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1755 / COMPARATIVE IMPACT OF MN2+ AND NI2+ ON THE MICROALGA CHLORELLA SOROKINIANA

Keywords:

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BACKGROUND

Manganese serves as a co-factor of more than 30 enzymes in microalgae, including the core components of energy and redox metabolism. Nickel is utilized as a co-factor of urease. Both of these transition metals represent important pollutants of aquatic ecosystems. The effects of Mn and Ni excess on microalgae are poorly understood.

OBJECTIVES

We analyzed and compared the impact of Mn^{2+} and Ni^{2+} on growth, mucilage release, and redox metabolism of Chlorella sorokiniana.

METHODS

The impact of a set of concentrations of Mn^{2+} and Ni^{2+} on growth of C. sorokiniana culture in 3N-BBM+V medium in the early stationary phase was evaluated by changes in optical density at 750 nm and biomass during 7 days treatment. Mucilage release was analyzed using SEM microscopy. Redox settings were analyzed by oxidation-sensitive fluorescent probe and assays for thiols.

RESULTS

Ni was more toxic than Mn and affected culture growth at lower concentrations. Microalgal cells started releasing mucilage polymers within 1 h of exposure to 1 mM Mn^{2+}, whereas no mucilage was observed even at 24 h of treatment with equimolar Ni^{2+}. The peak of reactive oxygen species production was reached faster for Ni^{2+} than Mn^{2+}. Mn-induced drops in the concentration of reduced thiols showed a recovery after 1 h and 24 h. Ni^{2+}-induced drop was irreversible. The observed differences between the impact of Mn and Ni may be related to different redox and coordinative properties and to higher capacities of microalgae to sequester Mn in relation to higher quotas than Ni that are required for normal function.

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