Int. J. Adv. Res. Biol. Sci. 2(11): (2015): 256–259

International Journal of Advanced Research in Biological Sciences
ISSN: 2348-8069
www.ijarbs.com
Coden: IJARQG(USA)

Research Article

SOI: http://s-o-i.org/ 1.15/ijarbs-2-11-31

Antibacterial activity and Phytochemical Screening of methanolic extract of *Pavonia procumbens* (Malvaceae)

[1]M. Manoranjitham and [1-2]S. Premalatha*

[1]PG & Research Department of Botany, Arignar Anna Government Arts College, Musiri-621 211. Tamil Nadu, India.
[2]PG & Research Department of Botany, Government Arts College (Autonomous), Coimbatore-641 018. Tamil Nadu, India.
*Corresponding author: *spr_latha@yahoo.co.in*

Abstract

Antimicrobial potential of methanolic leaf extract of *Pavonia procumbens* was carried out. The antimicrobial activity was tested against five bacterial strains. Among the five different strains used, in the case of *Staphylococcus aureus* the zone of inhibition is higher (30.17 mm) in 60µg/ml concentration. In *Staphylococcus epidermidis* the zone of inhibition is higher in 60µg/ml concentration (26.44 mm) In *Escherichia coli* zone (34.17mm) was observed in 60µg/ml concentration followed by 40µg/ml (26.42 mm). At 40µg/ml of concentration the zone of inhibition is higher (25.67 mm) in *Klebsiella pneumoniae* and in *Proteus mirabilis* showed (31.19mm) zone of inhibition in 60mg /ml concentration. The methanolic extract was effective on all the five bacteria tested and extract was subjected to phytochemical analysis to confirms the presence of various secondary metabolites

Keywords: Antimicrobial, *Pavonia procumbens, Staphylococcus aureus, Klebsiella pneumoniae.*

Introduction

India is a treasure chest of biodiversity which hosts a large variety of plants and has been identified as one of the eight important 'Vavilorian' centres of origin and crop diversity. Although its total land area is only 2.4% of the total geographical area of the world, the country accounts for 8% of the total global biodiversity with an estimated 49,000 species of plants of which 4,900 are endemic (Kumar and Asija 2000). There is a continuous and urgent need to discover new antimicrobial compounds with diverse chemical structures and novel mechanisms of action because there has been an 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. Higher plants produce hundreds to thousands of diverse chemical compounds with different biological activities (Hamburger and Hostettmann, 1991). It is believed that these compounds have an important ecological role. These antimicrobial compounds produced by plants are active against plant and human pathogenic microorganisms (Mitscher *et al*., 1987). There are several reports in the literature regarding the antimicrobial activity of plant crude extracts and the bioassay-guided fractionation of them to yield active principles (Rabe and van Staden, 2000; Zgoda-Pols *et al*., 2002). From an estimated 250,000 higher plants in the world, only 5–15% have been studied for a potential therapeutic value (Balandrin *et al*., 1985; Kinghorn, 1992). A large number remains to be investigated. Medicinal plants have long been the subject of human curiosity and need. Plant-derived products are present in 14 of the 15 therapeutic categories of pharmaceutical preparations that are currently recommended by medical practitioners and they form an important part of the health-care system

in the western world (Phillipson and Anderson, 1989). It is estimated that there are about 2,500,000 species of higher plants and the majority of these have not been examined in detail for their pharmacological activities. The antimicrobial properties of certain Indian medicinal plants were reported based on folklore information (Dayal and Purohit, 1971; Hook and Thomas, 1995; Reddy, 1995), and a few attempts were made on inhibitory activity against certain pathogenic bacteria and fungi (Taylor *et al*., 1995).

Plant based antimicrobials represent a vast untapped source. The use of plant extract for medicinal treatment has become popular when people realized that the effective life span of antibiotic is limited and over prescription and misuse of traditional antibiotics are causing microbial resistance (Alam et al., 2009). These bacteria are considered as a significant source of bateremia in burn victims, urinary tract infections and hospital acquired pneumonia patients. As a result of indiscrimate use of antimicrobial drugs in the treatment of infectious diseases, microorganisms have developed resistance to many antibiotics. There is a need to develop alternative antimicrobial drugs. One of the best approach is to screening the local medicinal plants which represent a rich source of novel antimicrobial agents. The present study was carried out to investigate the antibacterial potential of methanolic leaf extract of *Pavonia procumbens* belonging to families Malvaceae were tested against medically important five bacteria.

