BIOLOGICAL ASPECTS
"GRACILARIA CHILENSIS"

Division : Rhodophyta
Class : Rhodophyceae
Order : Gracilariales
Family : Gracilariaceae
Genus : Gracilaria
Especie : Gracilaria Chilensis
Common name : Pelillo

The Gracilaria chilensis is known as pelillo, this red seaweed has cylindrical filamentous thallus of 1-2 mm in diameter and up to 2 meters long, consisting of one or more axes elongated branched alternating, opposite or irregular, red violet color.

The thallus can be fixed to hard substrates, through a disc of adhession, however, they often are buried in the sand. The reproductive structures are in the cortical layer of thallus. In the case of the structure cistocarpicas these are visible but the tetrasporangios and male reproductive structures are visible only in a court under the microscope.

This genus, is found primarily in the Pacific coast in North America, South America and China. In Chile has been reported from Arica to Puerto Montt (Maullín river). His bathymetry from the surface to 10 m deep, more often buried in the sand. Lives in protected bays with sandy or muddy funds, and in some cases attached to hard substrates.

Pelillo known as the "ogo-nori" in Japan, "chinesse moss" in China, "sea-string" in South Africa.

This species inhabits bays, sandy-protected funds. He has great tolerance to temperature and salinity, which is why he lives and grows in different environments, and estuarine salt, intertidal and subtidal. There are about 150 species of this genus in the

world, but not more than 5 are of economic importance.

For the South East Pacific have been described 11 species of Gracilaria, of which 2 are of economic importance to Chile: Gracilaria chilensis and Gracilaria lemaneiformis. For these resources, there are records of landings since 1967 and only since 1982 is beginning to grow commercially.

The Gracilaria is used in food and in preparing food, it is also an important raw material in the production of agar-agar. At present, the annual yield of Gracilaria in the world is around 30,000 tonnes, dry weight, and the majority comes from natural production.
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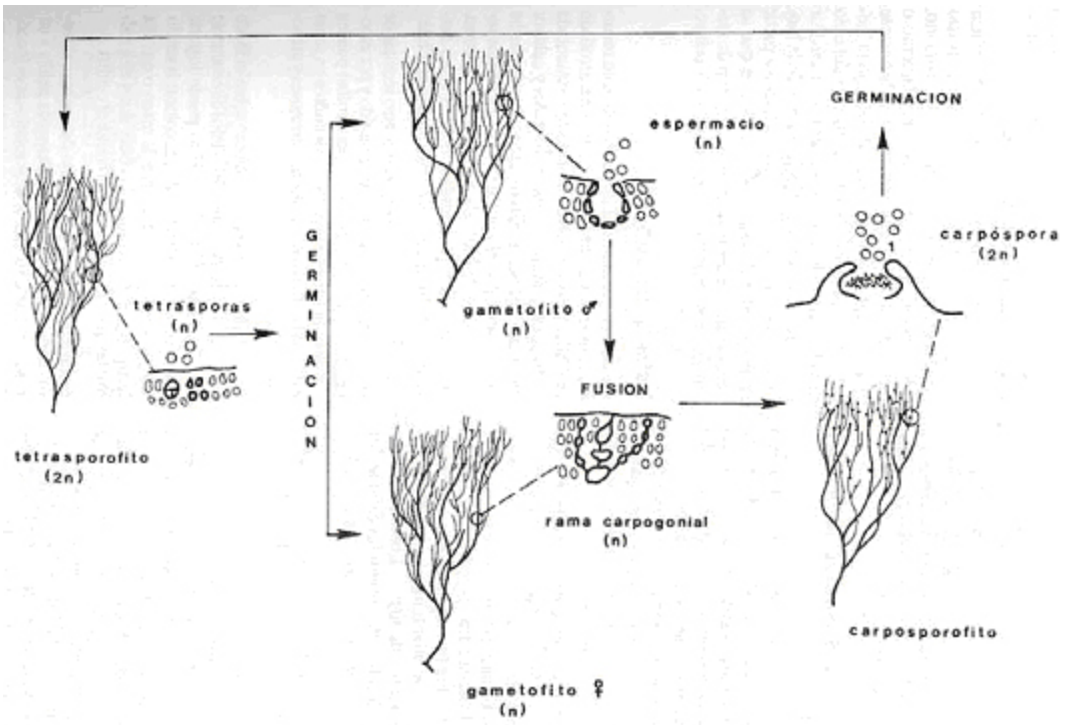
LIFE CYCLE

