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A simple method for the cultivation of algae *Chlorella vulgaris* (Bejerinck)

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Abstract. Original data about on development of culture medium and selection of optimal cultivation conditions for the alga *Chlorella vulgaris* Beijerinck are presented. The most favorable conditions for algae growth were daylight, temperature 25° C and rotation at the speed 100 rpm. The most effective culture medium was of the Bold basal medium with the addition of vitamins thiamine, cyanocobalamin and soil extract.

1. Introduction

Chlorella vulgaris is one of the most commercially used species of algae [1]. This alga has a stimulating effect on the growth of agricultural plants [2] and is also able to suppress the development of pathogenic microorganisms [3]. To obtain biomass chlorella in the shortest time it is necessary to develop optimal methods for its cultivation. The aim of the study was to assess the effect of various cultivation conditions on the growth of algae and to develop a simple cost-effective method of its production.

2. Method

In study algological and biotechnological methods were used. In experiment authentic strain of *Chlorella vulgaris* BCAC 76 was used. For developing a modified recipe of culture medium Bold's liquid medium [4] with the addition of soil extract and / or vitamins (B₁ - thiamine and B₁₂ - cyanocobalamin) were tested. In experiments for identification of optimal cultivation conditions Bold's medium was placed in the required conditions: in refrigerator at +4 ° C Birusa 460 H-1, heating to 25°C without stirring, a mixed device at 100 rpm without heating, under a daylight, under a phytolamp and under a lighting equipment during the light and dark phases of 12:12 h. To assess the influence of conditions two parameters were used: the concentration of cells in 1 ml of suspension (using a Goryaev camera), and the optical density of the suspension (using a KFK-3-01 concentration photocolimeter).

3. Results and discussion

It was found that the combination of Bold's medium with vitamins and soil extract leads to a significant increase in the optical density of *Chlorella vulgaris*. Therefore, this variant of the culture medium is most effective in obtaining large volumes of a suspension of algae. The microalgae productivity was also determined based on the optical density of the suspension at a wavelength of 670 nm. The highest productivity of *Chlorella* is achieved on the 12th day of cultivation with a combination of Bold's medium with vitamins and soil extract.

During the experiment on estimation the optimal temperature for the cultivation of algae, the maximum increase in biomass was observed when the suspension was heated to 25° C. Based on the literature data, as well as the results of our experiment, we can conclude that low temperatures negatively affect the growth and development of *Chlorella*. Cultivation at room temperature showed

low rates of increase in algae biomass. Thus, to increase the productivity of a suspension of algae, it is necessary to create favorable temperature conditions to 25° C.

In the experiments of influence of the different illumination on *Chlorella* cultivation, it was found that maintaining the natural illumination (daylight) is optimal, which allows the microalgae to achieve maximum growth on the 12th day of cultivation. A relatively small increase in biomass was also shown by cultivation under lighting with a phytolamp.

Another indicator that affects the growth of algae is mixing, during which the movement of cell masses occurs in order to prevent their agglomeration. The results of the experiment showed that mixing at 100 rpm has a positive effect on the growth of algae.

Calculating the growth rate of the algae population under culture conditions revealed that the highest growth rate was observed under conditions of a combination of Bold medium with vitamins and soil extract, as well as algae that were cultivated with stirring and heating showed a good rate also. The lowest growth rate was recorded in algae, which were cultivated in the refrigerator (Table 1).

Table 1 *Chlorella vulgaris* growth rate under various conditions

Condition	Bold medium + vitamins	Bold medium + soil extract	Bold medium + vitamins + soil extract	In refrigerator at 4°C	Under the phytolamp	Under a lighting equipment	Heating to 25°C	Mixing at 100 rpm
Growth rate μ	0,132	0,134	0,152	0,024	0,058	0,046	0,114	0,173

4. Conclusion

Thus, the proposed method of cultivating *Chlorella vulgaris* allows you to increase the growth rate of algae without the use of expensive equipment and is cost-effective. This method will be used for creation the biopesticide and growth stimulators on the basis *Chlorella* biomass.

References

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