

Nanochemistry and Nanobiotechnology

The effects of luminescent cadmium sulfide (CdS) quantum dots on the stability of the genetic structure of higher plants in the *Allium*-test

A.I. Prysiazniuk, O.V. Gorodna, V.V. Olefirenko, G.M. Tolstanova

*ESC "Institute of Biology" Taras Shevchenko National University of Kyiv,
Prospect Glushkova, 2, Kiev-01160, Ukraine.*

E-mail: alexsandragor11@gmail.com

The biosynthesis of semiconductor quantum dots (QD) is the promising new area of nanobiotechnology [1]. The biologically stabilized CdS QD have a great potential for application in bioscience and medicine. However, the problem concerning the potential toxicity of CdS QD put some doubts on their use. The aim of the present study was to test the effect of CdS QD on the stability of the genetic structure of higher plants in the *Allium*-test. CdS QD were biosynthesized using bacterial culture *Escherichia coli* and the fungus mycelium *Pleurotus ostreatus* [2, 3]. To test genotoxicity, seeds were grown on the substrate with matrix solutions (fungi or bacterial basis, and basis + CdS) or salt solutions (CdSO₄, Na₂S) with dilutions: 1:2, 1:4, 1:8 & 1:32. The frequency of anaphases with aberration (FAA) was calculated. FAA in control (grown with dH₂O) was 2.95%. Test solutions with dilution 1:2 and 1:4 significantly inhibited seeds growth and were not used to test genotoxicity. Salt solutions with dilution 1:8 and 1:32 induced 2-fold increase in FAA vs dH₂O. Seeds incubation with bacterial basis and basis+CdS also increased FAA vs dH₂O in both 1:8 and 1:32 dilutions. But effect was less profound vs salt solutions. Seeds incubation with fungi basis (1:32) increased FAA vs dH₂O. Incubation with basis+CdS in dilution 1:32, but not 1:8, induced FAA at the control level. Thus, we can assume that for samples: salts solutions, bacterial basis, bacterial basis + CdS and fungi basis have high toxicity at dilutions 1:8 & 1:32. For sample fungi basis + CdS that diluted 1:32 the FAA are close to the control. It needs further studies using lower concentrations in order to find alternative solutions when FAA rate would be stable downward trend.

1. Rizvi S.B., et al. Semiconductor quantum dots as fluorescent probes for in vitro and in vivo bio-molecular and cellular imaging // Nano Rev.- 2010.- 1.- P. 1-15.
2. Борова М.М., та ін. Стабільність квантових точок CdS, синтезованих за допомогою бактерії *Escherichia coli* // Доповіді НАН України. -2014.- N 7.- С. 145-151.
3. Борова М.М., та ін. Отримання квантових точок CdS з використанням гриба *Pleurotus ostreatus* // Доповіді НАН України. -2014.- N 2.- С. 153-159.