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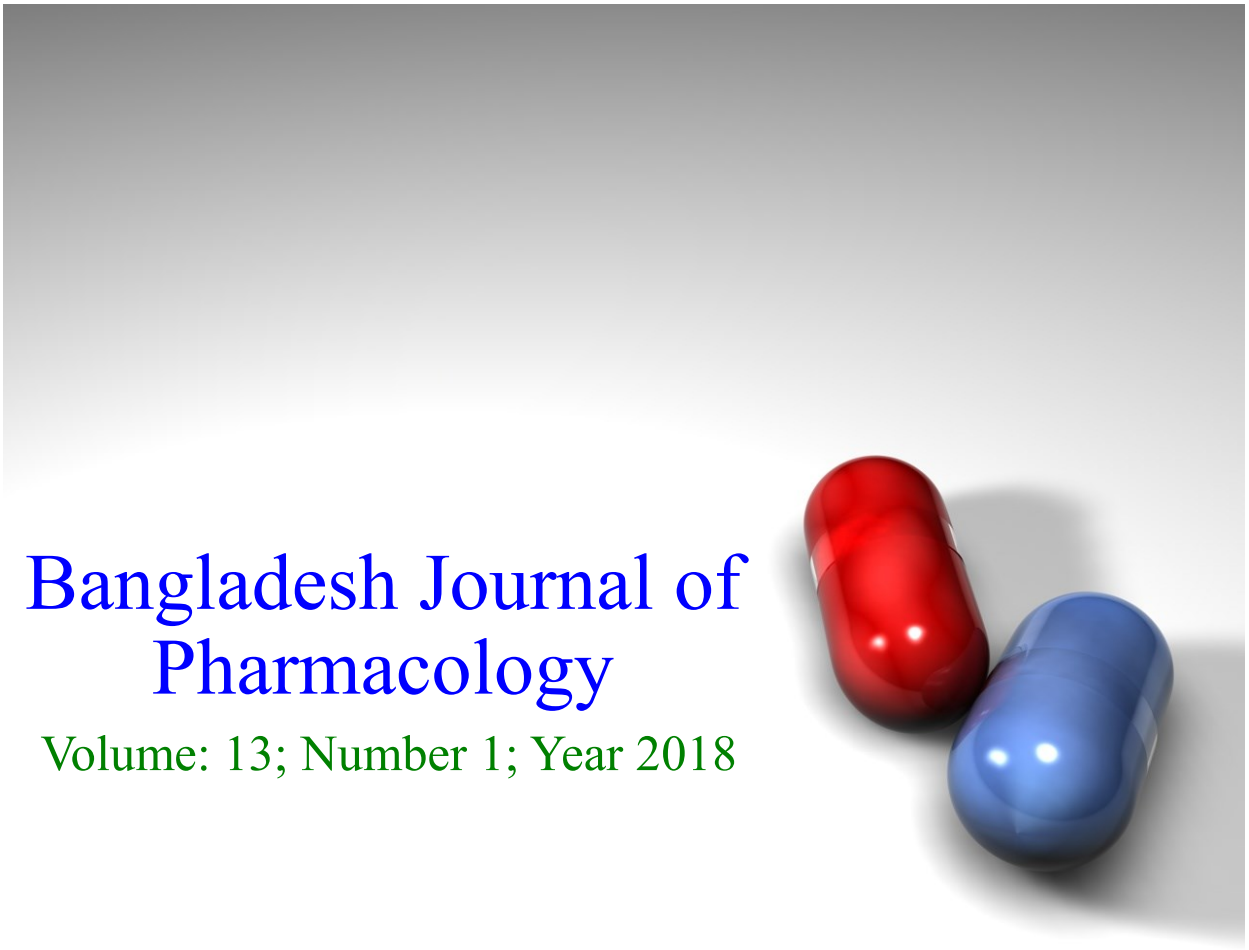

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Letter to the Editor

Antimicrobial and antioxidant potentials of marine sponges of South Andaman, India

Sir,

Marine organisms are a rich source of structurally novel and biologically active products, many of which exhibit structural and chemical features not found in terrestrial natural product (Jimeno 2002). The interest in marine organisms as a potential and promising source in pharmaceutical industries has been increased during the last few decades (Chander et al., 2014). Sessile marine invertebrates such as sponges, lacking morphological defence structures have developed the largest number of marine-derived secondary metabolites including some of the most interesting drug candidates. In marine invertebrates, so far 7,000 marine natural products have been reported. These include sponges (33%), coelenterates (18%), sea whip, sea fans and soft corals (24%) from representatives of other invertebrate phyla molluscs, echinoderms and bryozoans (Madhu et al., 2014).

Recent studies have reported the isolation of novel anticancer, antiviral, antibacterial, antifungal, antiprotozoal, anthelmintic, anti-inflammatory, immunosuppressive, antifouling and a range of other bioactive compounds from marine species (Majali et al., 2015; El Amraoui et al., 2014; Mehbub et al., 2014). In the present study, the antimicrobial and antioxidant properties of seven marine sponges are described. This is part of the programme on screening of marine organisms for a variety of biological activities, with the aim of identifying novel and potentially useful therapeutic agents.

Sponges were collected by scuba diving from sub tidal habitats, at depths of 8 to 10 m, at different locations of Wandoor, Chidiyatapu, Pongibalu and Havelock of South Andaman, India. Later, they were frozen and transferred immediately to the laboratory for methanol extraction. Identification of the specimens was carried out by Zoological Survey of India, Port Blair, Andaman and Nicobar Islands, India. The species investigated in this study are listed in Table I.