Materials and Methods

Source of plant materials

Plant of *Pavonia procumbens* was collected from Kolli hills, it is situated at an ever-so-pleasant altitude ranging from 1000 to 1300 m above mean sea level in the Namakkal district of Tamil Nadu state, South india. Some part of the eastern portion of the hill lies in the Perambalur district. Kolli hill (Kollimalai in Tamil) has an area of 282.92 sq. km16. It stretches 29 km from north to south and 19 km from east to west. Kolli hill is a part of the Talaghat stretch and eastward of the hill lies in Pachamalai. Collected plant specimen was identified by Dr. S. John Britto, Director, The Rapinat Herbarium and Centre for Molecular Sytematics, St' Joseph's College, Tiruchirapalli, Tamil Nadu, India and The Voucher specimen (IPH-52) was deposited in Entomology lab, Arignar Anna Government Arts College, Musiri, Tamil Nadu, India.

Extraction method

The dried leaves (100g) were powdered mechanically using commercial electrical stainless steel blender and extracted sequentially with methanol (500ml, Ranchem), in a soxhlet apparatus separately until exhaustion. The extract was concentrated under reduced pressure of 22-26mm hg at 45o C by 'Rotavapour' and the residue obtained was stored at 4ºC in an amber vial. Then the vials were named and covered with silver foil and transported to the laboratory. Until use those vials were kept in cool and dark place at 4ºC.

Test Organisms

Five bacterial strains, two Gram-positive (*Staphylococcus aureus* and *Staphylococcus epidermidis*) and three Gram-negative (*Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*) were used for the present studies.

Results and Discussion

In the present study, the antimicrobial activity of *P. procumbens* leaf methanolic extract against various microbial strains with respect to various concentrations (µg/ml) was presented in the Table 1. The zone of inhibition of test concentrations was compared with standard concentration of control Gentamycine (30µg/ml; for *E. coli, S. aureus;* Hailu Tadeg et. *al.*, 2005) Ofloxacin (10µg/ml for *K. pneumoniae*) and Chlorempheniсol (30µg/ml for *P. mirabilis* and *S. epidermidis*; Nancy *et al*., 2000) were used as reference standards.

Among the five different bacteria used, in the case of *Staphylococcus aureus* the zone of inhibition is higher (30.17mm) in 60µg/ml concentration against the control (30mm), followed by (29.61mm) in 40µg/ml concentration and (19.42mm) in 20 mg/ml. In the case of *Staphylococcus epidermids* the zone of inhibition is higher in 60µg/ml concentration (26.44 mm) against its control (25.18 mm) followed by (24.62) in 40µg/ml and (21.11) in 20µg/ml. In the stain *Escherichia coli* the zone of inhibition is higher (34.17mm) in 60µg/ml concentration against the control (25.10 mm), followed by (26.42 mm) in 40µg/ml concentration and (21.93mm) in 20 mg/ml. In the case of *Klebsiella pneumoniae* the zone of inhibition is higher in 40µg/ml concentration (25.67 mm) against its control (20.62 mm) followed by (19.53) in 60µg/ml and

(23.02) in 20µg/ml. In *Proteus mirabilis* the maximum inhibition zone (31.19 mm) was observed in 60µg/ml concentration against the control (30.01, followed by 40µg/ml (27.61 mm) and (23.02mm) in 20µg/ml. Preliminary phytochemical screening of methanolic extracts showed the presence of alkaloids, anthraquinones, flavonoids, phenols, saponins and tannins.

Table 1.Antibacterial activity of methanolic extract of *P. procumbens.*

Microorganism tested	Zone of inhibition (mm) with respect to concentration of methanolic extract			
	20 mg/ml	40 mg/ml	60 mg/ml	Control (30mg/ml)
Staphylococcus aureus	19.42	29.61	30.17	30
Staphylococcus epidermidis	21.11	24.62	26.44	25
Escherichia coli	21.93	26.42	34.17	25
Klebsiella pneumoniae	14.62	25.67	19.53	20
Proteus mirabilis	23.02	27.61	31.19	30

Gentamycine (30µg/ml; for *E. coli, S. aureus (*Hailu Tadeg et. *al.,* 2005), Ofloxacin (10µg/ml for *K.pneumoniae;* Karman *et al*., 2002) and Chloremphenicol (30µg/ml for *P. mirabilis* and *S. epidermidis*; Nancy *et al*., 2000) were used as reference standards.

