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Studies on Growth of Marine Microalgae in Batch Cultures: II. *Isochrysis galbana* (Haptophyta)

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Abstract: In this study, growth of *Isochrysis galbana* in batch algal culture was investigated in relation to some physical and chemical factors. For this purpose, batch culture of *I. galbana* was prepared in sea water and were kept under four combinations of light regime and carbondioxide supply. Three salinity levels, 25, 30 and 35‰ S were employed. Growth of the alga in culture varied with respect to number of individuals and size of maxima under different culture conditions. *I. galbana* showed better growth in the culture that was kept under 12 h illumination and 24 h of carbondioxide supply.

Key words: *Isochrysis galbana,* Haptophyta, batch culture

INTRODUCTION

Use of phytoplankton in aquaculture consists of culturing pure strains of selected microscobic algae. More than 40 different species of microscobic algae so far have been isolated that are extensively used in fish production systems. *Isochrysis galbana* (Haptophyta) is one of the most frequently used marine microalga in aquaculture[1-3]. Several studies have been carried out on the growth of *I. galbana* in cultures[4-6] and most of these studies were concerned mainly with growth of *I. galbana* in relation to different salinities and nutrient concentrations.

Salinity, nutrient concentrations, light, temperature and carbon source are generally considered as the most important parameters for culturing marine microalgae. This study was aimed to investigate the response of *I. galbana* to various culture conditions. For this purpose the influence of salinity, light duration and CO_2 on growth of *I. galbana* was investigated in batch culture.

MATERIALS AND METHODS

Materials and methods has been given by Sen *et al.*[7] in the studies on growth of marine microalgae in batch cultures I. *Chlorella vulgaris*.

RESULTS

As seen from the Fig. 1-4 the alga displayed similar growth patterns in all cultures kept under different conditions. Cell numbers of the alga remained almost unchanged during 1-5 days (lag phase). The alga then

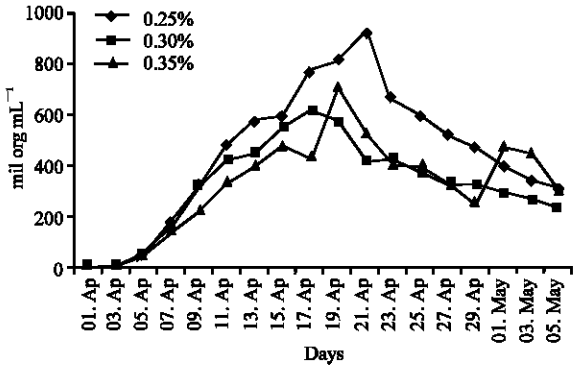

Fig. 1: Growth of *I. galbana* in culture with 24 h illumination and 24 h CO_2 supply at 25, 30 and 35‰ S

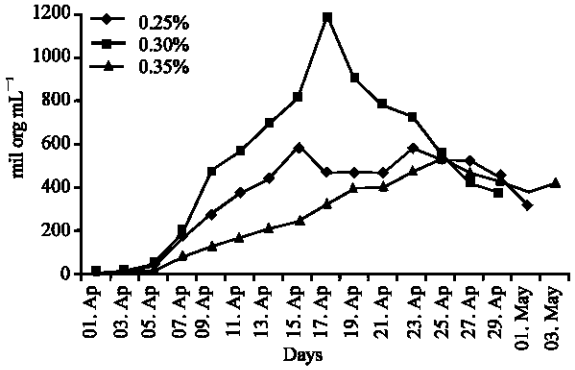

Fig. 2: Growth of *I. galbana* in culture with 24 h illumination and 12 h CO_2 supply at 25, 30 and 35‰ S