The marine sponges were homogenized in a blender with small amount of water and extracted by cold percolation method with methanol solvent (1:10 v/v.) for 72 hours at room temperature. The whole extract was collected in a flask, filtered and the solvent was evaporated to dryness under reduced pressure in an evaporator at 40-45°C. The residues were stored at 4°C for future use (Chander et al., 2016).

Table I

Antioxidant properties of selected sponge extracts

Name of the sponge	Antioxidant IC_{50} (µg/mL)
Callyspongia aculeata	186.2 ± 2.9
Dictyonella cactus	213.6 ± 10.7
Hyrtios erecta	32.5 ± 0.3
Neopetrosia exigua	36.6 ± 0.1
Paratetilla bacca	58.0 ± 1.5
Plakortis simplex	59.8 ± 0.1
Xestospongiatestudinaria	46.7 ± 0.3
Ascorbic acid	13.9 ± 0.1

The microorganisms used in this study included nine bacterial strains and one fungal strain. These include, *Escherichia coli* (MTCC 443), *Staphylococcus aureus* (MTCC 737), *Pseudomonas aeruginosa* (MTCC 1688), *Bacillus cereus* (MTCC 1272), *Staphylococcus epidermidis* (MTCC 3615), *Proteus mirabilis* (MTCC 425), *Shigella flexneri* (MTCC 1457), *Salmonella typhi* (MTCC 733), *Klebsiella pneumonia* (MTCC 129) and one fungal strain *Candida albicans* (MTCC 227), which were procured from Microbial Type Culture Collection, Chandigarh, India.

The agar well diffusion method was used to screen the antimicrobial activity (Chander et al., 2016). The antioxidant activity of the sponge extracts was assessed by their ability to scavenging 2,2-diphenyl-1-picryl-hydrazyl stable radicals (DPPH) by using the method described previously (Singh et al., 2015). All tests and analyses were run in triplicate and averaged.

Out of seven sponge extracts tested for antimicrobial activity, four were found to inhibit one or more microorganisms. The results of the antimicrobial screening of the crude extracts are shown in Table II. Among the sponges screened, *Neopetrosia exigua* showed promising activity against the tested microorganisms. Methanol extracts of *Plakortis simplex*, *Dictyonella* Schmidt, *Xestospongia testudinaria* also showed anti-bacterial activity. *N. exigua*

Table II

Antimicrobial activity of methanol crude extracts of sponges

Microorganisms	Zone of inhibition (mm)								
	Hyrtios erecta	*Paratetilla bacca*	*Dictyonella cactus*	*Neopetrosia exigua*	*Xestospongia testudinaria*	*Plakortis simplex*	*Callyspongia aculeata*	Gentamicin	Nystatin
Staphylococcus aureus	-	-	14.7 ± 0.6	13.7 ± 1.2	-	14.7 ± 1.2	-	17.7 ± 0.6	-
Bacillus cereus	-	-	14.7 ± 1.2	17.3 ± 0.6	18.3 ± 1.5	15.7 ± 1.2	-	22.7 ± 1.2	-
Pseudomonas aeruginosa	-	-	-	-	-	-	-	12.7 ± 0.6	-
Klebsiella pneumonia	-	-	-	14.0 ± 1.0	-	-	-	14.0 ± 0.0	-
Esherichia coli	-	-	13.3 ± 1.5	14.7 ± 1.2	-	10.7 ± 0.6	-	18.3 ± 0.6	-
Shigella flexeneri	-	-	-	16.3 ± 2.1	-	10.7 ± 0.6	-	19.7 ± 1.5	-
Salmonella typhi	-	-	-	13.3 ± 1.5	-	-	-	15.3 ± 1.2	-
Staphylococcus epidermidis	-	-	-	18.7 ± 0.6	15.7 ± 1.2	11.0 ± 1.0	-	21.7 ± 0.6	-
Proteus mirabilis	-	-	-	14.7 ± 1.2	-	-	-	12.7 ± 0.6	-
Candida albicans	-	-	-	10.0 ± 0.0	-	-	-	-	17.7 ± 0.6

'–'indicates No activity

extact only showed antifungal activity against *C. albicans*.

The *Hyrtios erecta* extracts exhibited radical scavenging activity having IC_{50} value 32.5 ± 0.3 µg/mL followed by *N. exigua* and *X. testudinaria* having IC_{50} value 36.6 ± 0.1 µg/mL and 46.7 ± 0.3 µg/mL respectively (Table I). However, all extracts offered less scavenging activity as compared to the standard antioxidant ascorbic acid (IC_{50} = 13.9 ± 0.1 µg/mL).

Previous reports have shown that crude extracts of *N. exigua* was earlier reported to have strong inhibitory activity against *P. berghei* (Abdillah et al., 2013). *N. exigua* extract produced the largest zones of inhibition against *S. epidermidis* followed by *X. testudinaria* extract against *B. cereus*. The most sensitive bacterium was *B. cereus, S. epidermidis* and *S. aureus*. On the other hand, none of the sponge extracts inhibited the growth of *Pseudomonas aeruginosa*. Extracts of *H. erecta*, *Paratetilla bacca* and *Callyspongia aculeata* showed nil antimicrobial activity against the pathogenic strains screened.

In the present study, marine spongesfound to possess

were effective. To the best of our knowledge, this is the first report demonstrating the antimicrobial activity of the marine spongesfrom Andaman and Nicobar Islands, with few exceptions. These organisms need to investigate in detail, in order to isolate biologically active molecules and thus paving the way to search for novel compounds. Furthermore, the encouraging biological activity observed in this study show that the Andaman and Nicobar Islands are potential source of variety of marine organisms worthy of further investigation.

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The authors have declared that there is no conflict of interest.

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