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Bactericidal Activity of *Stoechospermum sp*

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ABSTRACT

Seaweeds are used as a source of nutraceuticals for decades especially in oriental countries. In the present study the bactericidal activity of the solvent extracts of *Stoechospermum sp* collected from the coast of Tamil Nadu was investigated using agar well diffusion method. The ethanol extract was found to be effective against five of the seven pathogens tested.

Keywords: seaweeds, antibacterial activity, methanol extract, plate assay.

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INTRODUCTION

Seaweeds lack true stems leaves and roots and grow in marine environment. They are a rich source of vitamins, minor elements and other nutraceuticals [1,2]. They have been widely used in the cosmetic, pharmaceutical and food industries. Seaweeds are found to possess anticancer and antimicrobial properties [3,4]. Ethanol, methanol and chloroform extracts of *Ulva sp.*, *Sargassum ilicifolium* and *Kappaphycus alvarezii* were found to be effective against a wide range of bacterial pathogens [5]. *Stoechospermum sp* (Phaeophyta, Dictyotales) is a brown alga having greenish brown thalli that is erect, tufted and linear 7-26 cm in height. It is attached to rhizoids and is present as drift material in sandy beaches [6]. The methanolic extracts of *Stoechospermum marginatum* were found to possess cytotoxic, antioxidant and metal chelating properties [7]. A wide range of compounds like saturated and unsaturated fatty acids, sterols, diterpenes and D-mannitol were isolated from chloroform and methanolic extracts of *Stoechospermum marginatum* [8,9]. Gold nanoparticles have been synthesized using *Stoechospermum marginatum* to check its effectiveness against bacterial pathogens [10]. The present study was carried out to investigate the bactericidal activity of *Stoechospermum sp.* against seven bacterial pathogens namely, *Aeromonas hydrophila*, *Edwardsiella tarda*, *Pseudomonas fluorescens*, *Salmonella typhi*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Escherichia coli* using agar well diffusion method.

MATERIALS AND METHODS

Preparation of Extracts

The algae *Stoechospermum sp* was collected from the southern coast of Tamil Nadu. It was dried, weighed, chopped and finely powdered in a mixer grinder. The sample (5 g) was soaked in various organic solvents namely, 80% ethanol, methanol and ethanol:chloroform (1:1). It was kept for 48 hours at room temperature and mixed at regular intervals. After 48 hours the extract from each solvent was filtered using Whatman No1 filter paper for further analysis.

Test Microorganisms

The bacterial pathogens used were that of *A. hydrophila*, *E. tarda*, *E. coli*, *P. aeruginosa*, *P. fluorescens*, *S. typhi*, and *S. aureus*. A loopfull of sample from each pure culture was inoculated in sterile nutrient broth and kept overnight at 37°C for growth. They were maintained as pure cultures in slants.

Plate Assay Method

Antibacterial activity was assayed using the agar well diffusion test technique [11]. Muller Hinton Agar Medium (pH 7.4) was prepared and the test organisms were spread evenly from the 24 h incubated broths of each organism. In each of the plates, two to four wells of 5

mm diameter were made using a sterilized cork borer. Concentrations of algal extract ranging from 50 µl, 75 µl and 100 µl respectively were placed in the wells and allowed to diffuse at room temperature for 30 min.

The extract loaded plates were kept for incubation at 37°C for 24 h. After incubation, a clear zone was observed around the well which was the evidence for the presence of bactericidal compounds in the algal extract. The zone of inhibition was measured in millimetres (including the diameter of the well).

RESULTS AND DISCUSSION

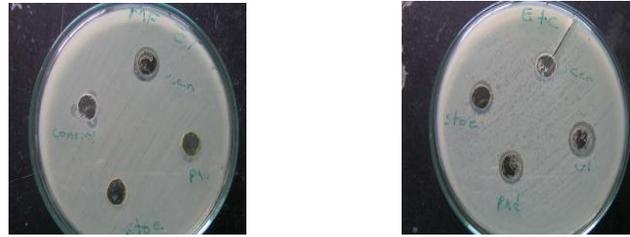
The bactericidal activity of *Stoechospermum sp* was investigated in this study. The ethanol, methanol and ethanol:chloroform (1:1) extracts of the algae was tested against *A. hydrophila*, *E. tarda*, *E. coli*, *P. aeruginosa*, *P. fluorescens*, *S. typhi*, and *S. aureus*. The results indicating the zone of inhibition in millimeters exhibited by the different concentrations of algal extracts are tabulated in Table-1. The algal extracts were not effective against *A. hydrophila* (Table-1).

Table-1 Bactericidal activity of *Stoechospermum sp*

S.No	Name of the organism	Zone of inhibition (mm)		
		Ethanol	Ethanol:Chloroform (1:1)	Methanol
1	<i>Aeromonas hydrophila</i>	-	-	-
2	<i>Edwardsiella tarda</i>	-	5	3
3	<i>Escherichia coli</i>	12	-	-
4	<i>Pseudomonas aeruginosa</i>	4	-	-
5	<i>Pseudomonas fluorescens</i>	5	4	-
6	<i>Salmonella typhi</i>	8	4	-
7	<i>Staphylococcus aureus</i>	8	3	-

The methanol and ethanol:chloroform (1:1) extracts showed mild activity against *E. tarda* (Fig-1). Ethanol was found to be the best solvent exhibiting bactericidal activity against *E. coli*, *P. aeruginosa*, *P. fluorescens*, *S. typhi*, and *S. aureus* (Fig-2-Fig-6). While methanol extracts showed no zone of inhibition against *E. coli*, *P. aeruginosa*, *P. fluorescens*, *S. typhi*, and *S. aureus*, ethanol:chloroform (1:1) extracts were effective against *P. fluorescens*, *S. typhi*, and *S. aureus*. The maximum activity was shown by the ethanol extracts against *E. coli* and the least activity was demonstrated by ethanol:chloroform (1:1) extracts against *S. aureus* (Table-1).

The antibacterial activity of *Stoechospermum marginatum* was studied and was found to be effective against *S. aureus*, *B. subtilis*, *S. typhimurium*, *E. coli*, and *P. aeruginosa* [3]. The methanol extracts of *Stoechospermum marginatum* were found to possess cytotoxic, antioxidant and metal chelating properties [7].



Methanol Extract

Ethanol:Chloroform (1:1)

Fig- 1 Bactericidal activity of *Stoechospermum sp* against *Edwardsiella tarda*



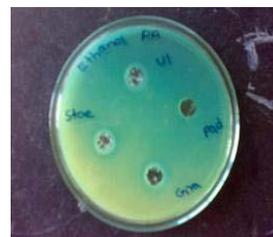
Fig- 2 Bactericidal activity of ethanol extract of *Stoechospermum sp* against *Escherichia coli*



Fig-3 Bactericidal activity of ethanol extract of *Stoechospermum sp* against *Pseudomonas aeruginosa*



Ethanol:chloroform (1:1)



Ethanol Extract

Fig-4: Bactericidal activity of *Stoechospermum sp* against *Pseudomonas fluorescens*



Ethanol Extract



Ethanol:chloroform (1:1)

Fig- 5: Bactericidal activity of *Stoechospermum sp* against *Salmonella typhi*



Ethanol Extract



Ethanol:chloroform (1:1)

Fig- 6 Bactericidal activity of *Stoechospermum sp* against *Staphylococcus aureus*

The present study had highlighted the effectiveness of *Stoechospermum sp* against seven bacterial pathogens. We are now concentrating on the possibilities of isolating the active principles imparting these properties to seaweeds.

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