The Gracilaria has a life cycle with alternating reproductive stages. Gametophytes are individuals of the sexual phase and are haploid (Manning simple chromosome). Gametes are produced in different individuals, gametophytes male and female. The oogonia (female gamete), is in the thallus of an individual female, and is fertilized by a espermacio (male gamete). Fertilization gives origin to another phase of the cycle of life, cistocarpo, which is a conceptáculo diploid (ie with a double envelope chromosome) that grows immersed in the thallus of the female gametophytes. Within the cistocarpo form spores, the carpósporas (diploids). Once the cistocarpo matures, the carpósporas are released into the environment, settle in the substrate, germinate and grow to form the third phase of the cycle of life, an individual is not sexual, the tetraesporofito (diploid). This mature form reproductive structures, the tetrasporangies, which releases tetraspores (haploid). These are going to the fund, germinate and grow to be male or female gametophytes closing the cycle of life. Gametophytes male, female and tetraesporofitos, have a similar morphology or are isomorphic. In natural populations and cultures is possible to find individuals sterile, or undifferentiated and these states are phenomena that dominate the population in some commercially important crops.



CULTIVATION SYSTEMS

There are several methods of cultivation of this resource, most of which have been developed in Chile. Other countries have also tried to cultivate in ponds, pools and crops in the coastal sea. The development of these technologies has been made possible by the contribution of knowledge on aspects of basic biology of this resource.

Pelillo cultivation, use four cultivation techniques: direct, indirect, and suspended by spores. Environments where they thrive, can be intertidal, subtidal, in shallow marine or estuarine areas with funds sandy and muddy-sand.

Direct cultivation:

The cultivation directly on the fund, is to bury bunches of thallus directly on the substrate. This can be achieved by making a pit or groove where to place the seeds with a hoe, shovel by hand or with a fork. These systems do not use waste materials that affect the subsequent cultivation.

Cultivation indirect:

Cropping systems indirectly, consist of bundles of pelillo moor to a substrate, which in turn is deposited in the fund. The most commonly used substrate, the sleeve is made of polyethylene, but are also used stones, ropes or stakes.
a) The polyethylene bags or "chululos": They consist of polyethylene bags filled with sand, which are tied bundles of thallus with elastic or pita cotton. This method was developed in 1986 by Pizarro and Barrales in the Bay area Caldera. The chululos, have been used on crops estuarine and subtidal, never in the intertidal. The sleeves, are arranged in parallel with the flow and are distributed in the fund according to the desired density (1 and 5 matches per square meter). After a period from 1 to 3 months, depending on the type of place and season of the year, the sleeves are filled with sediment, leaving the algae anchored. This method was used extensively in Chile between 1985 and 1990.
Since 1991, preferably using direct planting in the south, because the build-up sleeves produced significant changes in the substrate.

b) kill stones: They consist of bundles of thallus tied with elastic to stones. These are thrown from boats and ranked according to the desired density. This method is used on the island of Chiloe, Pudeto river.

c) Stakes: Consists of thallus to tie the stakes, which are later buried at the fund, with the help of a stick from a boat. This method is used in Chiloé and the Region VIII by artisanal fishermen.

d) Strings: Consists of interlacing, or seaweed to tie bunches of plastic ropes, which are suspended from their ends, to wooden stakes. However, plants have high rates of growth in the first few months, then there is necrosis of the thallus at the point of contact with the mother rope, causing substantial losses of biomass. This system has been used only on an experimental centers for commercial cultivation.

Suspended cultivation:

The suspended cultivation has been tried on an experimental basis in ropes and in commercial poultry. In the north, developed a system of corrals suspended. This is in large bags or "pens" of fishing net, held to 5-6 m deep, inside which is the seaweed.

The pens are maintained by surface buoys and can contain up to 5 or 7 tons of algae, which, by its specific gravity, making the structure remains at medium water. This system requires constant renewal of water to sustain growth. Can be damaged by

currents too strong, or tidal waves, so can only be developed in highly protected areas. It has been used with some success in Caleta Errazuriz, near Antofagasta.

When analyzing and comparing the methods described above, is that the benefits depend on the area where they are developed. The cultivation subtidal require divers and boats for the operation and maintenance, and are generally more productive than the intertidal cultivation. The systems of cultivation indirectly, have an anchoring mechanism that lowers the parting of the thallus, during the early stages of the crop. This has been very successful in the north (Caldera), where tidal waves usually occur that tend to give off biomass planted. In terms of infrastructure this method requires more ground facilities, such as barns and cellars. Instead, the system is used in direct cultivation successfully in the south of Chile, takes place in shallow bays and protected. The crops by spores require more infrastructure and technology systems that direct and indirect, but allow better control the quality of the thallus, which is generated as seeds. The latter alternative, is being used only recently in commercial cultivation of the Tenth Region, with the aim of renewing the stock of plants, existing and improve productivity.

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