# Chapter 3

## Phytoconstituents and antioxidant properties of *Bothriochloa pertusa* (L.) A.Camus (Poaceae): an ecological perspective

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**ABSTRACT**

*Bothriochloa pertusa*, a perennial grass commonly found along roadsides, is widely distributed in India. This study evaluated its phytochemicals and antioxidant activity using qualitative screening and thin-layer chromatography (TLC) based 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay. Results revealed that non-polar extracts yielded no detectable secondary metabolites, while ethanol and aqueous extracts showed tannins, saponins, flavonoids, and reducing sugars. TLC-DPPH analysis revealed diverse radical-scavenging compounds with varying Rf values, confirming the plant's antioxidant potential. These findings highlight *B. pertusa* as both an ecologically valuable forage species and a source of natural antioxidants.

**Keywords**: Fodder grass, bioactive compounds, conservation, pharmacology

## INTRODUCTION

The genus *Bothriochloa* of the family Poaceae is a widely distributed group of grasses, represented by about 38–40 species worldwide, of which 38 have been formally identified (POWO, 2023). In India, 13 species occur, with 6 considered endemic (Kellong et al., 2020). About three species of this genus are recorded from Odisha state (Mane et al., 2023). Of these, *B. pertusa*, known commonly as Pitted beard grass or Indian bluegrass, has attracted particular attention. A perennial $C_4$ species, it is native to tropical and subtropical regions but now stretches across Asia, Africa, and Oceania. Its photosynthetic efficiency enables it to capture carbon effectively, contributing to long-term carbon sequestration in soils (Yadav and Mishra, 2020). In Odisha, however, *B. pertusa* is more often seen in ordinary settings like open grasslands, roadside patches, and even neglected wastelands, where it is dismissed as a common weed (Behera et al., 2025). Yet, this simple grass hides remarkable ecological adaptations: it thrives in drought, withstands poor soils, and tolerates high temperatures, making it a dependable survivor in arid and semi-arid landscapes. Such resilience allows it to perform crucial ecological functions. Like many grasses of savannas and rangelands, it helps stabilize soil, curb erosion, and maintain the structural fabric of habitats essential for diverse plants and animals (Bengtsson et al., 2019). Instead of investing in tall above-ground biomass, it spreads through a dense mat of stolons that carpets the ground. This continuous cover not only resists grazing (Lebbink and Fensham, 2023) but also allows the species to flourish under heavy stocking once it colonizes bare patches. At the same time, its stoloniferous cover provides palatable forage for both domestic livestock and wild herbivores, ensuring a steady food base for pastoral livelihoods and wildlife alike. Year-round availability, combined with its ground-covering growth, enhances ecosystem resilience by supporting biodiversity and facilitating nutrient cycling (Lebbink and Fensham, 2023). Beyond its ecological role, *B. pertusa* also carries medicinal and pharmacological significance. Therefore, a try has been made to study its bioactive constituents that can connect its ecological importance with therapeutic relevance, positioning *B. pertusa*

not only as a cornerstone of grazing systems but also as a reservoir of natural compounds with potential applications in health and medicine.

## METHODOLOGY

Whole plants of *Bothriochloa pertusa* were collected from nearby Mahanadi areas of Cuttack district, Odisha, India (Figure 1). The plant species was identified by authors followed by published literature (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 (Kumar et al., 2013; Pattnaik and Bhatnagar, 2023; Jena et al., 2025).

## RESULTS AND DISCUSSION

The phytochemical screening of *Bothriochloa pertusa* showed that solvent polarity plays a key role in extracting metabolites (Table 1; Figure 2–4). Non-polar extracts (n-hexane) yielded no detectable compounds or activity, whereas polar solvents like ethanol and water extracted bioactive constituents. Ethanol extract contained tannins and reducing sugars, while the aqueous extract showed tannins, saponins, flavonoids, and reducing sugars. TLC-based DPPH (2,2-Diphenyl-1-picrylhydrazyl) assay of the aqueous extract further confirmed its antioxidant potential (Table 2; Figure 5). The ethyl acetate: methanol: water system produced a prominent spot at Rf 0.982 with streaking (0.384–0.711), and the chloroform: ethyl acetate: formic acid system showed a spot at Rf 0.960 with streaking (0.196–0.313), indicating compounds of varying polarities contributing to radical scavenging. In contrast, the n-hexane: petroleum ether: ethanol system yielded a single spot at Rf 0.540 (Figure 5), reflecting limited antioxidant diversity.

