Antimicrobial Activity of Acanthus ilicifolius (L.)

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Bose, et al.: Acanthus ilicifolius antimicrobial activity

The antimicrobial activity of alcoholic, butanolic and chloroform extracts of leaves and roots of the plant Acanthus ilicifolius were studied. Ampicillin and clotrimazole were used as standard antibacterial and antifungal agents respectively. The result of the study revealed that the alcoholic extract and chloroform extract of leaves exhibited strong inhibitory action against Bacillus subtilis, Staphylococcus aureus, Candida albicans, Aspergillus fumigatus and Aspergillus niger and moderate inhibitory action against Pseudomonas aeruginosa and Proteus vulgaris. The rest of the extracts showed moderate activity.

Key words: Acanthus ilicifolius, agar cup-plate method, antimicrobial activity, mangrove

Acanthus ilicifolius is a spiny herb found in mangrove of southern Thailand. In folklore and traditional practice, different parts of A. ilicifolius (Acanthaceae) have been used to treat rheumatism, asthma, paralysis, psoriasis and leucorrhoea¹. Antioxidant, hepatoprotective, leishmanicidal, tumour reducing and anticancer activities of various extracts of A. ilicifolius have been reported²⁴. These created an interest to test the possible antimicrobial activity of different parts of this plant, which has not been reported; hence, the present study was designed. The phytochemical literature reveals the presence of 2-benzoxazolinone, lignan glucosides, benzoazinoide glucosides, flavone glycosides and phenylethanoid

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glycosides in this plant. The present study was aimed at the preliminary investigation of antibacterial and antifungal activity of alcoholic, butanolic and chloroform extracts of leaves and roots of A. ilicifolius.

Leaves and roots of A. ilicifolius were collected from Netravati river valley of Mangalore in the month of October. The plant was authenticated in the Department of Botany, Netaji Mahavidyalaya, District Hoogly, West Bengal. The collected plant materials were shade dried at room temperature and mechanically reduced separately to course powders. The powders of leaves and roots (100 g each) were then extracted individually with 95% alcohol, butanol and chloroform in a Soxhlet apparatus by continuous heat extraction for 78 h. The extracts so obtained were concentrated to dryness by evaporating the solvents under reduced pressure.

The in vitro antibacterial and antifungal studies of the ethanolic, butanolic and chloroform extracts of the leaves and roots were carried out by the Agar cup-plate method. All the extracts were separately dissolved in dimethylsulfoxide (DMSO) to get 10 mg/ml solutions. Ampicillin (1 mg/ml) and clotrimazole (1 mg/ml) were used as standard antibacterial and antifungal agents respectively. The antibacterial activity was evaluated by employing 24 h cultures of Bacillus subtilis, Staphylococcus aureus, Pseudomonas aeruginosa and Proteus vulgaris using Muller Hinton Agar medium. Antifungal activity was carried out against 24 h cultures of Candida albicans, Aspergillus fumigatus and Aspergillus niger using Sabouraud dextrose agar medium. Antifungal activity was evaluated by employing 24 h cultures of Candida albicans, Aspergillus fumigatus and Aspergillus niger using Sabouraud dextrose agar medium. The petri dishes used for antibacterial screening were incubated at 37±1°C for 24 h, while those used for antifungal activity were incubated at 28±1°C for 48 h. The diameters of zone of inhibition surrounding each of the wells were recorded.

Table 1 enumerates the antibacterial and antifungal activity of the extracts of different parts of the title plant. The ethanol, butanol and chloroform extracts of the different parts of the plant exhibited strong to moderate activity against the test microorganisms. The results revealed that, the alcoholic and chloroform extracts of leaves exhibited strong inhibitory action against Bacillus subtilis, Staphylococcus aureus, Candida albicans, Aspergillus fumigatus and Aspergillus niger and moderate inhibitory action against Pseudomonas aeruginosa and Proteus vulgaris. The rest of the extracts showed moderate activity.

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Analysis of Bulk Sample of Salicylic Acid by Application of Hydrotropic Solubilization Method
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In the present investigation, the poorly water-soluble drug, salicylic acid has been solubilized using 0.5 M ibuprofen sodium and 2.0 M sodium salicylate solution as hydrotropic agents for the titrimetric analysis precluding the use of organic solvents. Both hydrotropes are economic and pollution-free. The mean percent estimation of salicylic acid estimated in bulk sample by Indian Pharmacopoeial method is 98.78%. The mean percent estimation by ibuprofen sodium method and sodium salicylate method are 99.25% and 98.82%, respectively. The results of analysis by the proposed method are very close to the results of analysis by the standard method. This confirms the accuracy of the proposed method. The proposed method was validated statistically by low values of statistical parameters viz. standard deviation, percent coefficient of variation and standard error. The proposed method is new, accurate, simple and economic.

Key words: Salicylic acid, hydrotropy, sodium salicylate, ibuprofen sodium, titrimetry

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Hydrotropic solubilization technique is one of the methods used to enhance the aqueous solubility of insoluble or slightly soluble drugs. This technique involves the addition of large amount of additives in presence of which the aqueous solubility of the solute shows multifold enhancement1-17. Maheshwari analyzed various poorly water-soluble drugs, using hydrotropic solubilization phenomenon viz. frusemide1, tinidazole 2, ketoprofen 3, cefixime 4 and ketoprofen5. Maheshwari et al. have developed various analytical techniques using hydrotropic solubilization phenomenon to analyze poorly water-soluble drugs, aceclofenac6, hydrochlorothiazide 7, cephalexin 8 and piroxicam 9. The Indian Pharmacopoeial method of titrimetric analysis of salicylic acid uses an organic solvent, ethanol for the solubilization of the drug. Drawbacks of using an organic solvent include toxicity, high cost and environmental hazards. The primary objective of this study was to preclude the use of organic solvent and to employ hydrotropic solubilizing agents, ibuprofen sodium and sodium salicylate, which are economic.

All chemicals and solvents used were of analytical grade. Salicylic acid (S. D. Fine Chemicals Limited, Mumbai) was procured from market. Ibuprofen was obtained as gift sample from Shree Pharmaceuticals Ltd., Indore, India.

Solubility of salicylic acid was determined in distilled water and different concentrated solutions of hydrotropic agents at 27±1°. Enhancement of solubility of salicylic acid in 0.5 M ibuprofen sodium solution and 2.0 M sodium salicylate solution was more than 12-folds and 6-folds respectively (as compared to solubility in distilled water).