

Chapter 4

Phytochemistry and Antimicrobial activity of *Croton bonplandianus* (Euphorbiaceae)

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ABSTRACT

Present study investigated the phytochemical composition and antimicrobial activity of the hydroethanolic extract of *Croton bonplandianus* apical parts. Qualitative phytochemical analysis revealed the presence of tannins, saponins, phenolic compounds, reducing sugars, and alkaloids. The extract exhibited antimicrobial activity against *Escherichia coli*, with a minimum inhibition concentration (MIC) of 100 mg/mL. Thin layer chromatography (TLC) analysis using different mobile phases showed distinct separation of compounds with R_f values ranging from 0.9 to 0.98. These findings suggest the potential of *C. bonplandianus* as a source of bioactive compounds with antimicrobial properties, warranting further research into its therapeutic applications.

Keywords: Bioactive compounds, medicinal plants, pharmacology

INTRODUCTION

Croton bonplandianus is a plant species known for its medicinal properties and potential therapeutic applications (Baliyan and Sharma, 2025). In traditional medicine, various parts of the plant are used to treat different

ailments, highlighting its importance in folk remedies (Basak et al., 2021). Phytochemical analysis of plants like *Croton bonplandianus* can reveal the presence of bioactive compounds with potential therapeutic properties. These compounds can include alkaloids, flavonoids, phenolic compounds, and others, each with unique biological activities (Chandrashekar et al., 2025). By identifying and characterizing these compounds, researchers can better understand the plant's medicinal properties and explore its potential applications (Jena et al., 2025). The growing concern over antimicrobial resistance has led to increased interest in plant-based antimicrobial agents (Jena et al., 2024). *C. bonplandianus*, with its reported medicinal properties, is a promising candidate for investigation (Baliyan and Sharma, 2025). Present study aims to evaluate the phytochemical composition and antimicrobial activity of the plant's apical parts, contributing to the understanding of its therapeutic potential and supporting the development of natural, plant-based remedies.



Figure 1: Collected apical part sample of *Croton bonplandianus*

METHODOLOGY

Apical part of *C. bonplandianus* were collected from nearby Mahanadi areas of Cuttack district, Odisha, India (Figure 1). The plant species was identified by Dr. Sanjeet Kumar. Collected parts 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 hydroethanolic solvent to obtain extract for further experimental analysis. Phytochemical screening was carried out using standard method (Kumar and Jena, 2014). Antibacterial activity was done against *Escherichia coli* (MTCC 45) using standard method (Kumar et al., 2013). Chromatographic analysis was carried out using standard methods to evaluate the secondary metabolites (Kumar and Jena, 2014).

RESULTS AND DISCUSSION

The qualitative phytochemical screening for the detection of nine secondary metabolites in hydroethanolic apical part extract of *C. bonplandianus* confirmed the selective presence of five bioactive compounds *i.e.* Tannin, Saponin, Phenol, Alkaloid and Reducing sugars (Table 1; Figure 2). The MIC results show that the hydroethanolic extract of apical part of *C. bonplandianus* inhibited *E. coli* growth at the highest given concentration establishing MIC at 100 mg/mL with visible growth at all the lower concentrations (50, 25 and 12.5 mg/mL). The negative control (nutrient broth) showed no growth, confirming sterility, while the positive control (microbial broth without extract) showed growth, confirming bacterial viability (Table 2). The TLC analysis of the hydroethanolic apical part extract of *C. bonplandianus* using different mobile phases showed single, high R_f spots in all three solvent systems, with values ranging from 0.9 to 0.98 (Table 3).

Table 1: Qualitative phytochemical analysis of apical part of *Croton bonplandianus* using hydroethanolic extract

Bioactive compounds	Hydroethanolic extract
Tannin	Present
Saponin	Present

Flavonoids	Absent
Terpenoids	Absent
Phenolic compounds	Present
Reducing sugars	Present
Steroids	Absent
Alkaloids	Present
Carbonyl compounds	Absent

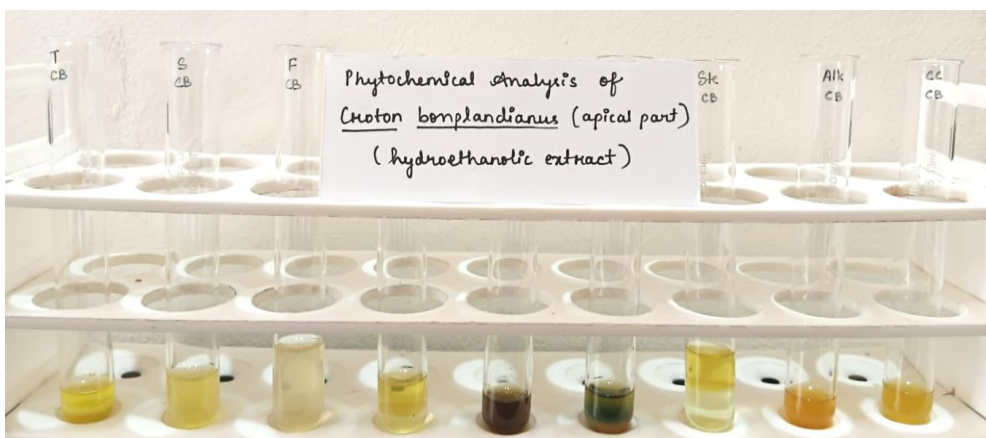


Figure 2: Detection of secondary metabolites

Table 2: Estimation of Minimum Inhibition Concentration (MIC) of hydroethanolic apical part extract of *Croton bonplandianus* against *E. coli*

Extract	Concentration (mg/mL)				MIC (mg/mL)
	100	50	25	12.5	
<i>Croton bonplandianus</i> (Apical part)	NG	G	G	G	100
Nutrient broth	NG	NG	NG	NG	-
Microbial broth	G	G	G	G	-

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

Table 3: TLC analysis of hydroethanolic apical part extract of *Croton bonplandianus* using different mobile phases

Hydroethanolic	Mobile Phases	Rf value of Spots
		S1
	Methanol: Chloroform (1:1)	0.9
	Ethyl acetate: Water: Acetic acid (8:1:1)	0.95
	Ethyl acetate: Chloroform (1:9)	0.98

(Rf: Retention factor)

C. bonplandianus has been also reviewed by Ghosh et al. (2018) to be used traditionally for curing gastro intestinal disorders, cold, cough, lungs infection, bronchitis, asthma, and hepatic problems. Its leaf extract was also used for treatment of cancer, venereal diseases, and ulcer.

CONCLUSION

Present study demonstrates the potential of *Croton bonplandianus* apical parts as a source of bioactive compounds with antimicrobial properties. The presence of tannins, saponins, phenolic compounds, reducing sugars, and alkaloids, along with the observed antimicrobial activity against *E. coli*, highlights the therapeutic potential of this plant. Further research is warranted to isolate and characterize the specific compounds responsible for this activity, as well as to explore their applications in traditional medicine and modern healthcare.

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