



ANTIBACTERIAL POTENTIAL AND PHYTOCHEMICAL SCREENING OF *PHYSALIS ANGULATA* AND *SOLANUM VIRGIANUM*

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ABSTRACT:

Plants belonging to the Solanaceae family are commonly used in traditional medicine for the treatment of different ailments. This study aimed at evaluating antibacterial potential and phytochemical screening of *Physalis angulata* and *Solanum virgianum*. *Solanum virgianum* showed antibacterial activity against *Escherichia coli*, *Proteus vulgaris*, *Staphylococcus aureus* and *Pseudomonas spp.* *Physalis angulata* showed antibacterial activity against *Escherichia coli*, *Staphylococcus aureus* and *Pseudomonas spp.* The Plants possess secondary metabolites which are contributing towards the inhibition of bacterial growth.

Key words: - *Physalis angulata*, *Solanum virgianum*, Solanaceae, Antibacterial, Phytochemical.

INTRODUCTION:

Introduction

The family Solanaceae comprises 300 genera and 5000 species¹ are distributed in the sub-tropical, warm-temperate climatic regions of the world. Pradhan and Singh², (1999) recorded 5 genera and 10 wild and 4 cultivated species from Ahmednagar district. The plants of this family are neglected as weeds but they have compounds which are having economic, pharmaceutical, agriculture value³. Infectious diseases are responsible for 14 million global deaths annually and amongst them, bacterial infections⁴ are a major threat. The only solution to this problem is use of antibiotics or chemicals. However, the increasing failure of chemotherapy and antibiotic resistance exhibited by bacterial pathogens has prompted researchers for screening of plants for their antimicrobial activity⁵.

In today's age bioprospecting and exploring the neglected plant resources for their valuable bioactive potential is essentially important⁶.

Thus, there is an urgent need to discover new antimicrobials for new and emerging bacterial diseases.

Solanum virginianum Linn. has various phytochemicals that are medically valuable and are important sources of pharmacological. It has antispermatic, hepatoprotective and anti-cancer properties⁷.

Physalis angulata L. traditionally useful as diuretic, laxative, anti-inflammatory, anticonvulsant. It is useful in gastric disorders^(8,9). All occur naturally as weeds in agricultural fields and waste places. Though they are named in the category of weeds, but are potential drug plants to cure human ailments^{10,24}.

Physalis angulata and *Solanum virgianum* are from the Solanaceae family, rich in secondary metabolites with specific pharmacological

properties^(11,12). The Present study focuses on Phytochemical screening and possible antibacterial activity of *Solanum virginianum* and *Physalis angulata*

MATERIAL & METHODS:

Plant materials: Fresh leaf samples of selected plants viz. *Solanum virginianum* and *Physalis angulata* collected from wastelands and agricultural fields. The plants were identified with the help of Flora of Maharashtra¹³.

Plant extracts preparation: The freshly collected plant materials were washed, shadow dried and then dried in hot air oven at a temperature not more than 45°C. The dried materials were coarsely powdered using an electric blender.

Extraction Methodology: For the extraction of crude bioactives, plant powder was initially diluted with water to sample ratio of 10:1 (v/w). The diluted plant sample was kept at room temperature undisturbed for 24 h. Then, it was kept in the orbital shaker for next 48 h. The concentrated extracts of the drugs were subjected to phytochemical tests for the detection of the presence or absence of the chemical constituents as per the standard procedures⁽¹⁴⁻¹⁸⁾.

Preliminary phytochemical screening -

The preliminary phytochemical screening was performed by standard methods of Plant Analysis⁽¹⁹⁻²⁰⁾. Analysis of phenols, tannins, flavonoids, alkaloids, steroids, saponins, carbohydrates, glycosides, terpenoids, quinones was done.

Antibacterial Activity

The antibacterial effect of extracts of the plants was tested by 'agar well diffusion' method²¹. 24 hours old culture of test organisms was taken, 0.1 ml of these suspensions was spread uniformly. Wells were made on the seeded plate with the help of a sterilized well borer of

6mm diameter. Wells were then filled with 25µl of the extracts and allowed to diffuse for 60 minutes in refrigerator at 4°C. The plates were then incubated at 37°C for 24 hours. The zone of the clearance around each well after the incubation period, confirms the antimicrobial activity of the respective extract. Each experiment was carried out in triplicates. The clear zones formed around each well were indicative of the antibacterial activity of the fractions. Random measurements in mm of the inhibition zones around wells in agar medium were taken and analyzed statistically.

RESULT & DISCUSSION:

Solanum virginianum and *Physalis angulata* were screened for the presence of various Phytochemicals using the qualitative analysis. The results are mentioned in Table 1.

