

**PHYTOCHEMICAL COMPOSITION, ANTIMICROBIAL AND HEMOLYTIC
ACTIVITY OF *SOLANUM TRILOBATUM* LINN**

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Summary

In this study, *Solanum trilobatum* leaves and stem were screened for the presence of major phytochemical groups. Different organic extracts (n-butanol, methanol and chloroform) of *S. trilobatum* leaf and stem were screened for antimicrobial and hemolytic activity. Antimicrobial activities of these extracts were performed by agar well diffusion method. Hemolytic activity towards human erythrocytes was screened by blood agar plate method. Phytochemical screening showed the presence of carbohydrates, saponins, phytosterols and tannins in leaf, whereas, stem possess carbohydrates, saponins, phytosterols, tannins, flavonoids and cardiac glycosides as major phytochemical groups. The n-butanol extract revealed high antibacterial activity than that of methanol and chloroform extracts. No hemolytic activity observed towards the human erythrocytes. Based on these results we concluded that *S. trilobatum* possess high antimicrobial activity and can used for the isolation of antimicrobial compounds.

Keywords: Antimicrobial; hemolytic; phytochemical groups

INTRODUCTION

Multidrug resistance is an emerging problem in healthcare industry, as various pathogenic microbes are reported to develop resistance towards the wide variety of drugs. These multi drug resistant organisms are very lethal and difficult to treat. Infection rate and the severity of the multi drug resistant organisms are very high in immunocompromised patients. To overcome these problems, discovery and development of new drug molecules are very essential.

Plants are one of the major groups which support a new drug production. The native systems of medicine like Ayurveda and Siddha plays an important role in the human health care system in India and also suggested to increase the natural resistance of the body to diseases¹. This system uses plants to treat various diseases from Ancient times². Medicinal plants are known for their extensive production of bioactive compounds which are responsible for the inhibition of growth of microorganisms.^{3,4}

S. trilobatum belongs to the family *Solanaceae* and distributed throughout the southern parts of India. *S. trilobatum* is reported to cure numerous diseases viz., tuberculosis, respiratory problems and bronchial asthma. *S. trilobatum* was reported to harbour hepatoprotective activity, antimicrobial activity,^{5,6} larvicidal activity⁷, antidiabetic activity, cytotoxic activity and anticancer activity⁸. The leaves and stem of *S. trilobatum* are reported to possess antimutagenic⁹ anti-inflammatory¹⁰ and anti ulcerogenic properties¹¹. The leaf extracts are used to increase male fertility and to cure snake poison¹². *S. trilobatum* contains chemical compounds like Solanone, β - solamarine, solanine, solasodine, glycoalkaloid and diosgenin and tomatidine. Phytochemical analysis of the whole plant of *S. trilobatum* particularly the leaves suggests the presence of various phytochemical compounds such as carbohydrates, flavonoids, saponins, phytosterols and tannins. The pharmacological uses of *S. trilobatum* might be because of the presence of these phytochemicals. Therefore, the present study was carried out to explore the antimicrobial activity and Hemolytic activity of *S. trilobatum* leaves and stem extracts against clinical isolates.

MATERIAL AND METHODS

PLANT MATERIAL

S. trilobatum was collected from the natural population growing in Amirthi forest, Vellore, TN, India. The Plant was identified with the help of a botanist. The plant samples were brought to Molecular and Microbiology Research Laboratory, VIT University, Vellore, Tamil nadu, India.

PROCESSING OF PLANT

The leaves and stem of *S. trilobatum* were collected and washed thoroughly in distilled water and shade dried at room temperature. Dried leaves and stem samples were uniformly ground using mechanical grinder to make fine powder. The powder was serially extracted in n-butanol, methanol and chloroform using a Soxhlet apparatus. These extracts were concentrated at 40°C under reduced pressure (72 mbar) with a Rotary evaporator and dried using lyophilizer. Dried extract were collected in air tight container and stored at 4°C up for further use.

PHYTOCHEMICAL SCREENING

Phytochemical screening of *S. trilobatum* leaf and stem was carried out using the standard protocols as described by JB Harborne.¹³

ANTIMICROBIAL ACTIVITY

TEST MICROORGANISM

The following clinical isolates were used in the study: *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Escherichia coli*. All the isolates were maintained on nutrient agar plates.

