

Table S1. Marine sources of natural substances with antioxidant activity

Source	Location of harvesting	Extracts Hydrolysates Biomass	Biological activity Potential applications	Ref.
Marine macro-organisms				
Seaweeds				
brown seaweeds				
<i>Sargassum ilicifolium</i> , <i>Sargassum angustifolium</i> , <i>Sargassum filipendula</i>	Qeshm, Is- land, Iran Indonesia	Fucoidan extracts	Antioxidant Antimicrobial Nutraceutical industry	[40] [41]
<i>Turbinaria decurrens</i> Bory	Phillipins	Fucoidan extracts	Radicals scavenger Cosmetics Drug-resistant bacterial infections Diabetes	[42]
<i>Toania atomaria</i> (Phaeophyta)	Rocky Bay, Abu Qir, Alexandria, Egypt	Ethanol extract	High antioxidant	[43]
<i>Caulerpa racemosa</i> var. <i>cylindracea</i>	Algeria coast	Crude extracts con- taining new bioactive components	Antioxidant Antibacterial	[44]
Unexplored <i>Padina tetrastromatica</i> , <i>Gracilaria tenuistipitata</i>	Bangladesh	Various solvent ex- tracts	Antioxidant	[45]
<i>Zonaria tournefortii</i>	-	Acilphloroglucinol derivatives	Antioxidant	[46]
<i>Ecklonia maxima</i> blades	-	Hydrolysates (celluclast-assisted; viscozyme-assisted)	Antioxidant Anti-inflammatory Functional food	[47]
<i>Ecklonia maxima</i> stipe	-	Maceration extracts	Very strong antioxidant UV protector	[29]
Red seaweeds				
<i>Gracilaria bursapastoris</i>	Nador laoon, Maroco	Extracts (ethanol)	Antioxidant	[48]
<i>Asparagopsis armata</i> , <i>Gracilaria gracilis</i> , <i>Hypnea musciformis</i> , <i>Laurencia obtusa</i> , <i>Pterocladia capillacea</i> , <i>Sphaerococcus cornopifolius</i>	north coast of Tunisia	Extracts (methanol)	Radical scavenging	[49]
Sea cucumbers				
<i>Holothuria tubulosa</i> Gmelin 1791	Turkey seas	Extracts (acetonitrile/tri- fluoroacetic acid, methanol, wa- ter/methanol)	Antioxidant	[50]
<i>Holothuria tubulosa</i> tegument	Bizerta	Extracts (chloroform-metha- nol mixture)	Antioxidant	[51]

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	lagoon, northern Tu- nisia			
<i>Stichopus japonicas</i> (<i>S. japonicas</i>)	Red sea	Ultrasonic extracts (water)	Antioxidant Anti-melanogenic	[52]
<i>Holothuria leucospilota</i>	Indonesian sea	Methanol extracts	Highest Antioxidant (among 16 from genus <i>Actinopyga</i> , <i>Bohadschia</i> , <i>Hol- othuria</i> , <i>Pseudocolochirus</i> , and <i>Stichopus</i>)	[53]
<i>Holothuria atra</i>	Indonesian sea	Extracts (methanol)	Highest antioxidant (among 21 other cucum- bers from Indonesian sea)	[54]
<i>S. japonicas</i>	-	Hydrolysates Enzymatic (alcalase, α -chymo- trypsin, fla- vourzyme, kojizyme, neutrase, papain, pepsin, trypsin pro- tamex)	Antioxidant (against H ₂ O ₂ -induced oxidative stress)	[55]
Fishes				
<i>Raja porosa</i> skate cartilage	-	Chondroitin sulphate (CS) extracted	Antioxidant (free radical scavenging more effective than shark CS)	[56]
<i>Sardina pilchardus</i> roe	-	Delivered lipids	Antioxidant Anti-inflammatory (lipid liposomes)	[58]
Marine invertebrates				
Marine sponges				
<i>Hyrtios erectus</i>	North Bay, South Andaman Sea	Methanol extracts	Antioxidant Anti-inflammatory	[62]
genus <i>Suberea</i> , family <i>Aplysinellidae</i>	-	Produced bromoty- rosine derivatives	Biological Pharmacological	[63]
<i>Diacarnus ardoukoba</i> associated <i>Streptomyces</i> sp. NMF6 strain	-	Ethyl acetate extract	Antioxidant Anticancer Antimicrobial Antiviral	[64]
Soft corals				
<i>Junceella juncea</i> <i>Cavernularia</i> sp. <i>white</i> <i>Menella</i> sp. <i>brown</i> <i>Menella</i> sp. <i>Virgularia</i> sp. <i>Sinularia compressa</i> <i>Sinularia variabilis</i>	Persian Gulf	Maceration extracts (methanol-ethyl Acetate)	Antioxidant Anticancer	[65]