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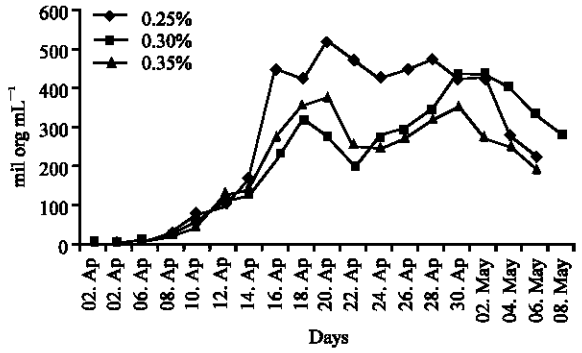

Fig. 3: Growth of *I. galbana* in culture with 12 h illumination and 24 h CO_2 supply at 25, 30 and 35‰ S

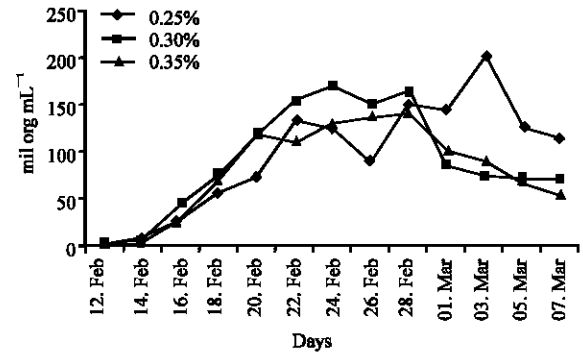

Fig. 4: Growth of *I. galbana* in culture with 24 h illumination with no CO_2 supply at 25, 30 and 35‰ S

started to increase in cell numbers and continued to increase until a maximum was reached. This active multiplication phase usually started on 4th or 5th day and lasted for 15-25 days according to the culture conditions. Cell numbers always decreased rapidly after all maxima.

I. galbana reached to a maximum of 925×10^6 cells mL^{-1} on 21st day in culture under continuous illumination and CO_2 supply at 25‰ S. A maximum of 625×10^6 cells mL^{-1} at 30‰ S and a maximum of 700×10^6 cells mL^{-1} at 35% S occurred on 17th and 19th days, respectively (Fig. 1).

In cultures with 24 h illumination and 12 h CO_2 supply maximum cell densities for 25, 30 and 35‰ S were 600×10^6, 1200×10^6 and 520×10^6 cells mL^{-1}, respectively (Fig. 2).

Cultures kept under 12 h illumination and 24 h CO_2 supply, maximum cell numbers of 520×10^6, 420×10^6 and 380×10^6 cells mL^{-1} were recorded at 25, 30 and 35‰ S, respectively (Fig. 3).

In cultures with 24 h illumination and without CO_2 maxima at 25, 30 and 35‰ S occurred in the order of 190×10^6, 160×10^6 and 140×10^6 cells mL^{-1} (Fig. 4).

DISCUSSION

Of all, best growth of *I. galbana* occurred in the culture subjected to 24 h illumination and 12 h CO_2 supply at 30‰ S since under these conditions maximum cell numbers were reached in a shorter time and the size of the maximum was by far greater than those recorded in other cultures with different conditions. This may indicate that continuous illumination strongly supported the growth of the alga in the present study.

In addition, 25 and 30‰ S levels appeared to be more suitable for the growth of the alga than 35‰ S. Thus the present study supported in part the finding of Laing and Utting[5] who found optimal salinity ranges medium prepared from artificial sea water to be 15-25‰ S for the growth of *I. galbana*. The present finding is also partly in harmony with the study of Fabregas *et al.*[8] who found salinity and nutrient concentration to be closely related to the growth of *I. galbana* emphasizing optimal growth were between 15-35‰ S. In addition, lower growth of *I. galbana* was also reported to be related to an increase in salinity from 31 to 36‰ S[5].

The growth of the alga was observed to be poorest in the culture with no CO_2 supply despite continuous illimunation. This finding may show how CO_2 supply can affect the growth of the alga. Fabregas *et al.*[8] also reported that an increase in the nutrient concentration did not produce an increase in biomass production but CO_2 added to the cultures increased the final biomass production of the alga in the culture of another marine alga *Tetraselmis suecica*. This also holds true for *I. galbana* in this study.

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