Effect of nano-oxides of certain metals on biosynthesis of extracellular hydrolases of micromycetes

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To study the effect of nanoparticles on biosynthesis of extracellular hydrolytic enzymes metal oxide nanoparticles: MgO, ZnO, ZnO/MgO in a ratio of 1:4, TiO_2 and Fe_3O_4 through hydrothermal and sol-gel techniques were synthesized. These nanomaterials were characterized by powder X-ray diffraction (XRD), infrared absorption spectroscopy (FTIR) and SEM-microscopy.

The assessment of the influence of synthesized nano metal oxides, was carried out according to their impact on biosynthesis of the enzyme at micromycetes *Trichoderma koningii*, *Fusarium gibbosum* and *Aspergillus niger* – producers of extracellular protease and amylase.

It was found that the impact of nanomaterials on the synthesis of hydrolases depends on the structure, dimension and concentration of the nanoparticles used as well as on the physiological and biochemical characteristics of the strain and the specificity of action of the enzymes synthesized by them. According to the results of research, ZnO, ZnO/MgO and Fe_3O_4 nanoparticles may be considered as stimulators of biosynthesis of extracellular proteases in micromycetes *Trichoderma koningii* and *Fusarium gibbosum.* However, the degree of their exposure to proteolytic complexes synthesized by two strains was different. In *Trichoderma koningii* strain this compounds increased the enzyme activity of both acid (by 12.1-22.3%) and neutral proteases (by 121.9-188.1%). In *Fusarium gibbosum* strain the stimulating effect caused by the action of nanoparticles was less significant (by 30.5-40.0%) and occurred only for neutral proteases. For the biosynthesis of amylase synthesized by micromycete *Aspergillus niger*, the studied a group of nanoparticles had mostly inhibitory effect (by 14.9-54.8%).

Biotechnological interest present ZnO nanoparticles of 30nm, which in the concentration of 5-10mg/L in the experimental conditions increased the activity of neutral proteases, as the main component of the enzyme complex strains, up to 3 times.