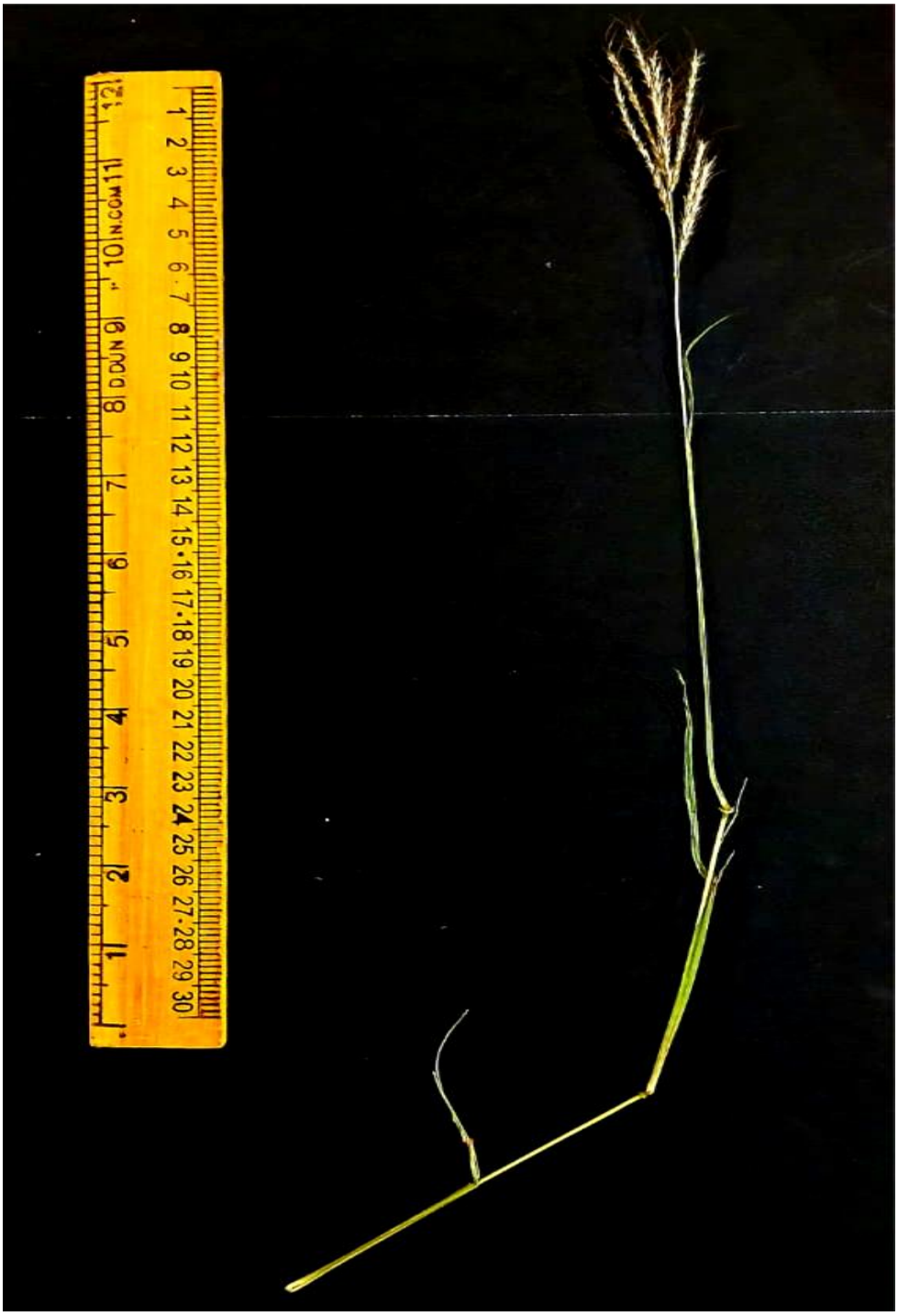


Figure 1: Plant parts of *Bothriochloa pertusa*

Table 1: Qualitative phytochemical analysis of *B. pertusa*

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

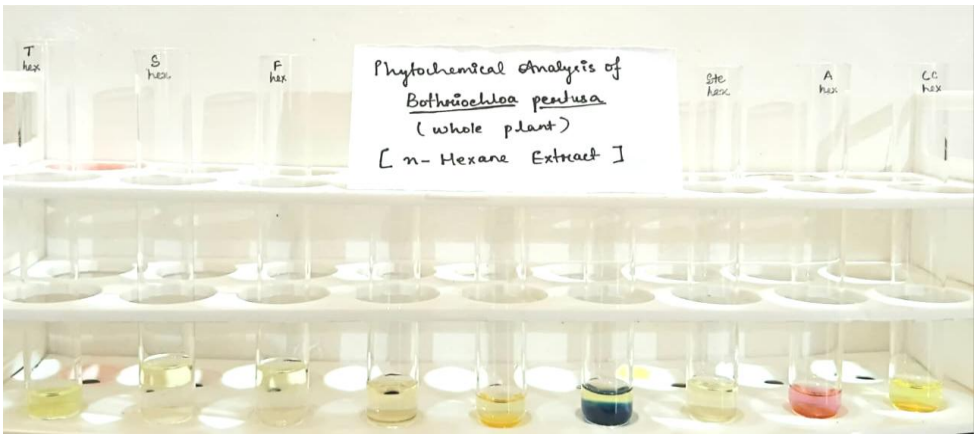



Figure 2: Phytochemical analysis of *B. pertusa* using n-hexane extract

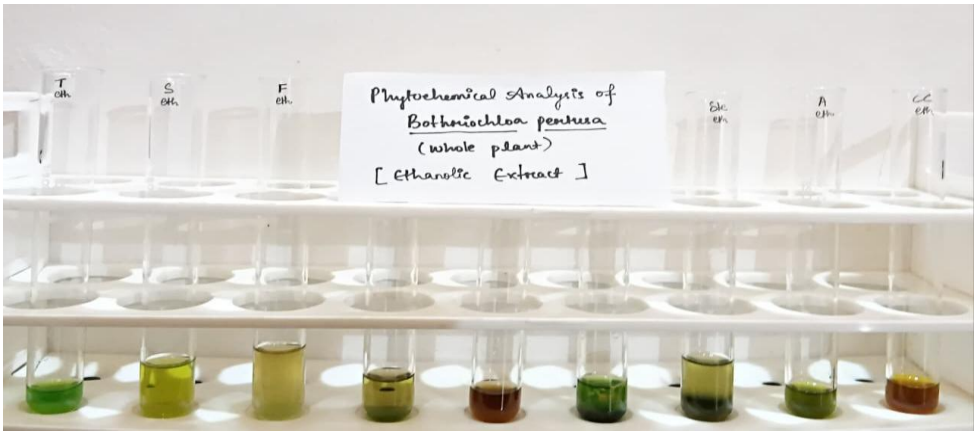



Figure 3: Phytochemical analysis of *B. pertusa* using ethanolic extract




Figure 4: Phytochemical analysis of *B. pertusa* using aqueous extract

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

