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Macroalgae Resources for Blue Economy Development in Bangladesh

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Abstract

Macroalgae are valuable marine resources that play an important role in supporting the blue economy because of their ecological importance, rich biochemical composition, and wide range of industrial applications. Globally, seaweed production has increased rapidly, mainly through aquaculture, contributing to food security, climate change mitigation, biotechnology, and sustainable coastal livelihoods. Although Bangladesh has a long coastline and suitable environmental conditions for seaweed growth, its macroalgal resources remain largely underutilized. This review provides a comprehensive overview of the diversity, distribution, cultivation status, commercial applications, ecosystem services, and future prospects of macroalgae in Bangladesh. The coastal waters of Bangladesh, particularly the Cox's Bazar-Teknaf coast and Saint Martin's Island, support a rich diversity of green (Chlorophyta), brown (Ochrophyta: Phaeophyceae), and red (Rhodophyta) seaweeds, including economically important genera such as *Gracilaria*, *Gracilariopsis*, *Hypnea*, *Sargassum*, *Padina*, and *Ulva*. These seaweeds are rich sources of hydrocolloids, proteins, pigments, polyphenols, sulfated polysaccharides, and other bioactive compounds that have applications in the food, pharmaceutical, nutraceutical, cosmetic, agricultural, aquaculture, bioenergy, and environmental remediation sectors. Despite encouraging progress in small-scale cultivation, the development of a sustainable seaweed industry in Bangladesh is limited by seasonal production, inadequate seed supply, insufficient processing facilities, limited investment, weak value chains, and the absence of comprehensive policy support. Expanding research and innovation, improving cultivation techniques, developing processing industries, strengthening market linkages, and implementing effective marine resource management policies will be essential for unlocking the full potential of macroalgae. This review identifies the major opportunities and challenges for macroalgae development in Bangladesh and outlines strategic recommendations to promote sustainable production, value addition, and blue economy growth.

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1. Introduction

Macroalgae are multicellular marine algae that play essential ecological and economic roles in coastal ecosystems [1]. Based on their pigmentation and biochemical characteristics, they are classified into three major groups: green (Chlorophyta), brown (Ochrophyta: Phaeophyceae), and red (Rhodophyta) [2]. Besides supporting marine biodiversity, macroalgae contribute

to carbon sequestration, nutrient cycling, shoreline protection, and habitat formation, making them important components of sustainable coastal ecosystems [3-4]. Owing to their rich composition of hydrocolloids, proteins, vitamins, minerals, polysaccharides, and bioactive compounds, macroalgae have gained global recognition for applications in food, pharmaceuticals, nutraceuticals, cosmetics, animal feed, agriculture, bioenergy, and environmental remediation [5].

The global macroalgae industry has expanded rapidly over the past two decades, driven by increasing demand for sustainable marine resources and blue economy initiatives. According to the Food and Agriculture Organization (FAO), global seaweed production exceeded 39 million tonnes in 2022, with more than 97% derived from aquaculture, predominantly in East and Southeast Asia [6]. Beyond their commercial value, seaweed farming is recognized as a climate-smart aquaculture practice because it requires no arable land, freshwater, or synthetic fertilizers while contributing to carbon capture and nutrient removal from coastal waters [4]. Consequently, macroalgae are increasingly considered strategic resources for achieving several United Nations Sustainable Development Goals (SDGs), particularly those related to food security, climate action, and sustainable use of marine resources.

Bangladesh possesses considerable potential for macroalgae-based blue economy development due to its approximately 710 km coastline along the Bay of Bengal and diverse coastal habitats, including estuaries, sandy beaches, mudflats, mangrove ecosystems, and Saint Martin's Island [7]. Previous surveys have reported between 165 and 193 marine macroalgal species, dominated by members of Chlorophyta, Ochrophyta, and Rhodophyta, highlighting the country's rich marine biodiversity [8-9]. Seaweed cultivation was initiated in the early 2000s and has subsequently expanded to include commercially important species such as *Gracilaria*, *Hypnea*, *Sargassum*, and *Ulva* in coastal areas of Cox's Bazar and Saint Martin's Island [10-12]. Although pilot-scale cultivation has demonstrated encouraging results, commercial production remains constrained by limited seed availability, inadequate processing infrastructure, insufficient investment, and weak market linkages.

Considering the increasing global demand for sustainable marine resources and Bangladesh's favorable environmental conditions, macroalgae represent an underutilized resource with substantial potential to support coastal livelihoods, marine biotechnology, food security, and climate-resilient economic growth. Therefore, this review provides a comprehensive synthesis of the diversity, cultivation status, commercial applications, ecosystem services, challenges, and future prospects of macroalgae resources in Bangladesh, highlighting their role in advancing the country's blue economy.

2. Commercially Important Seaweed Groups in Bangladesh

2.1. Red Seaweed (Rhodophyta)

Red seaweeds (Rhodophyta) constitute one of the most economically valuable groups of marine macroalgae owing to their extensive applications in the food, pharmaceutical, nutraceutical, cosmetic, agricultural, and biotechnology sectors (Fig.1). Their cell walls are rich in sulfated polysaccharides, particularly agar and carrageenan, which serve as essential hydrocolloids in food processing, pharmaceuticals, microbiological media, biomedical engineering, and biodegradable packaging materials. In Bangladesh, Rhodophyta represents the largest proportion of commercially important seaweeds, comprising 10 of the 26 economically significant species reported from the coastal waters of Cox's Bazar, Saint Martin's Island, Teknaf, and adjacent marine ecosystems [13].



***Gracilaria* sp.** ***Hypnea* sp.**

Fig 1: Representative specimens of red seaweed (Rhodophyta)

Commercially important red seaweed species recorded from Bangladesh include *Acanthophora spicifera*, *Asparagopsis taxiformis*, *Eucheuma cottonii*, *Gracilaria tenuistipitata*, *Gracilariopsis longissima*, *Gelidium pusillum*, *Hypnea musciformis*, *Hypnea valentiae*, *Kappaphycus alvarezii*, and *Porphyra indica* (Table 1). These species provide a broad spectrum of ecosystem services and industrial applications because of their high concentrations of bioactive compounds, including sulfated polysaccharides, phenolic compounds, carotenoids, phycobiliproteins, essential amino acids, vitamins, and minerals, many of which exhibit antioxidant, antimicrobial, antiviral, anti-inflammatory, and anticancer activities [14].

