

## Research Article



## Evaluation of *In-Vitro* Antibacterial Activity of *Solanum Sisymbriifolium* Aerial Parts

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### ABSTRACT

Recently, natural plants have received much attention as sources of biological active substances. In this present study we investigated different extracts of *Solanum sisymbriifolium* for their *In-vitro* antibacterial activity. *In-vitro* antibacterial activity was evaluated for ethanolic, ethyl acetate and hexane extracts against three Gram positive and three Gram negative bacteria by using cylinder plate assay. All the tested extracts of *Solanum sisymbriifolium* showed significant zone of inhibition against tested bacterial strains. Among the three types of *Solanum sisymbriifolium* extracts, the hexane extract showed better activity than the other extracts of *Solanum sisymbriifolium*.

**Keywords:** *Solanum sisymbriifolium*, aerial parts, microorganisms, antibacterial activity.

### INTRODUCTION

Antibiotic resistance has become a global concern<sup>1</sup>. There has been an increasing incidence of multiple resistances in human pathogenic microorganisms in recent years, largely due to indiscriminate use of commercial antimicrobial drugs commonly employed in the treatment of infectious diseases. This has forced scientist to search for new antimicrobial substances from various sources like the medicinal plants. The screening of plant extracts and plant products for antimicrobial activity has shown that higher plants represent a potential source of novel antibiotic prototypes<sup>2</sup>.

Numerous studies have identified compounds within herbal plants that are effective antibiotics<sup>3</sup>. Traditional healing systems around the world that utilize herbal remedies are an important source for the discovery of new antibiotics<sup>4</sup>; some traditional remedies have already produced compounds that are effective against antibiotic-resistant strains of bacteria<sup>5</sup>.

*Solanum sisymbriifolium* belongs to Solanaceae family and is popularly known as sticky nightshade. This herb is native to South America and is currently distributed throughout the world<sup>6</sup>. *S. sisymbriifolium* is best known for its use as trap crop for potato cyst nematodes such as *Globodera rostochiensis* and *G. pallida* and also resistant to bacteria like *P. solanacearum*<sup>7-10</sup>.

*S. sisymbriifolium* fruit is the main source of solasodine<sup>11</sup>. Solasodine is a glycoalkaloid used in the synthesis of corticosteroids and sex hormones<sup>12</sup>. The plants of the genus *Solanum* were used in traditional Indian systems of medicine as an anticancer agent<sup>13</sup>. In the present study, different extracts of *Solanum sisymbriifolium* were checked for their *In-vitro* antibacterial activity.

### MATERIALS AND METHODS

#### Preparation of extract from of *Solanum sisymbriifolium*

The plant *S. sisymbriifolium* was collected in the month of November, 2011 from Hanumadwake area, Visakhapatnam, Andhra Pradesh, India. The plant material was taxonomically identified by Dr. M. Venkaiah, Botanist, Andhra University. Freshly collected plant material was dried under shade and milled to obtain a coarse powder. To the coarse powder (500gms) four liters of ethanol (70%) was added and macerated for 5 days at room temperature (30°C). The macerated extract was obtained and concentrated under vacuum at temperature of 45°C by using rotary evaporator (Buchi, Switzerland), dried completely and stored in desiccator. The 70%v/v ethanolic extract was then fractionated into hexane and ethyl acetate fractions.

#### Test organisms

The microorganisms used in the experiment were procured from MTCC, IMTECH, Chandigarh.

#### Gram-positive organisms

*Staphylococcus aureus*, *Bacillus subtilis*, *Bacillus pumilus*.

#### Gram-negative organisms

*Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumonia*.

#### Evaluation of *in-vitro* antibacterial activity

The cylinder plate assay of drug potency is based on measurement of the diameter of zone of inhibition of microbial growth surrounding cylinders (cups), containing various dilutions of test compounds (extracts). A sterile borer was used to prepare the cups of 6 mm diameter in the agar medium spread with the micro-organisms and 0.1 ml of inoculums. These cups were spread on the agar plate by spread plate technique. Accurately measured (0.05 ml) solution of each concentration and reference



standards were added to the cups with a micropipette. All the plates were kept in a refrigerator at 2 to 8°C for a period of 2 hours for effective diffusion of test compounds and standards. Later, they were incubated at 37°C for 24 hours. The presence of definite zone of inhibition of any size around the cup indicates antibacterial activity<sup>14</sup>.

## RESULTS

### Evaluation of antibacterial activity

All extracts at concentrations of 50, 100, 200, 400 µg/ml per cup exhibited antibacterial activity against tested bacterial strains in a dose dependent manner but relatively low activity when compared to that of standard Rifampicin. Ethanol extract showed best results against *Bacillus subtilis* and *Staphylococcus aureus* and no effect on *E.coli* and *P.aeruginosa* at lower concentrations. Ethyl acetate fraction showed best results against *E.coli* and *K.pneumoniae*. Hexane fraction showed best results against *K.pneumoniae* and *B.pumilus*. The results are shown in the Table 1.

**Table 1:** Antibacterial activity of *Solanum sisymbriifolium* aerial parts extracts

Plant material	Dose (µg/cup)	Zone of inhibition <sup>#</sup> (diameter in mm)					
		gram (+) ve			gram (-) ve		
		B.s	S.a	B.p	E.c	P.a	K.p
Ethanol extract	50	08	09	07	-	-	07
	100	10	10	08	07	07	08
	200	13	12	09	09	08	10
	400	15	13	10	11	10	12
Ethyl acetate extract	50	10	11	08	08	08	14
	100	08	10	08	12	09	15
	200	11	09	09	14	10	16
	400	13	11	10	15	10	16
Hexane extract	50	12	10	12	09	09	09
	100	13	10	13	10	10	09
	200	11	11	10	11	10	12
	400	11	10	09	11	11	13
Rifampicin	50	24	22	19	19	24	28
DMSO		-	-	-	-	-	-
Water		-	-	-	-	-	-

S.a=*Staphylococcus aureus*; E.c=*Escherichia coli*; P.a=*Pseudomonas aeruginosa*; B.s = *Bacillus subtilis*; B.p= *Bacillus pumilus*; K.p = *Klebsiella pneumoniae*. --No activity; #Values are the average of triplicate; Includes the cup diameter (6mm).

## DISCUSSION

Ethanol extract did not show any effect on *E.coli* and *P.aeruginosa* at lower concentrations. Negative results do not mean absence of bioactive constituents nor is that the plant inactive. Active compound(s) may be present in insufficient quantities in the extracts to show activity with

the dose levels employed<sup>15</sup>. Lack of activity can thus only be proven by using large doses<sup>16</sup>. Alternatively, if the active principle is present in high enough quantities, there could be other constituents exerting antagonistic effects or negating the positive effects of the bioactive agents<sup>17</sup>. With no antibacterial activity, extracts may be active against other bacterial species which were not tested<sup>18</sup>.

## CONCLUSION

All extracts exhibited antibacterial activity against tested bacterial strains in a dose dependent manner but relatively low activity when compared to that of standard Rifampicin. The activity may be higher if larger dose levels were employed.

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