



Research Article

EVALUATION OF ANTIBACTERIAL ACTIVITY OF DIFFERENT SOLVENT EXTRACTS OF *BEGONIA CORDIFOLIA*

S. Amutha* and T. Sreedevikumari

P.G. Department of Zoology, Vivekananda College, Agasteeswaram, Kanyakumari- 629701, Tamilnadu, India

Article History: Received 4th May, 2016; Revised 10th June, 2016; Accepted 24th June; Published 30th June, 2016

ABSTRACT

The resurgence of several infections appeared to have been controlled and the increase in bacterial resistance have created the necessity for the development of new antibacterials. In this study the antibacterial efficiency of *B. cordifolia* leaf extracts were examined using Hexane, Ethyl Acetate, Acetone and Aqueous solution as solvents and tested against pathogens like *Vibrio harveyi* and *Pseudomonas aeruginosa* using disc diffusion method. The minimum zone of inhibition was observed in acetone and aqueous solution of *B. cordifolia*, showing less antimicrobial activity against both experimental strains. The other two extracts, hexane and ethyl acetate showed maximum zone of inhibition against the experimental strains. The antimicrobial activity of *B. cordifolia* extracts proved that it may be a new and effective herbal medicine to treat the infectious diseases, caused by *Pseudomonas aeruginosa* and *Vibrio harveyi*.

Keywords: Antimicrobial activity, Disc diffusion method, *Begonia cordifolia*, *Pseudomonas aeruginosa*, *Vibrio harveyi*.

INTRODUCTION

Plants, as the source of medicine, have been playing an important role in the health services around the globe (Thomson, 2010). About three quarters of the world's population relies on plant and their extracts for health care (Kunwar and Busmann, 2008). A large number of our population, particularly in rural areas depends largely on herbal remedies for the treatment of different types of diseases. It indicates the importance of the individual plants in the health care system (Amit Subedi *et al.*, 2011).

World Health Organization reports that, at least 75 to 95% of the world population's chiefly rely on traditional medicines and major part of traditional therapies involves the use of plant extracts or their active constituents (Moly, 2011). The demand for more and more drugs from plant sources are continuously increasing, which necessitates the screening of medicinal plants with promising biological activity (Sumathi and Parvathi, 2010). Medicinal plants are the gift of nature to cure number of diseases among human beings. Large number of plants in different location around the world have been extracted and semi-purified to investigate their antimicrobial activity individually (Vadlapudi and Chandrasekar, 2010).

But the expanding bacterial resistance to antibiotics has become a growing concern worldwide (Gardam, 2000).

Increasing bacterial resistance is prompting a resurgence in research of the antimicrobial role of herbs against resistant

strains (Hemaiswarya *et al.*, 2008). Among the herbs, *Begonia* comprises almost 1400 species arranged into 78 sections (Baranov and Barkley, 1974; Smith *et al.*, 1986; Doorenbos *et al.*, 1998; Forrest and Hollingsworth, 2003; Wilde and Plana, 2003). Among the *Begonia* species, *Begonia cordifolia* (Wight) Thwaites is a perennial herb having subterranean rhizomes, growing horizontally and also commonly available in the hill stations of Tamilnadu.

Hence in this study it was planned to determine the antibacterial activity of *Begonia cordifolia* plant extract against *P. aeruginosa* and *V. harveyi*.

MATERIALS AND METHODS

Plant collection

Begonia cordifolia leaves were collected from Papanasum, Tirunelveli District, Tamil Nadu.

Solvent extraction

The leaves of *Begonia cordifolia* was air- dried and powdered. About 250g of this powder was extracted with Hexane, Ethyl Acetate, Acetone, Methanol and Aqueous in

*Corresponding author address: Assistant Professor, P.G. Department of Zoology, Vivekananda College, Agasteeswaram, Kanyakumari- 629701, Tamil Nadu, India, e-mail: amuthamoni@yahoo.co.in, Mobile: +91 9444584935.

a Soxhlet apparatus. The extraction process was continued for 8h. The solvents were evaporated under reduced pressure. After determining the yields, the sediments extracts were stored at 4°C until further use.

Drug preparation

About 100 mg of each sediment extract Hexane, Ethyl Acetate, Acetone, Methanol and Aqueous was redissolved in 1 ml of 1% Dimethyl sulfoxide (Fischer chemicals, Fair Lawn N.J).

Test bacterial strains

All the experimental bacterial strains were propagated by IMTECH culture. *Vibrio harveye* and *Pseudomonas aeruginosa* were selected as test bacterial strains and maintained in stock culture. These bacteria were subcultured in nutrient broth media (Purchased from HiMedia Laboratories Limited, Mumbai, India) which was prepared by the following composition.

Preparation of nutrient broth liquid media

Eight grams of Nutrient agar was dissolved in 1000 ml of distilled water and boiled. The P^H was maintained to 6.9 ± 0.7 . The media was sterilized by autoclaving at 15 Lbs pressure and 121°C for 15 minutes.

