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Spirulina: Growth in Continuous and Batch Bioreactors and Response to Stress Conditions

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1. INTRODUCTION

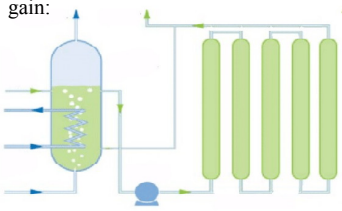
Spirulina platensis is a cyanobacterium with high biotechnological potential. *Spirulina* can be obtained both from natural reservoirs and artificially grown in bioreactors of various types and volumes. An important economic indicator of the process is an increase in the yield of biomass and a decrease in the cost of its production. For example, avoiding the need to cultivate spirulina at elevated temperatures with at least equal biomass yield.
Worldwide consumption of spirulina is increasing.
Global environmental pollution raises the question of *Spirulina's* resistance to stress contaminants.

2. The purpose of this work

is to develop methods for cultivating *Spirulina platensis* in two bioreactors, continuous and batch ones, and to assess the resistance of *Spirulina* cells to environmental stress caused by the presence of household chemicals.

3. Comparison of the technologies

Fully automatic cultivation and harvesting technology with precise control of all key parameters for the most intensive biomass gain:



-temperature control
-pH control
-salt control
-light control
-CO2 control
-control of surface contamination of photosynthesis
-quality control of recovered effluents

OPEN TYPE	CLOSED TYPE
Required site	Required site
Large	Compact
Water loss	Water loss
High	Low
CO2 loss	CO_2 loss
High	Low
O_2 content	O_2 content
Low	High, requires a separation unit
Temperature	Temperature
Strongly variable ± 10..18^{0}C	Stable ± 1..2^{0}C
Risk of infection	Risk of infection
High	Low
Manual labor	Manual labor
High	Minimum

Interesting!

The surprising observation is the positive effect of some laundry detergents on the growth of *Spirulina*. However, the effect depends on the composition of the substances used. The fact that toothpaste has a growth inhibitory effect on *Spirulina's* cells is not surprising, as most of toothpastes are expected to have antibacterial effects
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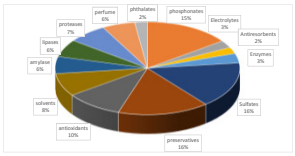
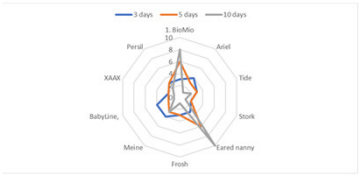
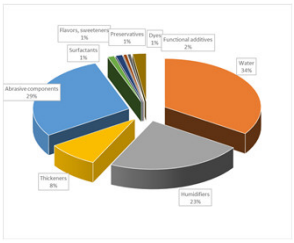
4. Influence of household chemicals at *Spirulina* viability



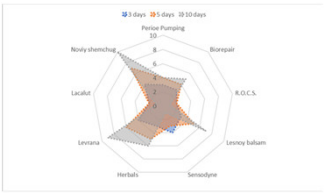
Averaged structure of laundry powder compositions on the Russian market, %



Petal diagram of the growth and death of *Spirulina* under the influence of the chemical compositions of laundry powders



Averaged composition of toothpastes compositions on the Russian market, %



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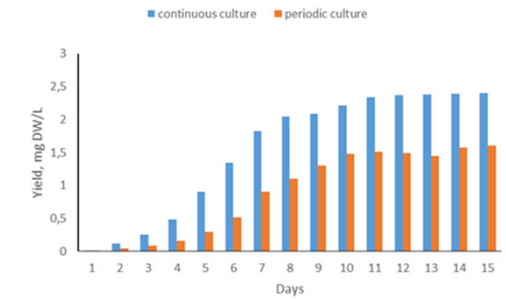

The productivity of *Spirulina* growing in a photobioreactor of continuous and batch cultivation.

5. Conclusion

This work was carried out within the framework of a project for the development of modern technologies for mass cultivation of microalgae for the needs of the food, pharmacological, perfumery, agricultural and other types of industries using a model photosynthetic bioreactor of continuous action. This work presents the results of cultivating *Spirulina* in a continuous phytobioreactor with an additional supply of carbon dioxide, which removes some disadvantages of periodic cultivation.

References

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