

## BIOACTIVITY OF MARINE ORGANISMS PART V : SCREENING OF SOME MARINE FAUNA FROM THE INDIAN COAST

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### ABSTRACT

Of twenty nine alcoholic extracts of marine organisms screened for a wide range of biological activities, 14 showed promising results. Of these, two were CNS stimulant, 3 hypoglycaemic, 2 anti-implantation, 2 antimicrobial, 2 antiviral, 1 spasmolytic, 1 hypotensive, 1 CNS depressant and six toxic. Six of these extracts showed multiple activities.

*Key-words* : Bioactivity, marine fauna.

A programme is in operation at the National Institute of Oceanography, Goa, in collaboration with the Central Drug Research Institute, Lucknow for the screening of extracts of marine organisms for a wide range of biological activities. The programme consists of collection, identification and extraction of marine flora and fauna found along the coastline (including islands) for biological screening. The results of biological screening of some marine organisms have been reported in earlier papers of the series (Naqvi, Solimabi, Kamat, Fernandes, Reddy, Bhakuni and Dhawan, 1981; Kamat, Solimabi, Naqvi, Fernandes, Reddy, Bhakuni and Dhawan, 1981; Kamat, Solimabi, Naik, D'Souza, Jayasree, Ambiye, Bhakuni and Srimal, 1990; Naik, Kamat, Parameswaran, Das, Bhattacharya, Ramani, Bhakuni and Srimal, 1989). The present communication deals with biological activity data of 29 extracts of marine animals. The biological screening includes tests for antibacterial, antifungal, antifertility, antiviral, hypoglycaemic and a wide range of pharmacological activities.

The marine animals for the study have been collected from the coasts of Goa, Maharashtra, Tamil Nadu, Gujarat, Lakshadweep and Andaman islands during premonsoon and postmonsoon periods. Fresh animal material was rinsed in water to free it from extraneous matter, cut into small pieces and immersed in 90% alcohol at ambient temperature. After two days the alcohol was decanted. The process was repeated three times. The solvent from the combined percolate was removed under reduced pressure and below 40°C. The alcoholic extract was finally dried in a vacuum desiccator. All the extracts of the marine animals were tested for antibacterial, antifungal, antiviral and a wide range of pharmacological activities. The details of these

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biological tests have been described elsewhere (Dhar, Dhar, Dhawan, Mehrotra and Ray, 1968; Bhakuni, Dhar, Dhar, Dhawan and Mehrotra, 1969, 1977).

Extracts of marine organisms showing biological activity are summarised in Table I.