| | Mobile Phases | Rf value of Spots | |
|---|---|---|---|
| | | S1 | Streak |
| Aqueous | Ethyl acetate: Methanol: Water (40:5.4:4) | 0.982 | 0.384 – 0.711 |
| | Chloroform: Ethyl acetate: Formic acid (5: 4: 1) | 0.960 | 0.196 – 0.313 |
| | n-Hexane: Petroleum ether: Ethanol (10: 10: 80) | 0.540 | - |

(Rf: Retention factor)

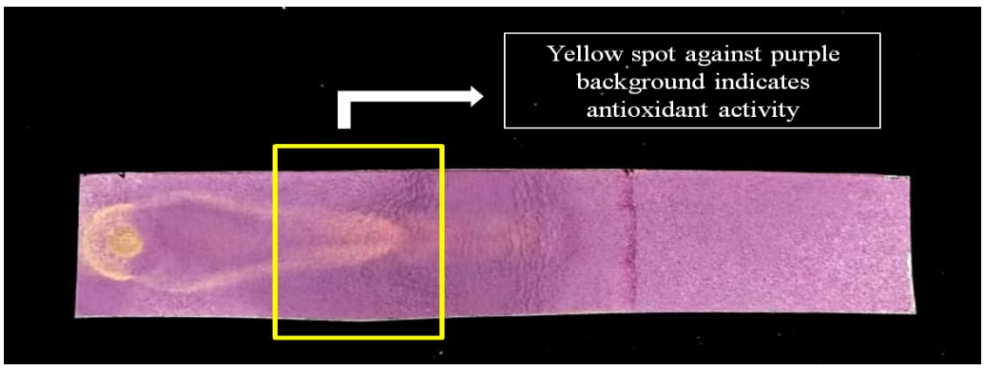



Figure 5: Antioxidant activity of *B. pertusa*

Other researchers have also documented the different aspects of *B. pertusa.* The essential oil composition of *B. pertusa* has been studied (Kaul and

