I J PS INTERNATIONAL JOURNAL OF PLANT SCIENCES
Volume 7 | Issue 2 | July, 2012 | 337-340

RESEARCH ARTICLE

Studies on phytochemical screening and antibacterial activity of (*Physalis minima* L.)

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SUMMARY

Aqueous and ethanol extracts of *Physalis minima* on five test bacteria such as (*Bacillus cereus, Escherichia coli, Klebsiella pneumonia, Pseudomonas fluorescens and Staphylococcus aureus)* exhibited concentration dependent antibacterial activity. All fractions showed a promising activity towards *Bacillus cereus Klebsiella pneumonia, Pseudomonas fluorescens and Staphylococcus aureus,* however, less inhibition was observed in *Escherichia coli.* Similarly when compared to aqueous leaf extract, ethanol leaf extract showed maximum activity against all the tested organisms.

Key Words : *Physalis minima*, Phytochemical analysis, Antibacterial activity

How to cite this article : Menaga, S. and Indrani Manorama, C. (2012). Studies on phytochemical screening and antibacterial activity of (*Physalis minima* L.). *Internat. J. Plant Sci.*, **7** (2) : 337-340.

Article chronicle : Received : 19.03.2012; **Revised :** 19.05.2012; **Accepted :** 05.06.2012

India is a land of rich biodiversity. Medicinal plants have been known for millennia and are highly esteemed all over the world as a rich source of therapeutic agents for the prevention of diseases and ailments. Antibacterial properties of various plant parts like the root, stem, leaves, flowers and fruits have been analysed for some of the medicinal plants for the past three decades. Medicinal plants could be used against the bacteria which are resistant to the present day antibiotics. So an analytical work in this line is necessary to analyse the phytochemical screening and antibacterial activities of an underexplored plant namely *Physalis minima* L.

MATERIALS AND METHODS

Plant materials were collected from the Revenue Village of Thoppupalayam, Erode district, Tamil Nadu. Plants were identified and confirmed with the authentic herbarium specimen available in the department of botany at Vellalar College for women, Thindal, Erode-12. Fresh leaves were collected and shade dried under room temperature. The dried leaves were grounded into a coarse powder and used for further investigations. The microorganisms used in the present study are *Bacillus cereus, Escherichia coli, Klebsiella pneumoniae, Pseudomonas fluorescens* and *Staphylococcus aureus.*

Two methods of extractions were carried out :

– Aqueous extraction
– Ethanol extraction

Extraction procedure :

A soxhlet apparatus was used for extracting antimicrobial active compounds from leaves. The collected plant leaves were shade dried and powered separately. 20g of dried powder was packed into thimble and then subjected to extraction with water and chloroform separately. The collected extracts were concentrated by evaporation under room temperature. The collected extracts were then chosen to test antibacterial activity.

Phytochemical analysis :

The powered leaf samples were analyzed for

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phytochemical analysis. (Qualitative analysis) (Table 1).

Qualitative analysis :

Preliminary phytochemical screening :

All the extracts were subjected to preliminary phytochemical tests followed by the methods of Herborne, (1973); Sadasivam and Manickam, (1996), Trease and Evans (1989).

Bacterial inoculam preparation :

Bacterial cultures included in this study were *Bacillus cereus, Escherichia coli, Klebsiella pneumoniae, Pseudomonas fluorescens* and *Staphylococcus aureus.* All the cultures were grown in Muller-Hinton agar medium. The inoculum was used for antibacterial assay.

Antibacterial assay :

The media and the test bacterial cultures were poured into Petridishes [Muller-Hinton agar media]. The test strain (0.2ml) was inoculated into the media to inoculum size (108 cells/ml). The plant extracts were tested for antibacterial activity in the agar well diffusion method (Perez *et al*., 1990) against *Bacillus cereus Escherichia coli, Klebsiella pneumoniae, Pseudomonas fluorescens* and *Staphylococcus aureus.*

Agar well diffusion method :

The antibacterial activity was tested against leaves of *Physalis minima*, L. The inoculum of microorganism was prepared from bacterial culture. About 15-20 ml of Muller Hinton agar medium was poured in the sterilized Petridish and allowed to solidity. One drop of each bacterial strain was spread over the medium by a sterile rod. Wells of 5 mm in diameter and about 2cm apart punctures in the culture medium using sterile cork borers were made. About 25µl, 50µl, 75µl and 100µl of plant leaf extracts were added to the wells separately. Plates were incubated at 37°C for 24 hours. Antibacterial activities were evaluated by measuring the diameter of inhibition zone.

RESULTS AND DISCUSSION

Phytochemical screening revealed that leaves of *Physalis minima* contained alkaloids, flavonoids, cardiac glycosides, coumarins, phenols, saponins, tannins and triterpenoids (Table 1). The effect of aqueous and ethanol extracts of *Physalis minima* on five test bacteria is shown in Table 2 and 3. Ethanol extract was more effective than aqueous extract. In ethanol extract *Escheriachia coli* was found to be the most resistant organism, *Pseudomonas fluorescens* was the least resistant and the other bacteria were moderately sensitive.

