SPIRULINA BIOMASS CONTAINING SILVER NANOPARTICLES – RAW AND SAFE MATERIAL FOR THE DEVELOPMENT OF MULTIPURPOSE REMEDIES

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Today, bionanotechnology represents one of the fastest growing areas *of* interdisciplinary research with applications in various fields. Along with the results obtained in the development of various models for the biosynthesis of nanoparticles, the results of using metal nanoparticles as stimulators of cell growth and biosynthetic processes of various biotechnological objects of industrial interest were noted.

Cyanobacterium *Arthrospira platensis* (spirulina) is well known as one of the most industrially used sources of various biomolecules with distinct biological properties. A number of nanoparticles, especially silver nanoparticles, have been shown to have a positive effect on cell growth and metabolism during spirulina cultivation. It has been established that the type, size, coating, and concentration of nanoparticles determine the nature of their effect on metabolic processes in this culture. At the same time, when using nanoparticles as biosynthesis stimulators, there is a possibility that they can affect the biological value of spirulina biomass as a raw material and, ultimately, the quality of end products. The conditions and parameters of spirulina cultivation process in the presence of silver nanoparticles in a polyethylene glycol coating have been determined, which ensure the production of safe and harmless additives from spirulina biomass without diminishing its biological value. In this case, spirulina cultivation was carried out on a nutrient medium containing (g/L): $NaNO_3$ - 2.5, $NaHCO_3$ - 8.0, NaCI - 1.0, K_2SO_4 -1.0, Na_2HPO_4 - 0.2, $MgSO_4 \bullet 7H_2O$ - 0.2, H_3BO_3 - 0.00286, $MnCI_2 \bullet 4H_2O$ - 0.00181, $CuSO_4 \bullet 5H_2O$ - 0.00008; MoO_3 - 0.000015, FeEDTA - 1.0 ml/L, at a temperature of 30- 32°C, pH 8.0-10.0 and illumination of 37-55 µM photons/m^2 under continuous lighting regime, for 6 days. On the 5th day of growth, polyethylene glycol-coated silver nanoparticles up to 5nm in size were added to spirulina culture at a concentration of 0.10 - 0.12 µM/L. At the end of the cultivation cycle, about 1.2 g/L of biomass (up to 30% more) and about 6% lipids (up to 28% more) were obtained. The content of malondialdehyde in biomass, as one of the main markers of toxicity in cells, did not exceed the level of this indicator in the biomass obtained by growing spirulina in the absence of nanoparticles (see Figure).

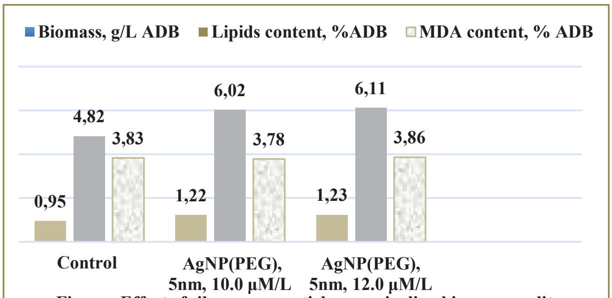

Figure. Effect of silver nanoparticles on spirulina biomass quality.

Thus, the addition of polyethylene glycol-coated silver nanoparticles at the end of the exponential growth phase reduced the contact time of spirulina cells with these nanoparticles. The age of the culture and the reduction of the contact time with nanoparticles were the determining factors that suppress the formation of free radicals and the excessive accumulation of end products of lipid peroxidation, w

hich made it possible to obtain high-quality and safe biomass – raw material to develop products with multiple qualities.

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