STUDIES ON ANTIBACTERIAL ACTIVITY IN LEAVES AND FRUITS EXTRACT OF *Solanum nigrum* LINN

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ABSTRACT

The present investigations were carried out to study of antibacterial and phytochemical analysis of leaves and fruits extract of *Solanum nigrum*. The antibacterial activity of Acetone, Methanol, Dichloromethane and Aqueous extracts of the leaves and fruits of *Solanum nigrum* using disc diffusion method. The antibacterial activity was detected against *Bacillus subtilis*, *Pseudomonas aeuroginosa*, *Staphylococcus aureus* and *Escherichia coli*. The zone of inhibitions was recorded and analysed standard control of Streptomycin. The present investigation all the extracts were found to be effective against bacterial species.

KEY WORDS

Solanum nigrum, Antibacterial activity, Plant extract and Disc diffusion method

1. INTRODUCTION

Medicinal plants are very important source of life saving drugs for the ever increasing word population. According to World Health Organization up to 80 percent of the world's population is dependent mainly on traditional medicinal plants. India is endowed with a rich wealth of medicinal plants which have been a valuable source of natural products for maintaining human health. A large number of medicinal plants are used in several formulations for the treatment of various diseases caused by microbes (Megala and Elango, 2012).

The medicinal plants occupy a significant place in modern medicine as a raw material for some important drugs, although synthetic drugs and antibiotics brought about a revolution in controlling different diseases. But these synthetic drugs are out of reach millions of people. Those who live in remote places depend

on traditional healers, whom they know and trust. The judicious use of medicinal herbs can even cure deadly diseases that have long defied synthetic dung (Prakash and Jain, 2011).

The antimicrobial activity have been screened because of their great medicinal relevance with the recent years, infections have increased to a great extent and resistant against antibiotics, become an ever increasing therapeutic problem (Austin *et al*., 1999). Natural products of higher plants may give a new source of antimicrobial agents. There are many research groups that are now engaged in medicinal plants research (Hamil *et al*., 2003).

Solanum nigrum is an important plant in traditional medicinal belongs to the family of Solaniaceae (Jain *et al*., 2011). It is known as Manathakkali keerai in Tamil. *Solanum nigrum* commonly known as maku or black night shade usually grows as a weed in moist habitats in different kinds of soils.

Solanum nigrum used as vegetable in few South Indian states like Tamil Nadu and Karnataka (Rajeswari *et al*., 2013). The plant has been extensively used in traditional medicine in India. Traditionally this plant is used to cure liver disorders, chronic skin ailments (Psoriasis and ringworm), inflammatory, painful periods, fever, diarrhea, eye diseases and hydrophobia (Kirtikar and Basu, 1953). In India, the berries are casually grown and eaten, but not cultivated for commercial use. In south India the leaves and berries are routinely consumed as food. The berries are referred to as fragrant tomato. The plant is being exploited extensively by the local people and used for medicinal purposes. The fruit and leaves based dishes are common in Tamil Nadu, Kerala, Andhra Pradesh and Karnataka. This plant's leaves are used to treat mouth ulcers that happen during winter seasons of Tamil Nadu. *Solanum nigrum* has been used as the important ingredient for herbal formulations in India, It is mainly used for treating liver diseases, (Ikeda *et al*., 2000).

2. MATERIALS AND METHODS

TEST ORGANISMS AND CULTURE MEDIA

The clinical pathogenic bacterial strains were aseptically collected from Rajah Muthiah Medical College and Hospital, Annamalai University. The bacterial cultures *viz*., *Bacillus subtils*, *Pseudomonas aeuroginosa*, *Staphylococcus aureus* and *Escherichia coli* were maintained in nutrient broth. The bacterial cultures stored in 4º C for their future studies.

