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## Carbon and nutrient removal from centrates and domestic wastewater using algal-bacterial biofilm bioreactors

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### ABSTRACT

The mechanisms of carbon and nutrient removal in an open algal-bacterial biofilm reactor and an open bacterial biofilm reactor were comparatively evaluated during the treatment of centrate and domestic wastewater. Comparable carbon removals (>80%) were recorded in both bioreactors, despite the algal-bacterial biofilm supported twice higher nutrient removals than the bacterial biofilm. The main carbon and nitrogen removal mechanisms in the algal-bacterial photobioreactor were assimilation into algal biomass and stripping, while stripping accounted for most carbon and nitrogen removal in the bacterial biofilm. Phosphorus was removed by assimilation into algal-bacterial biomass while no effective phosphorous removal was observed in the bacterial biofilm. Carbon, nitrogen and phosphorus removals of  $91\pm 3\%$ ,  $70\pm 8\%$  and  $85\pm 9\%$ , respectively, were recorded in the algal-bacterial bioreactor at 10 d of hydraulic retention time when treating domestic wastewater. However, the high water footprint recorded ( $0.5\text{--}6.7\text{ l m}^{-2}\text{ d}^{-1}$ ) could eventually compromise the environmental sustainability of this microalgae-based technology.

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