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Short Communication

Antimicrobial activity and phytochemicals of *Solanum trilobatum* Linn.

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In this study, aqueous methanol and n-butanol extracts of aerial parts of *Solanum trilobatum* L. (Solanaceae) were tested for antimicrobial activity by disc diffusion method. From the results, it was found that extracts from leaves, flowers, stem and fruits revealed antimicrobial activity against Gram (+) and Gram (-) bacteria. Maximal antibacterial activity was seen against *Klebsiella* with aqueous extract whereas methanol extract of stem showed maximal activity against *Staphylococcus aureus*. The Minimum Inhibitory Concentration (MIC) exhibited by *S. trilobatum* aqueous extracts against tested organisms ranged between 0.06-0.5 mg/ml. Presence of tannins, saponins, flavanoides, phenolic compounds, cardiac glycosides and carbohydrates indicates *S. trilobatum,* is one of the potential medicinal plant for therapeutic use.

Keywords: *Solanum trilobatum*, antimicrobial activity, minimum inhibitory concentration, medicinal plant, therapeutic use.

INTRODUCTION

Many infectious microorganisms are resistant to synthetic drugs, hence an alternative therapy is very much needed. *Solanum trilobatum*, a thorny creeper with bluish violet flower, more commonly available in Southern India has been used traditionally in Siddha system of medicines to treat various diseases (Mohanan et al., 1998). It has been widely used to treat respiratory disorders, especially bronchial asthma (Govindan et al., 1999, 2004). It was reported that *S. trilobatum* possess antioxidant activity (Shahjahan et al., 2005), hepatoprotective activity (Shahjahan, 2004) and protects UV induced damage and radiation induced toxicity in mice (Mohanan and Devi, 1998). Sobatum, the partially purified petroleum ether extract of *S. trilobatum* was reported to be very effective in tumor reduction (Mohanan and Devi, 1996). It was also reported that *S. trilobatum* possess anti-ulcerogenic activity (Amir and Kumar, 2004) and protects *Penaeus monodon* post larvae from bacterial attack (Citarasu et al., 2003). Furthermore, it posseses ovicidal activity against C*ulex quinquesfasciatus* and *C. tritaeniorhnchux* (Rajkumar and Jebanesan, 2004), and oviposition deterent and skin repellent activity against *Anopheles stephensi* (Rajkumar and Jebanesan, 2005).

Various chemical constituents are reported to be isolated from Solanum species, which includes alkaloids, phenolics, flavanoides, sterols saponins and their glycosides (Amir and Kumar, 2004). Alkaloides such as soladunalinidine and tomatidine were isolated from leaf and stem of Solanum species.

MATERIALS AND METHODS

Plant Materials

Fresh plants were collected from the medicinal garden and were identified with the help of a botanist. Voucher specimens were prepared and deposited in the herbarium section of the Vellore Institute of Technology (Deemed University), Vellore, Tamil Nadu, India. Stem, leaves, flowers and fruits of *S. trilobatum* were washed with distilled water, shade dried, powdered and stored in an air- tight container separately for further use.

Preparation of extracts

Aqueous extracts were prepared separately by transferring 1 g of the powder to sterile wide-mouthed screw-capped bottles. 10 ml of sterile de-ionized distilled water was added to the powdered samples

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Table 1. Antimicrobial activity of aqueous, n-butanol and methonal extracts of leaves stem, flowers and fruits of *Solanum trilobatum.*

Extracts	Diameter of the Zone of Inhibition (mm)			
	Gram positive		Gram negativve	
	Staphylococcus Aureus	***Bacillus subtilis***	***Escherichia coli***	***Klebsiella* sp.**
a) Aqueous extract	8	9	-	10
MIC (mg/ml)	0.5	0.5	-	0.063
b) Solvents Leaves : n- butanol	5	-	10	7
Stem:	-	-	6	-
n-butanol				
Methanol	11	-	-	-
Flowers: Methanol	9	-	11	-
Fruits: n-butanol	-	-	8	7

- No zone was observed.

which were allowed to soak for 24 h at room temperature, after heating the extracts for an hour at 100°C. The mixture was then centrifuged at 2000 rpm for 10 min at 4°C. The supernatants were filtered through a sterile funnel containing sterile Whatman filter paper No.1 and then filter sterilized using syringe filter containing 0.2 µ cellulose acetate membrane (Sartorius). Solvent extracts were prepared from aerial parts of *S. trilobatum by* soaking 1 g of powder of each in different solvents for about 48 h in sterile condition. After which similar procedure was used as that of aqueous extract to collect the solvent extract.

