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Studies on Growth of Marine Microalgae in Batch Cultures: IV. *Tetraselmis suecica* (Kylin) Butcher (Prasinophyta)

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Abstract: In this study, growth of *T. suecica* in batch algal culture was investigated in relation to some physical and chemical factors. For this purpose, batch culture of *T. suecica* was prepared in sea water and the cultures 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. *Tetraselmis suecica* showed better growth in cultures that was kept under 24 h illumination and 24 h of carbondioxide supply.

Key words: *Tetraselmis suecica,* Prasinophyta, batch culture

INTRODUCTION

Microorganisms are potentially useful in aquaculture, in the production of chemicals and as food and *T. suecica* Kylin (Butch) is one of the widely used marine algae in aquaculture[1-3]. Several studies related to effects of various parameters on the growth of *T. suecica* in culture were carried out. Influence of salinity on the production of *T. suecica* was emphasized by Laing and Utting[3]. Some of the parameters for mass production in order to obtain maximum growth velocity and cellular density were established by Fabregas *et al.*[4,5] which also studied mass culture and biochemical variability of *T. suecica* and they reported that great variability in chemical composition and growth of *T. suecica* in mass culture was closely coupled to changes in nutrient concentrations.

T. suecica is known to have the ability to grow in a wide range of nutrient concentrations and salinity conditions in batch cultures. The present work was carried out in order to observe the response of the alga in a batch culture subjected to different light regimes, CO_2 supply and salinity levels.

MATERIALS AND METHODS

Materials and methods has been given by Sen *et al.*[6] in the studies on growth of marine microalgae in batch cultures I. *Chlorella vulgaris*.

RESULTS AND DISCUSSION

The results shows that the alga displayed similar growth patterns in four experiments carried out in this study. Cell numbers of the alga remained almost unchanged during 1st-3rd days (lag phase) in first two experiments. However, lag phase lasted much longer (12 days) in the experiment in that the alga was subjected to 12 h illumination and 24 h CO_2 supply. The alga then started to increase in cell numbers and continued to increase until a maximum was reached. This active multiplication phase usually lasted for 20-25 days according to the culture conditions. Cell numbers always decreased rapidly after all maxima.

T. suecica reached to a maximum of $95x10^6$ cells mL^{-1} on 15th day in culture kept under continuous illumination and CO_2 supply at 25‰ S. Under the same conditions a maximum of $80x10^6$ cells mL^{-1} at 30‰ S and a maximum of $58x10^6$ cells mL^{-1} at 35‰ S occurred on 25th an 19th days, respectively (Fig. 1).

In experiment with 24 h illumination and 12 h CO_2 supply maximum cell densities at 25, 30 and 35‰ S were $78x10^6$, $54x10^6$ and $52x10^6$ cells mL^{-1}, respectively (Fig. 2).

Cultures kept under 12 h illumination and 24 h CO_2 supply, maximum cell numbers of $62x10^6$, $70x10^6$ and $77x10^6$ cells mL^{-1} were recorded at 25, 30 and 35‰ S, respectively (Fig. 3).

It is hard to mention any growth pattern of the alga in experiment in that the alga was subjected to 24 h illumination and without CO_2 supply since cell numbers did not increase and/or remained almost unchanged during this experiment. Cell numbers at 25, 30 and 35‰ S occurred in the order of $11.5x10^6$, $12x10^6$ and $9.5x10^6$ cells mL^{-1} (Fig. 4).