ANTIBACTERIAL ASSAY

Antibacterial activity of the crude extracts was determined by the agar well diffusion method. All the test organisms were inoculated in nutrient broth (pH 7.4.) for 8 hours. The Concentration of the suspensions was adjusted to 0.5. The bacterial isolates were seeded on Mueller Hinton agar plates by using sterilized cotton swabs. Agar surface was bored by using sterilized gel borer (6 mm diameter) to make wells. Hundred μl of test extracts (1000 $\mu\text{g}/\text{ml}$) was added to the well and 100 μl of sterilized distilled water served as control. The standard antibiotic discs were placed on the agar surface as positive control. Plates were incubated at 37°C for 48 hours.^{14, 15}

HEMOLYTIC ACTIVITY

Hemolytic activity was carried out by using blood agar plate method. The leaves and stem extracts (n-butanol, methanol and chloroform) were used to detect the hemolytic activity. The blood agar plates were prepared by adding human blood (5%) to blood agar base. Wells were punched on the blood agar surface by using a gel borer. The plant extracts were prepared 1000 $\mu\text{g}/\text{ml}$ concentration and a volume of 100 μl was transferred aseptically into the well. Then plates were incubated at 37°C for 12 hrs. The plates were then examined for the zone of hemolysis.¹⁵

RESULTS AND DISCUSSION

S. trilobatum was selected for this study because of its efficacy in the treatment of various diseases traditionally. The plant was collected from Amirthi Forest Area, Vellore district, Tamil Nadu, India. The area is well known for biodiversity and very few plants have been studied for medicinal properties. In this study, the leaves and stem extracts of *S. trilobatum* were prepared in different polarity solvents (n-butanol, chloroform and methanol) and the dried plant extracts were used for the estimation of antimicrobial and hemolytic activity. Phytochemical analysis of dried powder of *S. trilobatum* leaves showed the presence of carbohydrates, saponins, phytosterols and tannins, where as the stem portion possess carbohydrates, saponins, phytosterols, tannins, flavonoids and cardiac glycosides.

The n-butanol extracts of *S. trilobatum* leaves and stem showed antimicrobial activity against all test organisms. Methanol extract of *S. trilobatum* leaves and stem showed antimicrobial activity against *K. pneumonia* and *S. aureus* respectively. Whereas, chloroform extract of *S. trilobatum* leaves and stem not showed any antimicrobial activity. Results are summarized in Table 2. In this study *K. pneumoniae* is found to be highly sensitive to the extracts of *S. trilobatum*. The *S. trilobatum* having high medicinal values is used for asthma and throat pain.¹⁶ reported that 300 mg oral administration of *S. trilobatum* showed controlling ability for bronchial asthma. *S. trilobatum* also contains anti-carcinogenic activity.¹⁷ In order to measure the toxicity of *S. trilobatum* towards human erythrocytes, hemolytic activity was performed. All the extracts not showed hemolytic activity and so can be considered as safe for the human erythrocytes. Results are summarized in Table 3.

Table: 1 Qualitative Screening of Phytochemicals from *Solanum trilobatum*

Phytochemical	<i>Solanum trilobatum</i>	
	Leaves	Stem
Carbohydrates	+	+
Proteins	-	-
Phenolic compounds	-	-
Oil and fats	-	+
Saponins	+	+
Flavonoids	-	-
Alkaloids	+	+
Tannins	+	+
Phytosterols	+	+

Here: +: Present, -: not present

Table: 2 Antimicrobial activity of *Solanum trilobatum*

Test organisms	Inhibition zone diameter (mm)					
	Leave extracts			Stem extracts		
	n-BE	ME	CE	n-BE	ME	CE
<i>E. coli</i>	8.0±0.0	0.0±0.0	0.0±0.0	7.66±0.15	0.0±0.0	0.0±0.0
<i>K. pneumoniae</i>	25.66±0.2	18.66±1.52	0.0±0.0	20.0±0.17	0.0±0.0	0.0±0.0
<i>P. aeruginosa</i>	7.0±0.13	0.0±0.0	0.0±0.0	5.66±1.52	0.0±0.0	0.0±0.0
<i>S. aureus</i>	13.0±0.3	0.0±0.0	0.0±0.0	11.0±1.09	7.33±1.52	0.0±0.0

Here, n-BE: n-Butanol Extract, ME: Methanol Extract, CE: Chloroform Extract
All values represent the mean± standard deviation (n = 3 test).

Table: 3 Hemolytic activity of *Solanum trilobatum*

Plant extracts	zone of inhibition in mm	
	Leaf	Stem
n-Butanol	0.4±0.0	0.1±0.0
Methanol	0.0±0.0	0.0±0.0
Chloroform	0.0±0.0	0.0±0.0

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