

**Potential Cosmeceuticals from Marine Constituents****Vigneshwaran L.V**

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**Abstract:** Cosmetic pharmaceuticals, or cosmetic goods with drug-like qualities, are the most recent innovation in the pharmaceutical industry. Klingman coined the term "cosmeceuticals." There are many, and they are very different, marine resources. As a result, marine components have a variety of possible applications in the cosmetics industry, including as active ingredients, excipients, and additives. Some of the active marine sources used to create cosmeceuticals include sea weeds, marine fish, phytoplanktons, sponges, corals, sea mammals, fungi, bacteria, and mollusks. Cosmetics made from marine resources provide a variety of advantages, such as antioxidant activity, skin whitening, moisturising, de-pigmentation, and anti-aging. The market is flooded with cosmeceuticals that contain marine ingredients. This review focuses on the potential of marine components, a subject that has drawn academics' interest in recent years.

**Keywords:** Cosmeceuticals, marine, seaweeds, corals, phytoplankton

This is an open-access article under the [CC-BY 4.0](https://creativecommons.org/licenses/by/4.0/) license**Introduction**

Cosmetics are items used to clean and enhance the skin. About 4000 B.C., the Egyptians are credited with using this cosmetic for the first time. Pharmaceuticals, often known as drug products, are generally believed to include anything that modifies the structure or operation of the entire body in the course of preventing, reducing, treating, or curing disease. Cosmetics are products that use active ingredients and excipients that are ideal for different types of skin to improve the morphology, structure, and appearance of the skin (normal, oily, combination, sensitive, etc.). The word "cosmeceuticals," which combines these two terms on purpose, intends to give the cosmetic product drug-like effects. Given that his invention first appeared on the world market in 1996, Klingman is occasionally referred to as the "Father of Cosmetics."<sup>[1]</sup> Several scientists have been investigating the potential of marine natural chemicals over the past few years. The expanse of our seas and the almost astonishing amount of biodiversity in

the marine environment have encouraged researchers to delve into the therapeutic potential of secondary metabolites originating from marine organisms.<sup>[2]</sup> Marine sources contain a number of chemicals with anti-inflammatory, anti-allergic, anti-bacterial, anti-aging, and anti-wrinkle characteristics. The majority of cosmetics derived from marine sources include extracts or components from marine sponges, seaweed, fish, turtles, corals, phytoplankton, sea fennel, etc.<sup>[3]</sup>

**Active agents from the marine source used for the preparation of cosmeceuticals**

- ❖ Sea weed (EEB extract)
- ❖ Marine sponges
- ❖ Marine fishes (shark, jelly fish etc.)
- ❖ Corals
- ❖ Phytoplankton
- ❖ Crab
- ❖ Sea mammals
- ❖ Marine fungi and bacteria
- ❖ Molluscs (pearl oyster)

**Sea weed**

Invasive species working together will aid in the production of organic, environmentally safe cosmetic ingredients.

<sup>[4]</sup> There are three distinct types of seaweed or algae: red, green, and brown algae. The use of seaweed-derived ingredients in cosmeceuticals has dramatically increased in recent years as a result of the numerous scientific studies that have shown the potential skincare benefits of the bioactives from seaweeds. <sup>[5,6]</sup> Carotenoids, fatty acids, polysaccharides, phlorotannins, vitamins, sterols, tocopherol, phycobilins, and phycocyanins are some of the seaweeds that have drawn attention because of the variety of activities they can do. <sup>[4,6,7,8,9,10]</sup>

Here are a few instances:

➤ Agar, which is derived from the seaweed species *Pterocladia*, *Gelidium amansii*, *Gracilaria*, and *Pterocladia* and possesses thickening and antioxidant properties. <sup>[9]</sup>

➤ Alginate is a thickening and gelling agent made from brown seaweeds that is extremely stable. <sup>[11,12,13]</sup>

➤ Fucoidans with photoaging-inhibiting properties were found in *Ascophyllum nodosum*, *Chnoospora minimum*, *Ecklonia maxima*, *Hizikia fusiforme*, *Saccharina japonica*, *Sargassum hemiphyllum*, *Sargassum horneri*, *Sargassum polycystum*, and *Sargassum vachellianum*. Carrageenans, which have anti-inflammatory, anticancer, and anti-aging effects. <sup>[14]</sup>



**Fig. No. 1** Different types of seaweed/micro algae; A and D represents Red algae, B and E represents Green algae and C and F represents Brown algae.

