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## A REVIEW ON THE PHARMACOGNOSTICAL, ECOLOGY AND PHARMACOLOGICAL STUDIES ON MARINE RED ALGAE – *HYPNEA VALENTIAE*

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**ABSTRACT:** Seaweeds are the potential marine living resources in the world. More than 20,000 seaweeds are distributed throughout the world, of which only 221 (1.1%) are commercially utilized, which includes 145 species for food and 110 species for phycocolloid production. The biodiversity of the marine environment and the associated chemical diversity constitute a practically unlimited resource of new active substances in the field of the development of bioactive products. Carrageenans are galactans extracted mainly from species belonging to Gigartinales. These sulfated galactans, consist of linear chains of D-galactopyranoses linked in a (1 & 3) and b (1 & 4). Seaweeds constitute some of the most important reservoirs of new therapeutic compounds for humans. Several of them have been shown to have many biological activities, including anticancer activity, in this present review study is mainly focused on *Hypnea valentiae*.

## INTRODUCTION:

**1.1 Red Algae:** The red algae form a distinct group characterized by having eukaryotic cells without flagella and centrioles, chloroplasts that lack external endoplasmic reticulum and contain phycobiliproteins as accessory pigments, which give them their red color <sup>1</sup>. The chloroplasts in red algae resemble Cyanobacteria both biochemically and structurally. Food reserves are stored outside of the chloroplasts as Floridean starch <sup>2</sup>. Of the approximately 6000 species, most red algae are marine; only a few occur in freshwater <sup>3</sup>.

The red algal genus *Hypnea* (Lamouroux, 1813) is one of the widest spread macroalgae on tropical and subtropical shores <sup>4, 5</sup>. The genus, known to include 53 species, is of economic importance as a source of carrageenan <sup>6</sup>.

### 1.2. Classification: <sup>7,8,9</sup>

Phylum : Rhodophyta  
Order : Gigartinales;  
Family : Hypneaceae  
Species : *valentiae* (Turner) Montagne

**Descriptive Name:** *Hypnea* with upturned spines.

**1.3. Features: 1.** Plants are dark red-brown, 100-300 mm tall, with definite upright branches bearing, radial side branches, gradually shorter <sup>10</sup>.

**2.** Short spine-like branches, few on main branches, point upwards <sup>11</sup>.

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Usual habitat common in sheltered localities but where there is appreciable current flow, from shallow water to 11 m deep. Similar species *Hypnea charoides* but that species has denser spines that are at right angles to branches<sup>12</sup>.

## 2. Phytoconstituent Nature in Red Algae:

Seaweeds are known as valuable sources of protein, elements, dietary fibers, vitamins, essential amino acids, and essential fatty acids. Moreover, seaweeds also contain potential bioactive compounds which 87 exhibits antibacterial, antiviral and antifungal properties. The carrageenans - a type of sugar molecule - found in red marine algae are believed to boost interferon production in the immune system and might be an effective preventative against diseases like HIV, shingles and cold sores<sup>13</sup>. They contain high

amounts of fiber, protein, and minerals, thus considered an important nutritional food. They help improve the immune system, stimulating the functions of leukocytes<sup>14</sup>. It seems that this type of algae is a great adjuvant in the treatment of urinary tract infections, asthma, stomach disorders, skin diseases, boils, obesity, and high cholesterol levels. They also proved to be effective in the treatment of ulcers and tumors<sup>15</sup>. Seaweed extracts possess potent bacterial activity against the bacterial strain, thus supporting their folkloric usage, promising a future scope for the use of these marine seaweeds against ent microbial populations<sup>16, 17, 18</sup>. The characterization of the active compounds from seaweed extracts revealed the most focusing parameter, to determine the mechanism of pathway<sup>19, 20</sup>.

