Chapter 9

Pharmacological values of flowers of *Martynia annua* L. (Martyniaceae)

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ABSTRACT

Unlocking the secrets of nature's pharmacy, present study sheds light on the phytochemical profile and antimicrobial properties of *Martynia annua* flowers. The present analysis revealed a rich presence of bioactive compounds, including tannins, saponins, and phenolic compounds, which may hold the key to novel therapeutic applications. The hydroethanolic extract exhibited antibacterial activity against *Escherichia coli* and the identification of specific compounds through TLC (Thin Layer Chromatography) analysis suggests potential medicinal properties. Present study paves the way for further exploration of *M. annua* flowers as a valuable resource for traditional medicine and modern drug discovery.

Keywords: Antibacterial activity, bioactive compounds, traditional medicine

INTRODUCTION

Though native to tropical America, *Martynia annua* popularly known as Tiger's claw or Devil's claw has been widely naturalized in India for centuries and gradually became a part of local traditions and folk practices (Gupta and Deogade, 2020). In many rural areas, where access to formal

healthcare was once limited, the plants served as household remedies. *M. annua* flowers were boiled into soothing decoctions for coughs, throat infections, and respiratory troubles, while pastes from the leaves were applied to wounds, skin eruptions, and painful swellings (Gupta and Deogade, 2018). Fruits and seeds, though bitter, were used for easing inflammation and joint pain (Kaushik et al., 2021). These practices reveal how generations relied on *M. annua* as a simple but trusted aid in daily life.Plants also contributes indirectly to human well-being through their ecological interactions. The nectar-rich flowers attract bees, butterflies, and other pollinators, helping sustain insect populations that are vital for agriculture and food production (Nepi et al., 2018). Secondary metabolites play a vital role in traditional medicine, as they are responsible for the therapeutic properties of many plants (Hossain et al., 2025). In the context of modern drug discovery due to increasing global demand for plant-based medicines and the rise of antibiotic resistance, natural products are being reconsidered as important candidates for pharmaceutical development (Nasim et al., 2022). The study of *M. annua* flowers, therefore, not only validates the ethno-medicinal claims associated with the plant but also opens avenues for isolating new phytoconstituents that may play a role in designing drugs against microbial infections, inflammation, and other chronic diseases (Anand et al., 2019). Thus, the plant stands at the intersection of traditional wisdom and modern biomedical research.

METHODOLOGY

Flowers of *Martynia annua* were collected from nearby Mahanadi areas of Cuttack district, Odisha, India (Figure 1). The plant species was identified by Dr. Sanjeet Kumar, Ambika Prasad Research Foundation, India. Flowers 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. Antibacterial activity was done against *Escherichia coli* (MTCC 45) using standard method. Chromatographic analysis was carried out using standard methods to evaluate the secondary metabolites (Kumar and Jena, 2014; Marndi et al., 2024; Chandrashekar et al., 2025).



Figure 1: Collected inflorescence of *Martynia annua*

RESULTS AND DISCUSSION

The qualitative phytochemical screening for the detection of nine secondary metabolites in hydroethanolic flower extract of *Martynia annua* confirmed the selective presence of some bioactive compounds i.e. Tannin, Saponin, Phenol and Reducing sugars (Table 1; Figure 2). The hydroethanolic flower extract of *Martynia annua* 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. 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, Figure 3). The TLC analysis

of the hydroethanolic extract of *Martynia annua* flowers using different mobile phases revealed variations in compound separation efficiency. No spot was observed with the methanol: chloroform (1:1) system. In contrast, both ethyl acetate: water: acetic acid (8:1:1) and ethyl acetate: chloroform (1:9) systems produced a prominent spot with an Rf value of 0.985 (Table 3).