Of all, best growth of *T. suecica* occurred in the culture subjected to 24 h illumination and 24 h CO_2 supply at 25‰ S since maximum cell numbers was

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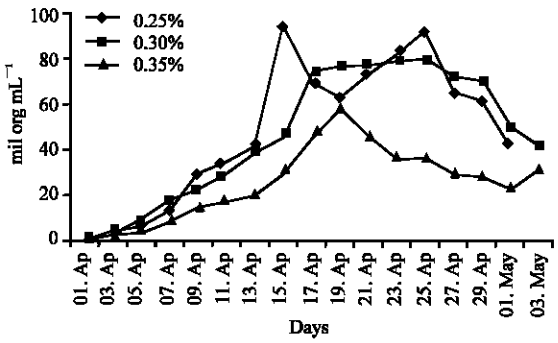

Fig. 1: Growth of *T. suecica* in culture with 24 h illumination and 24 h CO_2 supply at 25, 30 and 35‰ S

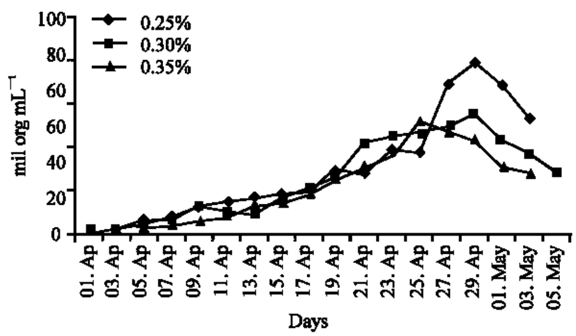

Fig. 2: Growth of *T. suecica* in culture with 24 h illumination and 12 h CO_2 supply at 25, 30 and 35‰ S

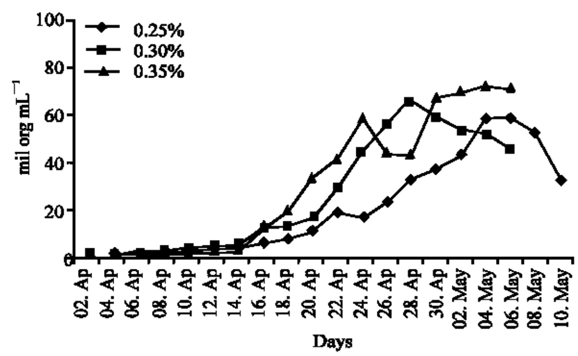

Fig. 3: Growth of *T. suecica* in culture with 12 h illumination and 24 h CO_2 supply at 25, 30 and 35‰ S

reached in a shorter time and the size of the maximum was by far greater than those recorded in other experiments with different conditions. Taking this finding into consideration it may be suggested that continuous illumination and CO_2 supply strongly support the growth of the alga.

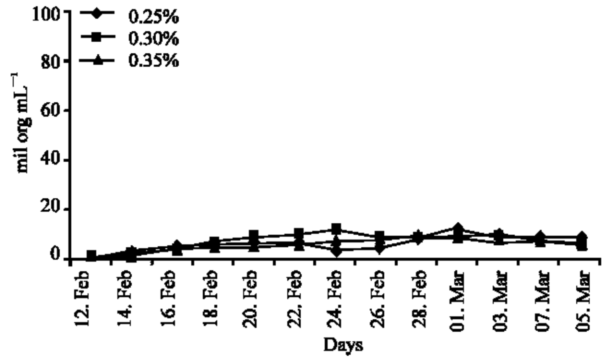

Fig. 4: Growth of *T. suecica* in culture with 24 h illumination with no CO_2 supply at 25, 30 and 35‰ S

Considering such low cell numbers of the alga in culture without CO_2 supply one may suggest that the alga was not able to grow in the absence of CO_2. The growth of the alga was observed to be poorest in the culture with no CO_2 supply despite continuous illumination. This finding supports Fabregas *et al.*[4] who 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 *T. suecica* in the culture.

The levels of 25 and 30‰ S appeared to be more suitable for the growth of the alga than 35‰ S in this study. This finding were in harmony with the study of Fabregas *et al.*[4] who found salinity and nutrient concentration to be closely related to the growth of *T. suecica* since optimal growth of the alga was between 15-35‰ S. This study partly supported Laing and Utting[3] who reported that lower growth of *T. suecica* was to be related to an increase in salinity from 31 to 36‰. The present study also supported the finding of Laing and Utting[3]. Who found optimal salinity ranges in medium prepared from artificial sea water to be 25-30‰ S for *T. suecica*.

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