



Sitalpati (*Schumannianthus dichotomus*): An Underutilized Fibre Crop Intertwined with Heritage

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Abstract

Viability of conventional agricultural practices is challenged by the ever-worsening climate crisis. It has created an urgent need to identify candidate crops that can remain stable under extreme environmental fluctuations. While mainstream attention focuses on a limited set of major fibre crops, a lot of underutilized species with significant potential remain largely overlooked by both the scientific community and industries. Sitalpati/Patdoi (*Schumannianthus dichotomus*), a wetland-adapted perennial from the Marantaceae family, is one such overlooked resources. Despite decades of cultural root in South and Southeast Asian societies, general awareness among people about the potential of this crop is still lacking. Beside its celebrated role in traditional handicraft industries, the species has exceptional ecological and biomedical potential. This paper integrates current scientific knowledge, identifies its manifold value and diverse applications, and positions *S. dichotomus* as a promising future target for scientific and industrial interest.

Keywords: Natural fibre, Phytoremediation, Rural livelihood, Traditional handicraft

Introduction

In addition to the major natural fibre crops like cotton, jute, flax, kenaf, roselle, sisal and ramie there are also many underutilized fibre species that has the capabilities to improve rural livelihoods and support sustainable farming agricultural practices. One such example is *Schumannianthus dichotomus* (Roxb.) Gagnep., locally known as *Sitalpati*, *Patdoi* or *Murta* in various parts of South and Southeast Asia. Belongs to family *Marantaceae*, Sitalpati is a perennial, rhizomatous shrub native to Bangladesh, North-eastern India, Myanmar, Thailand, Vietnam, Malaysia and surrounding regions. The glossy fibres extracted from its stems are suitable for handcrafted mats (Sitalpati mats), bags, hats, tableware and other artisanal products, which are an integral part of the cultural heritage and rural economy, especially in Bangladesh and the Indian states of West Bengal and Assam (Ahmed et al., 2007). Despite its wide use in traditional crafts and potential as a sustainable fibre source, *S. dichotomus* majorly remains under-researched and underexploited in scientific and industrial contexts. This paper aims to demonstrate what has been accomplished regarding the understanding of *S. dichotomus* as an

overlooked but economically viable fibre crop. The intention here is to generate interest and encourage collaborative research and multi-faceted development initiatives to encourage the wider adoption of the crop.

Taxonomy and Nomenclature

According to Hore and Sharma (1999), the genus *Schumannianthus* consists of at least 3 species:

1. *S. dichotomus* (Roxb) Gagnep.,
2. *S. monophyllus*
3. *S. virgatus* (Roxb) Rolfe.

Kingdom: Plantae

Phylum: Tracheophyta

Class: Liliopsida

Order: Zingiberales

Family: Marantaceae

Genus: *Schumannianthus*

Species: *Schumannianthus dichotomus* (Roxb.) Gagnep.

The diverse common and vernacular names across its geographic distribution are listed in the table 1.

Article History

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Table 1: Country and region-wise common names of *Schumannianthus dichotomus*

Sl. No.	Country	Region	Name
1	India	West Bengal	Sitalpati, Patitara, Muktapata, Madurpata, Mohtra
		Assam	Patidoi, Pati Doi
		Odisha	Khorsong
		North-East	Pong
2	Bangladesh	Sylhet	Murta, Pat-bat
		Chittagong	Fadirjam, Papita, Pati-jung
		Noakhali	Mastak
		Barisal	Paitrabon
3	Thailand	-	Khla
4	Myanmar	-	Thin
5	Vietnam	-	Lùm nước
6	Worldwide	-	Indian Matcane, Cool Mat

Morphological Characteristics

The plant is a shrub characterized by dichotomously branched stems, reaching a height of about 3-5 m and bearing oblong to lanceolate leaves. This shade-loving species thrives best in soils with high moisture content. Each node gives rise to a few branches that develop into leaves, flowers and fruits. The leaves are smooth, green and oval to elliptical, arranged in two rows with fine parallel veins and a tiny hairy ligule at the base. Its black, fibrous rhizomes, about 5-8 cm thick, produce new shoots twice a year; while the strong roots extend 40-60 cm deep into the soil. Flowering begins in early May and peaks by June with white, bisexual flowers borne in paired, branched panicles enclosed by a green, lance-shaped bract. The fruits are small, round and indehiscent and contain brown seeds that are slightly grooved. The total haploid genome length is of 12.7 μm . The chromosomes are short in length with the shortest chromosome of length 0.8 μm and longest being of 2.2 μm (Chowdhury and Konwar, 2006).

