

Chapter 5

Phytochemical and toxicity evaluation of flowers of *Trichosanthes costata* Blume (Cucurbitaceae)

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Abstract: *Trichosanthes costata* flowers were analysed for their secondary metabolites and cytotoxic activity. Phytochemical screening revealed the presence of tannins, saponins, flavonoids, terpenoids, phenolic compounds, and reducing sugars. Cytotoxicity analysis using brine shrimp lethality assay showed that the hydroethanolic extract of the flowers exhibited significant cytotoxic activity, with a 100% death rate at concentrations ranging from 12.5 to 200 mg/mL after 24 hrs. The findings of the study suggest that *T. costata* flowers may possess potential anticancer properties and further there is a need of more advance works in this aspect. Study also highlights the importance of less known medicinal plants in the development of future drug formulations & to minimize the impacts of antimicrobial resistance.

Keywords: Bioactive compounds; climbers; Cucurbitaceae; secondary metabolites

INTRODUCTION

Trichosanthes costata Blume (Figure 1) is a wild climber belonging to the Cucurbitaceae family, commonly found near forest fringes and tribal villages. It comes under less known medicinal plants. Its plant parts have pharmacological values (Singh and Kumar, 2024). Kumar et al., (2017) reported the antibacterial activity of leaf extracts of this plant against *Streptococcus mutans*, *S. pyogenes*, *Vibrio cholerae*, *Shigella flexneri* and *Salmonella typhi*. Recently, Saradar et al., (2024) documented the bioactive compounds of fruits of *T. costata*. Previous studies have overlooked the flowers of *T. costata* for phytochemical and cytotoxicity analysis. Present study seeks to fill this knowledge gap by examining the bioactive compounds and cytotoxic properties of *T. costata* flowers, (Figure 1) potentially unlocking their value as a source of novel therapeutic agents. The findings of present research will provide foundational data for developing future drugs against deadly diseases and antimicrobial resistance.



Figure 1: Flowers of *T. costata*

MATERIALS AND METHODS

The flowers of *T. costata* were collected from the Khordha district of Odisha, India. The plant species was identified by the authors and a specimen was submitted at APRFH (Figure 2). The Soxhlet extraction method was adopted using different solvents 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 flower 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 survivor nauplii were counted and analysed the death percentage (Kumar et al., 2012).

RESULTS AND DISCUSSION

The hydroethanolic extract of *T. costata* flowers was found to contain various secondary metabolites (Table 1). The cytotoxic activity of the hydroethanolic extract of *T. costata* flowers was evaluated using the brine shrimp lethality assay (Table 2). The hydroethanolic extract exhibited significant cytotoxic activity, with a 100% death rate at concentrations ranging from 12.5 to 200 mg/mL (Figure 3). The positive control, vincristine sulphate, also showed 100% cytotoxicity, while the negative control, 3.5 % saline, showed no cytotoxicity.