Among these taxa, *Gracilaria tenuistipitata* has attracted increasing attention because of its abundance of phenolics, flavonoids, terpenoids, and sulfated polysaccharides, which contribute to significant antioxidant and antiproliferative activities [15-16]. Likewise, *Gracilariopsis longissima* possesses antibacterial properties and has demonstrated considerable potential as a biological filter for heavy-metal removal in coastal aquaculture systems, highlighting its importance in environmental remediation and integrated multi-trophic aquaculture [17-18].

Species belonging to the genus *Hypnea*, particularly *H. musciformis* and *H. valentiae*, are recognized as important carrageenan-producing seaweeds with applications in food technology, pharmaceuticals, nutraceuticals, and agriculture. Their extracts have demonstrated antimicrobial, antioxidant, neuroprotective, and anticancer properties while also serving as ingredients in functional foods, livestock feed, and organic fertilizers [19-20]. Similarly, *Kappaphycus alvarezii*, one of the world's major commercial carrageenophytes, has become increasingly important because of its high carrageenan yield and its application as a plant biostimulant and liquid biofertilizer that enhances crop productivity and soil fertility [21-22].

Table 1: Red seaweeds available in Bangladesh and their commercial use

Seaweed species	Uses
Acanthophora spicifera	Antioxidant and antiproliferative activities [23]; pharmaceutical application [24]; phytoelicitor activity [25].
Asparagopsis taxiformis	Finfish aquaculture [26]; cattle feed supplement and anti-greenhouse potentiality [27].
Eucheuma cottonii	Sunscreen cream [28]; bioethanol production [29]; fish anesthetic agent [30]; antioxidant and antibacterial activity [31].
Gracilaria tenuistipitata	Antioxidant activity and bioactive compounds [15]; anticancer activity [16]; cattle feed supplement; reduction of methane emissions [9].
Gracilariopsis longissima	Antibacterial activity [17]; biofilter [18]; bioethanol production [29].
Gelidium pusillum	Biofuel and commodity chemicals production [41]; biofilm production; antioxidant and antibacterial activity [42].
Hypnea musciformis	Antimicrobial, anticancer, and neuroprotective activities [19]; food, feed, and industrial use [32]; phytochemical compounds and antioxidant activity [33].
Hypnea valentiae	Food, medicine, and biofertilizer [36]; removal of heavy metals [37]; antiglucoconeogenesis activity [38]; antibacterial, antioxidant, and anticancer activities [20].
Kappaphycus alvarezii	Food, medicine, and biofertilizer [36]; liquid fertilizer [21]; antioxidant activity [22].
Porphyra indica	Functional food [39]; bioactive compounds; antimicrobial activity [40]

Gelidium pusillum is another commercially valuable species owing to its production of premium-quality agar, which is widely used in microbiological culture media, food formulations, pharmaceuticals, and biodegradable biomaterials. Recent studies have further highlighted its antioxidant and antibacterial activities, suggesting additional applications in food preservation and biomedical products [41-42]. Likewise, *Eucheuma cottonii* serves as an important source of carrageenan and has demonstrated potential for bioethanol production, natural cosmetics, aquaculture, and antimicrobial formulations [28-29].

Economically important species, including *Acanthophora spicifera*, *Asparagopsis taxiformis*, and *Porphyra indica*, further broaden the utilization potential of Bangladesh's red seaweed resources. *A. spicifera* contains bioactive metabolites with antioxidant and phytostimulatory activities suitable for pharmaceutical and sustainable agricultural applications [24-25]. *A. taxiformis* has gained global recognition as a methane-reducing feed additive capable of substantially lowering enteric methane emissions from ruminants while improving feed efficiency, making it an important component of climate-smart livestock production [26-27]. In contrast, Porphyra indica is valued as a nutrient-rich edible seaweed containing proteins, essential amino acids, vitamins, minerals, and phenolic compounds that support its development as a functional food and nutraceutical ingredient [39].

2.2. Brown Seaweed (Ochrophyta: Phaeophyceae)

Brown seaweeds (Ochrophyta: Phaeophyceae) represent one of the most ecologically and economically important groups of marine macroalgae because of their abundance of structurally diverse polysaccharides, polyphenols, pigments, and bioactive metabolites (Fig.2). Globally, brown algae have gained increasing attention as renewable marine resources for the production of functional foods, pharmaceuticals, nutraceuticals, cosmetics, biofertilizers, biofuels, and environmentally sustainable biomaterials [67-68]. Their characteristic metabolites, including alginate, fucoidan, laminarin, phlorotannins, fucoxanthin, and mannitol, possess antioxidant, antimicrobial, antiviral, anti-inflammatory, anticoagulant, antidiabetic, and anticancer properties, making brown seaweeds among the most valuable marine resources for the emerging blue bioeconomy [69, 100].



Fig 2: Representative specimens of Brown seaweed (Ochrophyta: Phaeophyceae)

In Bangladesh, eight commercially important brown seaweed species have been documented from the coastal waters of Cox's Bazar, Teknaf, Saint Martin's Island, and the Sundarbans coastal region. These include *Colpomenia sinuosa*, *Dictyota dichotoma*, *Dictyota bartayresiana*, *Hydroclathrus clathratus*, *Padina tetrastromatica*, *Padina gymnospora*, *Sargassum oligocystum*, and *Sargassum ilicifolium* (Table 2) [13]. These species contribute substantially to coastal biodiversity and provide promising opportunities for industrial utilization owing to their rich biochemical composition and multifunctional biological activities. Among them, members of the genera *Sargassum*, *Padina*, and *Dictyota* are particularly important because of their high biomass productivity and broad industrial applications.

Colpomenia sinuosa has attracted considerable scientific interest because of its high concentrations of fucoidan and alginate, compounds that exhibit potent antioxidant, antidiabetic, and anticancer activities [77-78]. The species has also been investigated as a source of biofertilizers and industrial raw materials, highlighting its multifunctional economic potential. Likewise, *Dictyota dichotoma* contains diterpenoids and phlorotannins with demonstrated antimicrobial, antifouling, antioxidant, and cytotoxic activities, while extracts of this species have shown promising anticancer effects against several human cancer cell lines [85]. Another member of the genus, *D. bartayresiana*, has recently gained attention as a biological source for the green synthesis of metal nanoparticles with significant antibacterial, antifungal, and anticancer activities, expanding its potential application in nanobiotechnology and biomedical sciences [75].