Inoculum preparation

Inocula were prepared by picking colonies from 12h old cultures. Colonies were suspended in 5ml saline solution (0.145M). The density was adjusted by the spectrophotometer to 0.5 McFarland standard at a wavelength of 530nm to yield a stock suspension of 1×10^6 cells per ml (Barry *et al.*, 1983).

Preparation of nutrient agar medium

37 grams of Nutrient agar was dissolved in 1000 ml of distilled water and boiled. The P^H maintained to 7.3 ± 0.1 . The media was sterilized by autoclaving at 15 Lbs pressure and 121°C for 15 minutes.

Disk diffusion test

Experimental plates were assigned into four groups. Each group consists of six plates of *V. harveye*, six plates of *E.coli* and six plates of *P. aeruginosa*. About 1.5 ml bacterial inoculums (1×10^6 cells/ml) was uniformly seeded on nutrient agar plates. The nutrient agar medium was poured in glass petri dishes, left aside for 15 minutes and excess of suspension was then drained and discarded properly. Subsequently, filter paper discs (6mm in diameter) saturated with sediment extract was placed on surface of each inoculated plate. Culture plates, were incubated at $37 \pm 1^\circ\text{C}$ for 24 h. After 24 hr, bioactivity was determined by the measurement of zones of inhibition in diameter (mm). All the samples were tested in triplicates. Control had a solvent without test extract. All data were expressed as mean $\pm$ standard deviation and statistically analysed using Microsoft Office XP - Excel program.

RESULTS AND DISCUSSION

The results of the antibacterial activity of *Begonia cordifolia* are presented in Table-1. Hexane, ethyl acetate, acetone, methanol and aqueous extracts of *Begonia cordifolia* were confirmed the antibacterial activity against the *Vibrio harveye* and *Pseudomonas aeruginosa*. The maximum zone of inhibition was observed in methanolic extract of *Begonia cordifolia* against *Vibrio harveye*. The study also revealed that hexane, ethyl acetate extract shows moderated and acetone and aqueous extract shows minimum antimicrobial activity.

Table-1: Study of antibacterial activity of *Begonia cordifolia* leaf extract against selected bacteria using different solvents

Solvents	Zone of Inhibition (mm)	
	<i>Vibrio harveye</i>	<i>Pseudomonas aeruginosa</i>
Hexane	12	12
Ethyl Acetate	14	11
Acetone	8	12
Methanol	16	11
Aqueous	8	12
Gentamycin (Antibiotics)	-	10

Various studies on the efficacy of plant extracts used for antimicrobial activity has also been realized by many scientist in many plant species like *Adhatoda zeylanica* Medic (Ilango *et al.*, 2009), *Trianthema decandra* L. (Geethalakshmi *et al.*, 2010), *Argemire mexicana* L. (Rahman *et al.*, 2001), *Tinospora cordifolia* and *Cassia fistula* (Upadhyay *et al.*, 2011), *R. communis*, *P. niruri*, *A.*

lebbeck, *C. asiatica* and *T. cordifolia* (Sankar *et al.*, 2011). Recently, a number of plants have been reported for antibacterial properties across the world (Olowosulu and Ibrahim, 2006; Murugan and Mohan, 2012; Murugan and Mohan, 2013).

Organic solvents such as ethanol, acetone and methanol are often used to extract compounds (Eloff,

1998). The methanolic extract of *B. cordifolia* showed significant antimicrobial activity against the *Vibrio harveyi*. The effectiveness of the *B. cordifolia* extract largely depends on the type of solvent used. The organic extracts provided more powerful antimicrobial activity as compared to aqueous extracts.

However, Murugesan *et al.* (2011) mentioned that petroleum ether extract of plant *Menecylon umbellatum* Burm.f. Showed significant antimicrobial activity. Furthermore, water extract from leaves of *P. ocerifolium* had been reported to have prominent antibacterial activity against several gram positive and gram negative human pathogenic bacteria (Thatoi *et al.*, 2008). In the present investigation, different extracts of *B. cordifolia* was evaluated for exploration of their antimicrobial activity against *V. harveyi* and *P. aeruginosa*. The presence of antibacterial activity in a particular part of a particular species may be due to the presence of one or more bioactive compounds such as alkaloids, glycosides, flavonoids, steroids, saponins etc. (Baladrin and Kloeke, 1988).

CONCLUSION

B. cordifolia contain potential antimicrobial components, may be of great use for the development of new drugs in pharmaceutical industries against various diseases.

ACKNOWLEDGEMENT

The authors would like to thank Head of the Department of Zoology, Vivekananda College, for the laboratory facilities provided.

