

Chapter 1

Saccharum spontaneum: a medicinally important grass of India

Sweta Chandra¹, Manish Kumar², Anju Bala², Harjot Kaur², Sweta Mishra³ and Sanjeet Kumar^{3*}

¹Department of Botany, St. Columba's College, Hazaribagh, Jharkhand, India

²SD College, Barnala, Punjab, India

³Ambika Prasad Research Foundation, Odisha, India

*Email-Id: sanjeetaprf@gmail.com

Abstract: India is blessed with numerous grass species. From ancient times, they were part of Indian civilization because they had several uses. Unfortunately, very few reports are available on the medicinal aspects of grasses. Keeping this in view, an attempt has been made to document the medicinal and other uses of a culturally important grass, *Saccharum spontaneum*, through field and literature surveys. Results revealed that it has medicinal and ecological significance. Photographs are provided for easy identification in the field, and uses are discussed here to bring attention towards the importance of this grass in India.

Keywords: Grass, medicinal uses, ecological values

Introduction: Grasses are key vegetation in any landscape and are very associated with communities (Kumar et al. 2022; Nayak and Kumar 2023). They give us food (Dash and Kumar 2021), medicines (Mishra et al. 2022), and other day-to-day needs (Sinha et al. 2023). There is a need to explore the native grass species. Among the native grass species, *Saccharum spontaneum* L., a wild relative of sugarcane, is a perennial tall grass that invades naturally abandoned and pastoral lands in many tropical countries. This species is highly variable and diverse among the *Saccharum* species. This is a close relative and one of the most important parents in the interspecific hybridization of sugarcane. Although this species has the potential to be multipurpose and functional, it is still underutilized and neglected. It is commonly known as 'Wild Cane' in English, 'Kans' in Hindi, and "Kasatandi" in Odia (Pandey et al. 2015). Thin stalks with minimal or no sugar are its main characteristics, with a vast array of morphological variations (Manjunatha et al. 2018). Exposed silt plains created by the retreating monsoon floods each year are colonized by Kans grass, producing almost pure stands on the lowest areas of the flood land. It is a highly adaptable grass species that grows in a wide range of habitats across Southern Asia and East Africa to the Mediterranean, spanning the tropics to temperate regions (Bonnett et al. 2014). This occurs throughout India along the river and tropics of old world and grows as waste land weed. It is considered as valuable medicinal herb in traditional systems of medicine in India (Kumar et al. 2010). *S. spontaneum* (Figure 1) plant parts have been reported to exhibits some therapeutic properties

and used in folklore medicine in the treatment of dyspepsia, burning sensation, piles, sexual weakness, gynaecological problems, respiratory troubles, microbial infections (<http://hdl.handle.net/10603/233330>). Moreover, it provides a breeding ground for numerous pests that spread to the surrounding croplands. *S. spontaneum* is a serious weed of cotton, pearl millet, sorghum, sugarcane, rice, forage crops, horticultural gardens, and plantation crops such as tea and coffee in tropical and subtropical climates (Saha et al. 2018). Keeping the importance of this grass, an attempt has been made to gather the information on it through field and literature survey during 2021-2024. Field survey was carried out in near Mahanadi River areas of Cuttack, Odisha; Bonai Forest Division, Odisha and Jamtara Forest Division, Jharkhand. Gathered information is presented in this chapter to bring attention towards its importance for sustainable utilization.

Description: *S. spontaneum* is a perennial grass with slender culms, 100-200 cm tall, with deep roots and rhizomes, up to 4 m height, growing in stools or forming continuous cane-brakes and usually exhibiting vigorous rhizomatous tillering. Leaves are linear-lanceolate, base rounded, margins serrulate, apex acuminate, involute, glaucous; ligules ovate, membranous. Panicles densely silky white. Culms remain green, grey, ivory, or white, hard, but very pithy and often hollow in the centre, often rooting at the nodes, internodes usually long and nodes always thicker than internodes. Culms produce long, silky white panicles. Spikelets surrounded by hairs, paired, one sessile and the other pedicelled, similar, lanceolate, reddish-brown; callus densely long villous. Lower glume ovate-lanceolate, subcoriaceous, margins hyaline, ciliate. Upper glume ovate-lanceolate, dorsally keeled, margins ciliate. Lower floret empty. Upper floret bisexual. First lemma ovate-acute, hyaline. Second lemma linear-lanceolate, hyaline. Stamens 3; anthers yellow or reddish. Ovary oblong; stigma white. Pedicelled spikelet like sessile ones (Saxena and Bramham 1996; Pandey 2015; Figure 2). In India, germination and emergence occurs in June/July after the first showers of the rainy season; adult plants bear flowers by the end of the rainy season