Vats, 1998), revealing the presence of oxygenated sesquiterpenes such as intermedeol and acorenone-B, which contribute to its bioactivity and can be an essential data to support the potential bioactivity of the present secondary metabolites. A survey conducted in different parts of West Bengal (Saha et al., 2013) revealed that among the Lodhas, a decoction of fresh inflorescence of *B. pertusa* mixed with *Piper longum* (3:1) is given to children for cold and cough and the Mundas use powdered ripe grains of the same mixed with *Piper nigrum* in lukewarm water for treating breast tumors in women, administered for 15 days with advice to avoid alcohol. Apart from these, there is a research gap between its use as forage and pharmacological values that needs to be addressed.

## CONCLUSION

The present study demonstrated *Bothriochloa pertusa* to possess a range of polar phytochemicals with the aqueous extract proving to be the richest source of secondary metabolites such as tannins, saponins, flavonoids, and reducing sugars. TLC-DPPH assay further confirmed the antioxidant potential of this grass with different solvent systems revealing distinct Rf values and streaking patterns that highlighted the diversity of radical-scavenging molecules. These findings suggest that aqueous extracts of *B. pertusa* hold promising antioxidant properties, which could be explored further for potential applications in natural therapeutics and plant-based formulations. Nevertheless, research on this species remains limited, and further studies are needed to gain a deeper understanding on its potential. Expanding knowledge of its phytochemicals and pharmacological properties could provide valuable information, while future investigations may also clarify its ecological, forage, and practical applications in broader areas.

## REFERENCES

Behera SC, Mishra S, Mishra AK and Kumar S. (2025). Grasses of Chandaka-Dampara Wildlife Sanctuary. Ambika Prasad Research Foundation, Odisha, India.

Bengtsson J, Bullock JM, Egoh B, Everson C, Everson T, Connor TO, Farrell PJO, Smith HG and Lindborg R. (2019). Grasslands—more important for ecosystem services than you might think. Ecosphere. 10(2): e02582.

Jena N, Vimala, Singh B, Patra A, Sharma BP, Hossain E and Kumar S. (2025). Methods for ethnobotanical data collection, phytochemistry, antioxidant, anthelmintic, and antimicrobial activities for pharmacological evaluation of medicinal plants. Journal of Biodiversity and Conservation. 9(2): 87-107.

Kaul VK and Vats SK. (1998). Essential oil composition of *Bothriochloa pertusa* and phyletic relationship in aromatic grasses. Biochemical Systematics and Ecology. 26(3): 347-356.

Kellogg E, Abbott JR, Bawa K, Gandhi K, Kailash BR, Ganeshaiah KN, Babu SU and Raven P. (2020). Checklist of the grasses of India. PhytoKeys. 163: 1-560.

Kumar S, Jyotirmayee K and Sarangi M. (2013). Thin Layer Chromatography: a tool of biotechnology for isolation of bioactive compounds from medicinal plants. International Journal of Pharmaceutical Sciences Review and Research. 18(1): 126-132.

Lebbink G and Fensham R. (2023). The 'lawnification' of Australia's eastern grassy woodlands: the past, current and likely future spread of an invasive perennial grass, *Bothriochloa pertusa*. Biological Invasions. 25: 1779–1794.

Mane PR, Swamy J, Panda S, Kamila PK, Mastakar VK, Potdar GG and Salunkhe CB. (2024). The genus *Bothriochloa* (Poaceae: Andropogoneae) in Odisha: with an addition of species *Bothriochloa kuntzeana* (Hack.) Henrard. Vegetos. 38: 1469-1474.

Pattnaik M and Bhatnagar S. (2023). Phytochemical Analysis and Bio Evaluation of *Terminalia racemosa* bark. World Journal of Pharmaceutical research. 13(2): 674-680.

Plants of the World Online (POWO). (2023). The Royal Botanic Gardens, Kew.

Saha A, Hoque A, Mallick SK and Panda A. (2013). Medicinal Uses of Grasses by the Tribal People in West Bengal - An Overview. International Journal of Basic and Applied Sciences. 3(3): 63-70.

Shieh PC, Agoramoorthy G and Kuo DH. (2009). Evaluation of antioxidant Polyphenols in Taiwan's medicinal plants. Asian Journal of Chemistry. 21(7): 5556-5562.

Yadav S and Mishra A. (2020). Ectopic expression of $C_4$ photosynthetic pathway genes improves carbon assimilation and alleviate stress tolerance for future climate change. Physiology and Molecular Biology of Plants. 26(2): 195-209.