INFLUENCE OF SIDEROPHILIC NANOPARTICLES (Au, Fe, Co) ON ACTIVITY OF GLUCOSE OXIDASES OF PENICILLIUM GENUS

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Nanotechnology is a high–tech industry aimed at studying atoms and molecules. Development in this field leads to revolutionary successes in medicine and electronics. Of particular interest is the production of metal nanoparticles and their application in biosensor technologies. However, the high cost of the most commonly used nanoparticles (Au- nanoparticles and Ag- nanoparticles) forces researchers to pay attention to other nanostructures based on metals (such as Fe, Pt, Au, Ag, Ni), metal alloys containing Pt, Au, Pb, Ir, Ru, Cu, Pd, and metal oxides (such as ZnO, CuO, Cu_2O, MnO_2, TiO_2, CeO_2, SiO_2, ZrO_2, Fe_3O_4). Biosensors constructed on the basis of the above-mentioned nanoparticles are characterized by high selectivity, sensitivity, fast response time, and stability.

The purpose of the work is to obtain siderophilic nanoparticles (Au, Fe, Co) and analyze their effect on the activity of glucose oxidases of *Penicillium* fungi.

Nanoparticles of metals Au, Fe and Co were obtained by chemical synthesis methods. The size of the obtained nanoparticles varied from 6 to 150 nm. The stability of nanoparticles has been verified. It was found that gold nanoparticles remained stable and did not require additional functionalization. In other cases, when Co and Fe nanoparticles were obtained, their tendency to form associations (aggregates and agglomerates) was manifested. Polyphenols contained in tea extract and permeate of *Penicillium adametzii* culture fluid were used to stabilize iron nanoparticles. It is shown that sodium stearate should be used to prevent agglomerates of cobalt nanoparticles. At the same time, the size of nanoparticles depends on the molar ratio of the studied compound and Co nanoparticles and varies from 50 to 150 nm.

Subsequently, the effect of the above nanoparticles on the activity of glucose oxidases of *Penicillium adametzii* and *P. funiculosum* was studied. It was shown that cobalt and iron nanoparticles had an inhibitory effect on enzyme activity in all concentrations studied. With an increase in the concentration used, the inactivation constant increased by 8-10 times. Activators of glucose oxidase activity were not detected in the experiments.

As for Au nanoparticles, it has been established that the toxic effect of nanoparticles is due not only to their size but also to the method of their production. Thus, when Au nanoparticles obtained by the Brast-Shifrin method were added to the enzymes (in a ratio of 1:100 solution), their activity decreased by 56-63 %. This is probably due to the presence of enzyme inhibitors (toluene, tetraoctylammonium bromide) in the colloidal gold solution. The best method for obtaining nanoparticles was the French method, in which sodium citrate was used as a reducing agent and stabilizer. When the Au nanoparticles obtained in this way with a size of 6-13 nm were added to the enzyme solution in a ratio of 1:100, and an increase in their activity was observed by 1.2-1.5 times. It should be noted that a decrease in the affinity of enzymes to the substrate was observed, however, the efficiency of glucose oxidation was not observed.

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