#### Marine sponges

➤ Sponge bioactive metabolites are used to make a wide range of active ingredients for cosmeceutical products. The main four divisions of marine sponges are Calcarea (calcareous), Hexactinellida (horn sponges), Demospongiae (coralline), and Sclerospongiae (glass sponges).

➤ The list of marine active ingredients used is as follows: Wound healing uses collagen produced from *C. reniformis*. <sup>[15]</sup> ethyl acetate-based *R. globostellata* and *S. inconstans* extracts with antioxidant properties. <sup>[16]</sup>

➤ Geoditin A, which was generated from *G. japonica* and possessed skin-whitening characteristics, was discovered. Acne is treated using *A. cavernosa* extracts in methanol, ethanol, and hexane. <sup>[18]</sup> The osirisynes A, B, E, G, H, and I have anti-aging characteristics that come from *Haliclona* species. <sup>[19]</sup> The *Phorbasp* species-derived gaganin D exhibited the capacity to lighten skin. <sup>[20]</sup>

➤ Other marine sponges include *Callyspongia siphonella*, *Callyspongia* sp., *Fascaplysinopsis reticulata*, *Niphates furcata*, *Pseudosaberites clavatus*, and *Callyspongia clavata*. <sup>[31]</sup>



**Fig. No. 2** Different types of Sponges; A-Calcarea (calcareous), B-Hexactinellida (horn sponges), C-Demospongiae (coralline), and D-Sclerospongiae (glass sponges).

#### Marine fishes

In marine fish, there are lots of proteins and peptides, two physiologically active compounds. Collagen is the main

structural protein present in connective tissues and fish bones. Because it has the ability to scavenge free radicals, collagen derived from marine sources is appropriate for use in the formulation of skin care products. [21,22,23] The collagen obtained from marine fish is employed in cosmetic goods because of its better mechanical strength and reduced odour. [29] These compositions' effects on skin firming and hydration were also assessed. [30] The findings revealed that serum formulations had quicker and greater moisturising results. [29,30] Examples of marine fishes used for collagen extraction include *Paralichthys olivaceus*, *Sebastes schlegeli*, *Lateolabrax maculatus*, *Pagrus major*, jelly fish, *Mystus macropterus*, *Saurida* spp., *Trachurus japonicus*, *Mugil cephalis*, *Cypselurus melanurus*, *Dentex tumifron*, etc.

A component that is required for various cosmetic items can be found in jellyfish mucus. Since jellyfish possesses significant anti-aging effects, the cosmetics industry can intervene and help the fish population grow by including jellyfish in the development of anti-aging beauty goods. Scientists have replicated jellyfish cells in peptides and combined them with beauty treatments to cure and prevent DNA damage, encourage our skin cells to act young and regenerate, and promote DNA repair. [3]



**Fig. No. 3** Few Examples of Marine Fishes: A- *Paralichthys olivaceus*, B- *Lateolabrax maculatus*, C- Jelly fish and D- *Dentex tumifron*

#### Corals

Corals are marine invertebrates that are part of the Anthozoa class of the phylum Cnidaria. Typically, they form dense colonies that are made up of multiple, identical individual polyps. Corals are used in numerous skin care products, including