SOLVENT EXTRACTION

In the present study, the fresh leaves and fruits were used to evaluate their antibacterial activity. Plant extracts were prepared by cold percolation method. The leaves and fruits were air dried in room temperature for 10 days. The fully dried plant materials were powdered and weighed. The powdered leaves and fruits (5 gm) each was soaked in 50 ml of different solvents such as Acetone, Methanol, Dichloromethane and Aqueous extracts kept for 48 hours with intermittent shaking. The plant extract were filtrate through Whatman No.1 filter paper. The filtrated was collected in separate clean beaker

IN VITRO ANTIBACTERIAL ASSAY

The disc diffusion method was employed for determining antibacterial activity of leaves and fruits extracts as described by Bauer *et al*. (1966). The Muller Hinton agar medium was prepared and autoclaving at 121^{o}C at 15lbs pressure for 15 minutes. After sterilization, the media was transferred into sterile Petri dishes and then allowed to solidify. Then 0.1 ml of test organism was taken from the stock (broth). The sterile cotton swab were dipped in the broth and swabbed over the surface of Muller Hinton agar. The cultures were allowed to dry for 5 minutes.

The sterile disc was used. The plant extracts to be tested were prepared with various concentrations *viz.*, 50µl/ml, 100µl/ml, 150µl/ml and 200µl/ml. The sterile impregnated disc with plant extracts were placed on the agar surface with sterile forceps and gently press down ensure complete contact of the disc with the surface of agar. Control disc of Streptomycin is prepared and placed on the agar surface. Then all plates were incubated at 37^{o}C for 24 h at inverted position and the diameter of "zone of inhibition" will measured and expressed in mm.

3. RESULT AND DISCUSSION

In India, medicinal plants are widely used by all sections of people either directly as folk remedies or in different indigenous systems of medicine or indirectly in the pharmaceutical preparations of modern medicines. According to National Health Experts, 2000 different plants are used for medicinal preparations for both internal and external use in India alone. Among them, only 200 are of animal orgin and 300 of mineral origin, while 1500 drugs are extracted from various plants (Srinivasan *et al*., 2001). There is a continuous and urgent need to discover new antimicrobial compounds with diverse chemical structures and novel mechanism of action owing to the alarming increase in the incidence of new and re-emerging infectious diseases. Another big concern is the development of resistance to the antibiotics in current clinical use (Rojas, 2003).

To investigate the antibacterial activity of *Solanum nigrum* leaves and fruits. Using four different solvents such as Acetone, Methanol, Dichloromethane and Aqueous. The plant extracts were prepared with various concentration *viz.*,50 µl/ml, 100 µl/ml, 150 µl/ml, 200 µl/ml were studied against antibacterial activity of *Bacillus subtilis, Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Escherichia coli*. Positive control disc of streptomycin were used.

The Methanol extract exhibited pronounced inhibition against all the tested organisms. The maximum inhibition was observed on *Pseudomonas aeruginosa* in Methanol leaves extract 17mm (Table-2) and *Staphylococcus aureus* in methanol leaves extract 16 mm and *Bacillus subtilis* in methanol leaves extract 13mm (Table-1).

The moderate inhibition was observed on *Staphylococcus aureus* inhibited by Dichloromethane leaves extract 14 mm and fruits extract 12 mm for 200 µl. Followed by methanol fruits extract 12 mm (Table -3).

In the present study, 200µl Acetone extracts of fruits showed promising result against *Escherichia coli* (12 mm) (Table-4), *Pseudomonas aeuroginosa* (12 mm), *Staphylococcus aureus* (11 mm), *Bacillus subtilis* (10 mm).

The acetone extract of leaves exhibited more antibacterial activity against 200µl in *Pseudomonas aeuroginosa* (14mm), *Escherichia coli* (12 mm), *Staphylococcus aureus* (11 mm) and *Bacillus subtilis* (11 mm).

The Aqueous extract of leaves showed promising result against 100 µl in *Bacillus subtilis* (12 mm) followed by 200 µl in *Pseudomonas aeuroginosa* (12 mm), *Escherichia coli* (11 mm), *Staphylococcus aureus* (10 mm).

