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Antibacterial and phytochemical screening of *Solanum erianthum* D. Don

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ABSTRACT

The present investigation deals with the antibacterial potentials phytochemical screening of the aqueous and organic solvents extracts from powdered leaves of solanum erianthum were tested against nine bacterial pathogens (E.coli, Proteus vulgaris, Proteus mirabilis, Klebsiella pneumoniae, Pseudomonas aeruginosa, Serratia marcescens, Staphylococcous aureus, Salmonella typhi and Vibrio cholerae) by disc diffusion method. The results revealed that the ethyl acetate and chloroform extract shows high sensitivity to Vibrio cholerae, Salmonella typhi, and Serratia marcescens and less sensitivity and resistant to Pseudomonas aeruginosa. The phytochemical study revealed the presence of phenols, saponins, phytosterols, terpenoids, tannins and flavonoids.

Key words: *Solanum erianthum*, antibacterial potential, high sensitivity

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INTRODUCTION

India has rich heritage of medicinal plants as a group comprise approximately 8000 species and account for around 50% of all the higher flowering plant species (Suresh *et al*., 2008) [1]. The vast majority of people world wide still rely on traditional medicine for their everyday health care needs. It is also known fact that one quarter of all medicinal prescription are formulations based on substances derived from plants or plant derived synthetic analogs. According to WHO, 80% of the world's population, primarily those of developing countries depend on plant derived medicines for their health care (Balick *et al.,* 1994)[2]. Solanaceae is a one of the largest families in angiosperms comprises of 1700 species in 90 different genera, which are commonly found in the temperate and tropical regions of the world. Members of this family are often climbers or atleast scrambling plants. There are several poisonous species, including deadly night shade (*Atropha belladona*), Henbane (*Hyoscyamus niger*), thorn apple (*Datura stramonium*).*Solanum erianthum* D. Don is an unarmed shrub or small tree with dense indumentums of soft stellate hairs. Leaves were simple, ovate-elliptical; margin entire or slight wavy, base rounded to cuneate, and apex acute to acuminate. The leaves have been extensively used for leucorrhoea, piles, hemorrhoids, scrofula, headache, vertigo, digestive troubles and for wound healing purposes. Plants of this genus are known to contain alkaloids, solanine, or solasodine, the nitrogen analogue of diosgenin is pharmacologically accepted as its alternative (Burkill 2000)[3]. Ethno medicinal value of other *Solanum* species has been reported. The leaf of *Solanum torvum* is used for the treatment of wound infections, cough, sore throat, while *Solanum erianthum* is reported to have diuretic, purgative properties and active in the treatment of veneral disease and leprosy.

The systemic screening of antimicrobial plant extracts represents continuous effort to find new compounds with the potential to act against multi resistant pathogenic bacteria and fungi. A special feature of higher Angiospermic plants is their capacity to produce a large number of chemicals of high structural diversity. The so called secondary metabolites (Evans *et al*., 1986)[4], which are divided into different catagories based on their mechanism of function like chemotherapeutic, bactericidal and antimicrobial (Purohit and Mathur 1999)[5].

MATERIALS AND METHODS

Collection of plant materials

The fresh leaves and stems of *solanum erianthum* were collected from Kolli hills, Namakkal district of Tamil Nadu, India. The collected plant material was brought to laboratory for antibacterial activity studies and phytochemical analysis.

Preparation of plant extracts

The collected plant materials were air dried at room temperature for 2 weeks and ground in to uniform powder. 50 g of powdered plant materials were soaked in 300ml of organic solvents (ethanol, ethyl acetate, petroleum ether, and chloroform) and kept for 7 days for complete extraction. Then the extracts were filtered separately through a Whatmann No:1 filter paper. The samples were stored in refrigerator for further analysis (Udayakumar & Hazeena, 2002)[6].

Test Bacteria

E.coli, Proteus vulgaris, Proteus mirabilis, Salmonella typhi, Serratia marcescens, Klebsiella pneumoniae, Pseudomonas aeruginosa, Vibrio cholerae (Gram negative) and Staphylococcous aureus (Gram positive) were collected from Department of Microbiology, KAP Visvanatham Medical College, Trichy. The bacterial cultures were maintained on slants consisting of Muller Hinton Agar. The bacterial cultures were precultured in nutrient broth overnight for antibacterial screening.

Phytochemical analysis:

The plant extracts were subjected to various qualitative chemical tests to determine phytochemical constituents (Harborne, 1984)[7].

