P-II10

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 $\pm 1\,^{\circ}C$.

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.

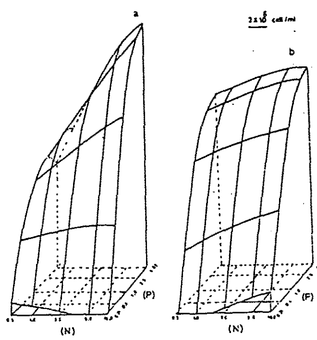
$$Y_4 . 10^6 = 8623 + 797\,X_N - 121\,X_F - 126\,X_{PF} - 1618\,X_N 2 - 643\,X_P 2 - 665\,X_F 2 \quad (1)$$

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

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

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

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.



REFERENCES.

Abdalla,R.R.,1986. The combined effect of nitrogen,phosphorus and iron on the growth of Selenastrum gracile Reinsch. Aquatic Botany, 23, 371-381.

Abdalla, R.R., Samaan,A.A. and El-Sherif, Z.M.,1986. Effect of some nutrients and their combinations on the growth of Nitzchia palea (Kutz) W.Sm. Rapp. Comm.Int. Mer. Médit. 30 (2). 189. (condensé des travaux).

Chu, S.P.,1942. The influence of mineral composition of the medium on the growth of planktonic algae. J.Ecol., 30: 284-325.

Cochran,W.G. and Cox,G.M.,1957. Experimental Designs. 2nd end. Wiley Publication in Applied Statistics, Wiley, New York.

Gotham,I.J. and Rhee,G-Y.,1981 a. Comparative kinetic studies of phosphate limited growth and phosphate uptake in phytoplankton in continuous culture. J.Phycol., 17: 257-265.

Gotham,I.J. and Rhee,G-Y.,1981 b. Comparative kinetic studies of nitrate limited growth and nitrate uptake in phytoplankton in continuous culture. J.Phycol., 17: 309-314.

P-II11

The winter Phytoplankton of the North Suez Canal, January 1990

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Phytoplankton as well as other organisms of the Suez Canal in general and Port Said in particular, is attractive to the marine biologists. The importance of Port Said area comes from being the northern entrance of the Suez Canal, the biota of which is affected by the northward current passing the Canal from October to July and reaching its maximum in winter (MORCOS, 1967). Such current carries the plankton organisms from the Indo-pacific Red Sea habitat to the Atlanto-Mediterranean habitat, and though facilitates the immigration of species between the two habitats.

During January 1990, samples were collected from 7 stations distributed inside the Canal, in the Harbour and outside the Harbour. Qualitative samples were collected by oblique hauling of a fine net with 55 µm mesh size, and the quantitative samples (one litre each) were collected from the surface water by Niskin bottle.

The winter (January) phytoplankton of Port Said was composed of 73 taxa of diatoms and 64 taxa of dinoflagellates. Remarkable number were neritic or littoral. The phytoplankton community was dominated by the diatoms: Nitzschia delicatissima, Lithodesmium undulatum, Chaetoceros curvisetum, Ch. decipiens, Leptocylindrus danicus, Rhizosolenia stolterfothii, Thalassiothrix frauenfeldii, Coscinodiscus gigas and Cyclotella meneghiniana. Some of dinoflagellates were common such as Ceratium furca, C. lineatum, C. egyptiacum and Protoperidinium cerasus. Several brackish and fresh water forms were observed in the area possibly transferred from the adjacent Lake Manzalah. The distribution pattern of phytoplankton species in Port Said showed obvious homogeny among the stations, but with different abundances. Such homogeny is attributed to the current regime in the Canal during winter (DOWIDAR, 1976).

In the water samples, the standing crop varied between 30636 cells l^{-1} and 890000 cells l^{-1} with an average of 349275 cells l^{-1}. The lowest crop was observed at the proper Mediterranean stations, while the highest crop was found near the inlet of the brackish water to the Canal. The leading species of the standing crop were Nitzschia delicatissima forming 36-71% of the total crop, Skeletonema costatum (5-25%), Cyclotella meneghiniana (18-19%) and Leptocylindrus danicus (5-7%).

The species composition and the standing crop of phytoplankton in Port Said varied significantly from those recorded by DORGHAM (1974) and DOWIDAR (1976). These variations are related to changes in factors acting in the Canal during the past two decades, such as increase of oil pollution and water disturbance due to the ship movements in the Canal and the widening processes of the Canal.

The most characteristic feature of the winter phytoplankton was the existence of several species, which were recorded by HALIM (1970) and DOWIDAR (1976) as Red Sea immigrants, namely; Coscinodiscus gigas, Biddulphia sinensis, Ceratium breve and C. egyptiacum in addition to Rhizosolenia shrubsolei, R. alata, R. calcar-avis and Guinardia flaccida, which might be also Red Sea immigrants, particularly in winter. Moreover, other Indo-pacific forms such as Hemidiscus hardmanianus, Ceratium schmidtii, C. lineatum, C. recurvatum, Protoperidinium ovatum and P. conicum v. assamushii were not recorded previously in the study area or in the eastern Mediterranean. Some of these species were found in significant density in the net samples. Therefore, they may be regarded as immigrants from the Red Sea. STEINITZ (1968) stated that introduction of individuals of species already represented in the involved area is immigration at least from the numerical point of view.

REFERENCES

DORGHAM, M.M., 1974. The plankton diatoms of Port Said area. M.Sc.Thesis, Alexandria Univ., Egypt.

DOWIDAR, N.M., 1976. The phytoplankton of the Suez Canal, Acta Adriatica, 18(14) : 241-256.

HALIM, Y., 1970. Microplancton des eaux égyptiennes. III. Espèces indo-pacifiques ou érythréennes à l'extrême nord du Canal de Suez. Journées Etud.Planctonol., Rapp. Comm. int. Mer. Médit. : 57-59.

MORCOS, S.A., 1967. Effect of the Aswan High Dam on the current regime in the Suez Canal. Nature, 214(5991) : 901-902.

STEINITZ, H., 1968. Remarks on the Suez Canal as pathway and as habitat. Rapp. Comm. int. Mer. Médit., 19(2) : 139-141.