The phytochemical screening of the plants revealed the presence of compounds like Phenols, flavonoids, saponins, terpenoids, steroids, glycosides. They might act as allelochemicals and be released in the surrounding environment, through various processes in the form of leachates, root exudates and even residues of plant parts which in due course of time become allelopathic to associated native plants. The antibacterial activity of leaf extracts of *Solanum virginianum* and *Physalis angulata* was tested against gram positive *Staphylococcus aureus* and gram-negative *Escherichia coli*, *Proteus vulgaris*, *Pseudomonas spp.* The results for antimicrobial activity are mentioned in figure 1 and 2. Agar well diffusion' method was used to find out antibacterial activities of selected plant species of Solanaceae family against *Escherichia coli*, *Proteus vulgaris*, *Staphylococcus aureus* and *Pseudomonas spp.* Inhibition zones were measured in mm. Data obtained was statistically analyzed using Single factor ANOVA.

The sensitivity of tested Gram-positive and Gram-negative bacteria to different extracts was variable. '*Solanum virginianum* showed antibacterial activity against all the four bacterianamely *Escherichia coli*, *Proteus vulgaris*, *Staphylococcus aureus* and *Pseudomonas spp.*, but the highest activity was shown against *Pseudomonas spp.* It showed inhibition zone of 7.33mm. Whereas of *Physalis angulata* showed highest activity of 4mm against *Staphylococcus aureus*. It has no activity against *P. vulgaris*.

The results are consistent with findings by Sateesh P *et al.*,¹² in phytochemical analysis of *Physalisangulta* reveals presence of alkaloids, flavonoids, phenols.

The antibacterial activity can be attributed towards the phytochemicals like alkaloids, flavanoids and saponins present in the plants. The Studies done by Reddy and Reddy,²² reported that the *Solanum virginianum* is one of the important medicinal herbs in Ayurveda. Their studies indicated that *Solanum virginianum* possesses antiasthmatic, hypoglycemic, hepatoprotective, antibacterial and insect repellent properties.

Donkor *et al.*, (2012) compared the antimicrobial activity of zinc oxide ointment and *P. angulata* crude fruit extracts against *Pseudomonas aeruginosa* and *Staphylococcus aureus*²³. The unformulated crude extract of plant fruit exhibited the highest inhibitory activity against *S. aureus*. These results showed that plant fruit extract is useful against the *S. aureus* infections.

CONCLUSION

The Phytochemical analysis suggests the presence of secondary metabolites which are medicinally important. The antibacterial activity reveals that a further detailed study of these neglected weeds of Ahmednagar district

should be done to obtain natural antimicrobial agents.

Thus, the results of this study suggested that Solanaceae plants from Ahmednagar district could be a good natural source of chemopreventive and/or chemotherapeutic agents.

REFERENCES:

- Willis, J C (1973): A Dictionary of the Flowering plants and Ferns 8th edition revised by H K hairy Shaw (Cambridge University Press).
- Pradhan, S.G. and Singh, N.P. (1999): Flora of Ahmednagar District, (Maharashtra) Published by Bishen Singh M. Pal Singh, Dehradun. Prakashan Publication, Pune. 105-108; 593-597
- R.G. Olmstead, L. Bohs, H. Abdel Migid, E. Santiago-alentin, V.F. Garcia, S.M. Collier (2008): A molecular phylogeny of the Solanaceae Taxon, 57:1159-1181
- Walsh, C. (2003): Where will new antibiotics come from? Nat Rev Microbiol; 1:65-70.
- Westh H, Zinn C.S, Rosdahl V.T. (2004): An international multicenter study of antimicrobial consumption and resistance in *Staphylococcus aureus* isolate from 15 hospitals in 14 countries. Microb Drug Resist; 10:169-76.
- Gagare S. B. and Jadhav P. S. (2018): Hepatoprotective and Antibacterial Potential of Purified Active Components from *Sesuvium portulacastrum* extracts. Journal of Chemistry and Chemical Sciences, Vol.8(4). 756-763.
- Poongothai, K. Ponmurugan, P., Amed, K.S., Kumar, B.S. and Sheriff, S.A. (2011): Antihyperglycemic and antioxidant effects of *Solanum xanthocarpum* leaves (field grown and in vitro raised) extracts on alloxan