Table 2: Brown seaweeds available in Bangladesh and their commercial use

Seaweed species	Uses
Colpomenia sinuosa	Antioxidant activity [76]; antidiabetic [77]; fertilizer and industrial use [32]
Dictyota dichotoma	Food, feed, and industrial use [32]; anticancer activity [25]; antifouling and antipredatory activity [23].
Dictyota bartayresiana	Antifungal activity [80]; antibacterial activity and cytotoxic effect [75].
Hydroclathrus clathratus	Antiviral activity [81]; antitumor [82]; antiherpesviral property [83].
Padina tetrastromatica	Wastewater treatment [84]; industrial and fertilizer use [32]; liquid biofuel production [70]; antioxidant activity and bioactive compounds [71].
Padina gymnospora	Anticoagulant activity [72]; wastewater treatment [73]; antioxidant activities [22]; antiviral activity [25].
Sargassum oligocystum	Anticancer activity [86]; sunscreen cream; antidiabetic activity; antioxidant and antistaphylococcal activity [88].
Sargassum ilicifolium	Feed, industrial, fertilizer, and medicinal use [32]; sunscreen cream [28]; anti-inflammatory and antioxidant activity [89]

Species of *Hydroclathrus* and *Padina* have also demonstrated considerable pharmaceutical and environmental significance. Sulfated polysaccharides isolated from *Hydroclathrus clathratus* exhibit broad-spectrum antiviral activity, particularly against herpes simplex virus, together with promising immunomodulatory and antitumor properties [81-82]. Meanwhile, *Padina tetrastromatica* and *P. gymnospora* possess high biosorption capacities for heavy metals and have therefore been investigated for wastewater treatment and environmental remediation. In addition, these species contain phenolic compounds and sulfated polysaccharides that contribute to their antioxidant, anticoagulant, antiviral, and

anti-inflammatory activities [22, 73]. Their biomass has also been explored as a feedstock for bioethanol and biodiesel production, supporting the transition toward renewable marine bioenergy resources [70].

Species belonging to the genus *Sargassum* are among the most commercially valuable brown seaweeds worldwide and have considerable potential for cultivation in Bangladesh. *Sargassum oligocystum* contains abundant fucoidan, phlorotannins, flavonoids, and carotenoids that exhibit antioxidant, antimicrobial, antidiabetic, and anticancer activities [87]. Similarly, *Sargassum ilicifolium* has emerged as a promising resource for nutraceuticals, pharmaceuticals, cosmetics, animal feed, and organic fertilizers because of its high content of bioactive lipids, polyphenols, and sulfated polysaccharides [89]. Furthermore, extracts of *Sargassum* species have been widely investigated as natural UV-protective agents in sunscreen formulations and as plant biostimulants that improve crop productivity and stress tolerance [28].

2.3. Green Seaweed (Chlorophyta)

Green seaweeds (Chlorophyta) are among the most diverse groups of marine macroalgae and constitute an important component of coastal ecosystems because of their ecological functions and broad commercial applications (Fig.3). Owing to their rapid growth, high photosynthetic efficiency, and rich nutritional composition, green macroalgae have emerged as promising renewable resources for food, pharmaceuticals, nutraceuticals, cosmetics, agriculture, aquaculture, wastewater remediation, and bioenergy production [90-91]. Their biomass contains abundant proteins, essential amino acids, dietary fiber, polyunsaturated fatty acids, chlorophylls, carotenoids, vitamins, minerals, sulfated polysaccharides (particularly *Ulva*), and diverse phenolic compounds, many of which exhibit antioxidant, antimicrobial, antiviral, anti-inflammatory, immunomodulatory, and anticancer properties [65, 100].



***Ulva* sp.** ***Caulerpa* sp.**

Fig 3: Representative specimens of green seaweed (Chlorophyta)

Bangladesh's coastal waters support several commercially valuable green seaweed species, particularly in Saint Martin's Island, Cox's Bazar, Teknaf, and adjacent intertidal habitats. Eight species have been recognized as commercially important, namely *Caulerpa racemosa*, *Caulerpa taxifolia*, *Codium fragile*, *Ulva intestinalis*, *Ulva lactuca*, *Ulva fasciata*, *Ulva compressa*, and *Ulva reticulata* (Table 3) [103]. Among these, the genus *Ulva* represents the largest proportion of commercially important green seaweeds in Bangladesh, reflecting its broad ecological distribution, rapid biomass production, and diverse industrial applications. Species of *Ulva* are increasingly cultivated worldwide because of their high productivity and suitability for integrated multi-trophic aquaculture, circular bioeconomy, and climate-resilient coastal farming systems.

Species belonging to the genus *Caulerpa* possess considerable nutritional and pharmaceutical value. *Caulerpa racemosa* is widely consumed as an edible seaweed in many tropical countries and is recognized for its high concentrations of phenolic compounds, flavonoids, carotenoids, vitamins, and minerals. These bioactive constituents contribute to significant antioxidant, antimicrobial, anti-inflammatory, and antiproliferative activities, making the species an attractive source of functional food ingredients and natural pharmaceutical compounds [39, 44]. Likewise, *C. taxifolia* contains diverse secondary metabolites with antimicrobial and cytotoxic properties and has demonstrated promising anticancer activities against several human cancer cell lines, highlighting its potential for future drug discovery [45-46].

Table 3: Green seaweeds available in Bangladesh and their commercial use

Seaweed species	Uses
Caulerpa racemosa	Bactericidal and larvicidal activity; bioactive compounds [47]; food source [48]; antioxidant and antiproliferative activity [93]; sunscreen creams [94].
Caulerpa taxifolia	Antimicrobial activity [45]; anticancer activity [46].
Codium fragile	Food, feed, and medicinal use [32]; antiviral, antiedema, antiallergic, antibacterial, antiprotozoal, and anticarcinogenic activities [49]
Ulva intestinalis	Food source [48]; antibacterial and antioxidant activities [50]; surimi fortification [51]; bioactive molecules [52]; biofertilizer [53].
Ulva lactuca	Natural preservative, antioxidant, and antibacterial activity [54]; animal feed, chemicals, and biofuel production [55]; food and biomedical applications [56]; biofertilizer [53].
Ulva fasciata	Antimicrobial activity [57]; biofuel production [58]; antioxidant activity [59]; food, feed, and medicinal use [32].
Ulva compressa	Antioxidant activity [60]; human consumption, animal feed, and pharmaceutical use [61].
Ulva reticulata	Food, medicine, and biofertilizer [36]; antimicrobial activity [62]; antibacterial activity [63].

