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3.1.4 Microalgae Aquaculture Feeds

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Keywords: aquaculture, feeds,

Abstract:

Microalgae feeds are currently produced by and for a number of aquaculture industries, including live algae feeds for use by bivalves seed, fish and shrimp aquaculture, and dried algal feeds for tropical fish. However, production systems are generally small, costs are high and global production of microalgae for such aquaculture feeds is only a few hundred tons per year. Astaxanthin from *Haematococcus pluvialis* is now being produced commercially by several companies around the world, using both open ponds and photobioreactors, and provides a potentially large (>US\$ 300 million, several thousand tons biomass) market in the salmon aquaculture industry. However, this market requires that current production costs and prices be reduced by an order of magnitude, to about \$10/kg of algal biomass (or about \$1,000/kg of astaxanthin, plant gate). An even larger potential market exists for microalgae as bulk aquaculture feeds to replace fish meal and oil, but production costs must be reduced to or below \$1/kg of dried biomass. This presentation will review the advances in this field over the past twenty years (see Benemann, J.R., "Microalgae Aquaculture Feeds, J. App. Phycology, 4: 233 - 245, 1992), outline the current state-of-the art, and project the mid-term potential of microalgae feeds in the aquaculture industry. The key to the future of this industry will be the development of very low-cost algal cultivation, harvesting and drying technologies. A recently completed, detailed techno-economic analysis of microalgal biomass production will be reviewed. Aquaculture feeds provide a pathway to the development of a much larger microalgae industry than currently supported by microalgae nutritional products, with more favorable economics than for other animal feeds or biofuels.

3.1.5 Astaxanthin production from *Haematococcus pluvialis* using photobioreactors

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Keywords: *Haematococcus pluvialis*, astaxanthin, photobioreactor

Abstract:

An integrated approach of astaxanthin production from the microalgae *Haematococcus pluvialis* was tested to determine its industrial feasibility using vertical and horizontal photobioreactors placed outdoors in Azores, Portugal (temperate maritime weather) from December 2009 to February 2010. The culture media utilized was made from common fertilizers and proved to be very effective. Various parameters as pH, dissolved oxygen, temperature and fluorescence were measured daily to assess the state of the culture. Biomass and astaxanthin concentration were calculated regularly. Biomass and astaxanthin productivity observed in this trial were substantially higher when compared to other studies done in similar conditions, suggesting that the methodology applied in the present study is effective and an interesting solution for industrial production of astaxanthin.

ASTAXANTHIN PRODUCTION FROM *HAEMOTOCOCCUS PLUVIALIS* USING PHOTOBIOREACTORS

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