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Effect of some nutrients and their combinations on the growth of *Ankistrodesmus falcatus*

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INTRODUCTION.

The purpose of this work is to investigate some algal nutrient relationships. The regression coefficient was used as a measureof the relationship between two dependants or more excluding the influence of a certain number of other physical and chemical factors which might simultaneously affect the variables considered. This paper is dealing with the effect of N, P, Fe and their intereffects on the growth of Ankistrodesmus falcatus var. mirabile W.& G.S. West.

MATERIAL AND METHODS.

The alga was cultured in modified Chu 10 solution, by adding the cations as chloride salts and the anionsas sodium salts (Chu,1942). The complementary effect of the three variables was evaluated by applying central-composite rotatable design (Cochran & Cox,1957) where each factor varied at 5 levels (-1.682, -1, 0, +1, +1.682). The scale of neutral variable change was chosen to be logarithmic,so the real element concentration was as follows: N(0.5, 1, 3, 9, 19 mg/l), P(0.214, 0.4, 1, 2.5, 4.67 mg/l), Fe (0.053, 0.1, 0.253, 0.64, 1.21mg/l Experiments were performed in triplicates. Cultures were grown in incubator at light intensity 5 K lux and temperature of 25 ± 1 °C.

RESULTS AND DISCUSSION.

Equations (1-4) represent the regression models describing the dependence of culture growth (Y) cell/ml on the different concentration levels of N, P, and Fe for the different days of experiment.

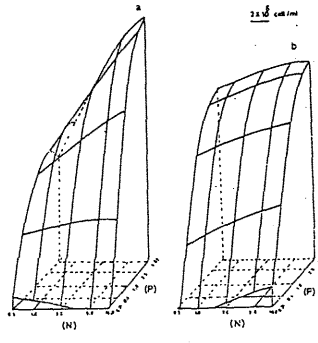
$$Y_4.10^6 = 8623 + 797\,X_N - 121\,X_P - 126\,X_{PF} - 1618\,X_N^2 - 643\,X_P^2 - 665\,X_F^2 \quad (1)$$

$$Y_6.10^6 = 14929 + 2485\,X_N - 403\,X_{NF} - 935\,X_{NPF} - 3067\,X_N^2 - 1483\,X_P^2 - 867\,X_F^2 \quad (2)$$

$$Y_8.10^6 = 16811 + 6003\,X_N + 1642\,X_P + 818\,X_{NP} - 562\,X_{PF} - 926\,X_{NPF} - 1981\,X_N^2 - 131\,X_P^2 - 667\,X_F^2 \quad (3)$$

$$Y_{10}.10^6 = 18133 + 7992\,X_N + 1386\,X_P + 1097\,X_{NP} - 1168\,X_N^2 - 1308\,X_P^2 - 693\,X_F^2 \quad (4)$$

For the second day of growth (Y_2), it was not possible to obtain adequate model. This may be attributed to the lag phase of growth during that time. The analysis of data showed that, allover the time of experiment, cultures were mainly affected by the simple linear regression effect of N. The effects of P and Fe were missed during some days of growth. This does not mean that at that particular time,P or Fe has no effect on algal growth,their effect can be easily detected through their intereffect for either one with the other or with N. Cultures were also affected by 2 unlike intereffects, the positive intereffect of N with P and the negative one of P with Fe. The synergistic effect of simultaneous N and P addition on culture growth has been discussed by several authors (Gatham & Rhee,1981 a,b ;Abdalla,1986), increasing nitrate concentration in culture media stimulates both N and P uptake by algal cells, establishing different amounts of cell N and P needed for cell division. The natural intereffect of P with Fe on algal growth is positive (Abdalla,1986;Abdalla et al.,1986).The unexpected negative nature in our case can be attributed to the fact that the concentration level for P and Fe used in this experiments was too high compared with the levels used in the previous mentioned papers. From the chemical point of view, in alkaline medium, the unchelated ferric ion,when the phosphate at a high level,enhances the formation of unsoluble ferric phosphate, lowering iron concentration, which negatively affects culture growth. The results of the present investigation show that the influence of variables acting together (interaction effects) are more important in understanding the dependence of culture growth on the concentration levels of nitrogen, phosphorus and iron.The relationship between algal growth and the concentration of N and P at the 8th day of growth is illustrated in Fig.a, where iron is at a level of (-1)0.1mg/l while Fig.b represents the same relationship when iron at the higher level (+1) 0.64 mg/l.



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