Codium fragile is another commercially valuable green macroalga owing to its nutritional composition and abundance of sulfated polysaccharides, sterols, and bioactive peptides. Numerous studies have reported antiviral, antibacterial, anti-inflammatory, antiallergic, antitumor, and immunomodulatory activities associated with its extracts, supporting its applications in functional foods, pharmaceuticals, and nutraceutical formulations [49]. Moreover, the species has been investigated as a sustainable ingredient for aquafeeds because of its high digestibility and favorable amino acid profile.

Among commercially important green seaweeds, species of the genus *Ulva* have received the greatest scientific attention due to their exceptional versatility and industrial significance. *Ulva lactuca*, commonly known as sea lettuce, is rich in proteins, vitamins, minerals, chlorophylls, carotenoids, and the sulfated polysaccharide ulvan, which exhibits antioxidant, antimicrobial, anticoagulant, immunomodulatory, and wound-healing properties [54, 65]. In addition to its use as human food and livestock feed, *U. lactuca* has been explored as a feedstock for bioethanol, biogas, biodegradable bioplastics, and biofertilizers, reflecting its importance in sustainable bioresource utilization [53, 96].

Similarly, *Ulva intestinalis*, *U. fasciata*, *U. compressa*, and *U. reticulata* have demonstrated broad applications in food, aquaculture, agriculture, and environmental management. Their extracts possess strong antioxidant and antimicrobial activities, while their high nutrient content supports their utilization as functional foods, feed additives, and organic fertilizers [50, 61]. Furthermore, the remarkable biosorption capacity of *Ulva* species for nitrogen, phosphorus, and heavy metals has promoted their application in integrated wastewater treatment systems and coastal bioremediation programs [64]. Recent advances have also highlighted the potential of ulvan-derived biomaterials for tissue engineering, controlled drug delivery, wound dressings, and biodegradable packaging, further expanding the industrial value of green macroalgae [65].

3. Future Prospects and Recommendations

The sustainable expansion of Bangladesh's macroalgae sector requires coordinated efforts in species diversification, technological innovation, value addition, policy support, and investment. Diversifying cultivation beyond the currently dominant red seaweeds to include resilient and high-value green and brown macroalgae will improve production stability, climate resilience, and biomass availability while reducing dependence on seasonal harvesting. Simultaneously, transitioning from the export of low-value dried biomass to the production of refined hydrocolloids, bioactive compounds, functional foods, pharmaceuticals, cosmetics, biostimulants, biodegradable materials, and bioenergy through integrated biorefinery approaches can substantially increase economic returns and resource-use efficiency within a circular blue bioeconomy. Furthermore, modernization of post-harvest processing, implementation of quality assurance and certification systems, adoption of environmentally sustainable farming practices, and establishment of marine spatial planning are essential to ensure product quality, environmental sustainability, and international market competitiveness. Long-term sectoral growth will also depend on strengthened public-private partnerships, targeted blue financing mechanisms, international research collaborations, technology transfer, and the development of modern processing infrastructure and value chains. Collectively, these strategic interventions can transform Bangladesh's underutilized macroalgal resources into a competitive, export-oriented marine bioresource industry that supports sustainable economic growth, coastal livelihoods, environmental conservation, and the national blue economy.

Conclusion

Seaweeds in Bangladesh have strong commercial potential, but the sector is still constrained by small-scale production, weak processing capacity, limited market integration, and inadequate policy support. With improved cultivation systems, value addition, certification, and export-oriented value-chain development, seaweeds could become a meaningful contributor to coastal livelihoods, sustainable industry, and blue economy growth.

References

1. Zaman M, Rahman MW, Wahab MA, Hossain MN. A review on diversified usage of seaweeds and its potential for production and utilization in Bangladesh. Mar Rep. 2026:97-124. doi:10.5281/zenodo.19458022.
2. Guiry MD, Guiry GM. AlgaeBase. World-wide electronic publication, National University of Ireland, Galway; 2025. Available from: https://www.algaebase.org.
3. Krause-Jensen D, Duarte CM. Substantial role of macroalgae in marine carbon sequestration. Nat Geosci. 2016;9(10):737-742. doi:10.1038/ngeo2790.
4. Duarte CM, Bruhn A, Krause-Jensen D. A seaweed aquaculture imperative to meet global sustainability

