Chapter 8

Roots of resilience: phytochemical and antioxidant perspectives on *Digitaria longiflora* (Retz.) Pers.

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ABSTRACT

Grasses are not merely background vegetation but they also shape ecosystems, sustain wildlife, and sometimes hide untapped medicinal potential. *Digitaria longiflora*, a resilient member of the Poaceae family, thrives across diverse and challenging habitats, offering both forage for herbivores and a window into bioactive chemistry. In this study, polar extracts of the plant revealed a rich array of secondary metabolites, including tannins, saponins, and reducing sugars, while non-polar fractions were largely inert. Qualitative antioxidant profiling uncovered multiple radical-scavenging compounds, reflected in distinct Rf values and streaking patterns, suggesting a complex phytochemical mosaic. Beyond supporting biodiversity and soil health, its bioactive constituents point toward potential applications in natural therapeutics. Expanding research on this overlooked grass could bridge conservation, forage science, and phytomedicine, demonstrating the hidden value of native flora in sustaining both ecosystems and human health.

Keywords: Photochemistry, natural therapeutics, wildlife forage

INTRODUCTION

The family Poaceae, one of the largest and most ecologically significant families of flowering plants, encompasses a remarkable diversity of grass species that sustain both ecosystems and economies worldwide (Linder et al., 2018). Members of this family not only serve as primary producers and soil stabilizers but are also increasingly recognized for their phytochemical richness and antioxidant potential, owing to the presence of bioactive compounds such as phenolics, flavonoids, tannins, and saponins (Gebashe at al., 2020). Among them, the genus *Digitaria* includes several ecologically resilient grasses that thrive across tropical and subtropical landscapes. Species such as *Digitaria radicosa* and *Digitaria sanguinalis* are widely recognized for their adaptability to a broad range of soil types (Minoji and Sakai, 2024), including those with low fertility, while *Digitaria longiflora* shares similar ecological traits within the genus. *D. longiflora*, the Indian Crab grass is an annual or perennial grass found along forest fringes, wastelands, and open fields, holds ecological importance as a native fodder species contributing to the trophic dynamics of grassland ecosystems (POWO, 2025). Its extensive root system aids in soil conservation, while its tender shoots provide wildlife forage during dry periods. Despite its abundance, *D. longiflora* remains underexplored for its phytochemical and antioxidant potential, which may parallel the bioactive profiles observed in other Poaceae members. Understanding its ecological value, biochemical composition, and adaptive physiology can provide new insights into grass-based conservation strategies and plant-derived therapeutics from native flora.

METHODOLOGY

Whole plants of *Digitaria longiflora* were collected from nearby Mahanadi areas of Cuttack district, Odisha, India (Figure 1). The plant species was identified by authors followed by published book on regional flora (Saxena and Brahmam, 1996). Whole plant was thoroughly washed. Further, they were cut into small pieces and extraction (n-hexane, ethanol and aqueous) was carried out using Soxhlet 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 (Kumar et al., 2013; Pattnaik and Bhatnagar, 2023; Jena et al., 2025).



Figure 1: Whole plant of *Digitaria longiflora*

RESULTS AND DISCUSSION

The qualitative phytochemical analysis of *Digitaria longiflora* revealed that the occurrence of secondary metabolites is strongly influenced by solvent polarity. While the non-polar n-hexane extract showed no detectable phytoconstituents, both ethanolic and aqueous extracts exhibited the presence of tannins, saponins, and reducing sugars, indicating that the plant is a rich source of polar bioactive compounds (Table 1; Figures 2–4). These metabolites are widely recognized for their antioxidant, antimicrobial, and metabolic-regulatory activities, which may contribute to the ecological adaptability of *D. longiflora* across diverse habitats.The TLC-based DPPH assay further confirmed the antioxidant efficacy of the aqueous extract through multiple Rf values and streaking patterns observed across different solvent systems (Table 2; Figure 5). In the ethyl acetate : methanol : water system, four distinct spots (Rf = 0.333, 0.416, 0.65, 0.7) and a streak (Rf = 0.4–0.916) indicated the presence of a wide range of polar antioxidant compounds. The chloroform: ethyl acetate: formic acid system revealed two spots (Rf = 0.938, 0.984) with a streak extending from 0 to 0.338, while the n-hexane: petroleum ether: ethanol system exhibited one prominent spot (Rf = 0.833) and a streak (0 to 0.35). These results highlighted the diverse composition of radical-scavenging metabolites in *D. longiflora*, suggesting synergistic antioxidant mechanism that could be further studied to test its efficacy in reducing cell damage and oxidative stress.

