LITHOLIFE
HEALTHY ALGAE MINERALS

COMMERCIAL PRESENTATION

Summary

About the Lithothamnion

Characteristics

The Lithothamniom species (*Lithothamnium calcareum*) is an alga of the *Rhodophyta* phylum, known as red algae, belonging to the order *Corallinaceas* and the *Hapalidiaceae* family. Corallinaceae are photosynthetic algae that depend on light.

Live Lithothamnion seaweed.

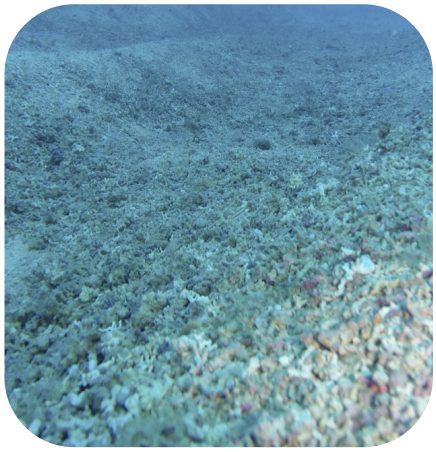
Several minerals are deposited in the cell wall of this alga (mainly calcium and magnesium carbonate) in the form of calcite crystals, representing about **80 to 90% of the biomass**. From the deposit of inorganic salts, the alga dies and loses the reddish coloration, characteristic of the surface living film of the algal crust.

In its composition at least **76 distinct elements** and in proportions totally **bioavailable** because it is a plant organism. They are biomineral complexes that mainly contain **calcium and magnesium**. In addition to the major composition of carbonates, the seaweed has more than **20 trace elements** present in varying amounts, mainly iron, manganese, boron, copper, zinc, molybdenum, selenium and strontium.

Formation of natural deposits

Red algae grow in overlapping layers. With the death of the lower layers that calcify (with a consequent change in color), the “marine bioclastic granulate” is produced.

With the tides and currents, some of these structures come loose and are “rolled” by the movements of these currents forming the deposits.



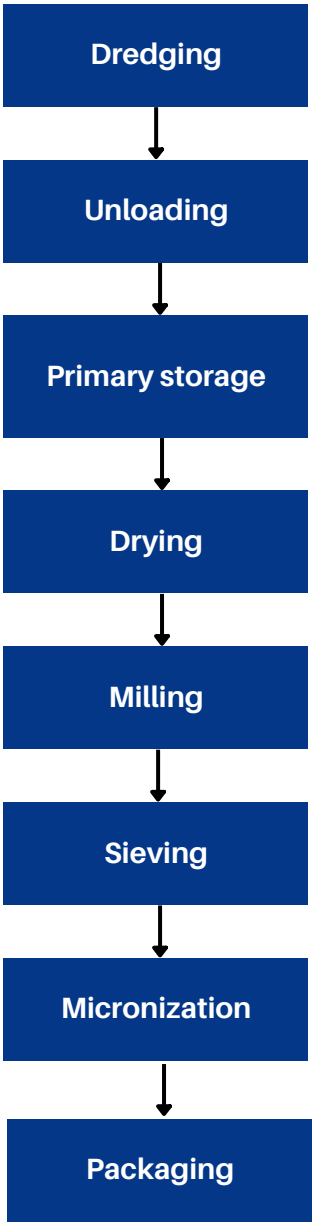
Seabed with calcified seaweed.

IBAMA (Brazilian Institute for the Environment and Renewable Natural Resources) carried out the license and limited the amount for extracting Lithothamnium calcareum so as not to affect local ecosystem. With the tides and currents, some of these. Litholife´s exploitation is in constant natural renewal. Therefore, **our activity is sustainable, and follows the strictest environmental controls**.

Extraction and processing

Skeletons of Lithothamnion algae are extracted by dredging process from natural deposits. To carry out the extraction, companies must have licenses such as those from IBAMA, ICMBIO - Instituto Chico Mendes de Biodiversidade, authorization from ANM - National Mining Agency , among others.

After dredging, the algae undergo a drying process, which can be natural - due to the location of the deposits on the northeast coast of Brazil - or forced through dryers. After the drying process, the algae undergo a milling process and different particle sizes are obtained, which define the purpose of their application. The figure on the side briefly illustrates the flowchart of the process for obtaining seaweed from Lithothamnion.