Natural Distribution and Habitat

It prefers to grow in marshy and swampy places under shade and requires ample amount of water for growth and has a moderate plant growth rate, these attributes prove to be effective for using them in constructed wetlands (Rahman *et al.*, 2022). However, it can be also grown in riparian zones with highly productive soils when it is used as a commercial fibre crop. The geographical distribution of *Schumannianthus dichotomus* is limited to South Asian countries; the distribution is listed in table 2.

Climate and Soil Requirements

It can thrive under a range of climate and soil conditions, particularly in tropical and subtropical agroclimatic conditions as explained in table 3.

Table 2: Geographical distribution of *Schumannianthus dichotomus*

Sl. No.	Countries	Regions
1	India	West Bengal, Odisha, Assam, Tripura, South Karnataka and Tamil Nadu
2	Bangladesh	Chittagong, Noakhali, Sylhet, Barisal
3	Others	Myanmar, Philippines, Thailand, Cambodia, Vietnam, Malaysia

(Source: Ahmed *et al.*, 2007)

Table 3: Climate and Soil requirement of *Schumannianthus dichotomus*

Details	Description
Temperature	Mean maximum temperature approx. 32 °C, thriving in humid tropical climates.
Rainfall	Moderate to high rainfall approx. 1250 mm year ⁻¹ .
Humidity	High relative humidity (74-90% seasonally) in tropical wetlands.
Soil Type	Clayey to silty clay loam soil, supports water retention but drains adequately with medium to high organic matter content. Slightly acidic to neutral conditions.
Water Regime	Stagnant water depth of 3-10 cm with seasonally waterlogged conditions.

Propagation Methods

Different propagation methods for *Schumannianthus dichotoma*, includes rhizomes, branch cuttings, rooted cuttings and seedlings. Rhizomes are the most reliable method for propagating *Schumannianthus dichotoma*, while seedlings, though they survive well but grow poorly. Using cuttings could be a cheaper option, but more research is needed to confirm their effectiveness. Since seed germination is quite low, better management practices are required and traditional propagation usually involves planting healthy branch cuttings in moist or waterlogged soil to promote new root and shoot growth (Ahmed *et al.*, 2007). Propagation using single-node cuttings marks a notable improvement over traditional technique. The optimized propagation protocol uses synthetic auxins to promote root formation, with the combination of NAA and IBA found to be most effective for hormone treatment. Treatments using around 200-300 ppm of these hormones have shown the best rooting responses in cuttings. There is still limited research available on micropropagation and tissue culture in *S. dichotoma*, pointing to the need for developing reliable and efficient lab-based propagation methods.

Agronomic Management

1. Sowing

Seeds mature during June-August and are dehusked, sun-

dried and stored before raising nurseries in February-March, where germination occurs by April-May. Seedlings reaching 18-20 cm height (2-4 leaf stage) are transplanted into muddy or shallow waterlogged fields at a spacing of 20-25 cm, with 4-5 seedlings per hill to ensure strong clump formation (Hore and Sharma, 1999).

2. Interculture Operations

Weeding is essential and is carried out annually during March-April when water levels recede, accompanied by light tillage around the hills to improve aeration, stimulate new rhizome growth and prevent field deterioration. This combined practice is repeated every year to ensure healthy establishment and optimum clump development of the crop.

3. Harvest

Yield begins from 3rd year onward. Plants remain productive for year unless abandoned and the major harvesting cycle is every 5-6 years (Hore and Sharma, 1999). Murta matures to a height of 3 to 4 meters and can be harvested in 3 to 4 years. There are two ways to harvest: “partial harvest,” where mature stems are cut throughout the year as needed for Sitalpati products and “total harvest,” where the entire stand is cleared and replanted after 10 to 15 years, when the quality and quantity of the yield start to decline.

Socio-Economic Significance

Substantial number of artisans’ life revolves around sitalpati handcrafts. Cooch behar, the main hotspot of murta farming and processing in West Bengal, alone has more than 25000 artisans. Sitalpati mats are priced based on their size and design, reflecting both material and labour investment. Standard mats, ranging from 5×7 to 6×7 feet, typically cost 350 to 750 INR. At the high end is the “Phoolsajjapati” (≈ 4000 INR) which requires about 5 man-days of work, while the core Sitalpati mats sell for around 800-1000 INR and take roughly 3 man-days to make.

The Indian Council of Agricultural Research (ICAR), New Delhi, launched a mat-cultivation project under which the North Bengal Campus of Bidhan Chandra Krishi Viswavidyalaya, Cooch Behar, carried out research on the murta plant. In that study, Debnath *et al.* (1992) concluded that after discounting future costs and converting returns to present values, the average annual net return from perennial murta cultivation was about 298% more remunerative than the second-best alternative, jute-winter paddy-summer pulse cropping system.