Table I – Marine animals screened for biological activity

Organisms (1)	Place & month of collection (2)	Biological tests (3)	Activity observed (4)	LD50 mg/kg (5)
<b>Arthropoda:</b>				
<i>Balanus tintinnabulum</i>	Vasco, G December	A2,4,9-11; B1-3,5,7; E1,2,G2, J1-3,K1, L1-4, N	-	681
<i>Balanus tintinnabulum</i> <i>tintinnabulum</i> (Linn)	Ratnagiri, M October	A2,4,9-11; B1-3,6,7; E1,2; J1-3; K1; L1-4; N	-	625
<i>Leptodius arassimanus</i>	Malvan, M October	A2,4,9-11; B1-3,6,7; E1,2; J1,2; K1; L1-4; N	Toxic, CNS stimulant	31,6
<i>Pilumnus vesporttila</i> <i>Fabricias</i>	Okha, Guj December	A2,4,9-11; B1-3,6,7; E1,2; H; J1-3; K1; L1-4; N	-	>1000
<i>Trochus radiatus</i>	Malvan, M November	A2,4,9-11; B1-3,5,7; G2; J1-3; K1; L1-4; N	-	825
<b>Coelenterata :</b>				
<i>Acanthogorgia muricate</i> <i>Verilloan indica</i> <i>Thomson and Hudson</i>	Grand Island G, October	A2,4,9-11; B1-3,6,7; E1,2; J1-3; K1; L1-4; N	-	1000
<i>Echinomurica</i> sp.	" November	A2,4,9-11; B1-3,6,7; E1,G2,H,J1-3,K1,L1-4; N	Anti- fertility	>1000
<i>Alcyonium</i> sp.	Mandapam, T May	A2,4,9-11; B1-3,6,7; E1, J1-3; K1; L1-4; N	Antiviral	>1000
<i>Cassiopeia</i> sp.	"	A2,4,9-11; B1-3,6,7, E1; J1-3; K1; L1-4; N		>1000
<i>Echinogorgia</i> sp.	Grande Island G, October	A2,4,9-11; B1-3,6,7;		-
<i>Epizoanthus</i> sp.	Veraval, Guj December	A2,4,9-11; B1-3,6,7; E1,2; J1-3; K1; L1-4; N	Toxic & Hypoglycaemic	0.38
<i>Funceela</i> sp.	Vasco, G October	A2,4,9-11; B1-3,6,7 E1,2; J1-4; K1; L1-4; N	-	681
<i>Ixactis</i> sp.	Okha, Guj, February	G2, J1-3; L1-3,4	-	147
<i>Lexo suberites</i>	Mandapam, T February	A2,4,9-11; B1-3,6,7; E1; J1-3; K1; L1-4; N	Toxic, CNS Depressant, Hypoglycaemic	26.1
<i>Montipora foliosa</i>	" February	A2,4,9-11; B1-3,6,7 E1; J1-4; K1; L1-4; N	-	681

(1)	(2)	(3)	(4)	(5)
<i>Subergorgia suberosa</i>	Mandapam, T February	A2,4,9-11; B1-3,6,7; E1,2; H; J1-3; K1; L1-4; N	-	>1000
<b>Echinodermata :</b> <i>Aclinopyga mauritiana</i>	L, October	A2,4,9-11; B1-3,6,7; E1,3,4; H; J1-4; L1-4; N	Hypotensive, Antimicrobial	215
<i>Afrocucumis africana</i>	Agati, L October	A2,4,9-11; B1-3,6,7; E1,2; G2; J1-3; K1; L1-4; N	Antiviral, anti-implantation	681
<i>Holothuria atra</i>	Andaman March	A2,9 9-11; B1-3,5,7; C2; J1-3; K1; L1-4; N	-	681
<i>Holothuria echinitis</i>	L, April	A2,4,9-11; B1-3,6,7; E1,2; H; J1-3; K1; L1-4; N	Toxic	26.1
<i>Holothuria hilla</i>	Mandapam , T, April	A2,4,9-11; B1-3,6,7; E1,2; H; J1-3; K1; L1-4; N	-	316
<i>Holothuria impotius</i>	L, April	A2,4,9-11; B1-3,6,7; E1-2; H; J1-3; K1; L1-4; N	Toxic	38.3
<i>Stolus buccalis</i>	"	A2,4,9-11; B1-3,6,7; E1,2; H; J1-3; L1-4; N	-	1000
<i>Thelenata ananas</i>	L, October	A2,4,9-11; B1-3,6,7; C4; E1,3,4; J1-3; K1; L1-4; N	Toxic & antimicrobial	56.2
<b>Mollusca :</b>				
<i>Nerita</i> sp.	Mandapam, T January	A2,4,9-11; B1-3,6,7; E4, J1,2; L1-4	CNS Stimulant	68.1
<i>Octopus vulgaris</i>	Okha, Guj December	E1; G2; J1-3; K1; L1-4; N	Spasmolytic	1000
<i>Onchidium verruculatum</i> Cuvier	Mandapam, T May	A2,4,9-11; B1-3,6,7; E1; J1-3; K1; L1-4; N	Hypoglycaemic	>1000
<i>Thois rudolphi</i>	Okha, Guj March	A2,4,9-11; B1-3,6,7;	-	-
<i>Turbo intercostalis</i>	Malvan, M November	A2,4,9-11; B1-3,6,7; E-1,2; J1,2K1; L1-4, N	-	681

