ANALYSIS OF INTERACTION OF SILVER NANOPARTICLES SYNTHESIZED BY *PSEUDOMONAS STUTZERI* AND *TRICHODERMA HARZIANUM* WITH OXIDOREDUCTASES

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Recent studies of new cost-effective and environmentally friendly methods for obtaining metal nanoparticles are of great interest. In this regard, particular attention is given to production of nanoparticles by biological methods using cultures of microorganisms. A very important feature of this method is the possibility of obtaining stable nanoparticles of various shapes and sizes including particles with unusual properties which offers great opportunities for their usage in various fields of industry and agriculture.

The purpose of this work is to obtain silver nanoparticles (NPs) using *Pseudomonas stutzeri* and *Trichoderma harzianum* and analyze the effect on the activity of cholesterol oxidases and glucose oxidases.

At the Institute of Microbiology, Academy of Sciences of the Republic of Uzbekistan, solutions of NPs synthesized by *T. harzianum* (passed through the filter) and NPs synthesized by *P. stutzeri* were prepared in culture liquid (CL) and separated from CL by centrifugation. An analysis of the UV spectra of NP solutions showed that absorption maxima are observed in the wavelength range of 190–230 nm, 250–280 nm, and 380–420 nm, and the absorption band in the form of the shoulder at 302 nm, corresponding to silver NPs and silver ions, which is typical for both clusters and reduced silver NPs.

Employees of the Institute of Microbiology of the National Academy of Sciences of Belarus obtained enzyme preparations of cholesterol oxidase (ChO) from *Penicillium kapuscinskii* and *P. roquefortii*, as well as glucose oxidase (GOX) from *P. adametzii*. To analyze the effect of NPs synthesized by microorganisms on the activity of enzymes the initial components were used in the following ratios 1:50, 1:100, 1:200, 1:500, 1:1000.

As a result of the experiments, it was shown that NPs in various concentrations have both stimulating and depressing effects on the activity of these enzymes. It has been established that NPs in conjunction with *P. stutzeri* cells have the maximum stimulating effect on the activity of ChO *P. kapuscinskii*. In the ratio of NP/enzyme 1:100, an increase in the activity of ChO by 2.16 times was observed. Usage of NPs synthesized by *T. harzianum* in a ratio of 1:100 and 1:200, the activity of ChO increased insignificantly by 1.33 and 1.16 times respectively. Inhibition of the catalytic activity of ChO *P. kapuscinskii* by 1.2–3.0 times was observed when precipitated NPs obtained from *P. stutzeri* at all concentrations and NPs synthesized by *T. harzianum* in a ratio of 1:50 were used. As for the effect of NP preparations on ChO of *P. roquefortii* activity, it was shown that preparations of *P. stutzeri* NPs both in conjunction with bacteria and separated from them had a stimulating effect. Thus, the co-incubation of non-precipitated nanoparticles taken at a ratio of 1:1000 and precipitated nanoparticles at a ratio of 1:100, 1:200 and 1:500 led to increasing in ChO activity by 1.14 times. The remaining studied concentrations led to inhibition of the activity of ChO by 1.75−3.50 times was observed or the activity of ChO remained at the control level. The use of NPs synthesized by *T. harzianum* led to a 2.3−3.5-fold decrease of ChO activity in all studied concentrations.

In case of using GOX of *P. adametzii*, the effect of NPs on the activity of the enzyme was insignificant, regardless what type of the microorganism had synthesized them. An increase in GOX activity of 5-6 % was observed with the addition of *P. stutzeri* and *T. harzianum* NPs in a ratio of 1:100; in other cases, NPs did not affect the activity of the enzyme.

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