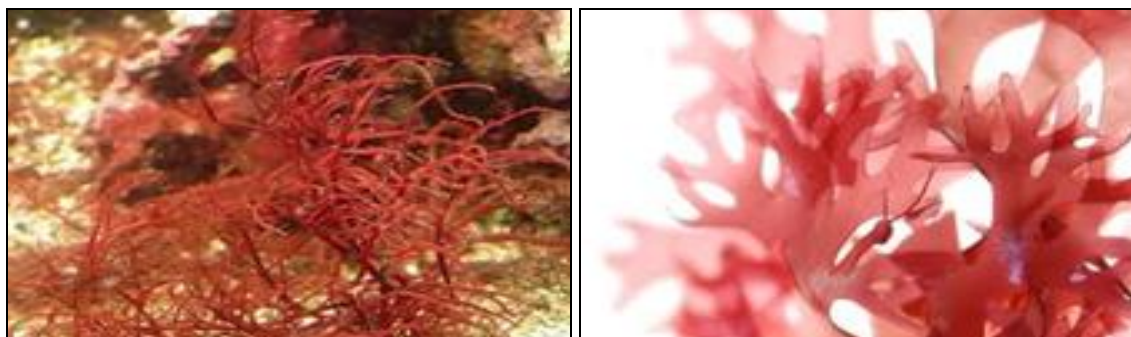


FIG. 1: ENTIRE PLANT PICTURE OF *HYPNEA VALENTIAE* (TURNER) MONTAGNE

TABLE 1: REVIEW ON PHARMACOGNOSTICAL STUDIES OF *HYPNEA VALENTIAE*

S. no.	Title	Journal name	Year	Vol. / Issue	Author	Conclusion
1	Phycological notes VII concerning three Pacific coast species, especially <i>Porphyra miniata</i>	Phycologia International Phycological Society)	March 1972	Vol. II, Issue 1, Pg : 43 - 46		<i>Hypnea valentiae</i> species discovered
2	Seasonal growth, reproduction & Spore shedding in <i>Hypnea valentiae</i> (Turn.) Mont	Plant Sciences	1983	Vol. 92, Issue -6, PP: 473- 482	G. Subha Rangal ah <i>et al.</i> ,	Explained about the growth reproduction, spore shedding diurnal periodicity Carposporophytes
3	Phycocolloid chemistry as a taxonomic indicator of Phylogeny in the Gigartinales, Rhodophyceae; A review & current development using fourier transform infrared diffuse reflectance spectroscopy	Phycological Research	1999	47, 167 - 188	Thierry chopin <i>et al.</i> ,	Discussed th Taxonomy, Fourier Transform – reflect the Phyco colloid details
4	Spore germination and Early stages of Development in <i>Hypnea valentiae</i> (Turner) Montagen, Rhodophyta	Botanica Marina	Oct, 1976	Vol. 20, Issue - 6, Pg: 381 - 384.	K. E. Mshigeni <i>et al.</i> ,	They studies the spore germination and given detailed information about microscopic studies with fluorescent studies
5	A taxonomic revision of a <i>Hypnea charoids valentiae</i> Complex (Rhodophyta, Gifartinales) in Japan, with a description of <i>Hypnea</i>	Phycological Research	March 2000	Vol. 48, Issue-1, pg: 27-35	Yuki masa, YamagIshi <i>et al.</i> ,	Investigated the morphological appearance of <i>Hypnea</i> . The nucleotide sequence of Plastid encoded a large subunit of the

<i>flexicaulis sp. nov</i>						ribulose 1,5 – biphosphate carboxylase/oxygenase gene (rbcl). They concluded that former collected <i>Hypnea</i> has an absence of Antler branches
6	Farming of <i>Hypnea valentiae</i> (Turner) Montagne at Minicoy Lagoon (Lakshadweep)	Seaweed Research Utilization	2005	27 (1&2), 93-98.	Gulshad Mohammed <i>et al.</i> ,	Studied the Variation in Salinity from June to January. First harvesting during Monsoon showed good yield. The study explained the relationship between Phosphate & Nitrate level in HV
7	Indian seaweed resources & he sustainable at the sawn of a new century	Current Science	July 2006	Vol. 91, no. 2, 25	P.V. Subba Rao <i>et al.</i> ,	Discussed the harvesting & occurrence of seaweeds throughout the year, mainly from January to March
8	Population structure of turbinid gastropods on the wave-exposed subtidal reefs: effects of density, body size, and algae on grazing behavior	Marine Ecology Progress series	2008	Vol. 362, 199 - 179, 2008	Thomas Wernberg <i>et al.</i> ,	Densities Turbinid gastropod on offshore, recorded - Ex: Turbo torquatus can consume a range of macroalgae, encompassing different thallus morphologist, at rates suggest it has potential to control of reef algae
9	A new contribution to the allied macroalgal flora of Greece (Eastern Mediterranean ) with emphasis on <i>Hypnea species</i>	Cryptogamie	2011	Vol. 32, Issue 4, Pg: 393-410	Tsiamis <i>et al.</i> ,	They discussed Structural analysis of <i>Hypnea valentiae</i>
10	Morphology, Ultrastructure, and immunocytochemistry of <i>Hypnea cervicornis</i> & <i>H. musciformis</i> from the coastal waters of Ceara, Brazil	Journal of Microscopy & Ultrastructure	April, 2014	2 (2014), 104 - 116	Thaiz B. S, Miguel <i>et al.</i> ,	Studied the <i>H. Cervicornis</i> , <i>H. musciformis</i> - 54 species ultrastructure character. Lectin localization was confirmed by
11	<i>Hypnea</i> species (Gig males, southeastern coast of Brazil based on molecular studies complemented with morphological analyses, including a description of <i>Hypnea edeniana sp.nov.</i> <i>H. flora sp.nov</i>	European Journal of Phycology	2014	Vol. 49, Issue - 4	Fabio Nauer <i>et al.</i> ,	Immunochemistry analysis Explained the Geographical distribution of <i>Hypnea</i> species

