Catalase-like activity properties of Fe_3O_4/PVP nanoparticles in the study of Sorghum seed germination processes

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Abstract. Since the discovery of the effect of the behavior of ferromagnetic (Fe_3O_4) nanoparticles in 2007 by a group of researchers, nanoparticles have shown their own peroxidase-like and catalase-like activity. A cycle of articles, dedicated to similar properties for other nanoparticles, have appeared: CeO_2, Ru, Pd, NiO [1].

However, nanomaterials with catalase-like activity have rarely been studied. In particular, depending on the acidity of the medium, magnetite nanoparticles as enzyme mimetics can exhibit both peroxidase and catalase properties.

Earlier, we studied the catalase activity of the soil when growing sorghum treated with colloidal solutions of Fe_3O_4/PVP nanoparticles. *Sorghum vulgare* was chosen as a test object. The test response is the length of the roots and shoots. The catalase activity was determined by the Galstyan method based on the evolving of oxygen [2].

According to the results of the research, the question of studying the processes associated with seed germination in the first stages, when oxygen plays a decisive role, has appeared. The process of germination of *Sorghum vulgare* seed was simulated. In the presence of Fe_3O_4/PVP nanoparticles,

incubated with H_2O_2 as the only substrate, oxygen evolving and oxygen production were controlled by an oxygraph (Clark electrode). It has been shown that the amount of evolved oxygen (i.e. catalase activity) depends on the time and concentration of magnetite nanoparticles.

References

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