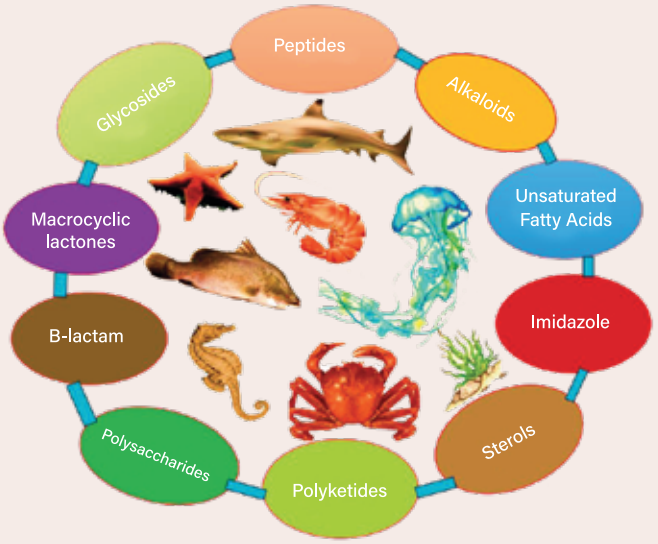
Article

Bioactive Natural Products Would be the Emerging Field of Blue Economy: A New Vision and Strategy for Sustainable Blue Growth

Assistant Professor Md. Masud Rana

The world's oceans hold a vast untapped resources, harboring countless species and ecosystems that have remained largely unexplored. Riding the wave of sustainability, the "blue economy" promises prosperity from our oceans while keeping them healthy and vibrant. Within this emerging field, bioactive natural products derived from marine organisms are emerging as a promising avenue for driving sustainable blue growth. Bioactive natural products are chemical compounds produced by living organisms that possess therapeutic properties or exhibit biological activity. Marine organisms, including microorganisms, algae, invertebrates, and fish, have evolved unique biochemical pathways and defense mechanisms to adapt and survive in the challenging marine environment. These adaptations have resulted in the production of a rich diversity of bioactive compounds with tremendous potential for various applications in sectors such as pharmaceuticals, nutraceuticals, cosmeceuticals, and agrochemicals. Harnessing of bioactive natural products from marine sources represent a paradigm shift in the utilization of marine resources. Unlike the traditional extraction of marine resources for food or energy, the focus has shifted towards discovering and developing novel bioactive compounds that address pressing societal challenges such as human health, food security, and environmental sustainability. This shift in perspective has led to the realization that the sustainable use of marine resources can support economic growth and contribute to conserving and preserving marine ecosystems. The potential of bioactive natural products from marine sources is vast. These compounds have exhibited diverse biological activities, including antimicrobial, antiviral, anticancer, anti-inflammatory, and antioxidant properties. Such properties have attracted attention from the pharmaceutical industry, where the need for novel drug candidates to combat drug-resistant infections and diseases remains high. Furthermore, the demand for natural and sustainable alternatives in the cosmetic and personal care industry has opened doors using marine bioactive in developing innovative and eco-friendly products.

Bangladesh exercises exclusive control over resources like oil and gas within its designated maritime zone. This commitment to ocean governance stems from 1974, when Bangabandhu Sheikh Mujibur Rahman initiated efforts to resolve maritime disputes with India and Myanmar. The current maritime boundaries with freshly occupied sea territory in the Bay of Bengal have created ample chance to expand Bangladesh's contribution to the GDP through the blue economy. Biotechnology technologies on marine resources are called marine (or blue) biotechnology. All endeavors that use marine resources as a source or a target for biotechnology applications fall under the umbrella of marine biotechnology. Biotechnology involves applying science and technology to living creatures and their components, products, and models to change living or non-living materials for the development of knowledge, goods, and services. The living organisms used in marine biotechnology come from aquatic sources. Marine biotechnology is a developing field centered on utilizing marine natural resources.



Marine biotechnology is a developing field centered on utilizing marine natural resources. Applications for marine biotechnology may include health, food, cosmetics, aquaculture & agriculture, fisheries, manufacturing, environmental remediation, biofilms and corrosion, biomaterials, research tools, etc. Marine biotechnology generally involves bioprocessing, bio harvesting, bioprospecting, bioremediation, bioreactors, etc. One of the most exciting and well-known results of marine biotechnology research is drug development. Because they differ significantly from those produced by closely similar terrestrial animals, the biochemicals produced by marine invertebrates, algae, and bacteria have enormous potential as new classes of drugs. A neurotoxin from a snail that possesses painkilling characteristics and is 10,000 times more potent than morphine without adverse effects is an example of a marine-derived medication. Other examples include an antibiotic from a fungus, two chemically similar substances from a sponge cure cancer and the herpes virus.

As more researchers turn to the sea for these biotechnological uses, there are now several marine-derived substances in clinical trials, and it is anticipated that many more will move to the clinic. Algae, crustaceans, and sea fan compounds are used in cosmetics, nutritional supplements, artificial bone (corals), and industrial applications. Marine-derived compounds are also used in fluorescent compounds from jellyfish, novel glues from mussels, and heat-resistant enzymes from deep-sea bacteria.

As a result, the horizontal breadth of marine biotechnology encompasses a wide range of uses, many of which rely on the marine environment for their raw materials. This includes creating a cutting-edge buoy system for monitoring ocean pollution to generate a novel cancer treatment from a deep-sea sponge. Bio-prospecting, enhancing the productivity of marine organisms, creating novel products, particularly food and feed items, and developing diagnostics and biosensors are a few examples of marine biotechnology's commercial applications. The entire drug/molecule development process, including screening, identification, efficacy testing, safety testing, and large-scale commercial production, is included in bioprospecting. Secondary metabolites produced by marine creatures are known as bioactive natural products. Over the past two decades, these products have drawn more chemists' and pharmacologists' attention. These products have been used for various things, such as food, pharmaceuticals, scents, pigments, and pesticides. Integrating bioactive natural products into the blue economy framework presents a new vision and strategy for sustainable blue growth.

Marine biotechnology can fuel economic growth by responsibly tapping ocean resources while preserving our precious underwater world. Moreover, the sustainable utilization of bioactive natural products can foster the establishment of blue biorefineries and create new opportunities for job creation, entrepreneurship, and technological advancements.

In conclusion, bioactive natural products derived from marine organisms can be the emerging field of the blue economy. With

unique chemical diversity and vast therapeutic potential, marine organisms offer exciting prospects for sustainable blue growth. By embracing this new vision and strategy, we can harness the power of the ocean's bioactive treasures while ensuring marine ecosystems' long-term health and resilience.

Unlocking the ocean's treasure chest of untapped potential: Interdisciplinary minds, bold innovation, and responsible stewardship can forge a future where prosperity and sustainability swim hand-in-hand.

Writer: Md. Masud Rana is the Chairman & Assistant Professor at the Department of Fishing and Post Harvest Technology, Sher-e-Bangla Agricultural University. Email: ranadof.bd@gmail.com