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USE OF METAL NANOPARTICLES AS A PART OF NUTRIENT MEDIUMS FOR PLANTS CULTIVATION IN THE CONDITIONS OF SPACE FLIGHT

Abstract

Optimal engineering systems for quality life and fruitful activity astronauts life include elements of plant cultivation as one of the units in a life-support system.To improve the method of plants growing on the artificial nutrient medium with balanced composition of elements necessary for growth and development of plants, we added essential metals Fe, Zn, Cu - in an electroneutral form as nanoparticles (NPs) instead of sulfates or other easily dissolving salts. Metal nanoparticles have some advantages in comparison with salts: NPs are characterized by prolonged and multifunctional actions; NPs are less toxic compared with salts; NPs are able to penetrate in plants tissues and stimulate vital processes in biotic dozes. A high reactivity of NPs, their active interactions with nutrient medium components, requires development of certain technological solutions for conservation of activity potential of nanoparticles in nutrient mediums. We developed an artificial nutrient medium with a balanced composition, including metal NPs for the efficient cultivation of plants in space flight conditions. In the nutrient Murashing-Skoog medium, instead of sulfates of iron, zinc, copper, the NPs of these metals or their combinations were introduced in concentrations of 2-100 times lower than the salt concentration. To cultivate plants under sterile conditions, plant seeds were placed on the surface of an agarized nutrient medium containing NP Fe, NP Zn, NP Cu or their combination and were grown in a climatic room at a temperature of 22 - 25 C, humidity of 36