Source of microorganisms

Microorganism such as *Staphylococcus aureus* (ATCC 700699), *Escherichia* coli (ATCC 10412), *Pseudomonas aeruginosa* (ATCC 27853), *Klebsiella* (ATCC 2719), *Salmonella typhi* (ATCC 700931), *Bacillus subtilis* (ATCC 11778) and, *Vibrio parahaemolyticus* (ATCC 33934) were used as test organisms. Exactly 0.2 ml of overnight cultures of each organism was inoculated into 20 ml of sterile nutrient broth and incubated for 3-5 h to standardize the culture to 10^6 cfu/ml. Mueller Hinton Agar solid media was used for culturing of bacteria. Agar diffusion assay was carried out to check the antimicrobial activity as described by Perez (1990). The plates were incubated at 37°C for 24 h during which activity was evidenced by the presence of a zone of inhibition surrounding the well. Each test was repeated three times and the antibacterial activity was expressed as the mean of diameter of the inhibition zones (mm) produced by the plants when compared to the controls. MIC was carried out as described by Attata et al. (2003).

Phytochemical analysis of the extract

Standard procedures were followed to identify the chemical constituents in the aqueous extract or the powdered specimens of aerial parts of a *S. trilobatum* as described by Sofowara (1993), Trease and Evans (1989) and Harborne (1973).

RESULTS AND DISCUSSION

Aqueous extract from of *S. trilobatum* leaves showed antibacterial activity against tested bacterial stains in the order of *Klebsiella* (10 mm; MIC-0.63 mg/ml), *B. subtilis* (9 mm; MIC-0.5 mg/ml), and *S. aureus* (8 mm; MIC-0.5 mg/ml) (Table 1). The n-butanol extract of leaves of *S. trilobatum* showed antibacterial activity in the order of *E. coli* (10 mm), *Klebsiella* (7 mm) and *S. aureus* (5 mm). N-butanol extracts of fruits and stem showed similar activity. Methanol extracts of flowers showed inhibition over *E. coli* (11 mm) and *S. aureus* (9 mm) whereas stem extract showed inhibition only against *S. aureus* (11 mm). However, extracts of *S. trilobatum* failed to show any activity against *V. parahaemolyticus* and *S. typhi*.

The qualitative screening of phytochemical compounds in *S. trilobatum* revealed the presence of saponins and tannins in leaves, stem, flowers and fruits. Flavanoides, phenolic compounds and cardiac glycosides were present in all extracts except leaves. Similarly carbohydrates were present only in leaves and stem. These findings reveals that antimicrobial activity of *S. trilobatum* extracts may be due to the presence of these phytochemicals (Table 2). Furthermore, aqueous and solvent extracts of *S. trilobatum* were found to be very effective against both Gram positive and Gram negative (tested) organisms.

Clinical studies by Govindan et al. (2004) have reported that oral administration of *S. trilobatum* in a dose 300 mg for 3 days was found to be very effective in controlling mild to moderate bronchial asthma and the bioactivity is equivalent to that of administration of 200 mg of deriphylline.

From the studies it was concluded that antimicrobial activity of *S. trilobatum* extracts against organism indicates the medicinal value and supports the claim of

Table 2. Qualitative Screening of Phytochemicals from *S. trilobatum*

Phytochemicals	Plant extracts			
	Leaf	Stem	Flower	Fruit
Carbohydrates	+	+	-	-
	+	+	-	-
Saponins	+	+	+	+
Phytosterols	+	-	-	-
Phenolic compounds	-	-	-	-
	-	+	+	+
Tannins	+	+	+	+
Flavanoids	-	+	+	+
Cardiac glycosides	-	+	+	+

+ Presence of the phytochemical
- Absence of the phytochemical

traditional healers that it has been used to relieve throat congestion, cough and cold. However, further studies are needed to isolate bioactive principle in an aqueous and organic solvent extracts.

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