ANTIOXIDANT ACTIVITY OF SPIRULINA BIOMASS AT THE ACTION OF SOME PEGILATED NANOPARTICLES

L. RUDI[1], L. CEPOI[1], T. CHIRIAC[1], I. ROTARI[2], E. PLÂNGĂU[2], A. VALUTA[1], V. CARAUȘ[2], V. RUDIC[1]

[1]Institute of Microbiology and Biotechnology, Chisinau, Republic of Moldova;

[2]Doctoral school Biological Sciences, „Dimitrie Cantemir", State University, Chisinau, Republic of Moldova

Corresponding author email: rudiludmila@gmail.com

Microalgae are recognized sources of substances with antiradical and antioxidant properties. They are used as raw material for obtaining natural preservatives and pharmaceutical preparations. In recent times, microalgae successfully compete with traditional monocomponent plant sources of antioxidants. Their protection systems are very dynamic, responding promptly to environmental changes and physiological state by modifying the intensity of antioxidant properties. One of the main factors, which essentially modifies the antioxidant status of aquatic organisms, is the presence of metals in the environment. Understanding of the mechanisms involved in eliciting their action on the antioxidant status of microalgae ensures the possibility of obtaining a biomass, which contains a synergistic complex of antioxidant and antiradical substances.

Highlighting the mechanisms for modeling the antioxidant status of spirulina, as well as increasing the quantity of substances with antioxidant and antiradical properties by using different principles of directing the biotechnological processes, offer the possibility to predict the quality of obtained biomass.

Altering the antioxidant activity of spirulina biomass, in the direction of increase or reduction, is the result of toxic action of xenobiotics on spirulina culture. High concentrations of xenobiotics reduce the antioxidant activity of ethanolic extracts obtained from spirulina biomass.

The action of Ag_{PEG}NPs (5nm), Au_{PEG}NPs (5nm), Cu_{PEG}NPs (5nm) and Cd_{PEG}NPs (5nm) has been studied. High concentrations (1.0-10.0 μM/L) of Ag_{PEG}NPs and Au_{PEG}NPs cause a reduction of the antioxidant activity of ethanolic extracts obtained from spirulina biomass with 40-54% and 35-57%, respectively.

ABTS assay for ethanolic extracts from biomass, grown in the presence of Cu_{PEG}NPs, also established a reduction in antioxidant activity for high concentrations of these nanoparticles. Cadmium nanoparticles in low concentrations did not alter the antioxidant activity of extracts, which may be the result of the absence of a toxic effect of nano-scale cadmium.

ABTS test for hydric extracts obtained from biomass, cultivated in the presence of Ag_{PEG}NPs, established an increase of antioxidant values by 38% at 10.0 μM concentration of these nanoparticles. In the case of applying Au_{PEG}NPs, the antioxidant activity of hydric extracts from spirulina biomass has not changed. ABTS test for hydric extracts from biomass, grown in the presence of Cu_{PEG}NPs, established an increase of antioxidant values with 29-53% in the case of their adding in concentrations of 1.25-3.75 μM/L.

High concentrations of Cd_{PEG}NPs did not alter the antioxidant activity of hydric extracts from spirulina biomass. In the case of applying Cd_{PEG}NPs, no toxic effect has been established.

Therefore, the action of nanoparticles, used as stimulators of biosynthetic activity of spirulina, was not the result of induced stress.