Medicinal uses: *S. spontaneum* is known as a traditional herb with excellence medicinal values and has been advocated in the treatment of gynaecological troubles and respiratory problems. Roots are used as galactagogue and diuretic in Indian Ayurveda. Roots are also used as astringent, emollient, refrigerant, diuretic, purgative, tonic, aphrodisiac and useful in treatment of dyspepsia, burning sensation, piles, and sexual weakness. Aerial parts are useful in burning sensations, blood diseases, biliousness, and haemorrhagic diathesis. Stems are useful in vitiated conditions of pitta, vata, dyspepsia, haemorrhoids, and dysentery (Khalid and Siddiqui 2011). The rural people of Tamil Nadu and Andhra Pradesh use fresh juice of the stem for the treatment of mental illness and disturbances. Roots are sweet, astringent, emollient, refrigerant, diuretic, lithotriptic, purgative, tonic, aphrodisiac and useful in treatment of dyspepsia, burning sensation and piles (Kumar et al. 2010).



Figure 1: *Saccharum spontaneum* L., in Jamtara Forest Division, Jharkhand, India



Figure 2: Inflorescence and flowers of *Saccharum spontaneum* L



Figure 3: *Saccharum spontaneum* used by tribal communities of Jharkhand, India

It exhibits antioxidative, anti-diarrhoeal, and CNS depressant properties and it could also be used in cellulose production. It also contained minerals, organic acids, flavonoids, and phenolic compounds which was found to possess antioxidant activity. The compounds reported from *S. spontaneum* have biological activities. They act as defensive agents against herbivores and are useful for the plants own growth, reproduction, and responses to several abiotic and biotic stresses (Landingin et al. 2018).

Other Uses

S. spontaneum is not only medicinal agent, but it is also used in many household activities by the rural and tribal communities throughout India. It is a source of material for thatching (Figure 3). It is a coarse grass that cattle are not fond of and is only grazed in times of scarcity, but it has been shown to be beneficial for livestock. Due to its vast rhizome network, it is a highly effective binder of soils, making it invaluable in controlling and preventing soil erosion. It is also used in the production of ropes, mats, and brooms. The pulp is suitable for wrapping, writing, printing, and producing paper that can resist grease. Mulching with it is a great idea due to its slow decomposition rate. In Indonesia, young shoots are boiled and eaten with rice (Uphof, 1968; Thakur, 1984; Present study).

Phytoremediation potential

S. spontaneum is a grass that is frequently found in many heavy metal-enriched waste dumps, including fly ash pond sites. The production of ammonia, siderophore, hydrocyanide, and IAA was among the other features that promoted plant growth, and all of them are resistant to multiple heavy metals (Mukherjee et al. 2017). It has exceptional adaptive potential to survive under such extreme conditions, i.e., their survival does not require specific habitat management, and they can play a significant role in decontaminating and improving these habitats, especially during the initial stages of the revegetation process (Shaw 1992; Drzewiecka et al. 2021). At landfills and open-cast disposal sites, plants have developed various adaptation mechanisms that allow them to tolerate nutrient deficiencies on the one hand and heavy metal/metalloid toxicity on the other, using two basic strategies based on the mechanisms of accumulation (accumulator plants) and exclusion (stabilizer plants) (Maiti et al. 2008; Kumar et al. 2015). In the development of the internal mechanisms of complexation, compartmentalization, and deposition, accumulator plants like Kans grass tolerate high concentrations of trace elements in their tissue or accumulate them even at low concentrations in the substrate without significant physiological and morphological damage (Kostic et al. 2022).