Table 1: Qualitative phytochemical analysis of *D. longiflora*

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

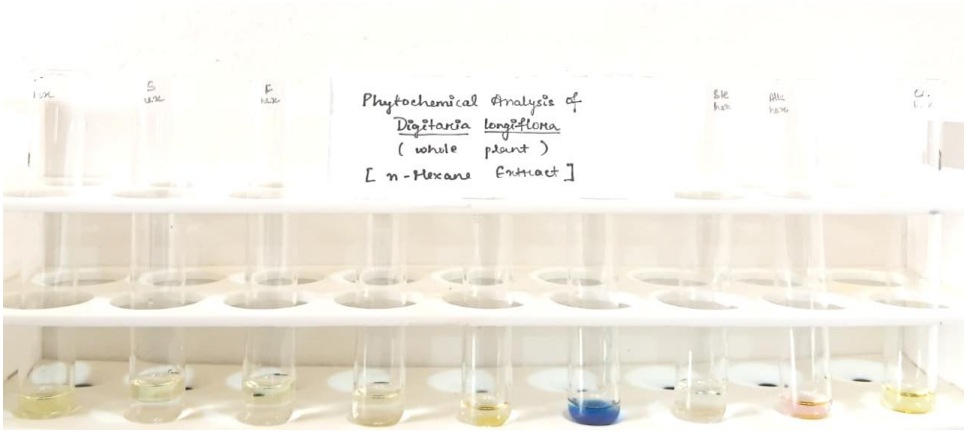

Figure 2: Phytochemical analysis of *D. longiflora* using n-hexane extract

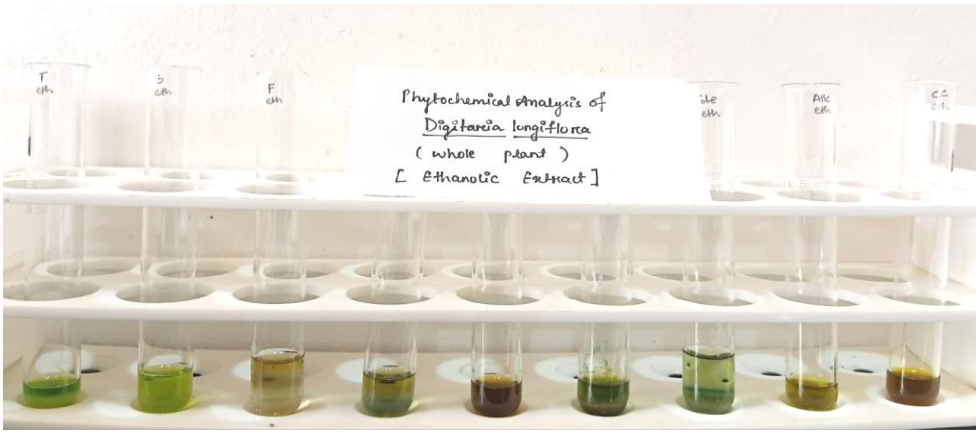

Figure 3: Phytochemical analysis of *D. longiflora* using ethanolic extract



Figure 4: Phytochemical analysis of *D. longiflora* using aqueous extract

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

	Mobile Phases	Rf value of Spots				
		S1	S2	S3	S4	Streak
Aqueous	Ethyl acetate: Methanol: Water (40:5.4:4)	0.333	0.416	0.65	0.7	0.4 – 0.916
	Chloroform: Ethyl acetate: Formic acid (5: 4: 1)	0.938	0.984	-	-	0 – 0.338
	n-Hexane: Petroleum ether: Ethanol (10: 10: 80)	0.833	-	-	-	0 – 0.35

(Rf: Retention factor)

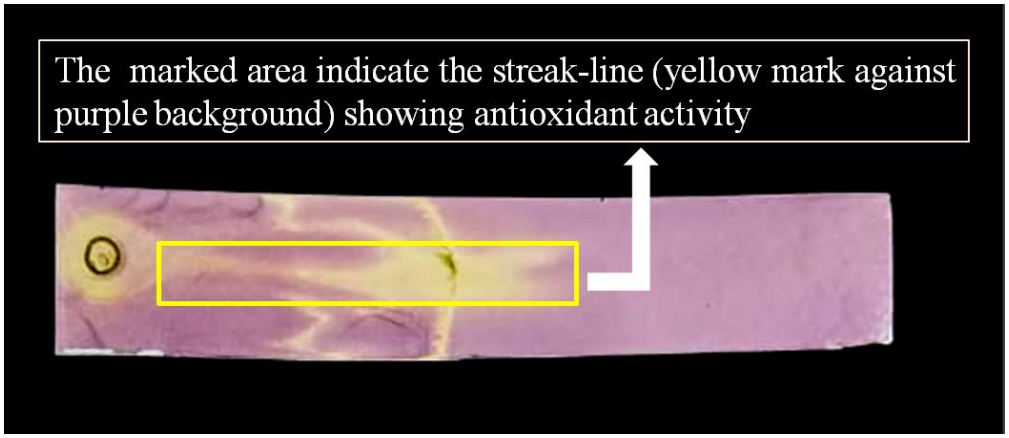

Figure 5: TLC based DPPH analysis using Ethyl acetate: Methanol: Water

CONCLUSION

The given study highlighted *Digitaria longiflora* as a promising grass species with notable phytochemical diversity and antioxidant potential. The dominance of polar metabolites such as tannins, saponins, and reducing sugars, along with multiple antioxidant-active spots in TLC-DPPH analysis, indicates a complex mixture of bioactive compounds contributing to its oxidative defense. Given its ecological resilience and abundance, *D. longiflora* represents an underexplored grass species with dual ecological and pharmacological significance. Further exploration through quantitative

assays, compound isolation, and in vivo evaluation could reveal its potential for natural therapeutics and sustainable ecological applications.

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