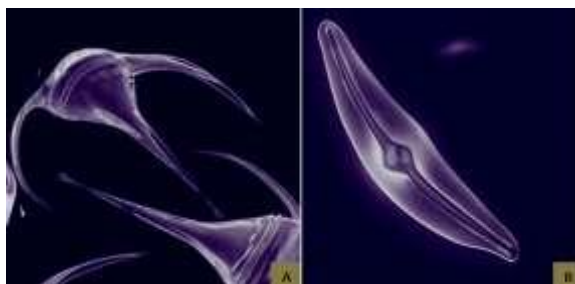
sunscreen, anti-aging products, acne treatments, cleaning agents that incorporate minerals to function as abrasives, powders, deodorants, and lipstick preparations. [3] Soft corals that are abundantly developing along the seafloor produce ethanolic extracts that can be utilised to reduce melanin formation safely. [27]



**Fig. No. 4** Few Examples of Corals: A- Brain coral, B- Mushroom coral, C- Star coral and D- Staghorn coral

#### Phytoplankton

Microalgae, also known as phytoplankton, have chlorophyll and require sunlight to exist and grow, making them similar to terrestrial plants. Diatoms, dinoflagellates, and cyanobacteria are a few of the important groups of this phytoplankton. microalgae extract with anti-aging and anti-microbial effects. This category will include functional antioxidants, polysaccharides, alginates, and carotenoids that support the health and appearance of the skin in cosmetics. [32] Such examples are plasmids, carotenoids, cyanobacteria, microalgae, polyunsaturated fatty acids, and tetrapyrrole. [28] *Laminaria ochroleuca*, *Chlorella vulgaris*, *Asparagopsis armata*, and *Ascophyllum nodosum* are a few of the marine species found in 27% of the cosmetics for sensitive skin (microalgae). [34]



**Fig. No. 5** Examples of Phytoplankton: A- Dianoflagellates and B- Diatoms

#### Sea mammals

Dolphins and other marine mammals commonly consume parabens, which are frequently used as preservatives in food, cosmetics, and pharmaceuticals. [36] Since turtle fat contains a lot of vitamin E, it is boiled to extract the oil, which is then used to produce cosmetics. In England, it's utilised in cosmetics like bath soaps, lotions, skin creams, and nail creams. [3]



**Fig. No. 6** Few examples of Sea Mammals: A- Sea lions, B- Dugongs and C- Whale

#### Marine fungi and bacteria

Due to their photoprotective, anti-aging, anti-microbial, anti-oxidant, and

moisturising properties, polyketides, alkaloids, peptides, proteins, lipids, mycosporines and mycosporine-like amino acids, glycosides, isoprenoids, and hybrids are a few marine bacteria and fungi-derived compounds that have great potential in cosmeceuticals and cosmetics. [33] The potential of marine microorganisms as a source of skin-whitening compounds has not yet been fully explored. It was shown that the tyrosinase inhibitor methylene chloride, which reduces melanocyte pigmentation, is produced by sea bacteria like *Pseudomonas*. [35] Most marine fungi, about one-third of them, are found in associations with algae. [38]

#### Molluscs

Treatments for a wide range of disorders use molluscs that have a multitude of secondary metabolites with different effects. They also showed anti-inflammatory, antiviral, and antioxidant effects and are used in the production of cosmetics. [37]



**Fig.No.7** Examples of Molluscs: A-Sea Butterflies, B-Slugs, and C-Snails

| SL. NO. | PRODUCT NAME             | BRAND NAME          | MARINE INGREDIENT USED                                 | PROPERTIES                                                                          |
|---------|--------------------------|---------------------|--------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1       | Eternal Cream            | SKEYNDOR            | Oil soluble marine fennel extract                      | Nourishes skin<br>Compensate the loss of skin volume<br>Fights early signs of aging |
| 2       | Collagen Nutrition Cream | IT'S SKIN           | Marine collagen from scales of fish living in deep sea | Firms skin<br>Reduces wrinkles<br>Balances oil and moisture                         |
| 3       | Skin Fuel Skin Elixir    | WELLBEING NUTRITION | Japanese marine collagen peptides                      | Fortifies hair and nails<br>Reduces signs of aging                                  |

