

POTENTIAL USE OF GOLD AND SILVER NANOPARTICLES IN PHYCOBIOTECHNOLOGY

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Nanotechnologies have rapidly migrated from technical field to biotechnology, creating the field of bionanotechnology. Nanoparticles can be a suitable alternative source for trace elements that act as stimulators of biosynthetic activity. The research aimed to select the concentrations of gold and silver nanoparticles, stabilized with polyethylene glycol, with the effect of stimulating the lipid content in spirulina culture.

Spirulina platensis CNMN-CB-02 strain was grown under autotrophic conditions in a liquid mineral medium supplemented with AuNP(PEG) and AgNP(PEG) in a concentration range of 0.025-1.0 μM . The experimental variants were compared to control samples.

Biomass content was calculated spectrophotometrically from the calibration curve. *Spectrophotometric determination* of lipid content was based on the reaction between lipid oxidation products with the components of phospho-vanillin reagent to produce a rose-colored complex.

The results revealed nanoparticle concentrations that increased biomass production and induced lipid synthesis and their accumulation in spirulina biomass. The concentration of $0.045 \pm 0.001 \mu\text{M}$ AuNP(PEG) was established, which enhanced cyanobacterial biomass by 40-44% and lipid content in biomass by 28-33%. Silver nanoparticles at a concentration of $0.0320 \pm 0.0011 \mu\text{M}$ stimulated spirulina productivity by 30-35%. In the resulting biomass, lipid content increased by 21-25%. This was due to the action of Ag nanoparticles and their small size (5 nm), which allowed them to quickly penetrate cells and stimulate cell proliferation. The contact of nanoparticles with the cell membrane induced the stimulation of lipid production.

The positive effect of nanoparticles on cell growth and metabolism has been demonstrated. The small size of nanoparticles favored their interaction with the cell surface and penetration into the cytosol. The scope of nanoparticle application has been expanded.