

KAPPA-CARRAGEENOPHYTES: GIGARTINACEAE-COMPLEX

-contain gelling-strength kappa-carrageenans much sought after by the phycocolloid industry.

- cell walls of members of the Gigartinaceae-complex, Gigartinaceae and Phyllophoraceae, contain κ -type carrageenans in the gametophytic phase and λ -carrageenans in the tetrasporophytic phase of the life cycle

- nearly every food stuff bought in the supermarket contains κ -carrageenan which has unique properties that cannot be replaced and which has diverse applications, e.g., beer/wine/vinegar (accelerates and improves clarity), chocolate milk drink (stabilizes and improves viscosity), ice cream (prevents ice crystals formation), flans/dessert gel (enhances flavor release), sauces and dressings (thickens and improves viscosity), beef patty (substitutes fat, retains moisture and increase yield), luncheon meat (prevents fat separation serves as a meat extender), poultry and ham (controls dehydration of frozen poultry enhances juiciness and increase yield), petfood, canned meat and fish (gelling and stabilizing agent), toothpaste (stabilizer), air freshener (gelling agent). etc. In fact, almost 30% of what we as consumers purchase in food stores and pharmacies contain these seaweed products in it.

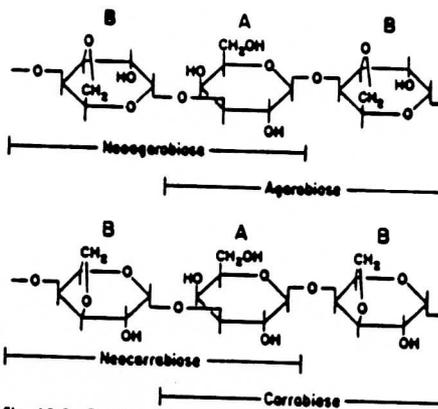


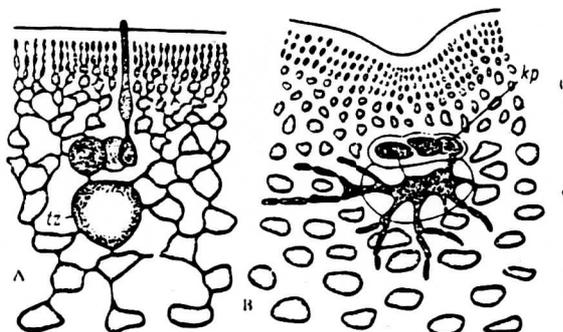
Fig. 10-2. Disaccharide repeating units of agaroses (upper) and carrageenans (lower).

-Fam. Gigartinaceae

-Fam. Phyllophoraceae

= true Gigartinales sensu strictu

-assemblage recognized earlier by Kylin (1932, 1956) who characterized it as having gonimoblasts developing primarily inwardly from one or more auxiliary cells, and cruciately divided tetrasporangia



GIGARTINACEAE

- worldwide, @100 species
- all triphasic, isomorphic life history type
- generic concepts are based on comparative analysis of a suite of ontogenetic and morphological characters that reflect distinct nutritional strategies of the cystocarp, as well as on a comparative developmental analysis of the tetrasporangial structures.
- multiaxial, mostly filamentous medulla
- unfertilized female reproductive structure (procarp) consists of a supporting cell bearing a 3-celled carpogogonial branch
- initial is a terminal cortical cell: misinterpretations of superficial similarities have resulted in erroneous systems of classification at a variety of taxonomic levels; e.g. procarp development involves division and growth patterns that are essentially the same as for the vegetative cortex; but because the procarp becomes buried at maturity, its origin had wrongfully been reported in the literature as being intercalary.
- supporting cell becomes multinucleate and fertilized carpogonium containing the fertilization nucleus fuses directly with the supporting cell, now called auxiliary cell
- auxiliary cell enlarges and its haploid nuclei contain amplified levels of DNA
- both diploid and haploid nuclei are thus intermixed and continue to multiply
- this is in contrast to the nuclear behavior in other red algae in which such heterokaryotic auxiliary cells are rare.
- enucleate protrusions form on the surface of the auxiliary cell into which the products of the diploid nuclei migrate and are cut off as gonimoblast initials.
- These pre-and earliest post-fertilization stages are **very conserved** characters in all Gigartinaceae, and **generic differences are based on**
 - o number of gonimoblast initials
 - o direction, modification of filaments or production of secondary filaments surrounding auxiliary cell
 - o interaction of gonimoblast cells with surrounding vegetative tissue
 - o how carposporangia are formed and released

Phylloporaceae

- worldwide, @100 species
- -multiaxial, mostly cellular medulla (two cells may be interconnected by multiple pit connections between these two cells!)
- 4 types of life history; generic concepts based on type of life history

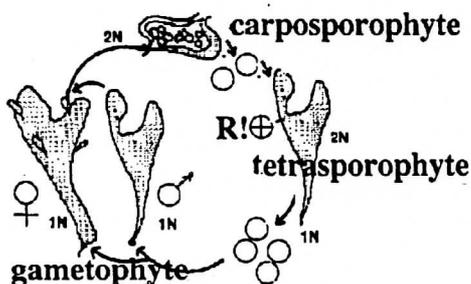


Fig. 1. ISOMORPHIC

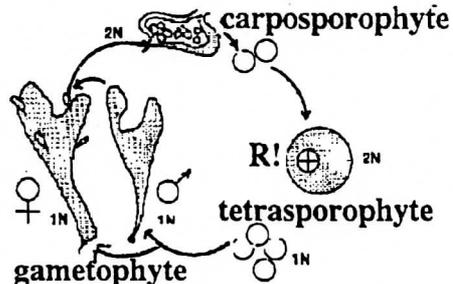


Fig. 2. HETEROMORPHIC

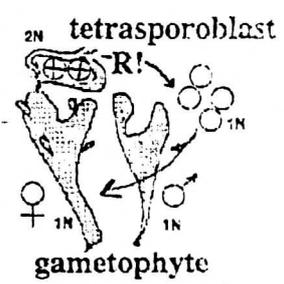


Fig. 3. TETRASPOROBLASTIC

- unfertilized female reproductive structure (procarp) consists of a supporting cell bearing a 3-celled carpogogonial branch and sterile branchlet
- fruiting bodies are either wartlike pustules called tetrasporoblasts, or cystocarps, which are said to be internal.
- In tetrasporoblasts, no carposporangia are formed, a free living tetrasporophyte is missing and the tetrasporophyte filaments develop directly on the female gametophyte
- revised generic concepts parallel those of the Gigartinaceae
- currently, genera are predominantly based on type of life history.
- includes family Petrocelidaceae (*Mastocarpus*)