**TABLE 2: REVIEW ON PHYTOCHEMICAL STUDIES OF *HYPNEA VALENTIAE***

S. no.	Title	Journal name	Year	Vol. / Issue	Author	Conclusion
1	Halogenated pyrrolopyrimidine analogs of adenosine from marine organisms: Pharmacological activities & potent inhibition of adenosine kinase	Biochemical Pharmacology	Feb 1984	Vol. 33, Issue 3, 347-355	Les P. Davies <i>et al.</i> ,	Isolated 5' - Deoxy -5- Iodo tubercidin, potent muscle relaxant & Hypothermia. (Iodinated nucleoside occurring from natural source)
2	Phytochemical Investigations on four species of <i>Hypnea</i> (Gigartinales, Rhodophyta)	Botanica Marina	1992	Vol. 35, pp:141 - 146	Shameel <i>et al.</i> ,	They summarized that <i>Hypnea pannosa</i> and <i>Hypnea valentiae</i> have different phytoconstituent due to habit ecology
3	Studies on Tanzanian	Life Science	2004	Vol. 3, No. 1,	M.S.P. Mtolera	They isolated

	Hypneaceae: Seasonal variation in content & Quality of kappa - Carrageenan from <i>Hypnea</i>			pp: 43 - 49	<i>et al.</i> ,	carrageenan extracted from <i>Hypnea valentiae</i> and determined the gel strength, gelling temperature and melting temperature
4	Seasonal variation of the growth, chemical composition & carrageenan from <i>Hypnea</i> harvested along the Atlantic coast of Morocco	Scientific Research	2008	Vol. 2 (10) pp: 509 - 514	Mouradi Aziza <i>et al.</i> ,	They concluded that the sugar carrageenan did not show any significant variation according to the season of harvest
5	Evaluation of the Proximate, fatty acid & mineral composition of representative green, brown & red seaweeds from the Persian Gulf of Iran as potential food and food resources	Journal of Food Science Technology	2012	49 (6) , 774-780, Nov-Dec - 2012	Kiuomars, Rohani <i>et al.</i> ,	Manganese is high, <i>Hypnea valentiae</i> ( 3.7 mg/100 mg) HP – SFA (Saturated Fatty Acid ) – 67.4 %, Red Algae – the Highest level of Iron
6	Proximate composition, nutraceutical constituents & fatty acid profile on GC – MS of seaweed collected from Balk Bay (Thondi), India	International Journal of Current Science	2014	12, E, 57 -71	Arun Kumar <i>et al.</i> ,	They studied <i>the Hypnea valentiae</i> physico chemical analysis and also explained the 16 - red & 7 - green seaweed
7	A review on Biochemical composition & Nutritional Aspects of seaweeds	Carib. Journal of Science Technology	2015	Vol. 3, 789 - 797	Madhu babu Kasimala <i>et al.</i> ,	Discussed the Red /Brown algae accumulate iodine & regarded as a source of concentrated iodine
8	Multipotential applications of seaweeds	Life Sciences Achieves (LSA)	2016	Vol. 2, Issues - 5, 747 - 757	K. Jayaprabhakaran <i>et al.</i> ,	They isolated carrageenan and characterized its sulfated polysaccharide structure
9	Red algae Therapeutic diversity from Thoothukudi & its Therapeutic potential: A search	Indo American Journal of Pharmaceutical Research	2016	Issn no: 2231, pg. no: 4173 - 4178	Sumayya <i>et al.</i> ,	Explained that <i>Hypnea valentiae</i> has polysaccharide and carrageenan was isolated from the methanol extract