Table 1: Qualitative phytochemical analysis of flowers of *Martynia annua* using hydroethanolic extract

Bioactive compounds	Hydroethanolic extract
Tannin	Present
Saponin	Present
Flavonoids	Absent
Terpenoids	Absent
Phenolic compounds	Present
Reducing sugars	Present
Steroids	Absent
Alkaloids	Absent
Carbonyl compounds	Absent

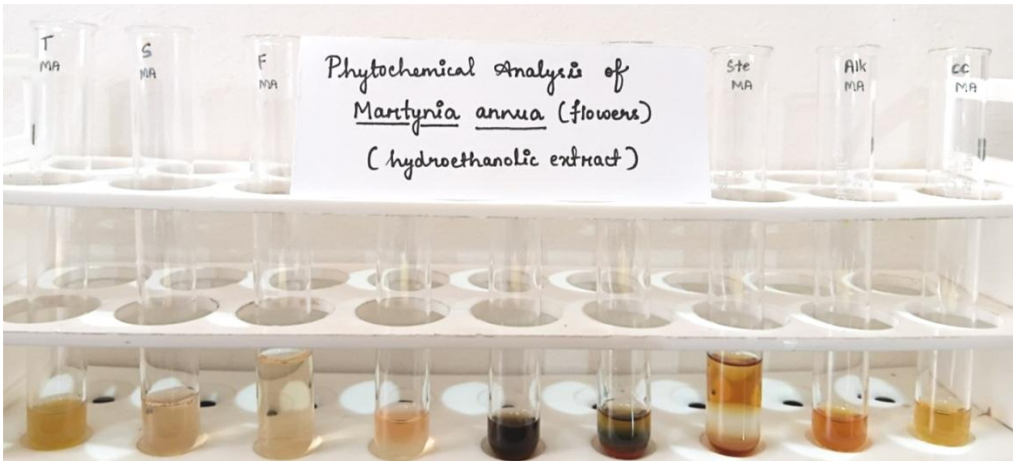


Figure 2: Detection of secondary metabolites

Table 2: Estimation of Minimum Inhibition Concentration (MIC) of hydroethanolic flower extract of *Martynia annua* against *E. coli*

Extract	Concentration (mg/mL)	MIC (mg/mL)

	100	50	25	12.5	
Martynia annua	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)

