Potential microalgae acclimation to centrate wastewater for nutrient removal

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Currently, nutrient removal from wastewater can be costly due to the amount of energy required for treatment and the costs associated with chemical addition. Microalgae-based wastewater treatment has shown promise in the removal of nutrients and the biomass produced could be used in animal food or biofuel production. Thus, microalgae could be a viable, eco-friendly option to implement as part of biological wastewater treatment. At a number of wastewater treatment facilities, centrate (CW) is produced from the dewatering biosolids following anaerobic digestion. CW can contain high nutrient concentrations, generally much higher than the initial influent wastewater. Therefore, CW represents a potential nutrient-rich cultivation medium for microalgal growth, however, it can also be toxic for their metabolism.

This study focuses on the improvement in the growth of three inocula using CW diluted with secondary wastewater after a 16-week acclimation period. Isolated strains of *C. vulgaris* (MCWW-S28) and two *Chlorella sp*. and *Scenedesmus sp.* consortia (B and D) were used. CW obtained from the Ravensview Wastewater treatment plant located in Kingston (Ontario, Canada) was diluted with secondary wastewater (SW) to obtain a 24% ratio. The initial ammonia and phosphate concentrations were 572.5 ± 0.01 mg/L and 83.33 ± 1.88 mg/L for the CW, and 0.47 ± 0.30 mg/L and 1.38 ± 0.04 mg/L for the SW, respectively. Dry cell weight was measured to evaluate the growth performance, and biomass production (g/L.d) was calculated for every cycle. Kruskal-Wallis statistical analysis indicated that the 5th growth cycle (15 d per cycle) presented a significant statistically difference ($P<0.05$) with respect to biomass productivity, suggesting a potential acclimation period required for the microalgae/consortia to adapt to the high-strength wastewater mixture. These results demonstrate the feasibility of microalgae to grow in high nutrient concentrations, thus ensuring their efficient removal.