Currently, Litholife benefits Lithothamnion in different granulometries ranging from 325 mesh to 1250 mesh, and also supplies the “In Natura” material.

Litholife has differentiated processing for human nutrition and is also responsible for marketing the product in this segment.

For larger granulometries (finer and micronized product), Litholife has an established partnership with a specialized company. The outsourced company, responsible for micronization above 550 mesh, is duly approved by Litholife and meets all the sanitary requirements established by the National Health Surveillance Agency – ANVISA, for the production of foods and ingredients for dietary supplements.

Commercialization

Lithothamnion algae are marketed in the following formats:

- In natura (does not go through the milling process, just dredging, drying and sieving);

-Powder with granulometries from 325 to 1250 mesh. Particle size varies according to product application.

Packaging

Lithothamnion seaweeds are marketed in 25 kg packages, with raffia material or, for granulometries above 400 mesh, kraft coated with polyethylene.
Litholife offers different conditions for big bag packages of 1 and 1.2 tons of product, according to the customers' needs.

Service and Delivery

Litholife ensurance the service of large volumes due to its installed capacity for dredging and processing. Litholife maintains permanent stock in 325 and 400 mesh granulometries, to meet the demand of the intern market. For the external market and for other grain sizes, the lead time between purchase confirmation and dispatch varies from 30 to 45 days, depending on the volume and technical specifications requested.

Transport

All Litholife transport is outsourced. Carriers are rigorously selected to ensure safety during product transport. In addition, due to the requirement of the Organic Conformity Certification - USDA, the transporters declare (through documentation) that they do not carry out the transport with chemical materials or possible contaminants to the Lithothamnion raw material.

Food safety requirements

The processing of Lithothamnion seaweeds for food, pharmaceuticals, cosmetics and food supplements, fulfill with the requirements of Good Manufacturing Practices for food producing establishments.

All batches produced are analyzed for the following parameters:

Physical-Chemical Parameters: humidity, strange materials, calcium and magnesium contents;

Microbiological parameters: *Bacillus cereus*, Coliforms at 45 °C, *Staphylococcus* coag. positva and *Salmonella sp*.

Inorganic substances: total arsenic, cadmium, lead and mercury;

Allergen Analysis: Crustaceans and Molluscs;

Litholife performs other analyzes according to the demand of each client and according to the legislative needs of each country.

The Lihtohamnion Algae supplied by Litholife are:

Allergen free

They are free of any elements from the groups that cause food allergies.

Free of chemical additives

No chemical additives are used during seaweed processing.

GMO/GMO free

They are free Genetically Modified Organisms in the composition.

Shelf life and conservation

The validity of the product is 36 months from the date of manufacture. Litholife recommends that, after opening, the product should be consumed within 180 days. The product must be stored in a dry and ventilated place away from light and heat.

Quality warranty

All batches are analyzed for the aforementioned parameters, in a third-party laboratory accredited to carry out the respective analyses. All batches present an analysis report guaranteeing safety and compliance with the parameters established by the technical specification.

Certifications

Litholife currently has 4 certifications:

GMP/BPF – Good Manufacturing Practices for food processing establishments. Defines and controls the quality and reliability of the production local, environment, production process, personnel and raw materials.

American Organic Compliance Certification – USDA, issued by the United States of the Department of Agriculture. The company is audited annually by **IBD – Biodynamic Institute..**

It attests that the certified company's industrial process complies with the specific norms of the Orthodox Jewish diet. These norms refer to permitted and prohibited foods, preparation methods and consumption occasions.

Warranty certificate issued by a Halal certifying institution recognized by Islamic countries, to attest that the companies, process and products follow the legal requirements and criteria determined by Islamic jurisprudence.

The Vegan Certificate or Vegan Seal refers to products not tested on animals and free of ingredients of animal origin, being cruelty-free.

Nutritional benefits

- Lithothamnion is a **100% natural product;**
- **Has no side effects** such as constipation, nausea, bloating and abdominal discomfort;
- Has **high absorption by the body** and for this reason does not produce waste or deposits in the arteries, which thus reduces the risk of developing heart problems;
- Lithothamnion algae are of vegetable and organic origin, and for this reason they have a high rate of bioavailability (**on average 87%**).