REFERENCES

- Amit Subedi, Mohan Prasad Amatya, Tirtha Maiya Shrestha, Shyam Kumar Mishra, and Bharat Mani Pokhrel, 2012. Antioxidant and antibacterial activity of methanolic Extract of *Machilus odoratissima*. *Kathmandu University J. Sci., Eng. Technol.*, 8(1), 73-80.
- Baladrin, M.J. and Kloeke, J.A., 1988. Medicinal aromatic and industrial materials from plants. Springer, Verlag, Berlin, pp. 1-36.
- Baranov, A.I. and Barkley, F.A., 1974. The sections of the Genus *Begonia*. Northeastern University, Boston, pp. 1-28.
- Barry, A.L., Badal, R.E., Hawkinson, R.W., 1983. Influence of inoculum growth phase on microdilution susceptibility tests. *J. Clin. Microbiol.*, 18, 645-651.
- Doorenbos, J.M.S., Sosef, M. and De Wilde, J.J.F.E., 1998. The Sections of *Begonia*, including descriptions, keys and species Lists. *Studies in begoniaceae VI. Wageningen Agricultural University Papers*, 98, 1-266.
- Eloff, J.N., 1998. Which extractant should be used for the screening and isolation of antimicrobial components from plants? *J. Ethnopharmacol.*, 60, 1-8.
- Forrest, L.L. and Hollingsworth, P.M., 2003. A recircumscription of *Begonia* based on nuclear ribosomal sequences. *Plant Syst. Evol.*, 241, 193-211.
- Gardam, M.A., 2000. Is methicillin-resistant *Staphylococcus aureus* an emerging community pathogen? A review of the literature. *Can. J. Infect. Dis.*, 11, 202-211.
- Geethalakshmi, R., Sarada, D.V.L. and Ramasamy, K., 2010. *Trianthema decandra* L. A review on its phytochemical and pharmacological profile. *Int. J. Eng. Sci. Technol.*, 2, 976-979.
- Hemaiswarya, S., Kruthiventi, A.K. and Doble, M., 2008. Synergism between natural products and antibiotics against infectious diseases. *Phytomed.*, 15, 639-652.
- Ilango K., Chitra V., Kanimozhi, P. and Balaji, G., 2009. Antidiabetic, antioxidant and antibacterial activities of leaf extracts of *Adhatoda zeylanica*. *J. Pharm. Sci. Res.*, 1(2), 67-73.
- Kunwar, R.M. and Bussmann, R.W., 2008. Ethnobotany in the Nepal Himalaya. *J. Ethnobiol. Ethnomed.*, 2,4:24. doi: 10.1186/1746-4269-4-24.
- Molly, M.R., 2010. Classifications, Terminology and Standards, WHO, Geneva: Xiaorui Zhang Traditional Medicines, traditional medicines: Global situation issues and challenges. 3rd Edition.
- Murugan, M. and Mohan, V.R., 2012. Antibacterial activity of *Mucuna atropurpurea*. *Dc. Sci. Res. Rep.*, 2, 277-280.
- Murugan, M. and Mohan, V.R., 2013. Evaluation of phytochemical analysis and antibacterial activity of *Cassia roxburghii* DC. and *Hyptis suaveolens* L. *Non-Timber Forest Prod.*, 2, 261-264.
- Murugesan, S., Annamalai Pannerselvam and Arumugame Chanemougame Tangavelou, 2011. Phytochemical screening and antimicrobial activity of the leaves of *Menaecydom umbellatum* Burm. F. *J. Appl. Pharmaceut. Sci.*, 1, 42-45.
- Olowosulu, A.K. and Ibrahim, Y.K.E., 2006. Studies on the antimicrobial screening of aqueous extracts of five plants used in folk medicine in Nigeria, West Africa. *J. Bio. Sci.*, 3, 21-26.
- Rahman, M.S., Md Faizus Saldin, Md. Abu Hena Mostofa Jamal, Anzana Pravin and Md. Khasrul Alam, 2011. Antibacterial Activity of *Argemone Mexicana* L. against water Borne Microbes. *Res. J. Med. Plant.* 5, 621-626.
- Shankar, K., Chavan, L., Shinde, S., and Patil, B., 2011. An improved DNA extraction protocol from four in vitro banana cultivars. *Asian J. Biotechnol.*, 3, 84-90.

- Smith, I.B., Wasshausen, D.C., Golding, J. and Karegreannes, 1986. Begoniaceae. Part Illustrated Key. Part. I. Annotated Species List. *Smithson Contro. Bot.*, 60, 1-584.
- Sumathi, P. and Parvathy, A., 2010. Antimicrobial activity of some traditional medicinal plants. *J. Med. Plants Res.*, 4(4), 316-321.
- Thatoi, H.N., Panda, S.K., Rath, S.K. and Dutta S.K., 2008. Antimicrobial activity and ethano medicinal uses of some medicinal plants from Similipal Biosphere Reserve, Orissa. *Asian Med. J. Plant Sci.*, (7)3, 260-267.
- Thomson, G.E., 2010. Further consideration of Asian Medicinal plants in treating common chronic disease in West. *J. Med. Plants Res.*, 4(2), 125.
- Vadlapudi V. and Chandrasekar, N.K., 2010. In vitro bioactivity of Indian medicinal plant *Cutatropis procera* (Ait.). *J. Global Pharma Technol.*, 2(2), 43-45.