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Antibacterial Activity of Pemphis Acidula Forst

K. Samidurai and A. Saravanakumar

Centre of Advanced Study in Marine Biology,
Annamali University, Parangipettai-608 502, Tamil Nadu, India

Abstract: To evaluate the antibacterial activity of the *Pemphis acidula* plant of extracts *viz.,* methanol, benzene and acetone were determined by the disc diffusion method for the pathogenic bacteria *viz., S. aureus, E. coli*, *P. aeruginosa, M. luteus* and *R. rhodochrous*. Among the three extracts tested methanol extract showed maximum zone of inhibition of 17.0 mm against the bacteria *M. luteus* at the concentration of 10%. The other two extracts benzene and acetone exerted the same range of inhibition zone against all the bacteria tested. Increase in the concentration of plant extract increased the zone of inhibition. The different activity in different concentration suggests different compounds with different polarities.

Key words: Antibacterial activity % *Pemphis acidula* % Pathogen

INTRODUCTION

Plants have an almost limitless ability to synthesize aromatic substances, most of which are phenols or their oxygen-substituted derivatives [1]. Most are secondary metabolites, of which at least 12,000 have been isolated, a number estimated to be less than 10% of the total [2]. In many cases, these substances serve as plant defense mechanisms against predation by microorganisms, insects and herbivores. Some, such as terpenoids, give plants their odors; others (quinones and tannins) are responsible for plant pigment. Infectious diseases are the world's leading cause of premature deaths, killing almost 50,000 people everyday. A large number of anti-microbial agents derived from traditional medicinal plants are available for treating various diseases caused by microorganisms [3]. They are used to eliminate the infecting micro-organisms. The therapeutically useful novel agents should inhibit the germs and exhibit greater selective toxicity towards the infecting germ than the host cells [4]. The present study was to investigate and determine the antibacterial activity of *Pemphis acidula* Forst. Which as a large aromatic shrub with typical five foliolate leave pattern, is found throughout the greater part of India and possess many medicinal values [5].

MATERIALS AND METHODS

Preparation of Plant Extract: The plant *Pe. acidula* (Lythraceae) was collected from Gulf of Mannar Biosphere Reserve, (9º14'47.2N lat. and 79º12'38.6E long.) Tamilnadu, India. The fresh leaves of *Pe. acidula* were washed with tap water and shade dried at room temperature (28 ± 2°C). The dried leaves (1.0 kg) were powdered by electrical blender. Three litre methanol, acetone and benzene separately were used for the extraction of 1.0 kg in the Soxhlet apparatus followed by the standard procedure [6]. The plant material was loaded in the inner tube of the Soxhlet apparatus and then fitted into a round bottomed flask containing methanol. The solvent was boiled gently (40°C) over a heating mantle using the adjustable rheostat. The extraction was continued until complete extraction was effected (8 hrs.) and the solvent was removed at the reduced pressure with the help of rotary vaccum evaporator to yield a viscous dark green residue (12.5 g) of each solvent of methanol, acetone and benzene leaf extracts. The antibacterial activity of *Pe. acidula* plant of different extract was investigated with five human pathogenic bacteria *viz., Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Micrococcus luteus* and *Rhodococcus rhodochrous,* which obtained from the microbial type culture collection

Corresponding Author: K. Samidurai, Research Scholar, Centre of Advanced Study in Marine Biology, Annamali University, Parangipettai, Tamil Nadu, India - 608 502

(MTCC) of Institute of Microbial Technology (IMTECH), Chandigarh, India. The stock culture was maintained on Muller-Hinton agar medium at 4°C.

Disc Diffusion Method: The disc-diffusion assay was used to determine the growth inhibition of bacteria by the plant extracts of *Pe. Acidula* [7]. Petri plates were prepared by pouring 10.0 ml of Muller-Hinton agar for bacteria and allowed to solidify and were seeded with 24 hours old culture of selected bacterial strains (10^6 cells/ml) sterile Whatman No.1 filter paper discs (6 mm diameter) containing 5% and 10% concentration of plant extract dissolved in 5 per cent dimethyl sulphoxide (DMSO). DMSO was used as negative control. Streptomycin was used as positive control. The Muller-Hinton agar assay plates used for testing bacterial susceptibility were incubated at 37°C for 24 hrs. Assessment of antibacterial activity was based on the measurement of diameter of inhibition zone formed around the disc. Three independent trails have been conducted for each concentration. Antibacterial activity was tested using disc diffusion method [8].

