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Inhibition the Harmful Cyanobacterium *Spirulina* using *Moringa oleifera* Functionalized Iron Oxide Nanoparticles in the Beira Lake, Sri Lanka

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Abstract

Harmful algal blooms (HABs) often result from eutrophication in freshwater lakes due to the excessive growth of algae. These colonies can be detrimental on human beings, fish, shellfish, aquatic mammals, and birds due to the production of toxins and depletion of oxygen in the water. Among all HABs, *Spirulina* is the type of cyanobacteria, often considered a type of blue-green algae that grows in both fresh and saltwater and a bloom-forming species that is common in eutrophic lakes and reservoirs. *Spirulina* typically consumed as a dietary supplement due to its high nutritional value. However, *Spirulina* produces cyanotoxins as microcystin and hepatotoxin that cause to acute poisoning. Moreover, it can absorb heavy metals from its aquatic environment. As an inhibitory agent, this study explores potential of *Moringa oleifera* functionalized iron oxide nanoparticles (MO-IONPs) in inhibiting *Spirulina* growth through coagulation. Iron oxide nanoparticle were synthesized using co-precipitation method and functionalized with *Moringa oleifera*. A series of MO-IONPs concentration combinations were tested for their efficacy. The Jar test was conducted to evaluate the inhibitory effects of MO-IONPs on *Spirulina* using water samples from Beira Lake, Sri Lanka. Algal growth inhibition was assessed by monitoring cell density. Notably, the inhibitory activity of *Spirulina* was increased when increasing the concentration combinations of MO-IONPs. The results demonstrated that there are significant inhibitory effects of MO-IONPs on *Spirulina*. Specifically, after a 30-minute exposure to 20 mg of IONPs combined with 400 mg of MO, *Spirulina* cell concentration reduced to 68.17±0.20% compared to the control group. Thus, the results suggest that MO-IONPs can be an effective coagulant in mitigating *Spirulina*-induced HABs in Beira Lake, Sri Lanka.

Keywords: Harmful algal blooms, *Spirulina*, Inhibition, *Moringa oleifera*, Iron oxide nanoparticles