|    |                                                              |              |                                             |                                                                                         |
|----|--------------------------------------------------------------|--------------|---------------------------------------------|-----------------------------------------------------------------------------------------|
| 4  | Algae Vitalizer<br>Ampoule Concentrate                       | BABOR        | Planton extract                             | Moisturizer                                                                             |
| 5  | Souttle Marine<br>Cleansing Foaming<br>Cream                 | PHYTOMER     | Algae extract                               | Brighten skin tone<br>Detoxifies skin<br>Protects skin from<br>contaminants             |
| 6  | Translucent Powder                                           | STAY QUICKRY | Pearl, Pearl<br>powder and Pearl<br>Protien | Easy application<br>Easy layering<br>Fadeproof<br>Hides imperfection                    |
| 7  | Pearl Whitening Face<br>Cream                                | JOVEES       | Pearl powder                                | Face whitening                                                                          |
| 8  | Biomarine Seaweed<br>Skin Correctening<br>Moisturizing Fluid | NUXE         | Seaweed Extract                             | Moisturizer                                                                             |
| 9  | Algo Mist Hydrating<br>Seaweed Facial Spray                  | RECEPECHAGE  | Laminaria<br>Digitata seaweed<br>extract    | Moisturizer<br>Cell renewal                                                             |
| 10 | Matte Liquid Lipstick                                        | BRENNTAG     | Jelly Fish Extract                          | Long lasting<br>Lubrication<br>Mattifying<br>Protects and<br>soothens lip<br>Waterproof |

**Table No. 1** Examples of some Marketed Cosmetics which contains Marine Ingredients

#### The benefits of marine cosmetics

Supply ingredients for skin care products that are both scientifically and environmentally sound.

Provides vitamins, minerals, and UV protection for the skin.

May be utilised in cosmetics as a cleansing, moisturising, and antioxidant ingredient.

Strong marine components help to hydrate, firm, slim down, add shine, and protect the skin.

Gelatin and collagen made from marine sources have superior health benefits and fewer adverse effects

Good source of secondary metabolites, used to treat and cure a variety of diseases. [3,10,37]

#### CONCLUSION

Sea life has the ability to produce unique compounds. Marine-derived cosmetics offer a range of health benefits.

Many of the elements derived from marine sources could be used in cosmetics. Currently, companies that produce cosmetics must use marine-based components. Marine diversity has drawn the attention of researchers and the beauty business recently because it is a field that is being researched.

#### REFERENCE

1. Oricha BS. Cosmeceuticals: A review. African Journal of Pharmacy and Pharmacology. 2010 Apr 30;4(4):127-9.
2. Alparslan L, ŞEKEROĞLU N, Kijjoa A. The potential of marine resources in cosmetics. Current Perspectives on Medicinal and Aromatic Plants (CUPMAP). 2018;1(2):53-66.
3. Uppala L. A Review on Active Ingredients from Marine Sources used in Cosmetics. SOJ Pharm Pharm Sci, 2 (3), 1-3. A Review on Active Ingredients from Marine Sources used in Cosmetics. 2015.
4. Querellou J, Børresen T, Boyen C, Dobson A, Höfle M, Ianora A, Jaspars

