Effects of low doses of short-term gamma radiation on growth and photosynthetic activity of *Cyanidioschyzon merolae*

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INTRODUCTION

Along with the development of nuclear physics, humanity studied the impact of ionizing radiation on living organisms, including higherplants and algae. There are plenty of studies that show the negative impact of radiation. However, it is possible to obtain positive effects by selecting the appropriate parameters of the radiation [1]. The studies of organisms showing high resilience to changing/extreme environmental conditions is of an exceptional importance for better understanding of extremophiles evolution, also concerning global warming, and can find application in biotechnology. *Cyanidioschyzon merolae* is a unicellular haploid red alga with simple cellular architecture, adapted to acidic hot spring environment with high sulfur content [2].

The aim of the study was to analyse the effect of low doses short-term gamma radiation on growth parameters and photosynthetic activity of *C. merolae*.

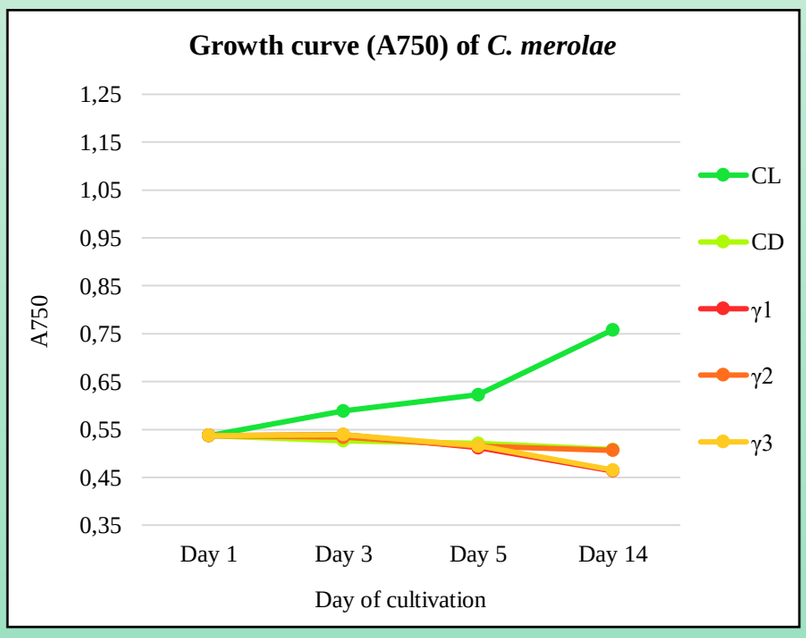
MATERIALS AND METHODS

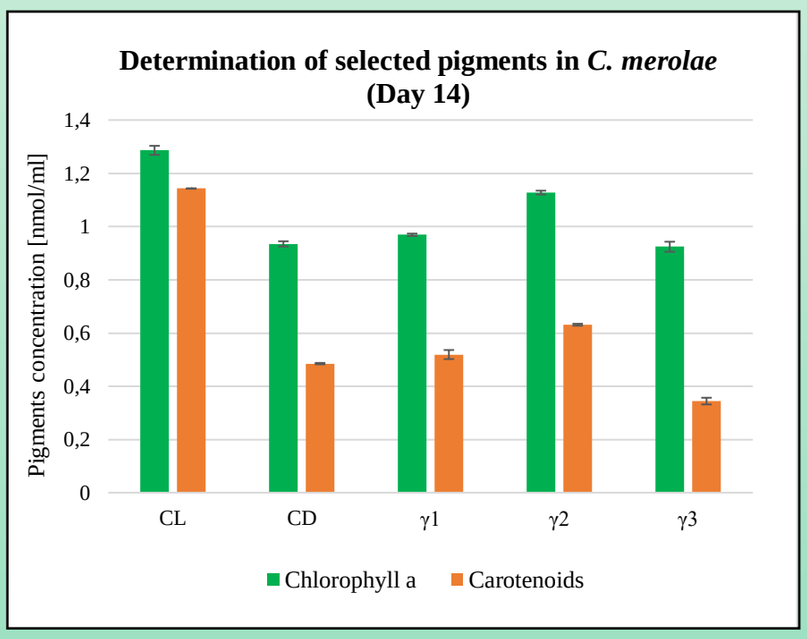
Algae used for studies, wild-type strain of *C. merolae*, were cultivated for two weeks in specially designed containers, with modified Allen medium, in the absence of visible light (except growth control group (light)). On the fifth day, part of cultivation (experimental sets γ1-3) was exposed to gamma radiation for 135 hours at three different dose rates: γ1: 260 mGy/h, γ2: 120 mGy/h, γ3: 62 mGy/h. Growth and content of photosynthetic pigments of *C. merolae* were estimated by measuring the optical density (absorbance) of the culture at the three wavelengths: 750, 663, 470 nm [2]. After finishing the cultivation, physiological condition of plants was determined using high performance fluorimetry (Dual PAM 100). In addition, plants pigments: chlorophyll and carotenoids were spectrophotometrically determined.