  This value is **higher than sources of mineral and animal origin**, such as dolomite and oysters. This high rate of bioavailability is due to the structure of the algae. The high porosity of the algae provides a greater surface area and contributes to better absorption of the minerals present in the algae. Inorganic sources and isolated organic minerals can cause health risks, such as allergies and possible deposits in arteries and joints.

Nutritional profile

Lithothamnion algae have in their composition several fundamental elements to the organism. Table 1 presents the nutritional and mineral profile in 100gr of seaweed.

Nutritional profile in 100g	**Lithothamniom***
Energetic value	28 kcal = 117 kJ
Carbohydrates	7,0 g
Sodium	347 mg
Calcium	32500 mg
Magnesium	3270 mg
Iron	77,6 mg
Fluorine	0,24 mg
Phosphor	34,1 mg
Manganese	1,47 mg
Copper	72 mg
Selenium	50 mg
Potassium	38 mg
Molybdenum	151 mg
Zinc	0,18 mg

Table 1 – *Lithothamnium calcareum* nutritional profile.
* Values may vary according to the batch.
SOURCE: Litholife Nutritional Analysis

Nutritional benefits

Amino acid profile

Lithothamnion algae also have in their composition polysaccharides and essential and non-essential amino acids in interesting amounts. The organic composition of the seaweed is balanced by the sea and the amount of minerals and these components may vary according to the deposits where the seaweed is extracted.

Amino acids make up approximately one-third of muscle protein. There are several important functions related to the proper functioning of the organism. Among the main functions, the following stand out: regeneration of muscle tissue, wound healing, maintenance of hair and nails, among other specific functions, according to the amino acid. Table 2 presents the profile of amino acids present in Lithothamnion algae.

Amino acid profile - Lithothamnion*

Amino acids	Concentration (mg/g)
Alanine	0,22
Arginine	0,28
Aspartic acid	0,53
Cysteine	0,45
Glutamine	0,10
Glycine	0,14
Histidine	0,16
Isoleucine	0,18
Leucine	0,12
Lysine	0,49
Methionine	0,40
Phenylalanine	0,18
Proline	0,19
Serine	0,19
Threonine	0,28
Tryptophan	0,07
Tyrosine	0,25
Valine	0,51

Table 2 – Profile of amino acids present in Lithothamnion.
* Values may vary according to the batch.
SOURCE: Litholife Laboratory Analysis

Applications

Lithothamnion algae can be used for:

- Enrich food and drink;
- Use of drugs and food supplements to supply minerals (mainly calcium and magnesium);
- Technological applications in food as an enrichment agent for formulations;
- Technological applications in food such as increasing the shelf life of products;
- Texture improvement in gluten-free breads, cereals and snacks;
- Emulsion stability agent;

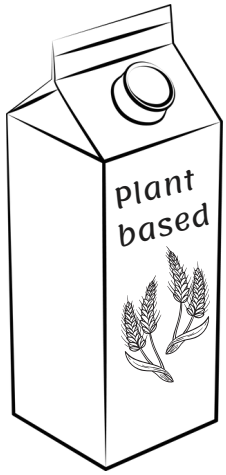
Foods

Lithothamnion seaweed can be widely applied in the food segment with several functions. It can be considered a functional ingredient, which can be used to enrich formulations, provide antioxidant agents with **high bioavailability**, **does not change flavor**, **does not contain anti-nutritional factors** (phytates, oxalates, tannins and other phenolic substances) in addition to having **irrelevant calories and fats** .

Vegan milk

One of the **main applications** of Lithothamnion is in the enrichment of vegan milk and beverage formulations. The application of seaweed, in addition to providing minerals such as **calcium, magnesium, iron** and others, acts as a stability agent, that is, it prevents or minimizes the separation of water and the base of the vegetable milk.

The amount of Lithothamnion applied varies depending on the desired amount of calcium and other minerals in the nutritional table. The recommendation for use in this segment ranges from 0.35 to 0.7%. Larger quantities can be tested and validated. The granulometry of seaweed recommended for application in vegetable milks are 400 and 550 mesh. The type of filling and the processing conditions of vegetable milk will define the best granulometry for application.