- M, Kijjoo A, Olafsen J, Rigos G. Marine biotechnology: realising the full potential of Europe. VLIZ Special Publication. 2010;47:21.
5. Jesumani V, Du H, Aslam M, Pei P, Huang N. Potential use of seaweed bioactive compounds in skincare—A review. *Marine drugs*. 2019 Dec;17(12):688.
  6. Jesumani V, Du H, Pei P, Zheng C, Cheong KL, Huang N. Unravelling property of polysaccharides from *Sargassum* sp. as an anti-wrinkle and skin whitening property. *International journal of biological macromolecules*. 2019 Nov 1;140:216-24.
  7. Gellenbeck KW. Utilization of algal materials for nutraceutical and cosmeceutical applications—what do manufacturers need to know?. *Journal of Applied Phycology*. 2012 Jun;24(3):309-13.
  8. Thomas NV, Kim SK. Beneficial effects of marine algal compounds in cosmeceuticals. *Marine drugs*. 2013 Jan;11(1):146-64.
  9. Wang HM, Chen CC, Huynh P, Chang JS. Exploring the potential of using algae in cosmetics. *Bioresource technology*. 2015 May 1;184:355-62.
  10. Couteau C, Coiffard L. Phycocosmetics and other marine cosmetics, specific cosmetics formulated using marine resources. *Marine drugs*. 2020 Jun;18(6):322.
  11. Morais T, Cotas J, Pacheco D, Pereira L. Seaweeds Compounds: An Ecosustainable Source of Cosmetic Ingredients?. *Cosmetics*. 2021 Mar;8(1):8.
  12. Sachan NK, Pushkar S, Jha A, Bhattacharya A. Sodium alginate: the wonder polymer for controlled drug delivery. *J Pharm Res*. 2009 Aug;2(8):1191-9.
  13. Priyadarshani I, Rath B. Commercial and industrial applications of micro algae—A review. *Journal of Algal Biomass Utilization*. 2012;3(4):89-100.
  14. López-Hortas L, Flórez-Fernández N, Torres MD, Ferreira-Anta T, Casas MP, Balboa EM, Falqué E, Domínguez H. Applying seaweed compounds in cosmetics, cosmeceuticals and nutricosmetics. *Marine Drugs*. 2021 Oct;19(10):552.
  15. Swatschek D, Schatton W, Kellermann J, Müller WE, Kreuter J. Marine sponge collagen: isolation, characterization and effects on the skin parameters surface-pH, moisture and sebum. *European Journal of Pharmaceutics and Biopharmaceutics*. 2002 Jan 1;53(1):107-13.
  16. Chairman K, Singh AR, Alagumuthu G. Cytotoxic and antioxidant activity of selected marine sponges. *Asian Pacific Journal of Tropical Disease*. 2012 Mar 1;2(3):234-8.
  17. Cheung FW, Guo J, Ling YH, Che CT, Liu WK. Anti-melanogenic property of geoditin A in murine B16 melanoma cells. *Marine drugs*. 2012 Feb;10(2):465-76.
  18. Yanti C, Vendy V, Hwang JK. In vitro antiacne activity of marine sponge *Acanthella cavernosa* extracts. *Int. J. Biol. Pharm. Res.(IJBPR)*. 2015;6:388-92.
  19. Campos PE, Herbette G, Chendo C, Clerc P, Tintillier F, de Voogd NJ, Papanagnou ED, Trougakos IP, Jerabek M, Bignon J, Le Goff G, Osirisynes GI, New Long-Chain Highly Oxygenated Polyacetylenes from the Mayotte Marine Sponge *Haliclona* sp. *Marine drugs*. 2020 Jul;18(7):350.
  20. Lee HY, Jang EJ, Bae SY, Jeon JE, Park HJ, Shin J, Lee SK. Anti-melanogenic activity of gagunin D, a highly oxygenated diterpenoid from the marine sponge *Phorbas* sp., via modulating tyrosinase expression and degradation. *Marine drugs*. 2016 Nov;14(11):212.
  21. Senaratne LS, Park PJ, Kim SK. Isolation and characterization of collagen from brown backed toadfish (*Lagocephalus gloveri*) skin. *Bioresource technology*. 2006 Jan 1;97(2):191-7.