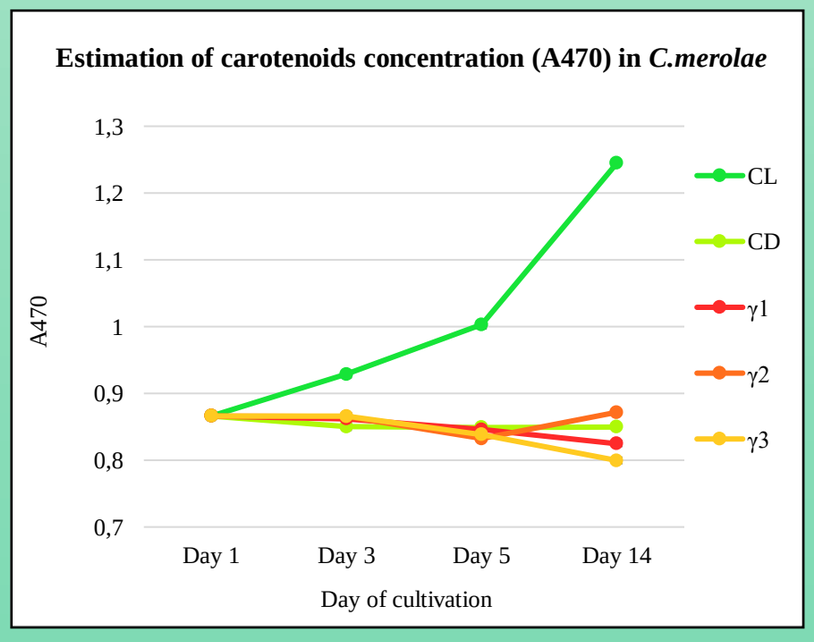
RESULTS

Algae exposed to radiation dose 120 mGy/h (γ2) grew noticeably better than in experimental sets γ1 (260 mGy/h) and γ3 (62 mGy/h). The concentration of algae cells (A750) in expermental variant γ2 after irradiation did not decrease in time and remained at a similar level as observed in the control (dark) samples. In contrast, concentration of pigments (especially carotenoids) slightly increased.