Applications

1. Traditional Sitalpati Weaving

Sitalpati weaving is a traditional craft deeply linked to the cultural heritage of the Bengali and Assamese cultures. These traditional sleeping and sitting mats are admired for their cooling attributes and are popular choices in hot and humid areas. This explains the origin of the name (*Sital*: cool; *pati*: mat; Bengali). Various types of pati are produced, including “Kamalkosh” which is regarded as the finest, as well as Mihi Sital, Bhushnai Pati, Mota Sital and Dalar Pati. Various steps of the production chain are shown in the figure 1.



Figure 1: Sitalpati production chain

UNESCO has recognized the Traditional Art of Shital Pati weaving of Sylhet and inscribed it on the Representative List of the Intangible Cultural Heritage of Humanity, acknowledging its cultural significance and craftsmanship. “Cooch Behar Sitalpati” may soon get a Geographical Indication (GI) tag.

Murta stems are split and processed into longitudinal strips, with each stem divided into outer “Saloi” and inner “Maji” halves. From these, three distinct layers of stem strips are extracted: “Sitalbeti” (outermost, smooth, shiny, waterproof and flexible), “Bukabeti” (middle, rough, brittle and less suitable for mat weaving) and “Dalabeti” (innermost, serving mainly as tying fiber or roofing material).

2. Fibre Quality and Natural Fibre Composites

The bast fibre of *S. dichotoma* is primarily composed of about 56% cellulose, 19% hemicellulose and 16% lignin. It has a density of approximately 1.10 g cm⁻³ and exhibits a tensile strength of around 378±13 MPa, indicating its strong and durable structural properties. Araldite AW106 (Bisphenol-A diglycidyl ether) with HV953U hardener served as the matrix. Higher fibre content produced denser, better-bonded composites. Water absorption rises slightly with more and longer fibres but stays within a normal range for natural materials. The tensile strength improves most at about 30% fibre content, after which it gradually declines due to uneven fibre distribution and weaker bonding (Kashyap and Shillargol, 2023).

3. Medicinal and Pharmacological Properties

Murta has been used as traditional medicine from time immemorial and is known to be an effective anti-pyretic and anti-spasmodic agent. The plant exhibits antihyperglycemic activities also by inhibiting enzymes which elevate blood glucose levels. Recently systematic study on application of the methanolic extract of *S. dichotomus* rhizome has shown that it can be used as a hepatoprotective agent by reducing hepatocyte injury and mitochondrial damage of liver cells. Sitalpati has proven analgesic and anti-oxidant properties and also prevents clotting of blood (Choudhury *et al.*, 2025).

4. Phytoremediation Potential

Rahman *et al.* (2022) conducted a study to check the

phytoremediation potential of the plant and found that it has a great role in wetland restoration by using it in the constructed wetland system. The planted system showed significantly higher pollutant removal by removing a considerable amount of BOD₅, COD, NO₃-N and NO₂-N than the control. The system also recorded increase in dissolved oxygen content in water.

The ethyl acetate extract of *Schumannianthus dichotomus* exhibits strong dose-dependent anthelmintic activity with structural worm damage confirmed by SEM/TEM, rich phytochemicals detected and GC-MS identifying Phthalic acid, di(2-propylpentyl) ester as the likely key bioactive component. In order to remove Ibuprofen quickly and effectively, a low-cost mesoporous adsorbent from *Schumannianthus dichotomus* (MSD) with a large surface area and pore volume was created (98% efficiency; 243.90 mg g⁻¹ capacity within 60 minutes). Performance was influenced by ionic strength and divalent ions and adsorption was exothermic and spontaneous. This method was effective because it was economically viable and energy efficient also.

Challenges and Research Gap

- Absence of effective micropropagation protocols or tissue culture procedures for large-scale seedling generation, as present propagation predominantly depends on conventional rhizome division methods.
- The lack of regulated post-harvest processing techniques results in significant material losses and quality variations.
- An aging artisan demographic and falling youth interest threaten the heredity of traditional weaving skills.

Conclusion

Exceptional adaptability to lowland wetland ecosystems combined with minimal external input requirements and demonstrated capacity for ecological restoration, positions *Schumannianthus dichotomus* within global climate adaptation initiatives and sustainability framework. Immediate priority intervention includes initiation of germplasm collection from major geographic centres, development of tissue culture protocols and standardized cultivation package of practices, inclusion of systematic breeding efforts and documentation of traditional

knowledge. If done right, there is promise to attract farmer enthusiasm and industrial investment while preserving invaluable cultural heritage.

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