

BIOACTIVITY OF MARINE ORGANISMS, PART III : SCREENING OF MARINE ALGAE OF THE INDIAN COAST FOR BIOLOGICAL ACTIVITY

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ABSTRACT

Ethanollic extracts from Indian marine algae have been tested for anti-viral, anti-bacterial, anti-fungal, anti-fertility, hypoglycaemic and a wide range of pharmacological activities. Of 34 species investigated 17 appeared biologically active. Six were diuretic, 3 hypoglycaemic, 3 hypotensive, 4 exhibited anti-implantation activity, cytokinin activity was observed in one and one showed adrenergic blocking action. The extracts neither had anti-bacterial, anti-fungal and anti-viral activities nor were toxic.

Key-words: Bioactivity, marine flora

As a part of our ongoing search for pharmacologically active principles from marine organisms, we have reported the results of an examination of 25 seaweeds (Naqvi, Solimabi, Kamat, Fernandes, Reddy, Bhakuni and Dhawan, 1981) and 26 marine animals (Kamat, Solimabi, Naqvi, Fernandes, Reddy, Bhakuni and Dhawan, 1981) from the Indian Coast. In the present investigation the biological activity of 34 more species, some of which are uncommon, has been studied.

Samples were collected, depending upon their availability, during pre- and post-monsoon periods at various sites along the west coast of India. Precaution was taken during collection to reduce the possible contamination due to epiphytes and other marine organisms. After collection, the material was washed under running tap water, checked for contaminants, dried at room temperature, powdered and extracted four times by soaking in 50% aqueous ethanol at room temperature. The extracts were concentrated to dryness under vacuum. The procedures employed for the biological tests have been described elsewhere (Naqvi, Solimabi, Kamat, Fernandes, Reddy, Bhakuni and Dhawan, 1981; Dhar, Dhawan, Mehrotra and Ray, 1968). The results of screening tests along with the data and site of collection are listed in Table I.

As is evident from Table I the ethanollic extracts of 34 specimens of algae belonging to three different phyla were subjected to a broad biological screen. Of these,

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Table I. Results of biological screening of extracts of seaweeds.

Seaweed	Place & month of collection	Biological tests	Activity observed	LD50 mg/kg
Chlorophyceae (green)				
<i>Acetabularia crenulata</i> (L) Kuntze	Andaman February	J1-4,K1,L1-4,N	—	>1000
<i>Caulerpa taxifolia</i> (Vahl.) Ag	Okha,Guj. April	A2,4,9-11,B1-3,6,7,H,J1-4 K1,L1-4,N	Hypotensive	825
<i>Chamaedoris auriculata</i> (Boergesen)	Veraval,Guj. December	A2,4,9-11,B1-3,6,7,G2,J1-4,K1, L1-4,N	—	825
<i>Halimeda macroloba</i> (Decaisne)	Andaman February	G2,J1-2,K1,L1-4,N	Diuretic, Anti-implantation	>1000
<i>Monostroma</i> sp.	Sirgaon G. November	A2,4,9-11,B1-3,6,7,G2,J1,2,K1, L1-4,N	60% anti-implantation	>1000
<i>Pseudobryopsis</i> sp.	Okha,Guj.	A2,4,9-11,B1-3,6,7,E,H,J1-3 L1-4,N	Hypoglycaemic	681
<i>Udotea indica</i> A & E.S. Gepp.	Porbander,Guj. December	A2,4,9-11,B1-3,6,7,J1-3,K1,L1-4 N	Cytokinin	1000
<i>Ulva reticulata</i> Forskal	Andaman February	A4,9-12,B1-3,5,6,7,1-3,K1 L1-4,N	—	681
<i>Valoniopsis</i> sp.	Krusadai T March	A2,4,9-11,B1-3,6,7,J1-3,K1, L1-4,N	—	1000
<i>Valoniopsis pachynema</i> (Martens) Boerges	Adatra,Guj. December	A2,4,9-11,B1-3,6,6,J1-3,K1 L1-4,12,N	—	825
Phaeophyceae (Brown)				
<i>Dictyopteris australis</i> Sonder	Cabo-da-Rama G December	A2,4,9-11,b1-3,5,7,E1,2,J1-3, K1,L1-4,N	Diuretic	681
<i>Hydroclathrus clathratus</i> C. Ag. (Have)	Dwarka,Guj. December	A2,4,9-11,B1-3,6,7,E1,H,J1-3, L1-4,N	Hypotensive	>1000

