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Sappan Wood: Nature's Treasure for Natural Colour and Cure

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In hilly terrains of India and Southeast Asia grows a plant that has been quietly supporting both medicine and the arts for centuries. *Caesalpinia sappan* L., commonly known as Sappan wood, is more than just a tree—it's a powerhouse of colour and healing. Belonging to the Caesalpiniaceae family, this small, spiny tree reaches 5–10 meters in height and thrives in areas about 1000 meters above sea level, where the climate is temperate. Mostly grown wild in states like West Bengal, Madhya Pradesh, and Odisha, this tree boasts reddish-brown wood that has caught the attention of both textile artists and traditional healers. Its heartwood is rich in a natural pigment called Brazilein, which not only produces a vibrant red dye for fabrics but also carries a long-standing reputation for its therapeutic properties in both Ayurvedic and traditional Chinese medicine.

Taxonomic Classification

Kingdom	:	Plantae
Sub kingdom	:	Viridiplantae
Infra kingdom	:	Streptophyta
Super division	:	Embryophyta
Division	:	Tracheophyta
Sub division	:	Spermatophytina
Class	:	Magnoliopsida
Super order	:	Rosanae
Order	:	Fabales
Family	:	Caesalpiniaceae/Fabaceae
Genus	:	*Caesalpinia*
Species	:	*sappan*

Sappan Wood as a Dye Source

Long before synthetic dyes were invented, cultures across Asia used plant-based dyes to colour their clothes. Sappan wood stood out as one of the favourites for its brilliant shades of red. When boiled in water, the heartwood releases a pigment known as brazilein, which transforms into vibrant colours that range from soft pinks to deep maroons—depending on how the dye bath is treated.

By adjusting the pH of the dye bath (for example, by adding vinegar or wood ash), we can achieve a spectrum of hues from lavender to oxblood red. Using different mordants—like alum, iron, or tin expands this range even further. Alum yielded bright reds, iron gave rich purples and blacks, while tin created a vivid scarlet. Historically, Sappanwood even coloured wine and meats and was used in facial powders for its colour stability and non-irritating properties.

Despite the advent of synthetic alternatives, there is a growing interest in reviving natural dyes for eco-friendly textiles, where Sappan wood is making a comeback.

Dye Extraction: From Trees to Fabric

The extraction of dye from Sappan wood is a time-honoured, eco-friendly process that has been passed down through generations. Despite its long history, the method remains surprisingly simple and accessible. The process begins with cleaning and drying the heartwood, which is then chopped into small pieces to maximize surface area for extraction.

The dried wood (figure 2) is subjected to a three-stage boiling process in distilled water. In the first stage, about 10 grams of dried Sappan wood is boiled in 500 ml of water for around 60 minutes at 80°C. The second stage involves re-boiling the same wood with an additional 300 ml of water. Finally, a third extraction is done using another 100 ml of water. The combined result of these stages is a deep red liquid that is rich in brazilein, the key colouring agent.

This extract can then be used to dye natural fibres like wool, silk, and cotton. However, the way the dye adheres to each type of fabric varies based on the chemical structure of the fibres. In wool and nylon, hydrogen bonding facilitates strong dye absorption due to the protein-based nature of the fibres. For cellulose fibres such as cotton and linen, however, the bonding is less direct. Here, the dye binds through van der Waals forces, which are weaker but still sufficient to produce vibrant and lasting colours, especially when aided by mordants.

Over the centuries, dyers have refined techniques to improve colour fastness, the ability of the dyed fabric to withstand washing, sunlight, and general wear. In this process, the use of mordants (helps to fix the dye to the fabric) is more essential. Alum (potassium aluminum sulfate) is one of the commonly used mordants and helps produce a rich orange-red colour. Other mordants like iron and tin shift the hues toward purples and deep reds, offering a wide palette of shades from a single plant source.

Additionally, the application of tannins, naturally found in plants like sumac or myrobalan, helps to anchor the dye more securely to the fabric, enhancing both its brightness and resistance to fading. The pH of the dye bath also influences the final colour: more acidic solutions yield orange tones, while alkaline baths bring out deeper, purplish hues.

Today, as the world turns its attention to sustainable fashion and environmentally friendly textile practices, Sappan wood is finding renewed relevance. Its ability to produce a wide range of natural shades, combined with its low environmental impact and traditional medicinal significance, makes it a valuable resource in modern artisan crafts and eco-conscious design. Whether used by village artisans or high-end fashion houses, Sappan wood continues to tell a story of beauty, science, and tradition—woven into every fibre it touches.

