THE EFFECT OF DIMENSIONS OF IRON OXIDE NANOPARTICLES ON BIOSYNTHESIS OF EXOCELLULAR PROTEASE OF MICROMYCETE STRAIN *FUSARIUM GIBBOSUM* CNMN FD 12

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Currently, micro- and nanoparticles (NPs) are more often promoted as stimulators of microorganisms productivity, exerting effects on viability, development and synthesis of secondary metabolites in microorganisms with different genotype: fungi, yeasts, bacteria.

The presented material is the result of investigations performed on *Fusarium gibbosum* micromycete with the utilization of Fe_3O_4 nano-oxide, selected as preferential for this strain. In order to establish the optimal sizes of Fe_3O_4 nanoparticles that would ensure the maximal increase of the enzyme activity, the iron oxide particles with sizes 10, 30 and 65–70 nm in concentrations of 5, 10 and 15 mg/L were tested. The enzyme activity was assayed on the 4th-6th day of cultivation; the period corresponded to the maximal synthesis of protease in the strain under standard cultivation. The upper level of the activity of acid and neutral protease in the control sample was observed on the 5th day of growth, being 2.04 U/ml and 2.52 U/ml, respectively. In experimental samples significant effects were obtained for Fe_3O_4 NPs with dimensions of 65–70 nm.

The addition of the nanoparticles of iron oxide was more effective for neutral protease. The optimal concentration of 10 mg/L has ensured the increase of enzyme activity in all tested samples. High level of proteolytic activity was observed from the 4th day of cultivation for all studied dimensions of NPs, the increase ranging from 22.7 to 30.9 %. On the 5th day of cultivation (the day with the maximal biosynthetic activity for the culture grown in standard conditions) the positive effect was more pronounced, being 26.6 % for NPs of 10 nm and 39.7 % and 50.8 % for NPs of 30 and 70 nm, compared to the control sample of the day (Figure).

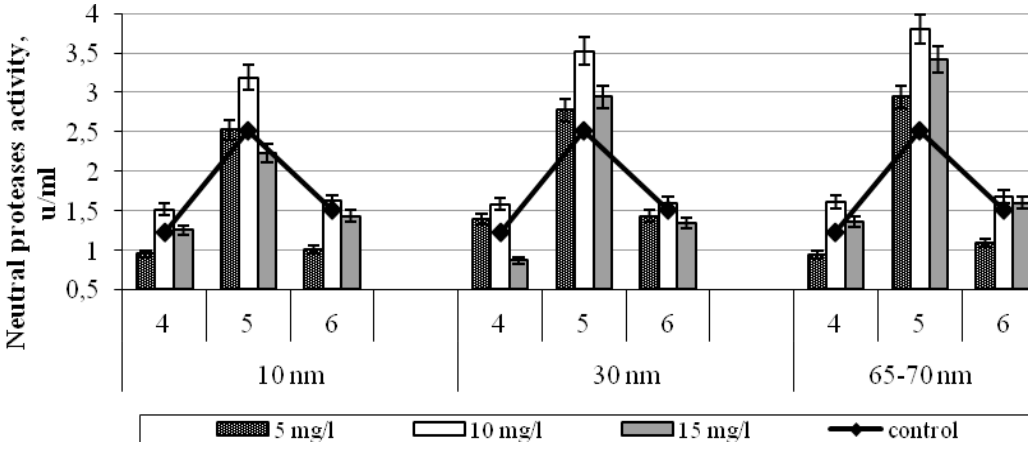

Figure. The effect of Fe_3O_4 nanoparticles of different sizes and concentrations on proteolytic activity of *Fusarium gibbosum* CNMN FD 12 micromycete

Based on the results obtained from the submerged cultivation of the *F. gibbosum* micromycete in the presence of Fe_3O_4 nano-oxide can be concluded:

- Nanoparticles with sizes of 10, 30 and 65–70 nm influence especially the activity of neutral protease and lesser the activity of acid protease.

- The maximal positive effect (of 50.8%) was demonstrated for iron oxide nanoparticles with sizes of 65–70 nm supplemented to culture in the concentration of 10 mg/L.