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Title: **Special carbon requirement of Spirulina platensis cultures.**

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By the industrial cultivation of blue-green algae, there very much appears the important question about their carbon nutrition.

Spirulina grows within the range of pH value of medium of 8.5 - 11.0. In this range of pH value in the culture medium CO_2 is present in the form of bicarbonate and carbonate, which serves as principal source of carbon for the present type of algae. Consequently in the literature there is no information about the influence of the pH of the medium, and the form of carbon components of the medium, on the rate-increase of Spirulina.

We were conducting investigations into the influence of some pH values of medium on the rate-increase of the alga Spirulina platensis.

Spirulina developed in glass bubbling cultivation with a "work-volume" of 200 ml in conditions of illumination with fluorescent illumination lamps (17 KlK [Klux]) and temperature range of 26-32°C.

They were composed of experiments with media of pH 9, 10, 11, so that in each of their initial concentration of carbon they were identical (500 mg/L). Consequently, the potential growth of the biomass as far as carbon is concerned must be idential and only the correlated forms of carbon in the medium different:-

for pH 9 $\frac{NaHCO_3}{Na_2CO_3} = 0.95$

pH 10 $\frac{NaHCO_3}{Na_2CO_3} = 0.65$

pH 11 $\frac{NaHCO_3}{Na_2CO_3} = 0.15$

The given values of pH in all variations were maintained by hourly titration in the suspension by sulphuric acid. The correct pH in the media in the

current experiments was maintained by the constant correlation of forms of carbon but there was a situation for removing the absolute amount of carbpn-containing anious, interchanging these in the process by a correction with ions of SO_4^{2-}.

The results of the experiment showed that for pH 11 the rate-increase for algae observed was less (430 mg/L) than for pH 9 and 10.

From the starting point obtained here it is possible to propose that Spirulina utilizes carbon preferably in the form of bicarbonate.

In the experiments with pH 9 and 10 the content of carbon in the medium has about 500 mg/L.If one takes into account that the content of carbon in the dry biomass is about 45%, then the maximum possible yield in these experiments constitutes approximately 1110 mg/L total dry biomass. We notice that by pH 9 the growth increase constitutes 1150 mg/L but at pH 10 at 1110 mg/L, that is, that carbon from the medium in both variations of the experiment was completely consumed in the culture. In the photo-synthetic process of the culture there takes place a constant consumption of the HCO_3^- ions from the medium, while sodium practically is not consumed by Spirulina. Therefore there takes place a continuous alkalization of the medium. Simultaneously ions of bicarbonate particularly are converted into ions of carbonate. The change results in a correlation of bicarbonate and carbonate ions and displacement of pH of the medium in the whole region.

The rate of displacement of pH in the cultural medium will depend on the intensity of absorption by the cells of HCO_3^- from the solution, which will determine the activity of the biosynthetic processes of the algal cells. The more intensive the process of the synthesis in the cells is, the higher the rate of consumption of HCO_3^- and the change of the pH of the medium.

In such a manner, from the rate of change of pH of the suspension can be calculated the function of the intensity of the biosynthesis in the cultures.

For maintaining the concentration of bicarbonate in constant level it is necessary to compensate for the loss of carbon, adding in the suspension CO_2. For this there will be carried out simultaneously a correction of pH of the medium and maintaining a fixed concentration of CO_3^{2-} and HCO_3^-.

For maintaining in the culture medium constant concentration of carbon we had to create and test a system that automatically regulated and maintained pH in the suspension, which carried out automatic delivery of

carbonic CO_2 acid by an alarm signal monitor unit of automatically controlled pH. In the system comes a solenoid valve connecting the CO_2 master (supply) to the suspension, an apparatus, feeding a signal to switch on and off this valve depending on the pH of the suspension. The consumption flow rate of CO_2 along the valve is registered by a gas meter. The amount of CO_2, that passes through the suspension in a unit time, makes it possible to estimate the intensity of the photosynthetic process in Spirulina cultures.

Notice

Please note that these translations were produced to assist the scientific staff of the FBA (Freshwater Biological Association) in their research. These translations were done by scientific staff with relevant language skills and not by professional translators.