Spectrophotometric measurements







Abbreviations

Cl, Control (light) - control grown in the light

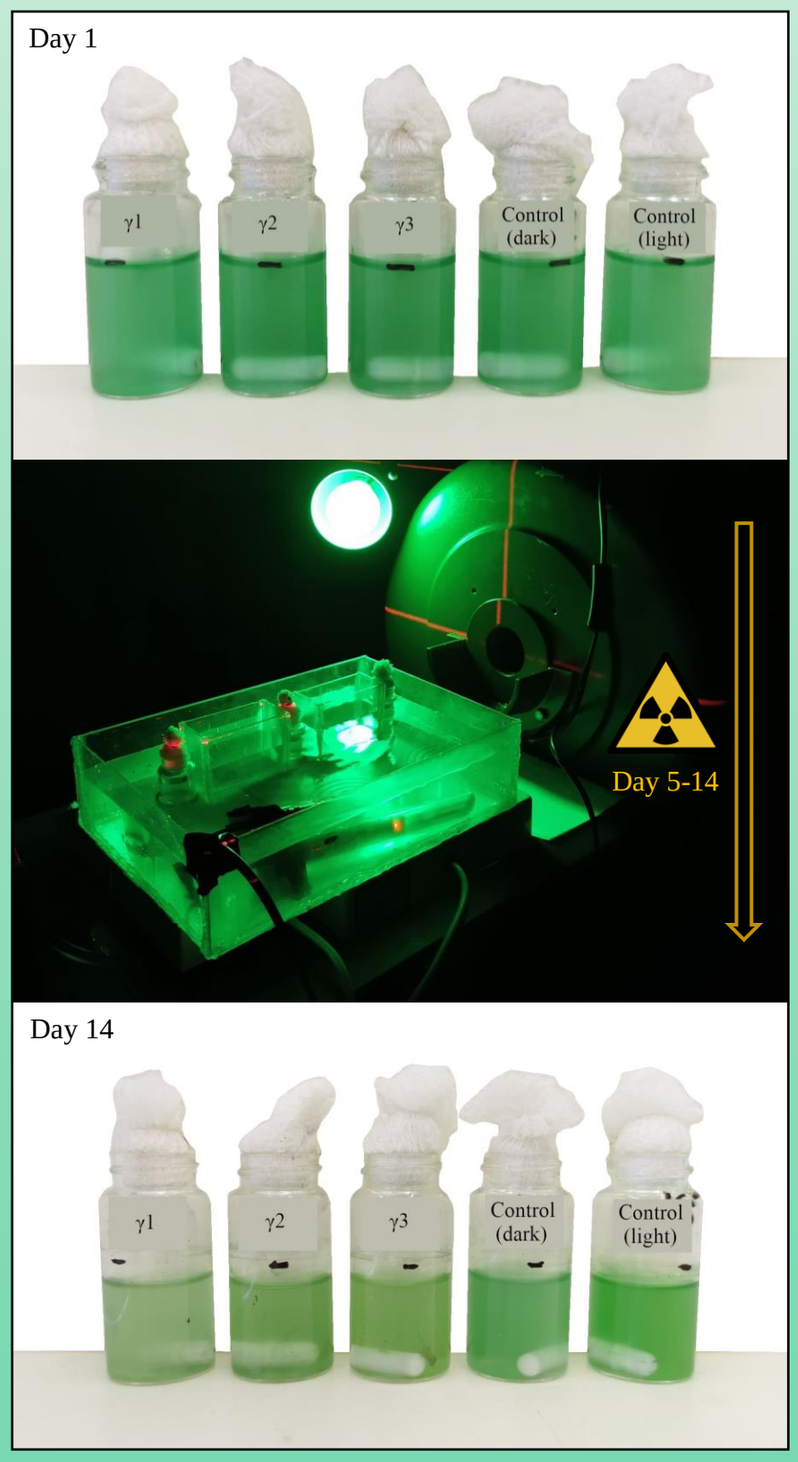
Cd, Control (dark) - control grown in the dark

γ1 - dose rate 260 mGy/h

γ2 - dose rate 120 mGy/h

γ3 - dose rate 62 mGy/h

Visual observation



SUMMARY

The results have shown that low doses of radiation evoke changes in *C. merolae*'s growth, photosynthetic activity and pigments synthesis. The effect depends on the dose rate. Noteworthy is the fact that the lowest dose (62 mGy/h) reduced the growth rate and concentration of carotenoids in *C. merolae* the most.

The research results are very promising and should be continued to investigate the mechanisms of the observed effects in details.

REFERENCES

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