Antibacterial activity:

The antimicrobials present in the plant extract are allowed to diffuse out into the medium and interact in a plate freshly seeded with the test organisms. The medium was prepared by dissolving 33.9g of the commercially available Muller Hinton Agar Medium in 1000ml of distilled water. The dissolved medium was autoclaved at 15lbs pressure at 121˚C for 15 minutes. The autoclaved medium was mixed well and poured on to 100mm petriplates (20ml/plate) while still molten. 50 ml of nutrient broth was prepared by dissolving 0.65gm of commercially available nutrient broth (H i Media) in 50ml of distilled water and boiled to dissolve the medium completely. The medium was dispensed as desired and sterilized by autoclaving at 15lbs pressure for 15 minutes. Petriplates containing 20ml Muller Hinton medium were seeded with 24hr culture of bacterial strains. Chloramphenicol antibiotic discs were placed on the surface of the Muller Hinton Agar medium inoculated with the target organisms. The plates were incubated at 37˚C and the zones of inhibition were measured (Udayakumar & Hazeena, 2002)[6].

RESULTS AND DISCUSSION

Antibacterial activity of leaf extract of *Solanum erianthum* was studied by measuring the zone of inhibition formed around the disc and the results are depicted in Table 1. Among the various solvent extracts tested, ethyl acetate leaf extract showed high activity against *Salmonella* typhi and *Serratia marcescens* moderate activity against *Pseudomonas aeruginosa, E.coli, Staphylococcous aureus and Proteus mirabilis.* Poor inhibition was associated with *Klebsiella pneumoniae, Vibrio cholerae* and *Proteus vulgaris*. Preliminary phytochemical analysis of leaf extracts revealed of maximum constituents were reported in *Solanum erianthum* which was rich in alkaloids, carbohydrates, glycosides, phenols, saponins, phytosterols, terpenoids, tannins, flavonoids and catechins (Table 2). Catechins were absent in all cases. Plants are the vital source of innumerable number of antimicrobial compounds. Several phytoconstituents like flavonoids (Tsuchiya *et al*., 1996)[7], phenolics and polyphenols (Mason and Wasserman, 1987)[8], terpenoids (Scrotichini and Pia Rossi, 1991)[9], sesquiterpenes (Goren, 1996)[10]etc., are effective antimicrobial substances against a wide range of microorganism. Several tannins, flavonoid and saponins have been reported to have antibacterial properties (Barnabas et al., 1988;[11] Miski *et al*, 1988;[12] and Bader et al, 1987)[13]. Venkatasan *et al*.,[14] reported that ethanolic extract of Solanum nigrum exhibited antimicrobial activities against 16 types of bacteria and fungi. Ambasta (1992)[15] reported that the alcoholic and aqueous extract of Solanum xanthocarpum showed hypotensive effect, antiviral activity against Ranikhet disease virus and also against sarcoma- 180 in mice. The leaves of *Solanum erianthum have* been reported as anti-malarial an anti-cholinergic **(**Huang *et al*., 2009[16] and Kakali *et al*., 1997**)[17].**The present study revealed that the antimicrobial activity of *Solanum erianthum* may be attributed to the various phytochemical constituents present in the crude extract. Hence the *Solanum erianthum* may be the alternative source for treating several infectious disease caused by various pathogen

Table 1

S.No	Test Organisms	Inhibition zone diameter in mm [mean± SD]					
		Methanol	Petroleum Ether	Ethyl Acetate	Chloroform	Aqueous	Positive Control (Chloramphenicol)
1.	*E.coli*	NA	6.6±1.5	13.6±6.3	11.6±6.3	9 ±0	1.4±0.0
2.	*Staphylococcous aureus*	9.6±1.5	NA	15.3±9.2	10±1.7	NA	1.6±0.0
3.	*Salmonella typhi*	9.5±0.7	5.6±1.1	16±15.5	15.6±8.3	7.3±2.5	1.8±0.0
4.	*Pseudomonas aeruginosa*	9±2.3	NA	9±1	12±2.6	NA	1.5±0.0
5.	*Vibrio cholerae*	NA	NA	21±15.5	11.5± 6.3	NA	2.0±0.0
6.	*Klebsiella pneumoniae*	NA	NA	NA	12±3.6	NA	1.5±0.0
7.	*Proteus vulgaris*	NA	8.3 ±2.0	13.3±10.4	NA	NA	2.1±0.0
8.	*Proteus mirabilis*	8.5±3.2	NA	12±2.0	11±1.7	NA	1.5±0.0
9.	*Serratia marcescens*	9.3±3.0	8±2.6	16±12.4	17 ±14.1	NA	2.0±0.0

NA : No Activity

Table 2: Preliminary phytochemical screening of *S. erianthum* D

S.NO	Name of the test	Methanol	Aqueous	Ethyl acetate	Petroleum ether	Chloroform
1.	alkaloids	–	–	–	–	–
2.	carbohydrates	–	–	–	–	–
3.	glycosides	–	–	–	–	–
4.	phenols	++	_	++	++	–
5.	saponins	–	–	++	++	++
6.	phytosterols	++	++	++	++	++
7.	terpenoids	–	++	–	–	–
8.	tannins	–	++	++	–	–
9.	flavonoids	–	–	–	++	–
10.	catechins	–	–	–	–	–

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