targets. Nat Sustain. 2022;5:185-193. doi:10.1038/s41893-021-00773-9.
5. Holdt SL, Kraan S. Bioactive compounds in seaweed: functional food applications and health benefits. J Appl Phycol. 2011;23(3):543-597. doi:10.1007/s10811-010-9632-5.
6. Food and Agriculture Organization of the United Nations. The state of world fisheries and aquaculture 2024: blue transformation in action. Rome: FAO; 2024.
7. Chowdhury MSN, Hossain MS, AftabUddin S, *et al*. Seaweed aquaculture in Bangladesh: present status, challenges and future prospects. Ocean Coast Manag. 2022;228:106309. doi:10.1016/j.ocecoaman.2022.106309.
8. Islam AKM. Contribution to the study of the marine algae of Bangladesh. Dhaka: University of Dhaka; 1976.
9. Sarkar MSI, Kamal M, Hasan MM, Hossain MI. Present status of naturally occurring seaweed flora and their utilization in Bangladesh. Res Agric Livest Fish. 2016;3(1):203-216. doi:10.3329/ralf.v3i1.27834.
10. Zafar M. Seaweed culture in Bangladesh holds promise. Infofish Int. 2005:8-10.
11. Islam MS, Hassan ML, Ali M, Islam MM, Sobuj MKA. Growth and succession of different cultivable seaweed species in Cox's Bazar coast, Bangladesh. Chittagong Univ J Mar Sci Fish. 2020;1(1):113-131.
12. Islam MS, Sobuj MKA, Islam HR, Hosain ME, Rashid MH. Present status of seaweed resources in Bangladesh: a review on the diversity, culture methods and utilization. Bangladesh J Zool. 2022;50(3):283-307. doi:10.3329/bjz.v50i3.65537.
13. Sobuj MKA, Shemul MS, Islam MS, Islam MA, Mely SS, Ayon MH, *et al*. Qualitative and quantitative phytochemical analysis of brown seaweed *Sargassum polycystum* collected from Bangladesh with its antioxidant activity determination. Food Chem Adv. 2024;4:100565. doi:10.1016/j.focha.2023.100565.
14. Lomartire S, Marques JC, Gonçalves AMM. An overview of the alternative use of seaweeds to produce safe and sustainable bio-packaging. Appl Sci. 2022;12(6):3123. doi:10.3390/app12063123.
15. Sobuj MKA, Islam MA, Islam MS, *et al*. Effect of solvents on bioactive compounds and antioxidant activity of *Padina tetrastromatica* and *Gracilaria tenuistipitata* seaweeds collected from Bangladesh. Sci Rep. 2021;11:98461. doi:10.1038/s41598-021-98461-3.
16. Vivek S, Kumar YAS, Palanisamy M. Phytochemical analysis and anticancer activity of *Gracilaria tenuistipitata* CF Chang & B-M Xia against breast cancer MCF-7 cells. Nelumbo. 2022;64(1):363-371.
17. Dayuti S. Antibacterial activity of red algae (*Gracilaria verrucosa*) extract against *Escherichia coli* and *Salmonella typhimurium*. IOP Conf Ser Earth Environ Sci. 2018;137:012074. doi:10.1088/1755-1315/137/1/012074.
18. Supriyantini E, Soenardjo N, Santosa GW, *et al*. Effectiveness and efficiency of the red seaweed *Gracilaria verrucosa* as biofilter in Pb absorption in seawater. AACL Bioflux. 2018;11(3):877-883.
19. Souza RB, Frota AF, Silva J, *et al*. *In vitro* activities of kappa-carrageenan isolated from red marine alga *Hypnea musciformis*: antimicrobial, anticancer and neuroprotective potential. Int J Biol Macromol. 2018;112:1248-1256. doi:10.1016/j.ijbiomac.2018.02.029.
20. Viswanathan S, Palaniyandi T, Shanmugam R, *et al*. Biomedical potential of silver nanoparticles capped with active ingredients of *Hypnea valentiae*, red algae species. Particul Sci Technol. 2022;40(6):686-696. doi:10.1080/02726351.2021.1992059.
21. Shah MT, Zodape ST, Chaudhary DR, Eswaran K, Chikara J. Seaweed sap as an alternative liquid fertilizer for yield and quality improvement of wheat. J Plant Nutr. 2013;36(2):192-200. doi:10.1080/01904167.2012.737886.
22. Bhuyar P, Sundararaju S, Rahim MHA, Unpaprom Y, Maniam GP, Govindan N. Antioxidative study of polysaccharides extracted from red (*Kappaphycus alvarezii*), green (*Kappaphycus striatus*) and brown (*Padina gymnospora*) marine macroalgae/seaweed. SN Appl Sci. 2021;3:402. doi:10.1007/s42452-021-04338-5.
23. Murugan A, Iyer VV. Antioxidant and antiproliferative activities of extracts of selected red and brown seaweeds from the Mandapam Coast of Tamil Nadu. J Food Biochem. 2014;38(1):92-101.
24. Babu B, Palanisamy S, Vinosha M, Anjali R, Kumar P, Pandi B, *et al*. Bioengineered gold nanoparticles from marine seaweed *Acanthophora spicifera* for pharmaceutical uses: antioxidant, antibacterial, and anticancer activities. Bioprocess Biosyst Eng. 2020;43(12):2231-2242. doi:10.1007/s00449-020-02408-3.
25. Ali O, Ramsubhag A, Jayaraman J. Phytoelicitor activity of *Sargassum* vulgare and *Acanthophora spicifera* extracts and their prospects for use in vegetable crops for sustainable crop production. J Appl Phycol. 2021;33(1):639-651. doi:10.1007/s10811-020-02309-8.
26. Thépot V, Campbell AH, Rimmer MA, Jelocnik M, Johnston C, Evans B, *et al*. Dietary inclusion of the red seaweed *Asparagopsis taxiformis* boosts production, stimulates immune response and modulates gut microbiota in Atlantic salmon, Salmo salar. Aquaculture. 2022;546:737286. doi:10.1016/j.aquaculture.2021.737286.
27. Ridoutt B, Lehnert SA, Denman S, Charmley E, Kinley R, Dominik S. Potential GHG emission benefits of *Asparagopsis taxiformis* feed supplement in Australian beef cattle feedlots. J Clean Prod. 2022;337:130499. doi:10.1016/j.jclepro.2022.130499.
28. Nurjanah, Nurilmala M, Anwar E, Luthfiyana N, Hidayat T. Identification of bioactive compounds of seaweed *Sargassum* sp. and *Eucheuma cottonii* Doty as a raw sunscreen cream. Proc Pak Acad Sci B Life Environ Sci. 2017;54(4):311-318.
29. Wadi A, Ahmad A, Tompo M, Hasyim H, Tuwo A, Nakajima M, *et al*. Production of bioethanol from seaweed, *Gracilaria verrucosa* and *Eucheuma cottonii*, by simultaneous saccharification and fermentation methods. J Phys Conf Ser. 2019;1341(3):032031. doi:10.1088/1742-6596/1341/3/032031.
30. Purbosari N, Warsiki E, Syamsu K, Santoso J, Effendi I. Evaluation of the application of seaweed (*Eucheuma cottonii*) extract as fish anesthetic agent. Aquac Int. 2021;29(4):1545-1560.
31. Teo BSX, Gan RY, Abdul Aziz S, Sirirak T, Mohd Asmani MF, Yusuf E. *In vitro* evaluation of antioxidant

