

VI. SUMMARY

SUMMARY

The investigation " A study on the mineral nutrition and biochemistry of some freshwater phytoplankters" is an attempt to expound the importance of certain macro and micronutrients on the growth and physiological activities of three selected freshwater phytoplankters. The nutrients selected for the study were phosphorus, calcium, magnesium (macronutrients), iron, manganese and zinc (micronutrients) and the algal species selected as the test organisms include three Chlorophycean members viz. *Chlorococcum humicola*, (Naeg.) Rabenhorst, *Chlorella ellipsoidea*, Gerneck and *Scenedesmus bijuga*, (Turp.) Lagerheim. An effort has also been made to determine the optimum concentration of these nutrients that would support maximum growth of the organisms under study.

The experimental algae were isolated by serial dilution technique from the water sample of a freshwater pond. The mother cultures of three

algae were raised in Ward and Parish medium and maintained in the logarithmic growth phase of the life-cycle.

In order to determine the optimum requirements of nutrients, each algal species was treated separately with varying concentrations of the concerned element. The different parameters like cell number, productivity, quantitative estimation of pigment, carbohydrate and protein were analysed regularly for a period of 21 days and compared with those of control cultures raised in the absence of the particular element. The results obtained in each experiment analysed statistically and discussed with the help of available literature.

For elucidating the requirement of phosphorus, the unialgal cultures were exposed to different levels of phosphorus as 0.06 ppm, 0.12 ppm, 0.24 ppm, 0.48 ppm and 0.96 ppm. It was found that 0.24 ppm P favoured maximum growth in the three algal species. Reduced cell number and productivity, an initial increase in the chlorophyll and carbohydrate content and decreased protein content in P-deficit cells of the control may be suggested as the symptoms of P-deficiency.

Different concentrations of calcium used for the treatment were 0.4 ppm, 0.8 ppm, 1.6 ppm, 3.2 ppm and 6.4 ppm. Results of the study revealed 1.6 ppm Ca as the more favouring concentration for maximum output of *Chlorococcum humicola*, (Naeg.) Rabenhorst, while 0.8 ppm Ca was found to be beneficial for *Chlorella ellipsoidea*, Gerneck and *Scenedesmus*

bijuga, (Turp.) Lagerheim. Much reduced growth was noticed in Ca-deficient cells of control.

With regard to magnesium, of the range of 0.365 ppm, 0.73 ppm, 1.46 ppm, 2.9 ppm and 5.8 ppm used, 2.9 ppm Mg was found to be inducing maximum growth responses in *Chlorococcum humicola*, (Naeg.) Rabenhorst and *Scenedesmus bijuga*, (Turp.) Lagerheim. *Chlorella ellipsoidea*, Gerneck showed an optimum requirement of 1.46 ppm Mg for its abundant growth. The lessened growth responses in control, devoid of magnesium, highlight the necessity of this element in the metabolism of the test organisms.

The study conducted also confirms the importance of trace elements iron, manganese and zinc in various life processes of the experimental algae. Of different concentrations of iron (0.0075 ppm, 0.015 ppm, 0.03 ppm, 0.06 ppm and 0.12 ppm) applied, 0.0075 ppm Fe stimulated the growth of *Chlorococcum humicola*, (Naeg.) Rabenhorst to a greater extent. *Chlorella ellipsoidea*, Gerneck and *Scenedesmus bijuga*, (Turp.) Lagerheim responded well in 0.015 ppm Fe.

0.07 ppm Mn was found to be optimum for *Chlorococcum humicola*, (Naeg.) Rabenhorst. *Chlorella ellipsoidea*, Gerneck and *Scenedesmus bijuga*, (Turp.) Lagerheim showed maximum growth responses in the treatments 0.035 ppm and 0.07 ppm Mn. The concentrations of manganese used were 0.0175 ppm, 0.035 ppm, 0.07 ppm, 0.14 ppm and 0.28 ppm and the control was raised in Mn-deficient medium.

In order to ascertain the optimum zinc requirement, the cells of *Chlorococcum humicola*, (Naeg.) Rabenhorst were subjected to a series of zinc concentrations viz. 0.02 ppm, 0.04 ppm, 0.06 ppm, 0.08 ppm and 0.1 ppm. 0.04 ppm and 0.06 ppm Zn appeared to be stimulatory to its growth. Excess amount of this element as well as its complete absence resulted in an adverse effect on the organism. On exposure to 0.02 ppm, 0.04 ppm, 0.08 ppm, 0.15 ppm and 0.3 ppm Zn, *Chlorella ellipsoidea*, Gerneck provided maximum growth in concentrations 0.04 ppm and 0.08 ppm. When the cells of *Scenedesmus bijuga*, (Turp.) Lagerheim were treated with 0.02 ppm, 0.04 ppm, 0.06 ppm, 0.08 ppm, 0.1 ppm and 0.3 ppm Zn, the concentrations 0.06 ppm and 0.08 ppm were found to be favouring the algal growth in different stages of life-cycle.

The observations reveal that all the studied elements, P, Ca, Mg, Fe, Mn and Zn are essential for the normal growth and metabolism of the test algae. Among the different elements, algal growth was found to be greatly influenced by phosphorus. The optimum concentrations of these nutrients for adequate growth of microalgae were found to be varying with the species. The adverse effect of all the nutrients beyond their respective optimum concentration was also noticed in the present investigation. Based on the current observations, an attempt has been made to modify the composition of Ward and Parish medium as suitable to each algal species (pp. 25-27).