In aqueous extract, *Bacillus cereus* was highly resistant and *Staphylococcus aureus* was highly sensitive and microbes showed moderate response.

In both the extracts 100µl/ml concentration was to be highly effective against all the test microorganisms.

Table 1 : Qualitative analysis of leaves

Name of the constituents	Name of the plant *Physalis minima*
Alkaloids	+
Flavonoids	+
Cardiac glycosides	+
Coumarins	+
Phenols	+
Saponins	+
Tannins	+
Triterpenoids	+

(+) – Presence of phytochemical constituent

Table 2 : Effect of ethanol extract of *Physalis minima*.on bacteria (RMI – cm^2)

Name of the bacterium	Concentration of leaf extract (µl/ml)											
	25			50			75			100		
	A_1	A_2	RMI	A_1	A_2	RMI	A_1	A_2	RMI	A_1	A_2	RMI
Bacillus cereus	0.5	0.4	0.8	0.5	0.4	0.8	0.5	0.5	1.0	0.5	1.0	2.0
Escherichia coli	0.5	0.3	0.6	0.5	0.4	0.8	0.5	0.4	0.8	0.5	0.4	0.8
Klebsiella pneumoniae	0.5	0.3	0.6	0.5	0.4	0.8	0.5	0.5	1.0	0.5	1.0	2.0
Pseudomonas fluorescens	0.5	0.4	0.8	0.5	0.5	1.0	0.5	1.0	2.0	0.5	1.4	2.8
Staphylococcus aureus	0.5	0.4	0.8	0.5	0.5	1.0	0.5	1.0	2.0	0.5	1.3	2.6

Table 3 : Effect of aqueous extract of *Physalis minima* on bacteria (RMI – cm^2)

Name of the bacterium	Concentration of leaf extract (µl/ml)											
	25			50			75			100		
	A_1	A_2	RMI	A_1	A_2	RMI	A_1	A_2	RMI	A_1	A_2	RMI
Bacillus cereus	0.5	0.3	0.6	0.5	0.4	0.8	0.5	0.4	0.8	0.5	0.7	1.4
Escherichia coli	0.5	0.3	0.6	0.5	0.4	0.8	0.5	0.5	1.0	0.5	0.6	1.2
Klebsiella pneumoniae	0.5	0.4	0.8	0.5	0.5	1.0	0.5	0.5	1.0	0.5	0.8	1.6
Pseudomonas fluorescens	0.5	0.3	0.6	0.5	0.5	1.0	0.5	0.7	1.4	0.5	1.0	2.0
Staphylococcus aureus	0.5	0.4	0.8	0.5	0.6	1.2	0.5	0.8	1.6	0.5	1.2	2.4

A_1 = Area of well in cm^2 A_2 = Area of zone of inhibition in cm^2 RMI = A_2/A_1

Over the past 20 years, there had been a lot of research work in the investigation of natural materials as sources of new antibacterial agents. Many reports showed the effectiveness of traditional herbs against microorganisms, as a result, plants are one of the bed rocks for modern medicine to attain new active principles.

In the present study, the medicinal plant species of *Physalis minima* was screened to detect the presence of several bioactive compounds and the results of screening showed the presence of alkaloids, flavonoids, cardiac glycosides, coumarins, phenols, saponins, tannins and triterpenoids which are reported to cure different diseases and ailments. Same active principles have also been obtained from several other medicinal plants and have been proved to be the cause of medicinal properties the those plants, (Roia and Smith, 1997; Parvathi, 1977; Salahuddin *et al*., 1998; Oyedyi *et al*., 1999; Nostro *et al*., 2000;Mandal *et al*., 2000; Akinpelu and Obuoter, 2000; Melcher *et al*., 2001 and Harput *et al*., 2004).

In the present investigations the ethanolic extract of the plants exhibited higher relative magnitude of inhibition against *Escherichia coli.* This credit to ethanol extraction may be attributed to the ability of ethanol to dissolve organic compounds better than distilled water.

Even though ethanol extract is found to be more active, aqueous also seem to possess moderate activity against the test organisms. Earlier similar observations were made by Sathiya and Muthuchelian (2008) in *Tabebuia rosea*, karthik kumar *et al*. (2007) in *Eclipta prostrata*, and Ramya *et al*. (2008) in *Pterocarpus marsupium.*

All the other test organism showed best response to both ethanol extract and aqueous extract. It is in line with work of Dhanabalan *et al*. (2008) in *Tridax procumbens*.

Conclusion :

This work paves a way to the analysis of secondary metabolites of various medicinal plants and the discovery of new drugs against pathogenic bacteria which show resistance to the present day antibiotics without causing any side effects.

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