# Chapter 10

## Qualitative phytochemical analysis, antibacterial activity and antioxidant potential of *Eriochloa procera* (Retz.) C. E. Hubb.

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**ABSTRACT**

Present study investigated the phytochemical profile, antibacterial efficacy, and antioxidant potential of *Eriochloa procera* whole plant extracts. Qualitative phytochemical screening revealed the presence of tannins, saponins, and reducing sugars across all extracts, while phenolics, flavonoids, and alkaloids were solvent-specific. The hydroethanolic extract exhibited significant antibacterial activity against *Escherichia coli*, with a Minimum Inhibitory Concentration (MIC) of 12.5 mg/mL. Thin Layer Chromatography (TLC)-based antioxidant analysis revealed a prominent antioxidant-active spot (Rf = 0.927). These findings suggest that *E. procera*, although often overlooked as a wild grass species, harbors bioactive compounds with potential therapeutic applications, particularly as antibacterial and antioxidant agents.

Keywords: Phytochemical profile, Antioxidant analysis, Antibacterial agent

## INTRODUCTION

Members of family *Poaceae* infamous as 'grasses' are common occurrence in moist areas and disturbed landscapes. They play a vital ecological role in soil stabilization and erosion prevention (Damor et al., 2021). While often overlooked, grass species serves as supplemental forage for livestock and wild herbivores, demonstrating their importance in both natural and agricultural ecosystems (Boval and Dixon, 2012). Grasses from the Poaceae family are known to harbor bioactive substances including tannins, saponins, and phenolic compounds with antimicrobial and anti-inflammatory properties (Fatima et al., 2018). This suggests that *Eriochloa procera* (Figure 1) may share similar therapeutic potential. Traditionally, certain grasses have also been employed in ethnomedicine, either as decoctions, poultices, or crude extracts to address ailments such as fevers, skin irritations, and digestive disorders (Anand et al., 2022). These practices point toward an underexplored reservoir of pharmacologically active compounds that are often disregarded due to the humble status of grasses as mere fodder or ground cover (Raza et al., 2024). In this context, *E. procera*, though poorly studied, stands out as a candidate worth scientific attention. In recent years, advancements in phytochemical analysis and bioassay-guided screening have allowed researchers to systematically evaluate wild grasses for secondary metabolites with therapeutic relevance (Sapunyo et al., 2023). Investigating the phytochemical diversity and antimicrobial capacity of *E. procera* not only contributes to ethnopharmacological knowledge but also broadens the scope for discovering affordable, plant-based alternatives in combating microbial resistance. Such research highlights how neglected species may hold the key to addressing modern biomedical challenges.

## METHODOLOGY

Whole plants of *Eriochloa procera* were collected from nearby Mahanadi areas of Cuttack district, Odisha, India. The plant species was identified by Dr. Sanjeet Kumar, Ambika Prasad Research Foundation, India. Plants were thoroughly washed under running tap water to remove dust. Further, they were cut into small pieces and macerated with the help of mortar and pestle by using different solvents (n-Hexane, Ethanol and Aqueous) to obtain extract for further experimental analysis (Jena et al., 2025).



Figure 1: Collected sample of *Eriochloa procera*

Qualitative phytochemical analysis, antibacterial activity against *Escherichia coli* and antioxidant analysis was carried out using standard methods (Kumar and Jena, 2014; Pattnaik and Bhatnagar, 2024), with slight modifications to suit the present experimental conditions.

## RESULTS AND DISCUSSION

The qualitative phytochemical screening for the detection of nine secondary metabolites in whole plant extract of *Eriochloa procera* using different solvents confirmed the selective presence of various bioactive compounds (Table 1; Figure 2-4). Tannins, saponins, and reducing sugars were detected across all solvent extracts (n-Hexane, Ethanol, and Aqueous). Phenolic compounds were detected only in the ethanol and aqueous extracts, whereas flavonoids and alkaloids were exclusively observed in the aqueous and ethanol extract respectively. Steroids, terpenoids, and carbonyl compounds were absent in all extracts showcasing broader phytochemical diversity of aqueous and ethanol extracts when compared to n-Hexane. The MIC (Minimum Inhibitory Concentration) results showed that the hydroethanolic extract of whole plant of *E. procera* exhibited strong antibacterial activity against *E. coli*, as no bacterial growth (NG) was observed in any of the tested concentrations (100, 50, 25, and 12.5 mg/mL). This indicates that the extract was effective in completely inhibiting the growth of *E. coli* even at the lowest concentration, showing the Minimum Inhibitory Concentration (MIC) at 12.5 mg/mL (Table 2; Figure 5). The negative control (nutrient broth) showed no growth, confirming sterility, while the positive control (microbial broth without extract) showed growth, confirming bacterial viability. The TLC (Thin Layer Chromatography) assay of the hydroethanolic extract of whole plant of *E. procera* demonstrated antioxidant activity in only one solvent system. A prominent spot with an Rf value of 0.927 was observed in Ethyl acetate: Methanol: Water (40:5.4:1), indicating the presence of antioxidant-related phytochemicals. In contrast, no detectable spots were obtained in when Chloroform: Ethyl acetate: Formic acid (5:4:1) and n-Hexane: Petroleum ether: Ethanol (90:10:1) were used as mobile phases. These results suggest that polar solvent systems are more effective in resolving antioxidant compounds in *E. procera*.

