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IMPACT OF CARBON AND SILICA SOL NANOSTRUCTURES ON SPRING BARLEY RESISTANCE TO THE ROOT ROT INFESTATION

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The impact of carbon and silica sol nanostructures and their derivatives on spring barley resistance to the root rot Cochliobolus sativus (S. Ito and Kurib.) infestation has been revealed in a series of laboratory and vegetation experiments. It was determined that silica sols based on 1 mass% and 20 mass% tetraethoxysilane (TEOS) (pH 2–3 and 7–8) with macro- and microelements (M), modified by incorporation titanium dioxide (TiO_2) in the form of anatase, detonation-synthesized nanodiamond (DND) or boron doped blend (DB with B), and glycerin have significantly strengthened phytoprotective properties and resistance of spring barley plants to the root rot infestation after seed treatment. The treatment of TEOS concentration of 20 mass% (pH 7–8) with M, 2,5 mass% DND and 1 mass % TEOS (pH 2–3) with M, 0,1 mass% TiO_2 and glycerin have positively influenced the survival rate and plant growth. Microbiological tests of barley seed surface showed that there was possible relationship between increasing plant resistance to the root rot and the regulating effect of silica sols on numerical structure of epigenous microorganisms and their taxonomic and functional group ratio. The increasing trend in spring barley resistance to the root rot was revealed after seed treatment by fullerene derivatives C_{60}-methionine and C_{60}-threonine and their nanocomposites. However the mechanism of the revealed positive influence was not related to the regulation of the microorganism number on the seed surface, but caused by the possible impact on plant metabolism and antioxidant activity.

Keywords: nanomaterials, amino acid fullerene derivatives C_{60}, silica sol, tetraethoxysilane, detonation-synthesized nanodiamond, titanium dioxide, seeds, spring barley, resistance, epigenous microorganisms, phytopathogen.