



Research Article

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Antibacterial activity of marine brown alga *Turbinaria conoides*

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ABSTRACT

Hexane, chloroform, methanol, chloroform: methanol (2:1 v/v) and petroleum ether extracts of *Turbinaria conoides* from the coast of Mandapam were tested *in vitro* for their antibacterial activities against *Escherichia coli*, *Salmonella typhi*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Proteus mirabilis* with the disc diffusion method. Petroleum ether was the best solution for extracting the effective antibacterial materials from the *Turbinaria conoides* used in this experimental and compared with standard drug, Amoxycillin. The present findings show the importance of *Turbinaria conoides* in producing new compounds having antibacterial activity.

Key words: Antibacterial activity, *Turbinaria conoides* and alga extract

INTRODUCTION

The seaweeds have a unique place in traditional medicine of maritime nation as vermifuges, aesthetics and antibiotics in the treatment of cough, wounds, gout, goiter, hypertension, venereal diseases, cancer and a variety of other sickness [1-2]. Resolution to the growing crisis of antibiotic resistance and their side effects are the breakthrough for search of new antimicrobial compounds from natural resources. Marine species have been used in a wide array of traditional remedies and provided a good source of antimicrobial activity. Algae are rich in phytochemical ingredient such as agar, carragenean and alginate, which were utilized in the field of medicine and pharmacy for decade [3]. The production of microbial inhibitory substances from marine species was noted as early as in 1917 [4]. Since then, several studies have been carried out to identify novel antimicrobial compounds from marine sources.

In the present study was undertaken to evaluate antimicrobial activity of the *Turbinaria conoides*. However against selected strains of both Gram-positive and Gram-negative bacteria. *Turbinaria conoides* belongs to the order; Fucales, family; Sargassaceae of Phaeophyceae, Phaeophycophyta.

EXPERIMENTAL SECTION

Sample was collected from the sea coast of Mandapam, Tamil Nadu, India in the form of dry sample. Alga sample were cleaned at epiphytes and necrotic parts were removed. Sample was rinsed with sterile water to remove any associated debris. Sample was kept under sunshade for 7 days.

Crude extract preparation

For preliminary investigation, 20.0 g dry powdered material was extracted with 200 ml of desired solvent [hexane, chloroform, methanol, chloroform: methanol (2:1 v/v) and petroleum ether] in cold maceration method using aspirated bottle and the extract thus obtained was dried *in vacuo*.

Test Microorganisms

Clinical isolates of *Escherichia coli*, *Salmonella typhi*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Proteus mirabilis* were gifted by Dr Agarwal's eye Hospital, Chennai, used as the test organisms. Disc diffusion method Bauer [5] was adopted for the determination of antibacterial activity of the extract residues. From the stock cultures of various test organisms, inoculum was prepared by subculturing each of the organisms on Muller-Hinton agar at 37°C. Seeding of Muller-Hinton agar plates was done using the 24 hr culture with a cotton swab under aseptic conditions. The discs loaded with extract residues were aseptically placed on top of the seeded medium and gently pressed to ensure contact. The plates were then incubated at 37°C. After overnight incubation, the plates were observed for zones of inhibition. Amoxycillin were used as standard drug.

RESULT AND DISCUSSION

The antibacterial activity of the crude solvent extracts of the *Turbinaria conoides* five solvent systems namely, hexane, chloroform, methanol, chloroform: methanol (2:1 v/v) and petroleum ether. The bacteria *Staphylococcus aureus* were used as test organism (Table.7). In this preliminary investigation, the alga extract prepared with a mixture of petroleum ether proved to be more effective than the other solvent system used in inhibiting the growth of *Staphylococcus aureus* on Muller-Hinton agar plates. Chloroform: Methanol (2:1 v/v) exhibit only 75% maximum activity against the test organism (Table.1). While in methanol and chloroform of the alga were able to exhibit only 30 to 45% maximum activity against the test organism (Table.1). The hexane extract appeared to be poor growth of *Staphylococcus aureus*. Based on these observations, further experiments on the antibacterial activities of the *Turbinaria conoides* were carried out to petroleum ether extracts.

Table 1: Antibacterial activity of the crude solvent extracts of the *Turbinaria conoides*

S. No	Solvent used for extraction	Antibacterial activity (% maximum activity)
		<i>Turbinaria conoides</i>
1.	Hexane	15
2.	Chloroform	30
3.	Methanol	45
4.	Chloroform: Methanol (2:1 v/v)	75
5.	Petroleum Ether	100

Maximum activities (zone of inhibition) for *Staphylococcus aureus* were 6.4 cm (for *Turbinaria conoides* extract)

Table 2: Antibacterial activity of the crude petroleum extracts residue of the *Turbinaria conoides*

S. No	Test bacteria	Zone of inhibition (cm) ± S.E.	
		<i>Turbinaria conoides</i>	Amoxycillin
1.	<i>Staphylococcus aureus</i>	6.4 ± 0.145 (100)	3.6 ± 0.033
2.	<i>Proteus mirabilis</i>	5.4 ± 0.088 (84.3)	2.2 ± 0.057
3.	<i>Pseudomonas aeruginosa</i>	4.8 ± 0.057 (75)	1.8 ± 0.057
4.	<i>Salmonella typhi</i>	4.1 ± 0.058 (64)	2.3 ± 0.058
5.	<i>Escherichia coli</i>	4.0 ± 0.033 (62.5)	1.2 ± 0.033

The petroleum ether extract of the were prepared *Turbinaria conoides* as described earlier and testes at a concentration of 700 µg/disc by disc diffusion method against five pathogenic bacteria namely, *Staphylococcus aureus*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Salmonella typhi* and *Escherichia coli*. The results are presented in Table.2. The extract residues of alga recorded maximum activity against *Staphylococcus aureus* with an inhibition zone of 6.4 cm for *Turbinaria conoides* which are quite high (Table.2). *Proteus mirabilis* and *Pseudomonas aeruginosa* and were also effectively inhibited by the extract residues of the *Turbinaria conoides* (Table.2). The extract residue of *Turbinaria conoides* recorded minimum activity against *Eschechia coli* and

Salmonella typhi 62.5 to 64% (Table .2). The antibacterial activity of the petroleum ether extract residues of the *Turbinaria conoides* against the five pathogenic bacteria was compared with the standard antibiotics (Tables.2).

Marine genus synthesizes active constituents which are used in traditional and complementary medicine. Different varieties of marine algae were reported to contain active ingredients that can cure diseases. Nowadays, higher percentage of population prefers to use remedies of natural origin for curing illness as these claimed to produce less side effect [6]. The present study was focused on *Turbinaria conoides* for the antibacterial activity against bacteria.

Algae are eukaryotic organisms inhabited in salty sea water and is recognized to synthesize several bioactive compounds which show antimicrobial property [7]. The antifungal, antiviral and antibacterial activities of saponins are well documented [8-9]. Which clearly explain the activity of petroleum ether and methanol extracts against *Eschechia coli* [10]. The present study differs from the previous study since the antibacterial activity was evaluated using petroleum ether extract residues of the *Turbinaria conoides* .On evaluating the antibacterial property of *Turbinaria conoides*, the alga proved to be a potent antibacterial agent. The findings of this study also paves the way for further research to identify the specific active compounds that is responsible for its claimed antibacterial activity.

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