Table 1: Qualitative phytochemical analysis of *Eriochloa procera* (whole plant) using different extracts

| Bioactive compounds | n-hexane | Ethanol | Aqueous |
|---|---|---|---|
| Tannin | Present | Present | Present |
| Saponin | Present | Present | Present |
| Flavonoids | Absent | Absent | Present |
| Terpenoids | Absent | Absent | Absent |
| Phenolic compounds | Absent | Present | Present |
| Reducing sugars | Present | Present | Present |
| Steroids | Absent | Absent | Absent |
| Alkaloids | Absent | Present | Absent |
| Carbonyl compounds | Absent | Absent | Absent |

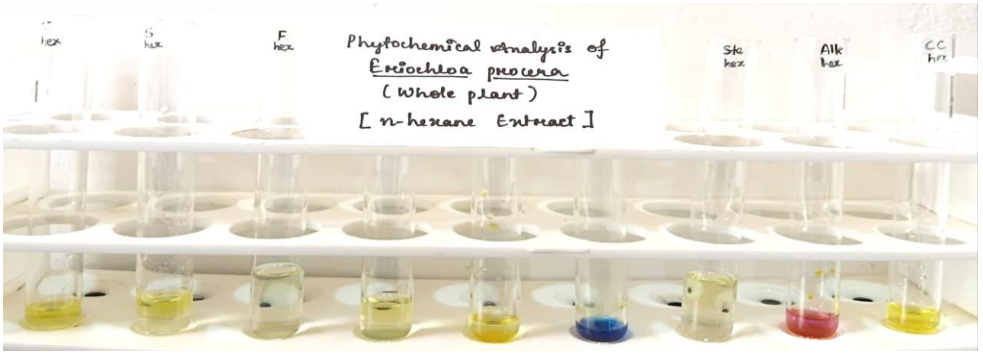



Figure 2: Phytochemical analysis using n-Hexane extract

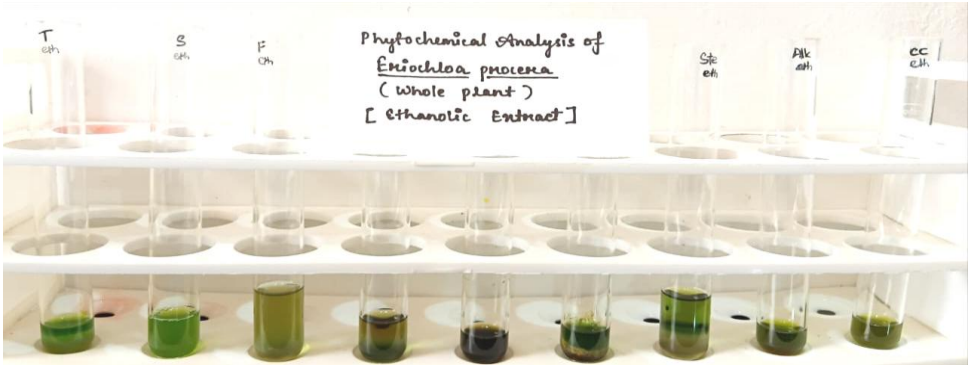



Figure 3: Phytochemical analysis using Ethanolic extract

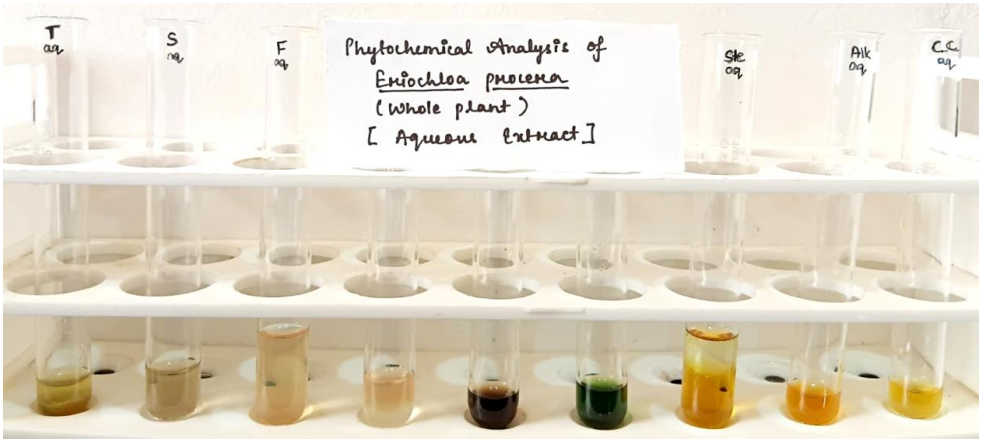



Figure 4: Phytochemical analysis of *Eriochloa procera* (whole plant) using Aqueous extract

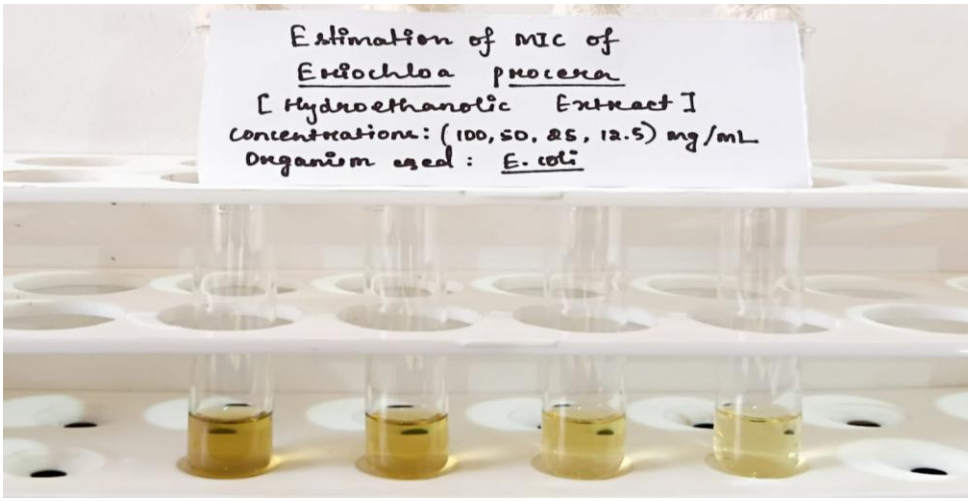



Figure 5: Estimation of Minimum Inhibition Concentration (MIC) against *E. coli*

Table 2: Estimation of Minimum Inhibition Concentration (MIC) of hydroethanolic extract of whole plant of *Eriochloa procera* against *E. coli*

| Extract | Concentration (mg/mL) | | | | MIC (mg/mL) |
|---|---|---|---|---|---|
| | 100 | 50 | 25 | 12.5 | |

| | | | | | |
|---|---|---|---|---|---|
| *Eriochloa procera* | NG | NG | NG | NG | 12.5 |
| Nutrient broth | NG | NG | NG | NG | - |
| Microbial broth | G | G | G | G | - |

(G: Growth of bacteria; NG: No Growth)