**TABLE 3: REVIEW ON PHARMACOLOGICAL STUDIES OF *HYPNEA VALENTIAE***

S. no.	Title	Journal name	Year	Vol. / Issue	Author	Conclusion
1	Neuroprotective effect of seaweeds inhibiting south Indian Coastal area (Hare Island, Gulf of Manner marine Biosphere Reserve) Cholinesterase inhibitory effect of <i>Hypnea valentiae</i> & <i>Ulva reticulata</i>	Neuroscience Letters	2010	Vol. 468, Issue 3,14 January, Pg: 216 -219	N. Suganthy, S. Karutha Pandian, K. Pandima devi	Concluded the Cholinesterase inhibitor about eight seaweeds. Mainly for Alzheimer's disease. Cholinesterase measured by Ellman's Colorimetric method
2	Biorestraining potentials of marine macroalgae collected from Rameshwaram, Tamil Nadu	Journal of Research in Biology	2011	Vol. 5, 382- 392	Anandhan <i>et al.</i> ,	Concluded that methanol extract of <i>G. crassa</i> & <i>Hypnea valentine</i> showed maximum antibacterial activity
3	A survey of cytotoxic effects of some marine algae in the chabaha coast of oman sea	Research Journal of Pharmacognosy	2014	1, 2014, 27-31	M. Mosaddegh <i>et al.</i> ,	Discussed the cytotoxicity effect in a different solvent. They concluded that chloroform extract showed the best activity

4	Antimicrobial activity of Bacteria associated with seaweeds against Plant pathogens on Pac with Bacteria found in seawater & sediment	British Microbiology Research Journal	2014	4 (8), 841 - 855	T. Surega <i>et al.</i> ,	Investigated the culturable bacteria (Epiphytic & Endobiotics), used as an antibiotic. The isolated bacterial strains were subjected to phylogenetic analysis for identification of protein gene sequencing
5	Antioxidant activities & phenolic contents of three red seaweeds (Division: Rhodophyta) Harvested from the Gulf of Manner of Peninsular India	Journal of Food Science Technology	April 2015	52 (4), 1924 -1935	Kajal Chakraborty <i>et al.</i> ,	A bioactive compound isolated from Methanol extract of <i>Hypnea valentiae</i> and Used in the treatment of cancer
6	Multipotential Applications of Seaweeds	Life Science Archives (LSA)	2016	Vol. 2, Issue - 5, 747 - 757	K. Jayaprakash <i>et al.</i> ,	Secondary metabolites isolated from seaweeds and used for the treatment of cancer
7	Biochemical composition of seaweeds & their Anti-cancer properties against Human papillomavirus (HPV) - A Review	International Journal of Pharmaceutical, Chemical & Biological Science (JJPCBS)	2016	6 (3), 271 - 279	Ashwini <i>et al.</i> ,	They explained the theoretical explanation about the k - carrageenan pharmacological activity by blocking HPV infection
8	Comparison of Antioxidant Activity of <i>Gracilaria edulis</i> & <i>Hypnea valentiae</i>	International Journal of Advance research, Ideas & Innovations in Technology	2017	Vol. 3, Issue -1	Chandra Mohan <i>et al.</i> ,	Studied the Comparative studies of Antioxidant Activity between the two species, they concluded HV has the highest antioxidant in ethyl acetate