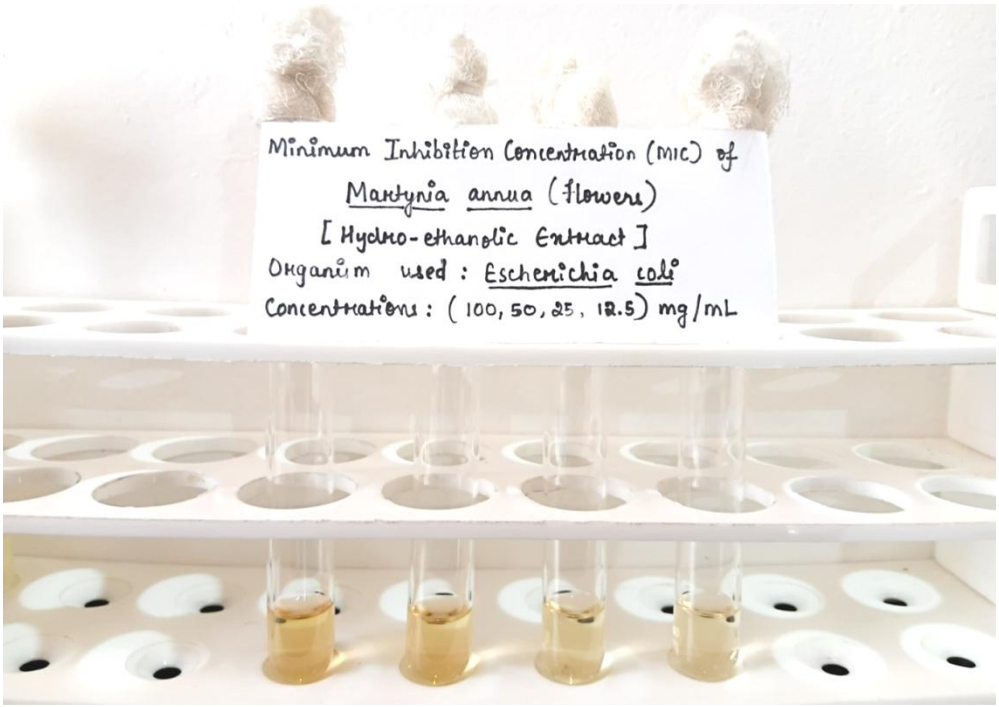


Figure 3: Estimation of Minimum Inhibition Concentration against *E.coli* bacteria

Table 3: TLC analysis of hydroethanolic flower extract of *Martynia annua* using different mobile phases

Hydroethanolic	Mobile Phases	Rf value of Spots
		S1

	Methanol: Chloroform (1:1)	Nil
	Ethyl acetate: Water: Acetic acid (8:1:1)	0.985
	Ethyl acetate: Chloroform (1:9)	0.985

(Rf: Retention Factor)

Acetone leaf extracts of *Martynia annua* has been reported by Sermakkani and Thangapandian, (2010) to show active antimicrobial action against *Klebsiella pneumoniae, Proteus mirabilis, and Proteus vulgaris*. Kenwat et al., (2013) documented *M. annua* to be used in Indian traditional medicine in treatment of diseases like epilepsy, inflammation, tuberculosis, sore throat, and in wound healing. Also, acetone extracts of *M. annua* leaves has been reported to show the presence of alkaloids, tannins, saponin, glycosides, flavonoids, anthocyanin, amino acid, steroids, and phenols. While, the ethanolic extract of *M. annua* contain flavonoids (Lodhi et al., 2016). Phytochemical screening executed by Kalaichelvi and Dhivya, (2016) of acetone, petroleum ether, ethanolic and aqueous extract of *M. annua* leaves indicated the presence Alkaloids, Saponinis, Tannins, Amino acids, Flavanoids and Terpenoids. Agar well diffusion of Ethanolic extract showed maximum zone of inhibition i.e. 30mm at 100 µg/mL against *Staphylococcus aureus* followed by *Klebsiella pneumonia* (29 mm), *Bacillus subtilis* and *Proteus mirabilis* (28 mm). The fruit of *M. annua* has been documented by Gupta and Deogade, (2018) to be used as local sedative and antidote for scorpion stings, venomous bites, and stings. Seed powder is also administered for treating Asthma and Itching in folk medicine. Kaushik et al., (2021) reported the presence of flavonoids, terpenoids, saponins, tannins, steroids, glycosides, proteins, carbohydrates, amino acids and polysaccharides in ethanolic fruit extract of *M. annua*. Verma et al., (2021) investigated the ethyl acetate extract of *Martynia annua* fruits and its phytochemical analysis confirmed the presence of alkaloids, steroids, carbohydrates, fat, volatile oil, tannin, flavonoid and phenolic compound.

The TLC results showcased the Rf value of Alkaloids, steroid, carbohydrates, tannin and Phenol to be 0.97, 0.41, 0.30, 0.82 and 0.84, respectively. The whole plant of *M. annua* has been reviewed to be used by Santal tribe in treatment of fever, scabies, sores, hair loss, and carbuncles on the back by Sharma et al., (2024). The above documentation highlights the pharmacological values of this plant.

CONCLUSION

Present study provided valuable insights into the secondary metabolites of *Martynia annua* flowers. The hydroethanolic extract exhibited antimicrobial activity against *Escherichia coli* and the identification of specific bioactive compounds through TLC analysis suggests potential medicinal properties. These findings suggest that *M. annua* flowers may possess medicinal properties worthy of further exploration, and additional researches are needed to fully elucidate their therapeutic potential and applications in traditional medicine and beyond.

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