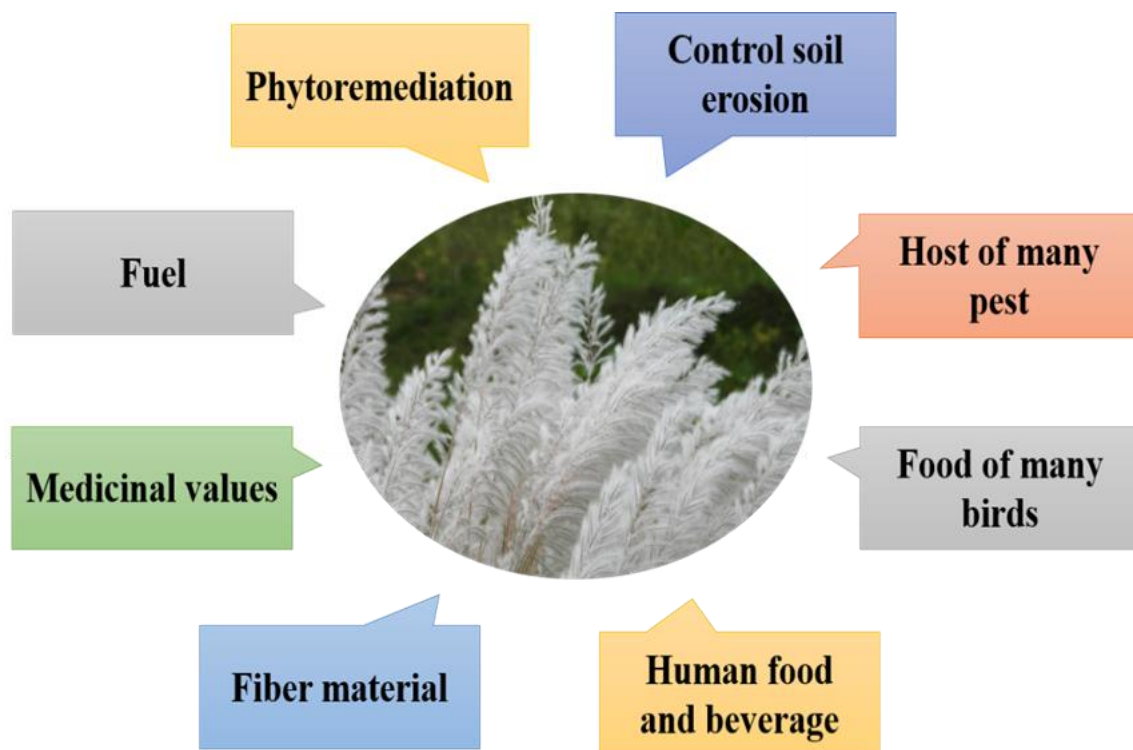


Figure 4: Diverse uses of *S. spontaneum* and future aspects for sustainable utilization

Conclusion

The present study concludes that *S. spontaneum* is used as fuel, fiber materials, medicinal agents, and foods (Figure 4). It also does phytoremediation and controls soil erosion, along with providing food to many faunal species, which shows its ecological services. Therefore, the study recommends that there is a need to explore this grass in various aspects for sustainable utilization and conservation action.

Acknowledgement

Authors are thankful to the DFO, Bonai Forest Division, Odisha and DFO, Jamtara Forest Division, Jharkhand.

References

- Bonnett GD, Kushner JNS and Saltonstall K. (2014). The reproductive biology of *Saccharum spontaneum* L.: implications for management of this invasive weed in Panama. *NeoBiota* 20: 61–79.
- Dash SS and Kumar S. (2021). Bamboo associated foods: a review. *Journal of Biodiversity and Conservation*. 6(2): 482-484.

