

Chapter 8

Phytochemical evaluation of fruits of *Trichosanthes costata* Blume: a medicinal cucurbit of India

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Abstract

Trichosanthes costata is a perennial climbing plant that has been consumed as a vegetable. The fruits are thought to be poisonous, but they are also recorded as being used as a condiment. The plant is being used as food and medicine for the treatment of ophthalmia, rheumatism, tetanus, snakebite, etc. These hearsay tribal claims have not been validated until now. The population of this plant is being threatened by the negligence of people. Therefore, observing the declining population of this plant, an attempt has been made to document the bioactive secondary metabolites through phytochemical screening of the plant, *T. costata*, using three different extracts (aqueous, ethanol, and methanol). The results showed the presence of tannins, saponins, phenolic compounds, flavonoids, and reducing sugars in different extracts of *T. costata*. The results indicated the anti-inflammatory and anti-rheumatic properties of the plants, along with their ability to treat eyesight problems. Therefore, the plant should be conserved and cultivated in larger amounts.

Keywords: Wild cucurbits, *Trichosanthes costata*, phytochemical screening, bioactive compounds, conservation, cultivation

Introduction

The evidence of cultivation and domestication of plants and animals was observed between 12,000-10,000 years ago (Chomicki et al., 2020). The cultivation provided a sustainable need for nutrition. Early cultivation practices have set the list of crops for cultivation from generation to generation. Among the early cultivation and usage of plants, cucurbits stand as old stone age food and life stuff. Later, ancient people also learned to use them as medicinal agents and for various domestic purposes.

Due to deforestation, urbanization, availability of easy food, and modern medicinal agents, the usage of such plants for day-to-day purposes is going to be erased. In this scenario, documentation of unexplored plants like cucurbits already explored by early people is an important task (Kumar et al., 2017). Keeping this in view, qualitative phytochemical screening of the fruits of *Trichosanthes costata* was carried out to draw attention to its pharmacological potential. The climber generally grows in the wild, on rocky hill roadsides (Fig. 1). The branches are weak with a fleshy quadrangular hairy stem. The leaves are simple, alternating, heart-shaped, sharp, hairy on both sides, and have serrated margins. The leaf blade has an ovate-heart shape, is membranous, and has five angular or three lobes, with a larger, triangular center lobe. Both surfaces are rough, and the tip is long-pointed (Fig. 2). The axillary umbel racemose male flowers have a faint smell, thin peduncles, leaf-like bracts that are yellow-brown villous and have three lobes; the corolla is white with segments that are oblong-ovate, the calyx tube is tubular and elongate, the filaments are about 0.5 mm, and the anthers are about 7 mm (efloraofindia.com). The solitary female flowers have stalks measuring 2-4 cm, an ovary that is oblong, yellow-brown villous, and sharp at both ends. The style is 6-8 mm, and there are three stigmas (Fig. 3). The fruit has an orange hue, is 4-5 cm long, smooth, has 10 ribs, and is pointed on both ends (Fig. 4-5). The blunt, oblong seeds are found on both ends (flowersofindia.net).

Methodology

Collection of plant parts and extraction

The fruits of *T. costata* were collected for experimental works from the CDA Sector-13 area, Cuttack district, Odisha state in August 2024. The senior author identified the plant. The Soxhlet extraction method was adopted for phytochemical analysis using different solvents (Kumar et al., 2012; Kumar et al., 2013). Phytochemical analysis was conducted to detect nine secondary metabolites using standard methods (Dwibedy et al., 2015; Murmu et al., 2016; Kumar et al., 2017; Sahoo et al., 2021; Aradhana et al., 2022; Singh et al., 2022; Devi et al., 2023; Marndi et al., 2024; Verma et al., 2024).



Figure 1: Habitat of *Trichosanthes costata*



Figure 2: Whole plant of *Trichosanthes costata*



Figure 3: Flower bud of *Trichosanthes costata*



Figure 4: Fruit of *Trichosanthes costata*



Figure 5: Ripen fruit *Trichosanthes costata*

Results and discussion

Phytochemical screening of the fruits of *T. costata* showed the presence of tannins, saponins, phenolic compounds, and reducing sugars in 3 different solvents viz., aqueous, ethanol, and methanol. It was also noticed that flavonoids were present in the aqueous and methanol extracts of the *T. costata* fruits along with the detection of terpenoids only in the methanol extract of the *T. costata* fruits (**Table 1**). Some researchers have worked on the plant to document the phytochemical potential of the plant. The evaluation of the medicinal values of *Gymnopetalum chinense* has been done by performing phytochemical and anti-microbial analysis of the leaves of the plant to screen new bioactive compounds to fight against ailments and development of new drugs (**Kumar et al., 2017**). Apart from some of this research, there has not been many works on this plant, therefore, it is necessary to work on different plant parts and bring out the pharmacological potential of the plant.

Table 1: Phytochemical screening of secondary metabolites using different extracts of fruits of *T. costata*

Bioactive compounds	Aqueous	Ethanol	Methanol
Tannin	Positive	Positive	Positive
Saponin	Positive	Positive	Positive
Flavonoids	Positive	Negative	Positive

Terpenoids	Negative	Negative	Positive
Phenolic compounds	Positive	Positive	Positive
Reducing sugar	Positive	Positive	Positive
Steroids	Negative	Negative	Negative
Alkaloids	Negative	Negative	Negative
Carbonyl compounds	Negative	Negative	Negative

Conclusion

Presence of tannins, saponins, flavonoids, terpenoids, phenolic compounds, and reducing sugars in 3 different extracts of the fruit extract of *T. costata* indicates the pharmacological potential of the plant. The deseeded unripe fruits of *T. costata* are used as a condiment and the leaves are used as a vegetable. The plant is used against rheumatism, tetanus, ophthalmia, etc. and this has not been validated till now. The results of the study contribute to the validation of the claims by documenting anti-inflammatory, anti-rheumatic, anti-microbial, etc. properties of the plant.

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