Seaweed	Place & month of collection	Biological tests	Activity observed	LD50 mg/kg
<i>Iyengaria stellata</i> (Boergs)	Adatra, Guj. December	A2,4,9-11,B1-3,6,7,J1,2,K1,L1-4,N	Adrenergic	825
<i>Padina gymnospora</i> (Kuetz) Vickers	Adatra, Guj. March	A2,4,9-11,B1-3,6,7,E1,H,J1-4,L1-4,N	Blocking agent Hypoglycaemic	1000
<i>Pocockella variegata</i> (L) papenfuss	Krusadai T March	A2,4,9-11,B1-3,6,7,G2,J1,2,K1,L1-4,14,N	CNS stimulant	1000
<i>Sargassum cinereum</i> J. Ag.	Malvan M March	A2,4,9-11,B1-3,6,7,G2,J1,2,K1,L1-4,N	CNS stimulant	1000
<i>Sargassum myriocystum</i> J. Ag.	Gulf of Mannar T March	A2,4,9-11,B1-3,6,7,J1-4,K1,L1-4,N	—	—
<i>Sargassum wightii</i> Greville	Gulf of Mannar T March	A2,4,9-11,B1-3,6,7,G2,H,J1-3,K1,L1-4,N	—	>1000
<i>Spatoglossum asperum</i> J. Ag.	Anjuna G March	A2,4,9-11,B1-3,6,7,G2,H,J1-3,K1,L1-4,N	69% anti-implantation and hypotensive	1000
<i>Turbinaria decurrens</i> Bory	Andamans February	J1-3,K1,L1-4,N	—	1000
<i>Rhodophyceae (Red)</i>				
<i>Botryocladia leptopoda</i> (J. Ag.) Kylin	Adatra Guj. December	A2,4,9-11,B1-3,6,7,G2,J1-4,K1,L1-4,N	Anti-implantation and CNS stimulant	825
<i>Chondrococcus</i> sp.	Anjuna G February	A2,4,9-11,B1-3,6,7,E3,J1-4,K1,L1-4,N	—	>1000
<i>Galaxaura oblongata</i> Lamour	Andaman February	A2,4,9-11,B1-3,6,7,E3,J1-4,L1-4,N	—	1000
<i>Galaxaura rugosa</i> Lamour	Andaman February	A2,4,9-11,B1-3,6,7,E3,J1-4,K1,L1-4,N	—	1000

Seaweed	Place & month of collection	Biological tests	Activity observed	LD50 mg/kg
<i>Gastroclonium iyengarii</i> Srinivasan	Adatra, Guj. December	A2,4,9-11,B1-3,7,J1-3,K1, L1-4,12,N	—	>1000
<i>Gracilaria edulis</i> (Gmel) Silva	Pirotan, Guj. December	A2,4,9-11,B1-3,6,7,J1-4,K1, L1-4,12,N	—	825
<i>Gracilaria</i> sp.	Andaman February	J1,2,K1,L1-4,N	Diuretic Hypotensive	>1000
<i>Halymenia venusta</i> Boerigs	Okha Guj. December	A2,4,9-11,B1-3,6,7,G2,J1-4, K1,L1-4,N	—	825
<i>Jania adhaerens</i> Lamour	Mandapam T December	A2,3,4,B1-5	—	—
<i>Laurencia papillosa</i> (Forsk.) Greville	Anjuna G February	A2,4,9-11,B1-3,5,7,E1,2,G2, J1-3,K1,L1-4,N	Diuretic	>1000
<i>Scinaia hatei</i> Boerigs	Okha Guj. February	A2,4,9-11,B1-3,6,7,E1,H, J1-3,L1-4	Hypoglycaemic	>1000
<i>Solieria</i> sp.	Anjuna G January	G2,J1-3,K1,L1-4,N	Diuretic, anti- fertility	316
<i>Spyridia insignis</i> J. Ag.	Trivandrum K December	A1-4,B1-4,J1-3,5,K2,L1,3,4,N	—	>1000
<i>Spyridia fusiformis</i> Boerigs	Andaman February	A2,4,9-11,B1-3,6,7,E3,G2,J1-3, K1,L1-4,N	Diuretic, Hypoglycaemic	68.1

G = Goa, Guj. = Gujarat, K = Kerala, M = Maharashtra, T = Tamil Nadu

Codes of biological tests: A, Antibacterial (A1, *Bacillus subtilis*; A2, *Staphylococcus aureus*; A3, *Salmonella typhi*; A4, *Escherichia coli*; A5, *Agrobacterium tumefaciens*; A9, *Streptococcus faecalis*; A10, *Prevotella vulgaris*; B, Antifungal (B1, *Candida albicans*; B2, *Cryptococcus neoformans*; B3, *Trichophyton mentagrophytes*; B4, *Microsporium canis*; B5, *Aspergillus niger*; B6, *Aspergillus fumigatus*; B7, *Sporotrichum schenckii*); E, Antiviral (E1, Ranikhet Disease virus; E2, Vaccinia virus; E3, Semli, Forest virus); G, anti-implantation in rats; H, hypoglycaemic; J, effect on cardiovascular system (J1, effect on respiration, J2, cardiovascular effects; J3, effect on preangionically stimulated mitating membrane; J4, effect on heart rate); K, effect on isolated tissues (K1, spasmolytic); L, effect on central nervous system (L1, gros effects; L, hypothermia; L3, analgesia; L4, supramacimal electroshock-seizure pattern test); N, diuretic and O, anti-inflammatory. LD values are expressed mg/kg in the mice).

17 were inactive. The diuretic activity shown by the algae may be due to the presence of sodium chloride.

It has been demonstrated by several research workers that seaweed extracts exhibited inhibitory effects upon a number of gram +ve and gram -ve bacteria but none of the extracts tested by us were found to be effective against the bacteria and fungi.

The most promising activity observed by us is perhaps the anti-implantation activity in four species, viz., *Halimeda maculosa*, *Monostroma* sp., *Spatoglossum asperum* and *Botryocladia leptopoda*.

ACKNOWLEDGEMENTS

Thanks are due to Dr. B.N. Desai, Director, NIO, Dr. B.N. Dhawan, Director, CDRI, Lucknow and Dr. R. Sen Gupta for their interest in the programme. Partial funding through a scheme, "Bioactive Substances from the Indian Ocean" (Grant No. PL 480-N 00014-82-G-0130) by the Office of Naval Research, USA is gratefully acknowledged.

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