

Chapter 7

Phytochemical and toxicity evaluation of seeds of *Trichosanthes costata*

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Abstract: This study investigated the phytochemical composition and cytotoxic activity of *Trichosanthes costata* seeds. Phytochemical analysis revealed the presence of tannins, saponins, phenolic compounds, and reducing sugars in the hydroethanolic extract. The extract exhibited potent cytotoxic activity, with 100% mortality of nauplii at all concentrations tested. These findings suggest that *T. costata* seeds may be a valuable source of natural compounds with potential therapeutic applications.

Keywords: Cucurbits, secondary metabolites, unexplored plants

INTRODUCTION

The search for new and effective therapeutic agents from natural sources has been an ongoing endeavour, driven by the need to address various health challenges

(Dzobo, 2022; Hossain et al., 2025). Plants have been a rich source of bioactive compounds, with many modern medicines derived from plant-based sources (Kumar and Satapathy, 2011; Kumar et al., 2017; Sahoo et al., 2021; Jena et al., 2024; Devi et al., 2024; Jena et al., 2025). However, despite the vast array of plants available, many remain unexplored for their medicinal potential (Kumar and Dash, 2012; Das et al., 2020; Das et al., 2022; Devi et al., 2022; Mishra et al., 2022; Saha et al., 2022; Agarwal et al., 2023; Nayak and Kumar, 2023). Screening new and unexplored plants can lead to the discovery of novel compounds with therapeutic properties, providing new avenues for the treatment and management of diseases (Kumar et al., 2013; Nayak et al., 2021; Sahu et al., 2024). In this context, wild cucurbits can be a good selection. Among the wild cucurbits, *Trichosanthes costata*, is an unexplored plant (Figure 1). Less work is carried out using different parts of *T. costata*. Therefore, seeds of this plant are selected for the present work. The present study aims to contribute to the understanding of the medicinal potential of *T. costata* by examining its phytochemical profile and cytotoxic activity, to identify potential therapeutic applications.

MATERIALS AND METHODS

Seeds of *T. costata* were collected from Cuttack district, Odisha (Figure 2). The plant species was identified by the authors using published literature (Kumar et al., 2022). The Soxhlet extraction method was adopted using hydroethanolic extract for phytochemical analysis (Devi et al., 2023; Marndi et al., 2024; Jena et al., 2024). For toxicity analysis, hatching of Brine cysts was the initial process. Standardization of the optimum was done at 2.0, 3.5, and 5.0 % saline concentration to check the optimum salinity for proper hatching of Brine shrimp (*Artemia salina*) cysts (Kumar et al., 2012). The brine shrimp cysts are then incubated in 3.5% saline water with proper aeration, room temperature between 28-35°C and light for 48 hours. Proper hatching could be observed within 24-48

hours, depending upon the quality of cysts, proper aeration, and light provided. Different concentrations (12.5 mg/ml, 25 mg/ml, 50 mg/ml, 100 mg/ml, and 200 mg/ml) of the seed extracts were taken, and 3.5% saline water was used to make the volume 2 ml in each test tube. 1% DMSO was used to dissolve the crude extracts. Ten nauplii were selected and introduced to five test tubes of the extracts. Positive and negative controls were prepared using vincristine sulphate (5 mg/ml) and 3.5% saline water, respectively, with a volume of 2 ml. The live larvae are highly mobile and thus differentiate from the unhatched cysts. The survivor nauplii were counted and analysed for the death percentage (Kumar et al., 2012).

RESULTS AND DISCUSSION

The phytochemical analysis of *T. costata* seeds revealed the presence of tannins, saponins, phenolic compounds, and reducing sugars in the hydroethanolic extract. Conversely, flavonoids, terpenoids, steroids, alkaloids, and carbonyl compounds were not detected (Table 1). The cytotoxicity analysis demonstrated that the hydroethanolic extract exhibited potent cytotoxic activity, with 100% mortality of nauplii at all concentrations tested (12.5-200 mg/ml). This cytotoxic effect was comparable to the positive control, vincristine sulphate, indicating the extract's potential as a source of bioactive compounds with therapeutic applications (Table 2).

Table 1: Phytochemical analysis of seeds of *Trichosanthes costata* using hydroethanolic extract

Bioactive compounds	Hydroethanolic extract
Tannin	+ve
Saponin	+ve
Flavonoids	-ve
Terpenoids	-ve
Phenolic compounds	+ve
Reducing sugar	+ve

Steroids	-ve
Alkaloids	-ve
Carbonyl compounds	-ve

(+ve: Presence; -ve: Absence)

Table 2: Cytotoxicity analysis of seeds of *Trichosanthes costata* using hydroethanolic extract

Extract	Concentration (in mg/ml)	Initial number of Nauplii	Number of deaths of Nauplii	Death rates (%)
			After 1 hour	
Hydro-ethanolic extract	12.5	10	10	100
	25	10	10	100
	50	10	10	100
	100	10	10	100
	200	10	10	100
	3.5% Saline	10	0	0
	Vincristine sulphate	10	10	100

Kumar et al., 2017 detected saponins, phenolic compounds, flavonoids, tannins, glycosides, etc., and evaluated anti-bacterial activity against human pathogenic bacteria (*Streptococcus mutans*, *S. pyogenes*, *Vibrio cholerae*, *Shigella flexneri*, and *Salmonella typhi*) by agar well diffusion (AWD), disc diffusion (DD), and broth dilution methods. Saradar et al., 2024, worked on the phytochemical analysis of *T. costata* fruits and reported the presence of bioactive compounds like tannins, saponins, flavonoids, phenols, reducing sugar, etc., using three different extracts. Tambe et al., 2025 have documented a range of secondary metabolites found in *T.*

costata flowers, along with toxicity analysis of the plant using the brine shrimp lethality assay.



Figure 1: Habitat of *T. costata*



Figure 2: Collection of seeds of *T. costata* for experimental work

CONCLUSION

Hydroethanolic extract of *Trichosanthes costata* seeds exhibits potent cytotoxic activity, likely due to the presence of bioactive compounds such as tannins, saponins, and phenolic compounds. These findings suggest that *T. costata* seeds may be a valuable source of natural compounds with potential therapeutic applications, warranting further investigation and characterization.

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