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<i>Sinularia polydactyla</i>				
Soft corals	-	Derived Sinularin, Dihydrosinularin	Antioxidant Anti-cancer	[66]
Crabs				
<i>Grapsus albolineatus</i>	rocky shore	Hydrolysate (Alcalase) (bioactive peptides)	Antioxidant Antibacterial	[67]
Molluscs				
<i>Tympanotonus fuscatus var radula</i> (Linnaeus) <i>Pachymelania aurita</i> (Muller)	NigerDelta, Nigeria	-	Antioxidant	[70]
jellyfish <i>Acromitus flagellatus</i>	Indian ocean	Nematocysts crude venom	Antioxidant (proteins, lipids, carotenoids)	[71]
Microorganisms				
Microalgae				
<i>Dunaliella salina</i> <i>Tetraselmis chuii</i> <i>Isochrysis galbana</i>	clone Tahiti	Extracts (methanol)	Antioxidant	[74]
<i>Nannochloropsis oculata</i>	-	Extracts (methanol)	Antioxidant Antimicrobial Anticancer	[75]
<i>Nannochloropsis gaditana</i>	-	Extracts (methanol)	Antioxidant Anti-inflammatory (in diabetic rats)	[76]
<i>Galdieria sulphuraria</i> , <i>Ettlia carotinos</i> , <i>Neochloris texensis</i> , <i>Chlorella minutissima</i> , <i>Stichococcus bacillaris</i> , <i>Schizochytrium limacinum</i> , <i>Cryptocodinium cohnii</i> , <i>Chlorella vulgaris</i>	-	Crude extracts	Antioxidant Cytotoxic Therapeutic	[77]
Ninetyone (91) microalgae strains photo-tropically grown to generate biomass marine heterokonts <i>Bacillariophyte</i> cf. <i>Stauroneis</i> sp. LACW24, <i>Ocrophyte</i> cf. <i>Phaeothamnion</i> sp. LACW34	Irish waters	Extracts (polar solvents)	Biomass generation Antioxidant	[79]
<i>Chlorella</i> sp. S14	-	Biomass Polyunsaturated fatty acids (PUFA) extracts	Antioxidant Anti-proliferative	[80]
Bacteria				
New Gram-positive marine <i>Actinobacteria</i> strain	Unexplored sea sediment Alang Gulf,	Extracts (ethyl acetate)	Antioxidant Antibacterial	[82]

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	Khambhat, Gujarat			
<i>Streptomyces sp. SCS525</i>	Marine sediments	Extracts (ethyl acetate)	Strong antioxidant	[83]
Algae associated bacteria	Red Sea, Jeddah, Pakistan	Extracts (ethyl acetate) Secondary metabolites	Pharmac. industry (steroids, saponins, tannins, flavonoids, anthocyanin, betacyanin)	[84]
<i>Bacillus Planococcus</i>	Saline Aushazia Lake, Saudi Arabia	Saline environment	Antioxidant (salinity stress enhanced) Foods Postbiotics	[85]
<i>Cyanobacteria Chroococcidiopsis sp. LEGE 06174</i>	-	Extracts (ethanol-PBS; acetone-PBS; methanol-PBS)	Antioxidant Antioxidant industry	[86]
Fungi				
<i>Aspergillus puulaauensis</i> TM124-S4	-	Extract (water)	Skin protection	[90]
Sponge-associated endophytic fungi: <i>Tedania anhelans</i> <i>Myxilla arenaria</i> <i>Callyspongia fibrosa</i>	east and west coasts of India	Sabouraud Dextrose Agar Medium	Antioxidant Anticancer Anti-inflammatory	[91]
<i>Myrothecium sp. Bzo-l062</i>	Deep sea	Extract (ethyl acetate) Four new components derived	Antioxidant Anti-inflammatory	[93]