22. Xu Y, Han X, Li Y. Effect of marine collagen peptides on long bone development in growing rats. *Journal of the Science of Food and Agriculture*. 2010 Jul;90(9):1485-91.
23. Swatschek D, Schatton W, Kellermann J, Müller WE, Kreuter J. Marine sponge collagen: isolation, characterization and effects on the skin parameters surface-pH, moisture and sebum. *European Journal of Pharmaceutics and Biopharmaceutics*. 2002 Jan 1;53(1):107-13.
24. Cho JK, Jin YG, Rha SJ, Kim SJ, Hwang JH. Biochemical characteristics of four marine fish skins in Korea. *Food chemistry*. 2014 Sep 15;159:200-7.
25. Nagai T, Ogawa T, Nakamura T, Ito T, Nakagawa H, Fujiki K, Nakao M, Yano T. Collagen of edible jellyfish exumbrella. *Journal of the Science of Food and Agriculture*. 1999 May 1;79(6):855-8.
26. Okazaki E, Osako K. Isolation and characterization of acid-soluble collagen from the scales of marine fishes from Japan and Vietnam. *Food Chemistry*. 2014 Apr 15;149:264-70.
27. Sanjeewa KA, Park YJ, Fernando IS, Ann YS, Ko CI, Wang L, Jeon YJ, Lee W. Soft corals collected from Jeju Island inhibits the  $\alpha$ -MSH-induced melanogenesis in B16F10 cells through activation of ERK. *Fisheries and Aquatic Sciences*. 2018 Dec;21(1):1-8.
28. Heydarizadeh P, Poirier I, Loizeau D, Ulmann L, Mimouni V, Schoefs B, Bertrand M. Plastids of marine phytoplankton produce bioactive pigments and lipids. *Marine drugs*. 2013 Sep;11(9):3425-71.
29. Allard R, Malak NA, Huc A, inventors; Coletica SA, assignee. Collagen product containing collagen of marine origin with a low odor and preferably with improved mechanical properties, and its use in the form of cosmetic or pharmaceutical compositions or products. United States patent US 6,660,280. 2003 Dec 9.
30. Khaufaire- Uhoda E, Fontaine K, Piérard GE. Kinetics of moisturizing and firming effects of cosmetic formulations. *International journal of cosmetic science*. 2008 Apr;30(2):131-8.
31. Seradj H, Moein M, Eskandari M, Maaref F. Antioxidant activity of six marine sponges collected from the Persian Gulf. *Iranian Journal of Pharmaceutical Sciences*. 2012 Oct 1;8(4):249-55.
32. Wang HM, Chen CC, Huynh P, Chang JS. Exploring the potential of using algae in cosmetics. *Bioresource technology*. 2015 May 1;184:355-62.
33. Corinaldesi C, Barone G, Marcellini F, Dell'Anno A, Danovaro R. Marine microbial-derived molecules and their potential use in cosmeceutical and cosmetic products. *Marine Drugs*. 2017 Apr;15(4):118.
34. Ferreira MS, Resende DI, Lobo JM, Sousa E, Almeida IF. Marine Ingredients for Sensitive Skin: Market Overview. *Marine Drugs*. 2021 Aug;19(8):464.
35. Corinaldesi C, Barone G, Marcellini F, Dell'Anno A, Danovaro R. Marine microbial-derived molecules and their potential use in cosmeceutical and cosmetic products. *Marine Drugs*. 2017 Apr;15(4):118.
36. Xue J, Sasaki N, Elangovan M, Diamond G, Kannan K. Elevated accumulation of parabens and their metabolites in marine mammals from the United States coastal waters. *Environmental science & technology*. 2015 Oct 20;49(20):12071-9.
37. Pati P, Sahu BK, Panigrahy RC. Marine molluscs as a potential drug cabinet: an overview. *Indian journal of Geo-marine sciences*. 2015 July;44(7):961-970.
38. Balabanova, L.; Slepchenko, L.; Son, O.; Tekutyeva, L. Biotechnology potential of marine fungi degrading plant and algae polymeric substrates. *Front. Microbiol*. 2018, 9, 15–27

39. Santhanam R, Ramesh S, Sunilson AJ. Biology and Ecology of Pharmaceutical Marine Sponges. CRC Press; 2018 Sep 3.