

ARL scientists have performed a comprehensive program of research on the biology of Irish Moss. Success in the project has revolved around an understanding of three principal areas: the chemical nature of carrageenans, the relationship between these compounds and the life cycle of Irish Moss, and the ability to grow the plant vegetatively on a large scale.

In the late 1940's, carrageenan was fractionated into two components, kappa, the desirable gelling agent, and lambda, a viscous, less valuable fraction. Industry uses this procedure routinely to isolate the kappa from the lambda form. ARL scientists helped to characterize the molecular structures of these carrageenans, and succeeded in describing the life cycle of *C. crispus* as well. The work showed that beds of the algae contained three normally indistinguishable types of mature plants, a male, a female and a diploid form, the latter being a sexual fusion product of the other two. This knowledge led to a key discovery — the carrageenan type is linked to the phases of *C. crispus*' life cycle. The sexual (or haploid) plants produced the kappa form while the diploid plant produced the lambda form.

If these plant types are grown alone, the expensive fractionation procedures to separate kappa and lambda carrageenan can be eliminated. Researchers at ARL's Sandy Cove Seaweed Culture Station solved the remaining problem. Working with large experimental tanks that simulated the marine environment, they determined the conditions under which *C. crispus* can be grown vegetatively on a large scale.

This development has made possible the cultivation of that phase of the life cycle of Irish Moss which yields the type of carrageenan of greatest industrial interest. Two companies, Marine Colloids Ltd. and Genu Products, have signed a licence agreement with Canadian Patents and Development Limited on the process. Each has established pilot plants to investigate the possibilities of large scale application of the growth techniques.

Scientists at the ARL are now turning to other marine algae that grow in the Atlantic region. One of the plants under study is *Gracilaria*, a source of the agar used in the food and pharmaceutical industries. Along with the necessary basic investigations of the reproductive cycle and growth conditions of this plant, researchers are attempting to culture it in the same

manner as Irish Moss.

According to ARL's Dr. J. P. van der Meer, a plant geneticist, *Gracilaria* is an excellent plant to study as a model for all red algae: "this alga is mostly restricted to the warm waters of the gulf of the St. Lawrence, the shallow warm waters off Prince Edward Island and the "salt ponds" of Nova Scotia. It is not abundant enough to sustain a viable industry, but there is an interest in it from a mariculture (sea-farming) point of view."

"When I joined ARL," continues Dr. van der Meer, "there were only a few research papers in the scientific literature on the genetics of red algae. The field was virtually unexplored territory. We could only assume that red algae would breed in a manner similar to that of higher plants, although they might well have some unique breeding properties.

"One of the first things we did with *Gracilaria* was to treat it with a chemical mutagen to get some variability that we could use for genetic

studies. Although the normal form of the plant is brown, we produced other colored forms to study its genetic inheritance.

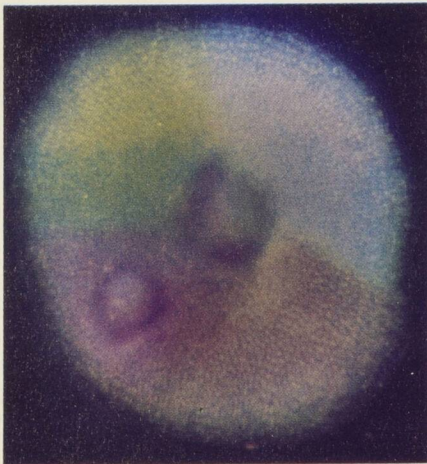
"We are now looking at various approaches to culturing *Gracilaria* in tanks; these include using new forms of the plant with more than the usual number of chromosomes in the nucleus. These so-called "triploid" algae (with an additional set of chromosomes) seem to be larger and to grow faster than the normal form of the plant. Their use, along with other refinements in the growing conditions, might make possible the commercial culture of *Gracilaria* in tanks, or in the Nova Scotia salt ponds."

Mariculture, the farming of marine plants, may well be one of humanity's key sources of nutrition in the future. The Atlantic Regional Laboratory is ensuring that Canada will be suitably equipped with the necessary knowledge and technical know-how for expansion into this area. □

Michel Brochu

Cherchez la femme

Another marine plant that ARL is looking at is a Maritime delicacy called dulse: this Maritime favorite is a large edible red alga that is harvested on Grand Manan Island, New Brunswick, and eaten for its distinctive and delicate flavor. It is also high in protein. A most peculiar feature of this plant is that in 150 years of research, nobody has ever found a female plant. There are many male plants and many spore-carrying plants, but no female plants. ARL scientists are trying to solve this genetic riddle through chromosome studies and other investigations.



Cherchez la femme

Une autre plante qui éveille l'intérêt des chercheurs du LRA est une spécialité des Maritimes, la dulse. Les résidents de cette région se régalaient de cette grande algue rouge comestible qu'on récolte dans l'île du Grand Manan, au Nouveau-Brunswick. Ils apprécient sa saveur particulière et en retirent également une bonne source de protéine. Une caractéristique plutôt surprenante de cette plante est qu'en cent cinquante années de recherche, on n'en a jamais découvert de forme femelle. Il en existe beaucoup de plantes mâles ou de plantes porteuses de spores, mais pas de femelles. Les chercheurs du LRA essaient de percer ce mystère génétique au moyen d'études portant sur les chromosomes et d'autres investigations.

This *Gracilaria* spore combines four of the color mutations possible in the plant. Scientists from the Atlantic Regional Laboratory of NRC use these color mutations as a tool to unravel the genetic mysteries of this algae.

Ce spore de *Gracilaria* possède en même temps quatre des couleurs possibles chez cette plante. L'étude des mutations de couleur de cette algue est un outil permettant aux chercheurs du Laboratoire régional de l'Atlantique du CNRC de déchiffrer ses mystères génétiques.

Dr. J. P. van der Meer, Atlantic Regional Laboratory/
Laboratoire régional de l'Atlantique