and antibacterial activities of *Eucheuma cottonii* extract and its *in vivo* evaluation of the wound-healing activity in mice. J Cosmet Dermatol. 2021;20(3):993-1001. doi:10.1111/jocd.13624.
32. Pati MP, Sharma SD, Nayak L, Panda CR. Uses of seaweed and its application to human welfare: a review. Int J Pharm Pharm Sci. 2016;8(10):12-20. doi:10.22159/ijpps.2016v8i10.12740.
33. Rafiquzzaman SM, Ahmad MU, Lee JM, *et al*. Phytochemical composition and antioxidant activity of edible red alga *Hypnea musciformis* from Bangladesh. J Food Process Preserv. 2016;40(5):1074-1083.
34. Hong DD, Hien HM, Son PN. Seaweeds from Vietnam used for functional food, medicine and biofertilizer. J Appl Phycol. 2007;19(6):817-826. doi:10.1007/s10811-007-9228-x.
35. Vafajoo L, Cheraghi R, Dabbagh R, McKay G. Removal of cobalt(II) ions from aqueous solutions utilizing the pre-treated *Hypnea valentiae* algae: equilibrium, thermodynamic, and dynamic studies. Chem Eng J. 2018;331:39-47.
36. Dhanalakshmi S, Jayakumari S. Preliminary phytochemical investigation of *Hypnea valentiae* with antigluconeogenesis activity in goat eye. Pharmacogn J. 2019;11(6):1406-1408.
37. Tanna B, Brahmbhatt HR, Mishra A. Phenolic, flavonoid, and amino acid compositions reveal that selected tropical seaweeds have the potential to be functional food ingredients. J Food Process Preserv. 2019;43(12):e14266. doi:10.1111/jfpp.14266.
38. Mantada PK, Parimi R. GC-MS characterization, isolation and antimicrobial activities of isolated compounds from actinomycetes isolates from *Porphyra indica* seaweed. J Pharm Sci. 2021;13(12):673-676.
39. Baghel RS, Trivedi N, Gupta V, Neori A, Reddy CRK, Lali A, *et al*. Biorefining of marine macroalgal biomass for production of biofuel and commodity chemicals. Green Chem. 2015;17(4):2436-2443. doi:10.1039/C4GC02532F.
40. Agarwal P, Kayala P, Chandrasekaran N, Mukherjee A, Shah S, Thomas J. Antioxidant and antibacterial activity of *Gelidium pusillum* (Stackhouse) against *Aeromonas caviae* and its applications in aquaculture. Aquac Int. 2021;29(2):845-858. doi:10.1007/s10499-021-00661-1.
41. Tanna B, Choudhary B, Mishra A. Metabolite profiling, antioxidant, scavenging and anti-proliferative activities of selected tropical green seaweeds reveal the nutraceutical potential of *Caulerpa* spp. Algal Res. 2018;36:96-105. doi:10.1016/j.algal.2018.10.019.
42. Ersalina EB, Abdillah AA, Sulmartiwi L. Potential of *Caulerpa racemosa* extracts as sunscreen creams. IOP Conf Ser Earth Environ Sci. 2020;441:012007. doi:10.1088/1755-1315/441/1/012007.
43. Sruthikeerthia K, Rangaiaha G, Lakshmi P. Antimicrobial activity of crude extracts of chlorophycean seaweeds *Ulva*, *Caulerpa* and *Spongomorpha* spp. against clinical and phytopathogens. Drug Invent Today. 2010;2(6):311-314.
44. Mehra R, Bhushan S, Yadav UP, Bast F, Singh S. *Caulerpa taxifolia* inhibits cell proliferation and induces oxidative stress in breast cancer cells. Biologia. 2019;74(2):187-193. doi:10.2478/s11756-018-0163-x.
45. Nagaraj SR, Osborne JW. Bioactive compounds from *Caulerpa racemosa* as a potent larvicidal and antibacterial agent. Front Biol. 2014;9(4):300-305. doi:10.1007/s11515-014-1312-4.
46. Khan MSK, Hoq ME, Haque MA, Islam MM, Hoque MM. Nutritional evaluation of some seaweeds from the Bay of Bengal in contrast to inland fishes of Bangladesh. IOSR J Environ Sci. 2016;10(11):59-65.
47. Lee C, Park GH, Ahn EM, Kim BA, Park CI, Jang JH. Protective effect of *Codium fragile* against UVB-induced pro-inflammatory and oxidative damages in HaCaT cells and BALB/c mice. Fitoterapia. 2013;86:54-63. doi:10.1016/j.fitote.2013.01.020.
48. Srikong W, Bovornreungroj N, Mittraparparthorn P, Bovornreungroj P. Antibacterial and antioxidant activities of differential solvent extractions from the green seaweed *Ulva intestinalis*. ScienceAsia. 2017;43(2):88-95. doi:10.2306/scienceasia1513-1874.2017.43.088.
49. Jannat-Alipour H, Rezaei M, Shabanpour B, Tabarsa M. Edible green seaweed, *Ulva intestinalis*, as an ingredient in surimi-based product: chemical composition and physicochemical properties. J Appl Phycol. 2019;31(4):2529-2539. doi:10.1007/s10811-019-1744-y.
50. Davoodi MN, Milani JM, Farahmandfar R. Preparation and characterization of a novel biodegradable film based on sulfated polysaccharide extracted from seaweed *Ulva intestinalis*. Food Sci Nutr. 2021;9(8):4108-4116. doi:10.1002/fsn3.2370.
51. Sekhouna D, Kies F, Elegbede I, Matemilola S, Zorriehzahra J, Hussein EK. Use of two green algae *Ulva lactuca* and *Ulva intestinalis* as bio-fertilizers. Sustain Agric Food Environ Res. 2021;9(4). doi:10.7770/safer-v0n0-art2259.
52. Abd El-Baky HH, El Baz FK, El-Baroty GS. Evaluation of marine alga *Ulva lactuca* L. as a source of natural preservative ingredient. Electron J Environ Agric Food Chem. 2008;3(3):434-444.
53. Bikker P, van Krimpen MM, van Wikselaar P, Houweling-Tan B, Scaccia N, van Hal JW, *et al*. Biorefinery of the green seaweed *Ulva lactuca* to produce animal feed, chemicals and biofuels. J Appl Phycol. 2016;28(6):3511-3525. doi:10.1007/s10811-016-0842-3.
54. Yu-Qing T, Mahmood K, Shehzadi R, Ashraf MF. *Ulva lactuca* and its polysaccharides: food and biomedical aspects. J Biol. 2016;6(1):140-151.
55. Paulert RJ, Smania Stadnik MJ, Pizzolatti MG. Antimicrobial properties of extracts from the green seaweed *Ulva fasciata* Delile against pathogenic bacteria and fungi. Algol Stud. 2007;123:123-130. doi:10.1127/1864-1318/2007/0123-0123.
56. Trivedi N, Gupta V, Reddy CRK, Jha B. Enzymatic hydrolysis and production of bioethanol from common macrophytic green alga *Ulva fasciata* Delile. Bioresour Technol. 2013;150:106-112. doi:10.1016/j.biortech.2013.09.103.
57. Shao P, Chen M, Pei Y, Sun P. *In vitro* antioxidant activities of different sulfated polysaccharides from chlorophytan seaweeds *Ulva fasciata*. Int J Biol Macromol. 2013;59:295-300. doi:10.1016/j.ijbiomac.2013.04.048.
58. Shalaby EA, Shanab SMM, El-Fayoumy EA. *Enteromorpha compressa* exhibits potent antioxidant