- Drzewiecka K, Gąsecka M, Magdziak Z, Budzinska S, Szostek M, Niedzielski P, Budka A, Roszyk E, Doczekalska B, Gorska M et al. (2021). The Possibility of Using *Paulownia elongata* S. Y. Hu × *Paulownia fortunei* Hybrid for Phytoextraction of Toxic Elements from Post-Industrial Wastes with Biochar. *Plants*. 10: 2049. <http://hdl.handle.net/10603/233330>
- Khalid M and Siddiqui HH. (2011). Pharmacognostical evaluation and qualitative analysis of *Saccharum spontaneum* (L.) Root. *International Journal of Pharmaceutical Sciences and Drug Research*. 3(4):338-41.
- Kostic O, Gajic G, Jaric S, Vukov T, Matic M, Mitrovic M and Pavlovic P. (2022). An Assessment of the Phytoremediation Potential of Planted and Spontaneously Colonized Woody Plant Species on Chronosequence Fly Ash Disposal Sites in Serbia—Case Study. *Plants*. 11(1):110.
- Kumar A, Ahirwal J, Maiti SK and Das R. (2015). An assessment of metal in fly ash and their translocation and bioaccumulation in perennial grasses growing at the reclaimed opencast mines. *International Journal of Environmental Research*. 9: 1089–1096.
- Kumar CAS, Varadharajan R, Muthumani P, Meera R, Devi P and Kameswar B. (2010). Psychopharmacological studies on the stem of *Saccharum spontaneum*. *International Journal of PharmTech Research*. 2(1): 319-321.
- Kumar S, Mishra S, Mishra AK and Kumar SN. (2022). Floral diversity of Koira & Barsuan ranges of Bonai Forest Division, Odisha. Bonai Forest Division & Ambika Prasad Research Foundation, Odisha. APRF Publishers, India. Pp 1-480.
- Maiti SK and Jaiswal S. (2008). Bioaccumulation and translocation of metals in the natural vegetation growing on fly ash lagoons: A field study from Santaldih thermal power plant, West Bengal, India. *Environmental Monitoring and Assessment*. 136: 355–370.
- Manjunatha T, Chandran K, Mahesh P, Mohanraj K and Appunu. (2018). Research article characterization of *Saccharum spontaneum* accessions from north-eastern India. *Electronic Journal of Plant Breeding*. 9(1):38–50.
- Mishra S, Agrawal B, Rathore S, Mishra AK and Kumar S. (2022). Medicinal grasses of Eastern Ghats of Odisha, India. *Indian Forester*. 148(11): 1172-1174.
- Mukherjee P, Roychowdhury R and Roy M. (2017). Phytoremediation potential of rhizobacterial isolates from Kans grass (*Saccharum spontaneum*) of fly ash ponds. *Clean Technologies Environmental Policy*. 19: 1373–1385.
- Nayak S and Kumar S. (2023). Medicinal plants used by tribals of Odisha. State Medicinal Plants Board & Ambika Prasad Research Foundation, Odisha; APRF Publishers, India. Pp 1-672.
- Pandey C, Bajpai O, Pandey DN and Singh N. (2015). *Saccharum spontaneum*: an underutilized tall grass for revegetation and restoration programs. *Genetic Resources and Crop Evolution*. 62 (3): 443–450.
- Saha B, Devi C, Khwairakpam M and Kalamdhad AS. (2018). Vermicomposting and anaerobic digestion – viable alternative options for terrestrial weed management – A review. *Biotechnology Reports*. 17:70-76.
- Saxena H.O. and Bramham M. (1996). The Flora of Orissa, Vol IV, Orissa Forest Development Corporation Ltd & Regional Research laboratory, Bhubaneswar, Odisha.
- Shaw PJA. (1992). A Preliminary Study of Successional Changes in Vegetation and Soil Development on Unamended Fly Ash (PFA) in Southern England. *Journal of Applied Ecology*. 29: 728–736.
- Sinha MK, Dimri R, Sharma BP, Kumar S and Marndi S. (2023). Medicinal grasses of India, Volume I. APRF Publishers, India. pp 1-59.
- Thakur C. (1984). Weed Science. New Delhi, India: Metropolitan Book Co.(P) Ltd.
- Uphof J. (1968). Dictionary of Economic Plants. New York, USA: Cramer.