The positive control, Streptomycin has observed the shown zone of inhibition of 10 mm, 10 mm, 11 and 10 mm in *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Escherichia coli* respectively (Table-5 to Table-8).

4. CONCLUSIONS

The results of the present study clearly suggested the importance of *Solanum nigrum* in treatment against infectious disease causing pathogenic microorganisms. Moreover, the therapeutic potential of the plant should also be checked when used in combination with other herbal drugs.

TABLE – 1
Antibacterial activity of plant extract of *Solanum nigrum* against *Bacillus subtilis*

Plant	Extract	Solvents used	Area of inhibition zone (mm)			
			50µl	100 µl	150 µl	200 µl
Solanum nigrum	Leaves	Acetone	9	10	10	11
		Methanol	10	11	11	13
		Dichloromethane	-	11	10	10
		Aqueous	-	12	-	-
	Fruits	Acetone	-	10	10	10
		Methanol	-	10	10	11
		Dichloromethane	-	-	-	10
		Aqueous	-	-	-	10

TABLE – 2

Antibacterial activity of plant extract of *Solanum nigrum* against *Pseudomonas aeuroginosa*

Plant	Extract	Solvents used	Area of inhibition zone (mm)			
			50µl	100 µl	150 µl	200 µl
Solanum nigrum	Leaves	Acetone	-	-	11	14
		Methanol	10	11	14	17
		Dichloromethane	11	10	10	13
		Aqueous	-	-	-	12
	Fruits	Acetone	-	11	11	12
		Methanol	10	10	10	10
		Dichloromethane	-	-	10	10
		Aqueous	-	10	-	11

TABLE – 3

Antibacterial activity of plant extract of *Solanum nigrum* against *Staphylococcus aureus*

Plant	Extract	Solvents used	Area of inhibition zone (mm)			
			50µl	100 µl	150 µl	200 µl
Solanum nigrum	Leaves	Acetone	-	10	10	11
		Methanol	11	13	14	16
		Dichloromethane	-	10	13	14
		Aqueous	-	-	10	10
	Fruits	Acetone	-	11	11	11
		Methanol	-	11	11	12
		Dichloromethane	-	10	11	12
		Aqueous	-	10	10	11

TABLE – 4

Antibacterial activity of plant extract of *Solanum nigrum* against *Escherichia coli*

Plant	Extract	Solvents used	Area of inhibition zone (mm)			
			50µl	100 µl	150 µl	200 µl
Solanum nigrum	Leaves	Acetone	-	10	10	12
		Methanol	-	-	10	10
		Dichloromethane	-	-	10	10
		Aqueous	-	-	-	11
	Fruits	Acetone	-	10	10	12
		Methanol	-	-	10	11
		Dichloromethane	-	-	10	10
		Aqueous	-	-	-	10

TABLE – 5

Antibacterial activity of plant extract of *nigrum* against *Bacillus subtilis*

Plant	Solvents used	Area of inhibition zone (mm)
		100 µl
Solanum nigrum	Acetone	-
	Ethanol	-
	Methanol	-
	Streptomycin	10

TABLE – 6

Antibacterial activity of plant extract of *nigrum* against *Pseudomonas aeuroginosa*

Plant	Solvents used	Area of inhibition zone (mm)
		100 µl
Solanum nigrum	Acetone	-
	Ethanol	-
	Methanol	-

	Streptomycin	10

TABLE – 7
Antibacterial activity of plant extract of *nigrum*
against *Staphylococcus aureus*

Plant	Solvents used	Area of inhibition zone (mm)
		100 µl
Solanum nigrum	Acetone	-
	Ethanol	-
	Methanol	-
	Streptomycin	11

TABLE – 8
Antibacterial activity of plant extract of *nigrum*
against *Escherichia coli*

Plant	Solvents used	Area of inhibition zone (mm)
		100 µl
Solanum nigrum	Acetone	-
	Ethanol	-
	Methanol	-
	Streptomycin	10

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