activity. J Biomed Biotechnol. 2011;2011:726405. doi:10.1155/2011/726405.
59. Paiva L, Lima E, Neto AI, Marcone M, Baptista J. Nutritional and functional bioactivity value of selected Azorean macroalgae: *Ulva compressa*, *Ulva rigida*, *Gelidium microdon*, and *Pterocladiella capillacea*. J Food Sci. 2017;82(7):1757-1764. doi:10.1111/1750-3841.13778.
60. Tran TTV, Truong HB, Tran NHV, *et al*. Structure, conformation in aqueous solution and antimicrobial activity of ulvan extracted from green seaweed *Ulva reticulata*. Nat Prod Res. 2018;32(19):2291-2296. doi:10.1080/14786419.2017.1408098.
61. Nainu F, Asri RM, Arsyad A, Manggau MA, Amir MN. *In vivo* antibacterial activity of green algae *Ulva reticulata* against *Staphylococcus aureus* in *Drosophila* model of infection. Pharmacogn J. 2018;10(5):993-997. doi:10.5530/pj.2018.5.169.
62. Circuncisão AR, Catarino MD, Silva AMS, Cardoso SM. Minerals from seaweeds: health benefits and risks. Mar Drugs. 2023;21(2):82. doi:10.3390/md21020082.
63. Kidgell JT, Magnusson M, de Nys R, Glasson CRK. Seaweed bioactives potential as nutraceuticals and functional ingredients: a review. J Food Compos Anal. 2024;133:106453. doi:10.1016/j.jfca.2024.106453.
64. Arias A, Feijoo G, Moreira MT. Macroalgae biorefineries as a sustainable resource in the extraction of value-added compounds. Algal Res. 2023;69:102954. doi:10.1016/j.algal.2022.102954.
65. Cherry P, O'Hara C, Magee PJ, McSorley EM, Allsopp PJ. Risks and benefits of consuming edible seaweeds. Nutr Rev. 2019;77(5):307-329. doi:10.1093/nutrit/nuy066.
66. Lomartire S, Marques JC, Gonçalves AMM. An overview to the health benefits of seaweeds consumption. Mar Drugs. 2021;19(6):341. doi:10.3390/md19060341.
67. Shannon E, Abu-Ghannam N. Seaweeds as nutraceuticals for health and nutrition. Phycologia. 2019;58(5):563-577. doi:10.1080/00318884.2019.1640533.
68. Ashokkumar V, Salim MR, Salam Z, Sivakumar P, Chong CT, Elumalai S, Suresh V, Ani FN. Production of liquid biofuels (biodiesel and bioethanol) from brown marine macroalgae *Padina tetrastromatica*. Energy Convers Manag. 2017;135:351-361. doi:10.1016/j.enconman.2016.12.054.
69. Sobuj MKA, Islam MA, Haque MA, *et al*. Evaluation of bioactive chemical composition, phenolic, and antioxidant profiling of different crude extracts of *Sargassum coriifolium* and *Hypnea pannosa* seaweeds. J Food Meas Charact. 2021;15:1653-1665. doi:10.1007/s11694-020-00758-w.
70. Silva TMA, Alves LG, de Queiroz KCS, *et al*. Partial characterization and anticoagulant activity of a heterofucan from the brown seaweed *Padina gymnospora*. Braz J Med Biol Res. 2005;38(4):523-533. doi:10.1590/S0100-879X2005000400005.
71. Mohamed HS, Soliman NK, Abdelrheem DA, Ramadan AA, Elghandour AH, Ahmed SA. Adsorption of Cd^{2+} and Cr^{3+} ions from aqueous solutions by using residue of *Padina gymnospora* waste as promising low-cost adsorbent. Heliyon. 2019;5(3):e01287. doi:10.1016/j.heliyon.2019.e01287.
72. Ali MSY, Anuradha V, Abishek R, Yogananth N, Sheeba H. *In vitro* anticancer activity of green synthesis ruthenium nanoparticle from *Dictyota dichotoma* marine algae. NanoWorld J. 2017;3(4). doi:10.17756/nwj.2017-049.
73. Bharathi DS, Boopathyraja A, Nachimuthu S, Kannan K. Green synthesis, characterization and antibacterial activity of SiO_2–ZnO nanocomposite by *Dictyota bartayresiana* extract and its cytotoxic effect on HT29 cell line. J Cluster Sci. 2022;33(6):2499-2515. doi:10.1007/s10876-021-02170-w.
74. Lekameera R, Vijayabaskar P, Somasundaram ST. Evaluating antioxidant property of brown alga *Colpo*Monla*menia sinuosa* (Derb. et Sol.). Afr J Food Sci. 2008;2(11):126-130.
75. Manam DVK, Murugesan S. Biological synthesis of silver nanoparticles from marine alga *Colpomenia sinuosa* and its *in vitro* anti-diabetic activity. Am J Bio-Pharm Biochem Life Sci. 2014;3(1):1-7.
76. Monla R Al, Dassouki Z, Sari-Chmayssem N, Mawlawi H, Gali-Muhtasib H. Fucoidan and alginate from the brown algae *Colpomenia sinuosa* and their combination with vitamin C trigger apoptosis in colon cancer. Molecules. 2022;27(2):358. doi:10.3390/molecules27020358.
77. Murugan A, Begum MS, Ramasamy MS, Raja P. Antifouling and antipredatory activity of natural products of the seaweeds *Dictyota dichotoma* and *Chaetomorpha linoides*. Nat Prod Res. 2012;26(10):975-978. doi:10.1080/14786419.2010.545355.
78. Varun S, Kumar SSPS. Biosynthesis of gold nanoparticles from aqueous extract of *Dictyota bartayresiana* and their antifungal activity. Indian J Adv Chem Sci. 2014;2(3):190-193.
79. Wang H, Ooi EVC, Ang PO. Antiviral polysaccharides isolated from Hong Kong brown seaweed *Hydroclathrus clathratus*. Sci China Life Sci. 2007;50(5):611-618. doi:10.1007/s11427-007-0086-1.
80. Wang H, Chiu LCM, Ooi VEC, Ang PO. A potent antitumor polysaccharide from the edible brown seaweed *Hydroclathrus clathratus*. Bot Mar. 2010;53(3):265-274. doi:10.1515/BOT.2010.029.
81. Wang H, Ooi VEC, Ang PO. Anti-herpesviral property and mode of action of a polysaccharide from brown seaweed (*Hydroclathrus clathratus*). World J Microbiol Biotechnol. 2010;26(9):1703-1713. doi:10.1007/s11274-010-0348-0.
82. Ahilya W, Anjali S. Application of *Padina tetrastromatica* for removal of heavy metal ions from wastewater. J Environ Res Dev. 2012;7(2):958-963.
83. Ali MS, Swaminathan R, Anuradha V, *et al*. Antiviral effects of L-fucose from *Padina gymnospora* against various strains of dengue virus. J Adv Sci Res. 2022;13(4):111-117. doi:10.55218/jasr.202213419.
84. Zandi K, Ahmadzadeh S, Tajbakhsh S, *et al*. Anticancer activity of *Sargassum oligocystum* water extract against human cancer cell lines. Eur Rev Med Pharmacol Sci. 2010;14(8):669-673.
85. Akbarzadeh S, Gholampour H, Farzadinia P, Daneshi A, Ramavandi B, Moazzeni A, *et al*. Anti-diabetic effects of *Sargassum oligocystum* on streptozotocin-induced diabetic rat. Iran J Basic Med Sci. 2018;21(3):342-346. doi:10.22038/ijbms.2018.25654.6329.