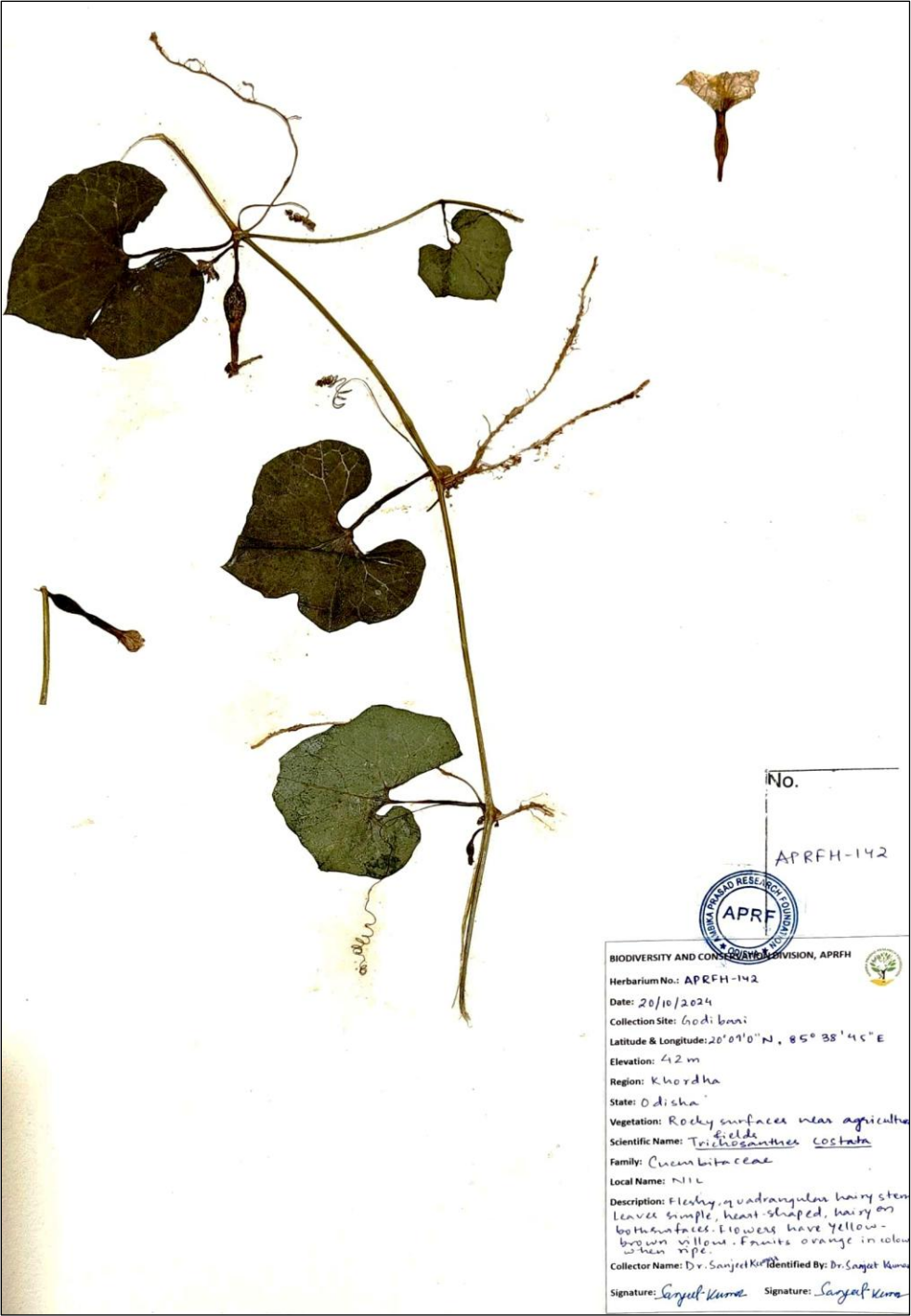


Figure 2: Herbarium specimen of *T. costata*

The present study investigated the phytochemical constituents and cytotoxic activity of *T. costata* flowers. The phytochemical screening revealed the presence of various bioactive compounds, including tannins, saponins, flavonoids, terpenoids, phenolic compounds, and reducing sugars. These compounds have been reported to possess various biological activities (Kumar et al., 2013; Sahoo et al., 2021; Devi et al., 2024).

It is suggested that the extract possesses potential anticancer properties, which may be attributed to the presence of detected bioactive compounds. Further studies are needed to isolate and characterize the bioactive compounds present in *T. costata* flowers and to evaluate their anticancer activity *in-vitro* and *in-vivo*.

Table 1: Phytochemical analysis of flowers 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: Present; -ve: Absent)

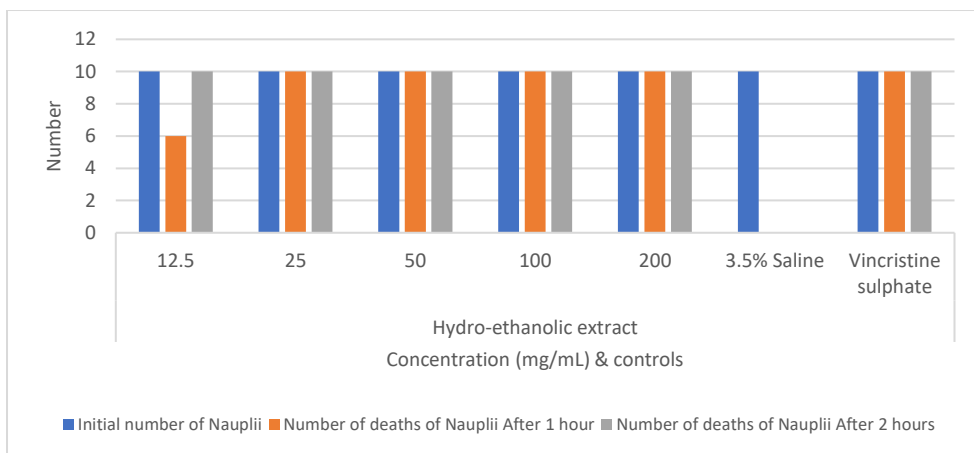


Figure 3: Cytotoxicity analysis of flowers of *T. costata*

Table 2: Cytotoxicity analysis of flowers of *T. costata* using hydroethanolic extract

Extract	Concentration (in mg/ml)	Initial number of Nauplii	Number of deaths of Nauplii		Death rates (%)
			After 1 hour	After 2 hours	
Hydro-ethanolic extract	12.5	10	6	10	100
	25	10	10	10	100
	50	10	10	10	100
	100	10	10	10	100
	200	10	10	10	100
	3.5% Saline	10	0	0	0
	Vincristine sulphate	10	10	10	100

CONCLUSION

Present study reveals that *Trichosanthes costata* flowers are rich in bioactive compounds and exhibit substantial cytotoxic activity. The observed cytotoxic effects may be attributed to the presence of these bioactive compounds. Our findings suggest that *T. costata* flowers hold promise as a potential source of anticancer agents, warranting further in-depth investigation to fully explore their therapeutic potential.

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