**TABLE 4: REVIEW ON BIOTECHNOLOGICAL STUDIES OF HYPNEA VALENTIAE**

S. no.	Title	Journal name	Year	Vol. / Issue	Author	Conclusion
1	GABA from <i>Hypnea valentiae</i> (Turn.) Mont. & its effect on the larval settlement of <i>Perna viridis</i> Linnaeus	Seaweed Research utilization	2005	27 (1 & 2)	Kaladharan <i>et al.</i> ,	They isolated GABA from <i>Hypnea valentiae</i> and dissolved in ethanol. They analyzed for the treatment of epilepsy.
2	Seasonal variation in Antibacterial Activity of seaweed <i>Hypnea valentiae</i> & its Epiphytic Bacteria	American Journal of Pharmacy & Health Research	2013	Vol. 1, Issue - 9.	Shanmugiah Mahendran <i>et al.</i> ,	Studies the Epiphytic Bacteria isolated from the <i>Hypnea valentiae</i> in the different solvent system. n- Butanol showed the highest activity (HV 10)
3	Effects of seawater salinity & Temp. on Growth & Pigment content in <i>Hypnea cervicornis</i> , J. Agardh (Gigartinales, Rhodophyta)	Biomed Research International	Sep, 2013	Vol. 2013, Article ID- 594308	Shantou <i>et al.</i> ,	Discussed the pH and salinity water. Compared the normal water and algae pigmentation interaction
4	Morphological and molecular assessment of native carrageenophyte <i>Hypnea valentiae</i> in Indian Subcontinent	Phycological Society	2014	Phykos 44 (1), 52 -58.	Fleix Bast, Satej Bhushan & Aijaz Ahmed John <i>et al.</i> ,	Studies about the Algal genomic extraction by Extracting DNA and Sequencing it
5	Antimicrobial activity of Bacteria associated with seaweeds against Plant pathogens on Pac with Bacteria found in seawater & sediment	British Microbiology Research Journal	2014	4 (8), 841 - 855	T. Surega <i>et al.</i> ,	Investigated the culturable bacteria (Epiphytic & Endobiotics), used as an antibiotic. The isolated bacterial strains were subjected to phylogenetic analysis for identification

6	The bioactive potential of endophytic fungi from macroalgae	International Journal of Research in Marine Sciences	Sep 2015	4 (2), 27-32	Rosamma Philip <i>et al.</i> ,	of protein gene sequencing. Isolated the Endophytic fungi; Algae
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**TABLE 5: REVIEW ON ENVIRONMENTAL STUDIES OF *HYPNEA VALENTIAE***

S. no.	Title	Journal name	Year	Vol. / Issue	Author	Conclusion
1	Role of red algae <i>Hypnea valentiae</i> (Gigartinales, Rhodophyta) in domestic effluent treatment at different light intensity & Quality	Indian Journal of Marine Science	1994	Vol. 23, Issue - 3, Pg: 162 - 164	Rengasamy	Discussed the effluent effect of <i>Hypnea valentiae</i>
2	Effect of biofouling on corrosion behavior of grade 2 titanium in Mandapam seawaters	Desalination	Sep 2008	Vol. 230, Issue 1-30, 92-99	S. Palraj <i>et al.</i> ,	Explained the deposition of Titanium in green, Red algae and analyzed
3	Preparation and characterization of activated carbon from marine macro-algal biomass	Journal of Hazardous	March 2009	Vol. 162, Issue 2-3, March 2009, 688- 694	R. Aravindhan <i>et al.</i> ,	Explained the preparation of Activated carbon prepared from <i>Hypnea valentiae</i> and used for the removal of phenol from aqueous solution.
4	Biosorption of Cadmium Metal Ion from simulated wastewaters using <i>Hypnea valentiae</i> Biomass: A kinetic & Thermodynamic study	Biosource Technology	2009	101 (5) 1466-70, Sep-2009	Aravindhan, Rathinam <i>et al.</i> ,	Studied the efficient Biosorption removal of Cadmium by red <i>Hypnea valentiae</i>
5	Sorption of Nickel by <i>Hypnea valentiae</i> - Application of Response Surface Methodology	World Academy of Science, Engineering & Technology Bioscience	2011	Issue 51, P-7, March - 2011	Rajasimman <i>et al.</i> ,	They concluded that <i>Hypnea valentiae</i> has potent surfactant activity
6	Economically Import Seaweeds of Kerala Coast, India - Review	Bioscience	2015	82, 32147 - 32153	S. K. Yadav	Discussed the uses of <i>Hypnea valentiae</i> - Edible, Medicinal, Industrial application

**CONCLUSION:** Seaweeds are primitive non-flowering plants, which contain different vitamins, minerals, trace elements, proteins, and bioactive substances. Many polysaccharides are recovered from seaweeds, with the most important of them being agar, alginic acid, laminarin, fucoidin, galactans, carrageenan, xylan, and mannans.

These seaweeds possess antibacterial activity against bacterial pathogens, thus supporting their folkloric usage, promising a future scope for the use of these marine seaweeds against microbial populations.

From the review of studies, we concluded that the Marine environment is an exceptional reservoir of biologically active natural products, many of which exhibit structural features not been found in terrestrial natural products.

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**CONFLICT OF INTEREST:** Nil

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