Chapter 5

Qualitative phytochemical analysis and antioxidant activity of *Leersia hexandra* Sw. (Poaceae)

Monjit Das[1], Shreya Pattanayak[2], Sanjeet Kumar[3] and Ghodke Anita Sureshrao[4*]

[1]Department of Botany, Department of Botany, Tripura University, Suryamaninagar, Tripura, India

[2]Department of Biotechnology, Orissa University of Technology and Research, Bhubaneswar, Odisha, India

[3]Ambika Prasad Research Foundation, Odisha, India

[4]Amaltas Institute of Ayurveda, Amaltas Ayurvedic Hospital and Research Centre, Dewas, Madhya Pradesh, India

*Email-Id: anitaghodke24@gmail.com

ABSTRACT

Leersia hexandra is a perennial aquatic grass and known for its ecological adaptability and medicinal properties. Present study aimed to evaluate the phytochemicals and antioxidant activity of *L. hexandra*. Phytochemical analysis revealed that solvent polarity strongly influenced metabolite extraction. Non-polar extracts did not show detectable compounds, whereas ethanol and aqueous extracts contained tannins, flavonoids, and reducing sugars. The aqueous extract exhibited the highest richness of bioactive compounds and antioxidant activity. The ethyl acetate: methanol: water system showed strong radical scavenging activity with an Rf of 0.983, followed by moderate activity in chloroform: ethyl acetate: formic acid and minimal response in non-polar solvents. The results highlighted the predominance of polar bioactive compounds in *L. hexandra*, supporting its potential as a natural antioxidant source and a candidate for future pharmacological and ecological applications as fodder grass.

Keywords: Antioxidant activity, fodder grass, phytochemical analysis, pharmacological applications

INTRODUCTION

Traditionally, grasses of the Poaceae family have been used in herbal formulations due to their wide range of secondary metabolites (Ishihara, 2021) such as flavonoids, tannins, phenolics, and saponins which are known for their antioxidant (Gebashe et al., 2020), antimicrobial (Mukarram, 2021) and anti-inflammatory effects (Limantol et al., 2022). Antioxidants derived from plants (Farma et al., 2023) play a critical role in neutralizing reactive oxygen species (ROS), which are responsible for oxidative stress and associated cellular damage (Gebashe et al., 2020). Identifying natural sources of antioxidants is therefore essential for the development of phytotherapeutic products and the promotion of health through natural remedies. *Leersia hexandra*, commonly known as southern cutgrass or rice cutgrass. It is widely distributed across India, thriving in wetlands, paddy fields, and along riverbanks (Behera et al., 2025). This species is known for its ability to grow under submerged and nutrient-deficient conditions, making it a vital component of wetland ecosystems where it contributes to soil stabilization, water purification, and habitat restoration. Its dense root and rhizome network helps in preventing erosion, improving sediment retention, and facilitating the natural regeneration of degraded landscapes (Trinidad et al., 2017). Beyond its ecological importance, *L. hexandra* plays a valuable role in sustainable source of fodder for livestock and wildlife along with phytoremediation properties (Chen et al., 2022). However, despite these ecological and economic advantages, the species remains underexplored in terms of its bioactive compounds and pharmacological potential. The present study was thus undertaken to investigate the phytochemical composition and qualitative antioxidant potential of *L. hexandra* by correlating solvent polarity with the extraction of bioactive compounds and highlight its possible pharmacological and ecological applications. The findings are expected to contribute to a broader understanding of this grass species as a natural reservoir of antioxidants and a potential eco-friendly resource for bioprospecting and sustainable utilization.

METHODOLOGY

Whole plants of *Leersia hexandra* were collected from Athgarh, Cuttack district, Odisha, India (Figure 1). The plant species was identified by authors (Behera et al., 2025). Whole plant was thoroughly washed under running tap water to remove dust. Further, they were cut into small pieces and using Soxhlet method extraction (n-hexane, ethanol and aqueous) was carried out for further experimental works (Jena et al., 2025). Qualitative phytochemical analysis for detection of secondary metabolites and Thin Layer Chromatography (TLC) based antioxidant analysis was done using standard methods (Jena et al., 2025; Kumar et al. 2013, Pattnaik and Bhatnagar, 2023).

