CULTURING REQUIREMENTS AND COMMERCIAL QUALITY OF FOUR DIFFERENT SPECIES OF *Ulva* (ULVALES, CHLOROPHYTA)

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Introduction

The commercial production of *Ulva* spp. by aquaculture is gaining in importance due both to the qualitative and quantitative increase in the use of the harvested biomass and its new applications in inland IMTA techniques. However, very little is known about the specific culturing requirements and commercial quality of the different species of *Ulva*. The aim of this work is to try from this point of view four *Ulva* species that could be grown in southern Europe: *U. australis*, *U. fasciata*, *U. ohnoi* and *U. rigida*.

Materials and methods

The four *Ulva* species (*U. australis*, *U. fasciata*, *U. ohnoi* and *U. rigida*) tested were specifically identified by sequencing the rbcl gene and the culture medium was in all cases seawater with high levels of N and P, like those to be found in inland fish-farms with Recirculating Aquaculture Systems (RAS), in which these crops could be integrated.

For the studies about light requirements and maximum growth rates of each *Ulva* species, a climate-controlled culture chamber has been used, with a daylight-type LED panel, 12:12 photoperiod and 20°C of temperature and different shading nets. Algae talus discs of 2 cm diameter, obtained from the same cultured clone, were used as replicas, placed in 6 well plates with 10 ml of seawater supplemented with nutrients.

To estimate the commercial quality and profitability of the crop of *Ulva* species, the biomass of each species was produced in 180 L seaweed culture tanks under a same lighting conditions, concentration of nutrients and water renewal strategies. were calculated The wet weight/surface and wet/dry weight ratios was analyzed, as well as their content in proteins, ashes, macro-minerals (Na, K, Ca, Mg) and trace-elements (Fe, Mn, Zn, Cu).

Results

All these species lose or altered many of their main distinctive morphological features, however, they continued to maintain some anatomic differential characteristics after grown in suspension.

The results obtained so far with regard to the light requirements indicate that there are significant differences between light saturation curves of northern (*U. australis*, *U. rigida*) and southern (*U. fasciata*, *U. ohnoi*) species and, therefore, an optimum growth rate at different light intensities. Moreover, the maximum growth rates are also different among species.

From the chemical composition point of view, and under the same culture conditions also significant differences between species were found, in many of the variables analyzed, with special relevance in the wet/dry weight ratios, ashes and protein richness. The protein content was in all cases significantly higher than the reference value of wild populations.

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Discussion and conclusion

Although their morphological similarities, *Ulva* species show a great variability in culturing requirements and commercial value. The main physical parameter that influence development of these species is the light intensity, since each species has their particular light saturation thresholds. Interestingly these differences in species behavior are more related to the characteristics of their wild habitats than to their phylogenetic relationships.

It is evident also that *Ulva* species grown in rich-nutrient systems, such as those tested in these experiments, considerably increase their percentages of protein with respect to those from wild populations. This fact has a great relevance in the valorization of the biomass obtained, for its use in feed and food.

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