Table 3: TLC-based Antioxidant analysis of hydroethanolic flower extract of *Eriochloa procera* using different mobile phases

| | Mobile Phases | Rf value of Spots |
|---|---|---|
| | | S1 |
| Hydroethanolic | Ethyl acetate: Methanol: Water (40: 5.4: 1) | 0.927 |
| | Chloroform: Ethyl acetate: Formic acid (5:4: 1) | - |
| | n-Hexane: Petroleum ether: Ethanol (90:10:1) | - |

(Rf: Retention factor)

*E. procera* is recognized as a wild grass with potential use as fodder, yet it has received little scientific attention compared to other forage species. Research on its nutritional value and bioactive potential remains scarce, making the present findings a first step toward understanding its broader significance.

## CONCLUSION

Present study highlights *Eriochloa procera* as a promising source of natural bioactive metabolites. The consistent presence of tannins, saponins, and reducing sugars, along with solvent-dependent detection of phenolics, flavonoids, and alkaloids, underscores the plant's phytochemical diversity. Its hydroethanolic extract demonstrated notable antibacterial efficacy against *E. coli* and exhibited antioxidant activity in TLC assays, suggesting its potential role in natural medicine and drug discovery. Further fractionation

and characterization of active compounds, alongside broader pharmacological screening, are recommended to establish its medicinal significance and practical applications.

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