

Nanochemistry and biotechnology

The effect of selenium nanoaquachelates on biomass accumulation and photosynthetic activity of the green algae *Chlorella vulgaris*

N.F. Mykhalenko

Membranology and Phytochemistry Department, M.G.Kholodny Botany Institute, NAS of Ukraine. 2 Tereshchenkivska str., Kyiv, 01004, Ukraine.

E-mail: membrana@ukr.net

Nanoaquachelates, the nanoparticles with the molecules of water and/or carboxylic acids as ligands, are the novel forms of microelement-containing additives in biotechnological applications. Primary nanomaterials obtained by means of blast erosion technique serve as an initial matter for the production of nanoaquachelates [1]. The ability of the hydrated nanoparticles to penetrate easily the cell membranes and release the ligands thereafter form the prerequisite for their high biological activity coupled with biocompatibility.

Selenium is an essential microelement for the normal growth and development of various organisms, mostly being involved in antioxidative processes [2]. The effect of selenium nanoaquachelates carboxylated with citric acid on biomass accumulation of the green algae *Chlorella vulgaris* was examined. Besides, the efficiency of the reactions of the light stage of photosynthesis was estimated by measuring chlorophyll *a* fluorescence at a room temperature and subsequent calculating of common photochemical quenching parameters [3].

Selenium nanoaquachelates at 0.4-4 mg/L concentrations stimulated algal growth, and the increase in biomass came up to 40-45%. 2-4 mg/L selenium nanoaquachelates also caused the increase in maximal quantum yield of Photosystem II photochemical reactions and in the net photosynthetic electron transport efficiency during the first week after their addition to *C. vulgaris* culture.

1. Kosinov M. V., Kaplunenko V. H. [Method of producing colloidal metallic nanoparticles "blast erosion nanotechnology for producing colloid metallic particles".] // UA Patent 29450.-10.01.2008.-Bul. N 1. [Ukr.]
2. Pilon-Smits E. A. H., Quinn C. F. Selenium metabolism in plants // Cell Biology of Metals and Nutrients, Plant Cell Monographs 17 [ed. by R. Hell, R. - R. Mendel].-Berlin Heidelberg: Springer-Verlag, 2010.-P. 225-241.
3. Murchie E. H., Lawson T. Chlorophyll fluorescence analysis: a guide to good practice and understanding some new applications // J Exp Bot.-2013.-64, N 13.-P. 3983-3998.