G = Goa, Guj = Gujarat, M = Maharashtra, T = Tamil Nadu, L = Lakshadweep  
 Codes for biological tests : A - antibacterial (A1, Bacillus; Subtilis; A2, *Staphylococcus aureus*; A3, *Salmonella typhi*; A4, *Escherichia coli*; A5, *Agrobacterium tumefaciens*; A9, *Streptococcus faecalis*; A10, *Klebsiella pneumoniae*; A11, *Pseudomonas aeruginosa*; A12, *Protens vulgaris*); B, antifungal (B1, *Candida albicans*; B2, *Cryptococcus neoformans*; B3, *Trichophyton mentagraphytes*; B4, *Microsporum canis*; B5, *Aspergillus niger*; B6, *Aspergillus fumigatus*; B7, *Sporotrichum schenckii*); E, antiviral (E1, Rannikhet disease virus; E2, Vaccinia virus; E3, Semliki Forest virus); G, antifertility (G2, anti-implantation in rats); H, Hypoglycaemic; J, effect on cardiovascular system (J1, effect on respiration; J2, cardiovascular effects; J3, effect on preganglionically stimulated neititating membrane; J4, effect on heart rate); K, effect on isolated tissue (K1, spasmolytic); L, effect on central nervous system (L1, gross effects; L2, hypothermia; L3, analgesia; L4, supramaximal electroshock seizure pattern test); N, diuretic and Q, anti-inflammatory. LD50 values are expressed mg/kg ip in mice).

Of the 29 extracts of marine animals tested, activity was observed in 14 extracts. Of the active extracts, 2 showed CNS stimulant, 4 hypoglycemic, 2 antifertility (anti-implantation), 2 antimicrobial, 1 spasmolytic, 1 hypotensive, 1 CNS depressant, besides these, six extracts were toxic. None of these, however, had antibacterial, antifungal, spasmogenic or diuretic activities.

The extract of holothurian spp. *Actinopyga mauritiana* exhibited hypotensive and antimicrobial activities, whereas *Thelenata ananas* showed toxicity in addition to antimicrobial activity. A saponin "Echinoside B" isolated from *A. mauritiana* was toxic to fishes (Parameshwaran, Naik, Das and Kamat, 1990). Three of the Holothuria sp. viz., *Holothuria echinitis*, *Holothuria impotius* and *Thelenata ananas* exhibited high toxicity. The extracts of *Afroccucumis africana* was found to possess antiviral and antiimplantation activity.

Among five extracts of Mollusca, *Nerita sp.* exhibited CNS stimulant, *Octopus vulgaris* spasmolytic, whereas *Onchidium verruculatum* showed hypoglycemic activity.

The ability of octopi to paralyze prey, before ingestion, with secretions of posterior salivary glands has long been known. The active agents present in the salivary glands of the octopus have been found to be a mixture of low molecular weight amines, peptides and proteinaceous materials (Hartman, Clark, Cyr, Jordon and Leibhold, 1960). Ghiretti (1960) isolated an active proteinaceous fraction from the salivary glands of *Octopus vulgaris* and *O. macropus*. While these authors found that the toxins from octopi have paralytic and hypotensive action, the present investigations indicated only spasmolytic action for the crude extract of *O. vulgaris*.

Among 11 coelenterates, extracts of 5 organisms exhibited biological activities. Extracts of *Alcyonium sp.*, *Cassiopeia sp.* and *Epizoanthus sp.* showed antiviral activity whereas *Lexosuberites sp.* possessed antimicrobial activity in addition to antiviral. Extract of *Echinomurica sp.* from Grande island, Goa, exhibited antifertility activity. Several heterocyclic azulene derivatives have been isolated from *Epizoanthus arenaceus*, but no biological activity of these compounds has been reported so far.

Of five extracts of Arthropoda, only *Leptodius sp.* collected from Malvan has shown toxic and CNS stimulant activity.

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