RESULTS AND DISCUSSION

The qualitative phytochemical analysis of *Leersia hexandra* revealed that solvent polarity significantly influenced the extraction of secondary metabolites (Table 1). Non-polar fractions did not yield any detectable compounds (Figure 2). In contrast, polar solvents ethanol and water extracted notable bioactive compounds (Table 1). The ethanol extract contained tannins and reducing sugars (Figure 3), while the aqueous extract showed the presence of tannins, flavonoids, and reducing sugars, indicating a higher concentration of polar phytochemicals (Figure 4). The antioxidant potential of the aqueous extract was confirmed through TLC based DPPH assay. The ethyl acetate: methanol: water system produced a spot at Rf 0.983 with streaking between 0.166–0.4, while the chloroform: ethyl acetate: formic acid system yielded a similar Rf value (0.983) but a shorter streak range (0–0.116). These results highlighted the predominance of polar bioactive compounds in *L. hexandra* responsible for its antioxidant potential (Table 2).



Figure 1: Plant parts of *Leersia hexandra*

Table 1: Qualitative phytochemical analysis of *A. cimicina*

Polarity	Extract	Detected secondary metabolites
Non-Polar ↓ Polar	n-Hexane	All tested bioactive compounds are not detected.
	Ethanol	Tannin and Reducing sugars
	Aqueous	Tannin, Flavonoid and Reducing sugars

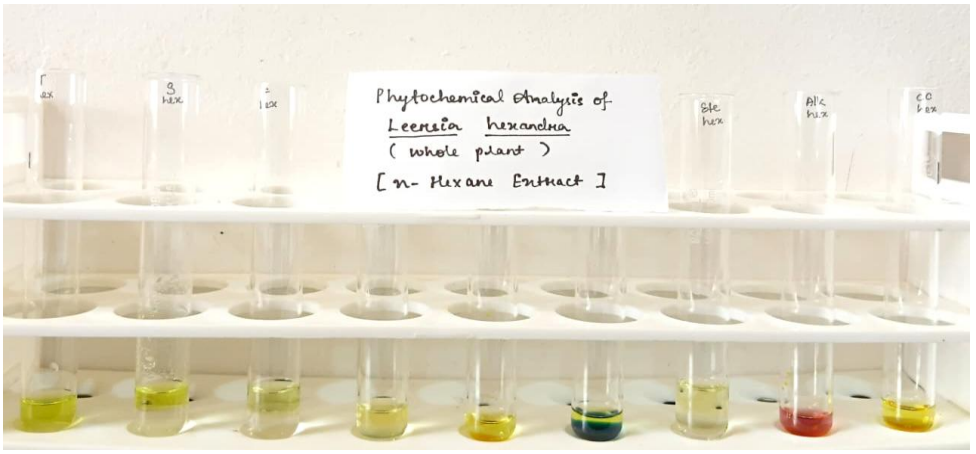


Figure 2: Phytochemical analysis of *L. hexandra* using n-hexane extract



Figure 3: Phytochemical analysis of *L. hexandra* using ethanolic extract



Figure 4: Phytochemical analysis of *L. hexandra* using aqueous extract

Table 2: TLC-based DPPH analysis of whole plant extract of *L. hexandra* using different mobile phases

	Mobile Phases	Rf value of Spots	
		S1	Streak
Aqueous	Ethyl acetate: Methanol: Water (40:5.4:4)	0.983	0.166 – 0.4
	Chloroform: Ethyl acetate: Formic acid (5: 4: 1)	0.983	0 – 0.116
	n-Hexane: Petroleum ether: Ethanol (10: 10: 80)	0.75	-

(Rf: Retention factor)

Other researchers have also documented the ecological and traditional aspects of *L. hexandra.* The plant has been reviewed to be used for treating hemoptysis and muscular tiredness (Hariyadi and Ticktin, 2012). Aqueous extract of leaves and stems has been used for treating hypertension in Cameroun and acetone extract of seeds were examined to contain a diverse range of secondary metabolites (Juwitaningsih et al., 2020). Studies have highlighted its capacity to tolerate and accumulate heavy metals such as Chromium, Copper, and Nickel (Chen et al., 2022), indicating its potential for environmental cleanup and wastewater treatment. This grass is used to make a traditional drink called 'aia banto' in West Sumatra, believed to help eliminate bodily toxins, alleviate asthma, and relieve shortness of breath

(Farma et al., 2024), highlighting its ecological value and significant therapeutic potential

CONCLUSION

The phytochemical and antioxidant analysis of *Leersia hexandra* demonstrated that the grass predominantly contains polar bioactive compounds, including tannins, flavonoids, and reducing sugars. The aqueous extract exhibited the most significant antioxidant activity, confirming its potential as a source of natural radical scavengers. These findings not only validate the traditional relevance of *L. hexandra* but also emphasize its value in pharmacological research and ecological restoration. Further studies focusing on compound isolation, structural characterization, and bioefficacy evaluation are recommended to advance its application in natural product development and wildlife management.

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