



Uptake of phosphorus from dairy wastewater by heterotrophic cultures of cyanobacteria

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ABSTRACT

The dynamic removal of different forms of dissolved and suspended phosphorus (reactive phosphorus, acid-hydrolyzable phosphorus, organic phosphorus and total phosphorus) by the cyanobacteria *Aphanothece microscopica Nægeli* cultivated heterotrophically in dairy processing wastewater was investigated. Bioreactor performance was highly dependent on operation temperature (10–30°C). *Aphanothece microscopica Nægeli* was able to uptake not only simple phosphorus species (reactive and acid-hydrolyzable phosphorus), but also complex fractions of organically bound phosphorus. Low bioreactor performance was evidenced by the suspended fractions. The conversion of suspended reactive phosphorus and suspended acid-hydrolyzable phosphorus varied between 50.3% and 93.3%. Suspended organic phosphorus and suspended total phosphorus became erratic, with peaks of phosphorus appearing after 8 h of hydraulic detention time and slightly impacting the global phosphorus balance. In addition to phosphorus removal, a good degree of organic matter and total nitrogen (N-TKN) removal occurred simultaneously. The resulting conversions varied from 64.6% to 96.9% and from 47.2% to 72.8% for chemical oxygen demand and N-TKN, respectively. Rapid biomass growth was verified and the resulting biomass production rates were 0.81–3.85 g l⁻¹ d⁻¹. These results indicate that heterotrophic bioreactors with cyanobacteria have a good potential for phosphorus removal from wastewater.

Keywords: Microalgae; Biological treatment; Heterotrophic cultivation; Wastewater; Phosphorus

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