THE INFLUENCE OF SOME METAL NANOOXIDES ON THE EXOCELLULAR AMYLASE ACTIVITY OF *ASPERGILLUS NIGER* CNMN FD 06 MYCELIAL FUNGAL STRAIN

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In order to identify new innovative solutions for directing and increasing amylase biosynthesis in fungal strain *Aspergillus niger* CNMN FD 06, the effect of nanocomposites of Ti, Fe, Zn and Cu metals with different characteristics was evaluated.

In the research were included the nanoparticles (NPs) as follow: nanodioxide of Ti (TiO_2) with dimensions of 21 nm and <100 nm, titanium silicon oxide nanoparticles TiSiO4<50 nm, nanooxides Fe_3O_4 50-100 nm, ZnO ≤50 nm and CuO <50 nm, as well as Cu metal (99,5%) with sizes of < 60-80 nm. The amylolytic activity of the strain *Aspergillus niger* CNMN FD 06 was monitored during the 5-7th days of cultivation – a period that corresponds to the maximum manifestation of amylase activity in the producer under submerged cultivation in classic conditions (control, without NPs). The nanocomposites were included in the culture medium in concentrations of 5 mg/L, 10 mg/L and 15 mg/L.

According to the obtained results, in all the experiments, the maximum of amylolytic activity in the control samples was established at the 6th day of cultivation and varied within 69.4 and 79.58 U/mL. In the experimental samples cultivated in the presence of Ti nanocomposites a stimulatory effect compared to the control of the same day was observed in the 5th day of cultivation. The amylolytic activity was superior to the control in all tested concentrations. In dependence of NPs concentration, the enzymatic activity exceeded the level of control by 17.64-24.06**%** in the case of TiO_2 nanodioxide of 21 nm, by 22.50-30.44 % in the variants with NPs TiO_2<100 nm and by 23.27-30.29 **%** – in the samples with titanium silicon oxide $TiSiO_4$<50 nm. At the same time, in the 5th day of cultivation a slight exceedance (by 1.72-2.34%) of the maximum control value (registered at 6th day of cultivation) was observed.

In the researches focused on the evaluation of copper nanoparticles effect, the maximum values of exocellular amylase activity in control samples were also found in the 6th day of cultivation, the activity being by 50.6% and 15.8% higher than in the 5th and, respectively, 7th day of cultivation. The activity of variants cultivated in the presence of NPs during 5th days was significantly higher compared to the control. The maximum stimulatory effect was found when minimal concentrations of the NPs were used. Thus, copper nanooxide with dimensions <50 nm ensured the increase of the enzymatic activity by 65.6% and 82.4%, respectively, at the concentration of 5 and 10 mg/L. When the NPs concentration was increased to 15 mg/L, the stimulatory effect is preserved, but it decreased to 55.8%. Copper nanoparticles (99.5%) with sizes of <60-80 nm ensure the increase of amylolytic activity by 60.7% (5 mg/L) and 65.6% (10 mg/L). Similarly, to the control variant, the maximum values of exocellular amylase activity in experimental samples were revealed on the 6th day of cultivation. The increase determined by nanoparticles was maintained only at the concentration of 10 mg/L for both NPs (CuO<50 nm and Cu (99.5%) <60-80 nm), constituting 9.3% and 10.5%, respectively.

According to the data, the TiO_2 nanodioxide with dimensions <100 nm, titanium silicon oxide $TiSiO_4$ nanoparticles with dimensions <50 nm, CuO nanooxide <50 nm and metallic nano-Cu (99.5%) with dimensions of <60-80 nm a recommend as stimulators of exocellular amylases biosynthesis in the micromycete *Aspergillus niger* CNMN FD 06 and can be used as a strategy of increasing the technological performance of the producer.

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