasthana 38/10), the Shalasaradi gaṇa (group headed by Shala and Sarja) is classified as kuṣṭhavinashana (curative for skin disorders), mehahara (useful in urinary disorders), paṇḍvamayahara (relieving anemia), and kapha-medo-visoṣaṇa (reducing Kapha and Meda (fat) tissue).SFurther, the Sarjayugma (resin of Shala) is described as kaṣhaya (astringent), rukṣa (dry/light), and kaphapaha (Kapha alleviating). It is useful in conditions like kuṣṭha (skin diseases), kaṇḍu (itching), krimi (worm infestations), sleṣma (Kapha disorders), and vata-pitta-rujas (diseases caused by Vata and Pitta). Similarly, Rala (resin of Shala) is mentioned in Raja

Nighaṇṭu as svadu (sweet), kaṣhaya (astringent), stambhana (constipating/absorbent), and vraṇaropaṇa (wound-healing). It is known as vipadibhutahanta (destroyer of toxic/infective conditions) and bhagnasandhanakṛt (promotes fracture healing and bone union).

Thus, classical Ayurvedic references highlight Shala and its resin (Rala) as highly significant in wound healing, fracture management, skin disorders, bleeding disorders, metabolic conditions, and as a detoxifying agent.

In our classical texts, such as Brihatrayee Charaka, Sushruta, and Ashtanga, numerous chikitasiya yoga and therapeutic measures are described in which the bark of the Shala tree and its resin have been mentioned. Its applications include vrana ropana(wound healing), mukha vrana (management of infected ulcers), Kushtha (treatment of skin disorders), sutika (postnatal care), Vatarakta (gout), rakta strava (bleeding disorders), kandu and kotha (itching and eruptions), udarad (urticaria), karana roga (ear diseases), agni dugdha (burns), sarpavisha (snakebite), and dupan karma (fumigation therapies). These references highlight the medicinal significance of the Shala tree. Therefore, it holds great potential for extensive medicinal utilization in the future.

Traditional uses by Locals

The leaves of this tree are used by the local and tribal people to make pattal (Plates), on which food is served and eaten. During weddings, its branches are used for making mandap (ceremonial canopies). In the mornings, the stem of this tree is often used as a toothbrush, which strengthens the teeth. This has also been described in the ancient text Rajvallabh Nighantu.

In villages, this tree is considered beneficial for the tribal communities, as it has multiple applications. Therefore, attention should be given to the conservation of this tree, and its plantation should be encouraged. This will not only help in maintaining the environment but also ensure the proper utilization of its medicinal properties.

CONCLUSION

Shorea robusta Gaertn. (Shala) stands out as one of the most significant medicinal and ecological species of the Indian subcontinent. Ayurvedic classics highlight its wide therapeutic range, where it is indicated in Vrana shodhana and ropana (cleansing and healing of wounds), Dhagdha (burns), Krimighna (antimicrobial/antiparasitic), Kandughna (anti-itch), Yoniroga har (management of gynecological disorders), Karnaroga har (alleviation of ear diseases), and Jwara (fever reduction), and modern pharmacological studies consistently highlight its diverse therapeutic potential, ranging from wound healing, antimicrobial, anti-inflammatory, and antioxidant activities to immunomodulatory, anti-obesity, antidiabetic, and neuroprotective effects. The presence of bioactive phytoconstituents such as triterpenoids, flavonoids, tannins, and phenolic compounds validates its traditional claims and underscores its multifaceted medicinal importance. Beyond its pharmacological role, *S. robusta* also contributes substantially to ecological balance and sustainable forest management. However, despite encouraging evidence, standardization of formulations, clinical validation, and translational research are necessary to bridge traditional wisdom with contemporary medicine. Thus, integrating Ayurvedic knowledge with modern scientific advancements will help establish Shala as a valuable therapeutic resource for future integrative healthcare systems.

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