

ABSTRACT

Ten species of colloid-bearing red algae from the environs of Port Royal, Jamaica were studied with regard to physiological ecology and mariculture potential. These species were *Polycavernosa debilis*, *Gracilaria verrucosa*, *G. cylindrica*, *G. domingensis*, *G. mammillaris*, *G. sjoestedtii*, *G. cervicornis*, *G. terete*, *Gelidiella acerosa* and *Agardhiella tenera*.

Tissue carbohydrate, protein and agar, as well as protein / carbohydrate (P/C) ratios, were examined for a year and analyzed for responses to changes in the physical parameters: temperature, salinity and dissolved oxygen and the chemical (nutrient) parameters of nitrate, ammonia and phosphate levels.

It was found that the greatest changes in the tissue protein levels were correlated to nutrient levels while temperature was inversely related to protein levels in 50 % of the species. Carbohydrates appeared to be inversely related to protein and highest levels were obtained during the summer months.

Carbohydrate levels in species with high surface area to volume ratios like those with a flattened morphology (*G. domingensis*) or a narrow cross section (*G. sjoestedtii*) were found to be positively correlated to

salinity.

Highest agar yield was from *Gracilaria cylindrica* from one site which gave a 66 % agar yield. Average yields were between 16 and 40 %.

Using P / C ratios as a state of growth indicator, showed that water temperatures at the sites were above optimum for the species studied. In the low surface area to volume ratio species, P / C ratios were also affected by ambient nutrients.

Production of algal material from spores is important for the development of mariculture both for breeding and strain selection. Carpospore release in most species was readily induced by dehydration exposures (up to 1 hour) followed by a dark period.

Contamination and resulting out-competition of the sporelings by the contaminants were seen as the greatest obstacles to sporeling production, and precleaning of the mother thallus was essential to successful spore release and growth. Alcohol used as a precleaning agent greatly inhibited successful cystocarpic sporulation. Successful tetrasporophyte sporulation was easier to achieve, likely due to a higher level of protection offered to the spores from the cleaning agents by the tetrasporophyte thallus and a lack of contaminant-filled cystocarps.

In sporeling growth experiments, growth rates as high as $9.2\% \text{ d}^{-1}$ were achieved. Streptomycin sulphate

(15 mg l⁻¹), added to decrease blue green algal contamination, severely limited sporeling growth. Dehydration exposure was found to be a useful tool against contamination. Exposure of sporelings to low salinity for a short period increased growth rates.

Culturing seaweeds has involved methods for raft, line, over reef dispersal, pond and tank culture. Successful tank culture was carried out for a number of the species studied.

At low stocking densities (0.2-0.7 g l⁻¹) in continuously aerated tanks, water changes once in three weeks and once in one week gave reasonable growth rates. These stocking densities could be as much as tripled (2.3 g l⁻¹) with the addition of a weekly nutrient pulse, with similar growth rates achieved.

Continuous addition of sea water allowed an increase in the stocking density (up to 2.65 g l⁻¹) with no appreciable fall in growth rate but at the cost of very high contamination levels which resulted in eventual falls in production.

Low concentrations of bleach (0.01 %) effectively decontaminated the hardier species studied with only short term negative growth effects.

Cetarium pica is a useful addition to *Gracilaria* tanks due to the tank cleaning done by this animal, cutting down maintenance and providing an additional

marketable item. Seaweeds must be kept moving and suspended in the water, however, to prevent grazing of the *Gracilaria* by the *Cetarium pica*.