Table 2. Preliminary phytochemical analysis Methanolic extract of *P. procumbens*

Phytochemicals	Methanolic extract
Alkaloids	+
Anthraquinones	+
Flavonoids	+
Phenolics	+
Glycosides	-
Saponins	+
Phytosteroids	-
Tannins	+

(+): Presence of chemical compound, (-): Absence of chemical compound

Present studies indicates that the methanolic extracts of *P. procumbens* have potential antibacterial activity. Many of the researchers (Alam et al., 2009) have reported that methanol is highly potent solvent for extracting the phytochemicals from the plant material. The significant activity of methanol extract, which is equal or slightly lesser than the standard antibiotics, tends toshow that the active compounds of the plants are better extracted with methanol. Natural products are known to play an important role in both drug discovery and chemical biology. In fact, many of the current drugs either mimic naturally occurring molecules or have structures that are fully or in part derived from natural motifs. India is also a home for many languages, cultures and beliefs that have in turn contributed to the high diversity of traditional knowledge and practice of the people, which, among others include the use of medicinal plants. More than 95% of traditional preparations in the country are some of the common uses of the medicinal plants sold in markets include fumigation, vermifuge, pain relief and treating skin infections. From the obtained results *P. procumbens* could serve as a source of plant derived natural products with antimicrobial resistance activity to be used against microbes.

In conclusion, the plant investigated possessed activity against strain of bacteria. The extensive use of this herbal plant by the local people in treating various types of skin disorders might therefore be justified by their antimicrobial activities against different strains of bacteria, which are known to be responsible for causing various skin infections. The results also indicate that scientific studies carried out on medicinal plants having traditional claims of effectiveness might warrant fruitful results.

References

1. Alam N, Shim MJ, Lee MW, Shin PG, Yoo YB, Lee TS (2009). Phylogenetic relationship in different commercial strains of *Pleurotus nebrodensis* based on ITS sequence and RAPD. Mycobiology, 37: 183-188.
2. Balandrin, M.F., Klocke, J.A., Wurtele, E.S., Bollinger, W.H., 1985. Natural Plant Chemicals; Sources of Industrial and Medicinal Materials. *Science* 228, 1154-1160.
3. Dayal, B., and Purohit, R.M., 1971. Screening of some Indian essential oils for their antifungal properties. Flavour India 2, 484–486.
4. Hailu Tadega, Endris Mohammedb, Kaleab Asresc and Tsige Gebre-Mariama. 2005 Antimicrobial activities of some selected traditional *Ethiopian guarana* seed extracts. Food Chemistry, 104: 1258–1268.
5. Hamburger M., Marston A., Hostettmann K., Search for new drugs of plant origin [In] *Advances in Drug Research Vol. 20*, B. Testa Editor. London: Academic Press 1991. p. 167-215
6. Hook, M., and Thomas, S., 1995. Antimicrobial activity of aqueous and starch extracts of *Tinospora cordifolia*. Current Science 69, 637.
7. Kinghorn, A.D., 1992. Plants as sources of medicinally and pharmaceutically important compounds. In: Nigg, H.N., Seigler, D. (Eds.), Phytochemical Resources for Medicine and Agriculture. Plenum Press, New York, pp. 75–95.
8. Kumar, V. and Asija, 2000. Biodiversity Conservation in: Biodiversity-Principles and Conservation. Agrobiosis (India), Jodhpur.
9. Mitscher, L.A., Drake, S., Goliapudi, S.R., Okwute, S.K., 1987. A modern look at folklore use of anti-infective agents. *Journal of Natural Products* 50, 1025-1040.
10. Nancy Eisenberg and Emotion. 2000. regulation, and moral development, Annu. Rev. Psychol, 51(1): 665–697
11. Phillipson, J.D., and Anderson, L.A., 1989. Ethnopharmacology and western medicine. Journal of Ethnopharmacology 25, 61–72.
12. Rabe, T., and van Staden, J., 2000. Isolation of an antibacterial sesquiterpenoid from *Warburgia salutaris*. Journal of Ethnopharmacology 73, 171–174.
13. Reddy, R.V., 1995. Ethnobotnical and Phytochemical studies on Medicinal plant resources of Cuddapah district, A.P., India. Ph.D., Thesis, Sri Krishnadevaraya University, Anantapur, India.
14. Taylor, R.S., Manandhar, N.P., and Towers, G.H.N., 1995. Screening of selected medicinal plants of Nepal for antimicrobial activities. Journal of Ethnopharmacology 46, 153–159.
15. Zgoda-Pols, J.R., Freyer, A.J., Killmer, L.B., and Porter, J.B., 2002. Antimicrobial resveratrol tetramers from the stem bark of *Vatica oblongifolia* . Journal of Natural Products 65, 1554–1559.