Traditional and Modern Medicinal Uses

Sappan wood (*Caesalpinia sappan*) earned its place in history as a powerful natural medicine. Native to tropical Asia and widely used in traditional healing systems, this vibrant heartwood has been a trusted remedy for generations in Ayurvedic, Unani, Chinese, and Southeast Asian medicine. And today, modern science is catching up with what ancient healers already knew. Sappan wood is a natural pharmacy in itself.

Brazilein, the vibrant red pigment found in Sappan wood (figure 1), is more than just a natural dye—it's a powerful healing compound. Known for its anti-inflammatory, antimicrobial, antioxidant, and haemostatic properties, this remarkable pigment has been used for centuries in traditional medicine. Its therapeutic effects help in reducing swelling, fighting infections, neutralizing harmful free radicals, and stopping bleeding, making it valuable in treating everything from minor wounds and gum problems to chronic inflammatory conditions.

In Ayurveda, the heartwood is described as cooling, bitter, sweet, and astringent, used to balance Pitta dosha, which governs heat and metabolism. Its haemostatic properties help in conditions like bleeding gums, internal haemorrhage, and excessive menstrual bleeding. It is also used to treat ulcers, wounds, and skin diseases, and is a common ingredient in herbal

toothpastes like Vicco Vajradanti, which is widely used across India to strengthen gums and reduce oral inflammation.

Women's health is another area where Sappan wood shines. It is a vital component of Lukol, an Ayurvedic formulation known for treating leucorrhoea, menstrual irregularities, and post-IUD bleeding. Its mild emmenagogue action helps regulate menstrual flow and reduce discomfort, making it a reliable herbal support for reproductive wellness.

In Traditional Chinese Medicine (TCM), Sappan wood is known to "invigorate blood" and is commonly used to treat blood stagnation, bruises, joint pain, and post-surgical recovery. It reduce inflammation and manage the side effects of radiation and chemotherapy. It is traditionally employed to treat malaria, anaemia, and even fatigue due to blood deficiency.

Sappan wood also possesses sedative and analgesic (pain-relieving) qualities. In Unani and traditional Southeast Asian medicine, it is used for calming the nerves, easing epileptic convulsions, treating insomnia, and even clearing mental confusion. In Kerala, a small stick of Sappan wood is soaked overnight in water to make a reddish herbal drink, praised for its antidiabetic, cooling, and blood-purifying effects.

Scientific research supports these traditional uses. Studies indicate that Sappan wood especially the flowers (figure 4) may have anti-tumour, immune-boosting, liver-protective, and antioxidant properties, making it a promising candidate for developing herbal medicines, nutraceuticals, and even cosmetics. The pods are also serve as a tonic for postpartum women and are used to relieve blood vomiting (figure 3).

In a world increasingly turning back to nature for wellness solutions, Sappan wood stands out not just for its colour, but for its capacity to heal. Whether steeped in tradition or embraced in modern laboratories, it remains a vibrant symbol of the power of plants to nurture and restore.

Conclusion

Sappan wood, with its rich red heartwood (figure 2), bridges the worlds of tradition and innovation. Its vibrant pigment, brazilein, has long been used to naturally dye fabrics in beautiful shades of red. Today, as interest in eco-friendly and sustainable dyes grows, Sappan wood is gaining renewed attention. Beyond its beauty, this wood holds remarkable medicinal value rooted in Ayurveda and traditional Chinese medicine. Brazilein offers proven anti-inflammatory, antioxidant, antimicrobial, and blood-staunching benefits. It is used in remedies for everything from gum problems to chronic inflammation and even menstrual disorders.

Modern research is now exploring its potential for treating diabetes, tumours, and immune disorders. Sappan wood is already part of popular herbal formulations like Vicco Vajradanti and Lukol in India. Its decoction is a traditional herbal drink in many South Asian households, especially in Kerala.

The wood's healing qualities are backed by both science and centuries of folk wisdom. Easy to extract and apply, its dye is safe, sustainable, and effective on textiles and food. Both textile and pharma industries are now rediscovering its versatile uses. As we seek greener, cleaner alternatives, Sappan wood offers solutions for both beauty and wellness. It reminds us that nature often holds the key to both healing and creativity. Sappan wood is more than a dye - it's a story of tradition, colour, and care.

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Stem of Sappan wood	**Hardwood of Sappan wood**	**Pods of Sappan wood**	**Flower of Sappan wood**