86. Bayuran R. Antioxidant and antistaphylococcal activity of topical fucoidan gel from *Sargassum oligocystum* Montagne. JPAIR Multidiscip Res. 2019;38(1):177-195. doi:10.7719/jpair.v38i1.731.
87. Saraswati, Giriwono PE, Iskandriati D, Andarwulan N. Screening of in-vitro anti-inflammatory and antioxidant activity of *Sargassum ilicifolium* crude lipid extracts from different coastal areas in Indonesia. Mar Drugs. 2021;19(5):252. doi:10.3390/md19050252.
88. Kidgell JT, Magnusson M, de Nys R, Glasson CRK. Seaweed bioactives potential as nutraceuticals and functional ingredients: a review. J Food Compos Anal. 2024;133:106453. doi:10.1016/j.jfca.2024.106453.
89. Lomartire S, Gonçalves AMM, Marques JC. Seaweed bioactive compounds: applications in food, pharmaceutical, and nutraceutical industries. Mar Drugs. 2023;21(1).
90. Kidgell JT, Magnusson M, de Nys R, Glasson CRK. Seaweed cultivation and processing for sustainable food, feed and bio-based products. J Food Compos Anal. 2024;133:106453. doi:10.1016/j.jfca.2024.106453.
91. Tanna B, Choudhary B, Mishra A. Metabolite profiling, antioxidant, scavenging and anti-proliferative activities of selected tropical green seaweeds reveal the nutraceutical potential of *Caulerpa* spp. Algal Res. 2018;36:96-105. doi:10.1016/j.algal.2018.10.019.
92. Ersalina EB, Abdillah AA, Sulmartiwi L. Potential of *Caulerpa racemosa* extracts as sunscreen creams. IOP Conf Ser Earth Environ Sci. 2020;441:012007. doi:10.1088/1755-1315/441/1/012007.
93. Trivedi N, Gupta V, Reddy CRK, Jha B. Enzymatic hydrolysis and production of bioethanol from common macrophytic green alga *Ulva fasciata* Delile. Bioresour Technol. 2013;150:106-112. doi:10.1016/j.biortech.2013.09.103.
94. Bikker P, van Krimpen MM, van Wikselaar P, Houweling-Tan B, Scaccia N, van Hal JW, *et al*. Biorefinery of the green seaweed *Ulva lactuca* to produce animal feed, chemicals and biofuels. J Appl Phycol. 2016;28(6):3511-3525. doi:10.1007/s10811-016-0842-3.
95. Holdt SL, Kraan S. Bioactive compounds in seaweed: functional food applications and legislation. J Appl Phycol. 2011;23:543-597. doi:10.1007/s10811-010-9632-5.
96. Cherry P, O'Hara C, Magee PJ, McSorley EM, Allsopp PJ. Risks and benefits of consuming edible seaweeds. Nutr Rev. 2019;77(5):307-329. doi:10.1093/nutrit/nuy066.
97. Shannon E, Abu-Ghannam N. Seaweeds as nutraceuticals for health and nutrition. Phycologia. 2019;58(5):563-577. doi:10.1080/00318884.2019.1640533.
98. Circuncisão AR, Catarino MD, Silva AMS, Cardoso SM. Minerals from seaweeds: health benefits and risks. Mar Drugs. 2023;21(2):82. doi:10.3390/md21020082.
99. Arias A, Feijoo G, Moreira MT. Macroalgae biorefineries as a sustainable resource in the extraction of value-added compounds. Algal Res. 2023;69:102954. doi:10.1016/j.algal.2022.102954.
100. Baghel RS, Trivedi N, Gupta V, Neori A, Reddy CRK, Lali A, Jha B. Biorefining of marine macroalgal biomass for production of biofuel and commodity chemicals. Green Chem. 2015;17(4):2436-2443. doi:10.1039/C4GC02532F.
101. Sobuj MKA, Shemul MS, Islam MS, Islam MA, Mely SS, Ayon MH, *et al*. Qualitative and quantitative phytochemical analysis of brown seaweed *Sargassum polycystum* collected from Bangladesh with its antioxidant activity determination. Food Chem Adv. 2024;4:100565. doi:10.1016/j.focha.2023.100565.

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