Applications

Gluten free products

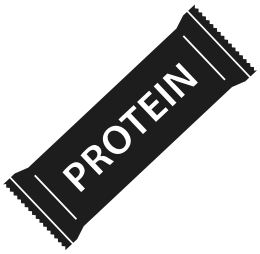
In gluten-free baking, Lithothamnion algae showed uniformity in color (mainly of the bread crust), reduced crumb formation, that is, breakage of the inner portion of the bread, and improved texture.

The application of the seaweed Lithothamnion also presented a better visual appearance of the product as a whole than the product without the seaweed, in addition to enrichment with the minerals naturally present in the seaweed. To demonstrate the benefits presented, the dosage will depend on the premix of gluten-free flours.

The recommendation is for application varies from 0.7 to 1.2% of the formulation. The granulometry recommendation is 400, 550 and 625 mesh. The size of the granulometry will depend on the gluten-free flour premix, the lipid composition of the formulation, other food additives present in it and the production process.

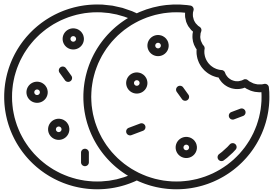
Cereal bars

The application of seaweed Lithothamnion has the technological purpose of maintaining the adherence of the seeds and other components, in addition to reducing breakage of the bars. The application recommendation to guarantee the technological benefit varies from 0.5 to 1%, according to the bar formulation and processing technology.



Cookies

A reduction in breakage and an improvement in texture was observed when applying Lithothamnion seaweed to wheat flour and/or starch-based cookies. In addition to the technological benefits, the cookies nutritionally delivered significant amounts of calcium, magnesium and other minerals present in seaweed.



For the application, the recommendation is to use a mesh of 400 mesh. The application dosage varies from 0.75 to 1.2% of Lithothamnion in the formulation.

Applications

Food suplements

In Brazil, according to the new 2018 regulatory framework for food supplements, according to Normative Instruction n.28, of July 26, 2018, which “Establishes the lists of constituents, limits of use, claims and supplementary labeling of food supplements”, the seaweed Lithothamnion is a recognized and permitted ingredient, that is, without the need for health registration for applications in calcium-based food supplements. In Brazil, the minimum and maximum amounts of calcium in the supplement must follow Annexes III and IV of the same Normative Instruction for the daily portion according to the age group (target public) of the product.

Lithothamnion seaweed can be applied in hard capsules, soft gel capsules and tablets. For each of these products, a different particle size is recommended for the production of calcium and mineral supplements based on Lithothamnion. Equipment conditions, encapsulators and other processes can also influence the particle size required for the application.

Association with type I and II collagen

Due to the mineral composition, the application of seaweed associated with type I and II collagen offers benefits in terms of bone and cartilage preservation. In addition, there is evidence that the application of seaweed also helps in the synthesis of collagen and elastin synthesis.

The recommendation for applying the Lithothamnion seaweed is in the granulometry of 400 or 550 mesh and the amount in the composition of the premix with collagen varies according to the desired nutritional profile of the minerals present in the composition of the seaweed.

Association with vitamin D_3 e K_2

There are several benefits when associating Lithothamnion with vitamins D3 and K2, among them are: increased absorption of calcium by the body; assists in the immune system; provides energy and prevents tiredness and fatigue; combat muscle pain.

Applications

Cosmetics

There are applications of Lithothamnion algae in bath products and refreshing moisturizers. In thalassotherapy, algae can be used in exfoliating soaps or as a slimming and anti-cellulite component in association with other algae such as Laminaria and Fucus.

Due to its abrasiveness Lithothamnion algae can be applied in **exfoliation agents**. Due to the mineral composition, the application ensures the removal of cells and promotes facial rejuvenation.

Drugs

Lithothamnion has in its composition polysaccharides with **antioxidant, antiviral, antitumor and anticoagulant properties**, due to the compounds present in its structure. In addition, due to the plant origin and the amount of minerals present in seaweed, it can be used as a mineral replenisher in capsules, tablets and powder mixtures.