- induced diabetic rats 4(10):778-785
europepmc.org
- Dash, B (1991): *Materia Medica of Ayurveda based on Madanpala's Nighantu*. B. Jain Publishers, New Delhi. P. 780.
- Daya, L. Chotani and H.V. Vaghasiya. (2012): A Phyto-pharmacological overview on *Physalis angulata* L. *Indian J. of Nat. Products and resources* 3(4):477-482.
- Akintayo L., Ogundajo Atikueke S., Akpome Nimota A., Tijani. (2015): Chemical constituent of the leaf essential oil of *Physalis angulata* L. *Asian journal of applied sciences* 3(4):652-55 <http://www.worldwidejournals.com>
- Lin, R.Y.; Wang, H.B.; Guo, X.K.; Ye, C.Y.; He, H.B.; Zhou, Y. and Lin, W.X. (2011): Impact of applied phenolic acids on the microbes, enzymes and available nutrients in paddy soils. *Allelopathy Journal* 28 (2):225-236.
- Sateesh P, Porika R and Mamidala, E. (2014): Phytochemical analysis and in vitro antidiabetic activities of *Physalis angulata* fruit extracts. *Phytochemical Analysis and In vitro Antidiabetic NJIRM* 2014; Vol. 5(2). 34-38.
- Singh, N.P., Lakshminarasimhan, Karthikeyan S., Prasanna P.V. (2001) : *Flora of Maharashtra State Vol I and II Botanical Survey of India*.
- Harborne, J. M. (1973): *Phytochemical Methods*, Chapman and Hall, London.
- Harborne, J. B. (2005): *Phytochemical methods. A Guide to modern techniques of plant analysis*, 3rd edition, Springer (India) Pvt. Ltd., New Delhi. Pages: 4 -7, 9-12, 45, 119, 125, 135.
- Kokate, C. K. and A. P. Purohit. (2006): *Pharmacognosy*. 34th edition, Nirali publications.
- Raaman, N. (2006): *Phytochemical Techniques*, New India Publishing Agency.
- Vogel, A.J. (1975): *A text book of practical organic chemistry*. 3rd edition, English Language Book Society & Longman Gr. Ltd. volatiles. *South African Journal of Botany* 76: 612-631.
- Gibbs, R.D. (1974): *Chemotaxonomy of flowering plants*, McGill queen's university press, Montreal. 523-619.
- Peach, K. and M. V. Tracey. (1979): *Modern Methods of Plant Analysis*. Narosa Publishing House, New Delhi-III. Pages: 471, 627, 658.
- Madhu, K.; Vanisree, R. and Devi, Y.P. (2015) : In vitro evaluation of antibacterial activity of leaf and flower extracts of *Parthenium hysterophorus* Biolife. 3(4): 838-842 www.biolifejournal.com
- Reddy, N.M. and Reddy, R.N. (2014): *Solanum xanthocarpum* chemical constituents and medicinal properties: A review. *Scholars Academic J. Of Pharmacy (SASP)* 3(2):148-49. Semantischolor.org
- Donker A, Glover R, Boateng J, Gakpo V. (2012): Antibacterial activity of the fruit extract of *Physalis angulata* and its formulation. *Journal of Medical and Biomedical sciences* 2012;1(4): 21-26.
- Gogoi, Pronob and M. Islam. (2012): Phytochemical screening of *Solanum nigrum* L and *S. myriacanthus* Dunal from Districts of Upper Assam, India. *IOSR Journal of Pharmacy*. 2, pp 455-459.

Table 1: Qualitative phytochemical analysis of *Physalis angulata* and *Solanum virginianum*

Phytochemical compound	<i>Physalis angulata</i>	<i>Solanum virginianum</i>
Alkaloids	+	-
Flavonoids	+	+
Phenols	+	+
Saponins	+	+
Sterols	+	+
Tannins	-	+
Carbohydrate	+	+
Cardiac glycosides	+	+
Terpenoids	+	+
Quinones	+	+

“+” present “-” absent

Figure 1: Antibacterial activity of leaf extracts of *Solanum virginianum*

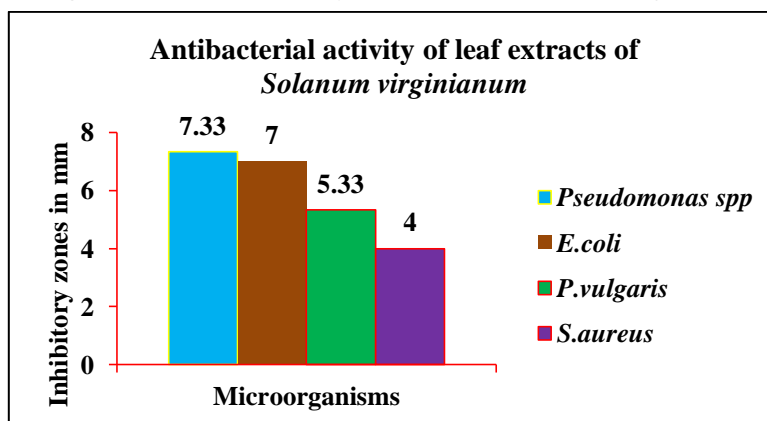


Figure 2: Antibacterial activity of leaf extracts of *Physalis angulata*