RESULTS AND DISCUSSION

The antibacterial activity of the *Pe. acidula* leaf extracts was tested. The plants were extracted with methanol, benzene and acetone. The results were displayed in graphical form and it shows the zone of inhibition at measured in a millimeter (Fig. 1 and Table 1).

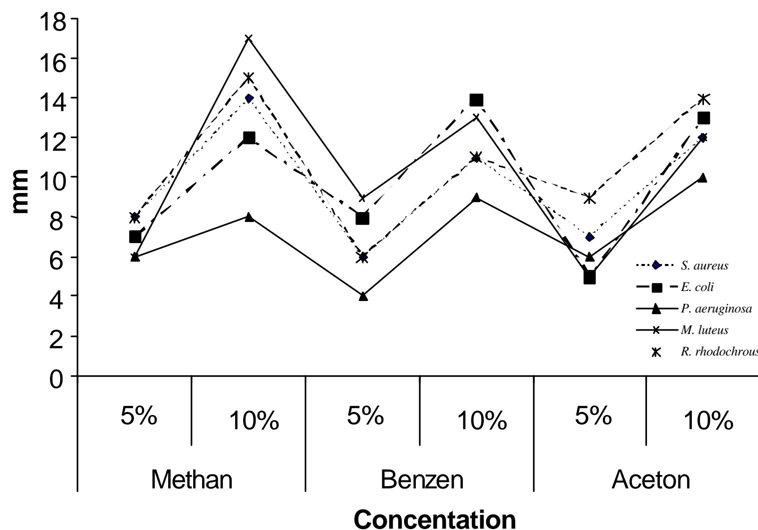

Fig. 1: Antibacterial activity of *Pe .acidula* at different concentration

Table 1: Antibacterial activity of *Pe .acidula* at different concentration

		Zone of inhibition (mm)				
Extracts	Concentration (%)	*S. aureus*	*E. coli*	*P. aeruginosa*	*M. luteus*	*R. rhodochrous*
Methanol	5	8	7	6	6	8
	10	14	12	8	17	15
Benzene	5	6	8	4	9	6
	10	11	14	9	13	11
Acetone	5	7	5	6	5	9
	10	12	13	10	12	14
Positive control	Streptomycin	11	9	6	13	15
Negative control	DMSO	NA	NA	NA	NA	NA

NA - no activity

All the three extracts of *Pe. acidula* were tested against the pathogenic bacteria namely *S. aureus, E. coli, P. aeruginosa, M. luteus* and *R. rhodochrous* at two different concentrations 5% and 10%. It was observed that methanol, benzene and acetone extracts of *Pe. acidula* possessed antibacterial activity against all the bacteria tested. Present findings are in agreement with Ahamed and Beg [9]. Among the three extract tested, methanol extracts showed the maximum zone of inhibition of 17.0 mm against the bacteria *M. luteus* at the concentration of 10%. Increase in the concentration of plant extract increased the zone of inhibition. While Taylor *et al.,* [10] observed that methanol extract showed activity against 11 strains of bacteria. The maximum zone of inhibition of 14.0 mm for *S. aureus* was observed at 10% concentration in methanol extracts. For the bacteria *E. coli* the maximum zone of inhibition of 14.0 mm observed in 10% concentration of benzene extracts. Maximum zone of inhibition 15.0 mm was observed in *R. rhodochrous* at 10% concentration of methanol extracts. Recent investigation of methanol and benzene extract showed the antimicrobial activity [11]. The present results suggest the presence of either good antibacterial potency or of high concentration of an active principle in the extract. *Pe. acidula* possessed very good antibacterial activity and can be used in therapeutic uses. However, suitable bacterial bioassays have been established to recognize and quantify antibacterial effects of plant extracts. Further studies have to be made on fractionation and separation of crude extracts in order to find out the principle antibacterial compound.

CONCLUSION

The plant extracts of *Pe. acidula* showed strong antibacterial activity. This three extracts possessed noticeable antibacterial activity against 5 human pathogenic strains. It is evident from the present study that the methanol extracts of *Pe. acidula* could be utilized as a good natural source of antibacterial agent in pharmaceutical industry. The rational for adopting such as methanol, benzene and acetone sequential extraction procedure was based on the polarity of the solvents that would leach out compound soluble in that particular solvent. The results clearly showed that all the three solvent extracts showed inhibition zone in different species of bacteria. However, the active components responsible for the antibacterial activities need to be evaluated. Therefore, it is suggested that further works may be performed on the isolation and identification of the antibacterial components in three extracts for its industrial and pharmaceutical application.

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