ABSTRACT

The increasing levels of generation of nutrient rich wastewaters around the world pose serious challenges where conventional biological and chemical methods of treatment have gradually begun to fail in meeting sustainability challenges and underlying criteria. In this study naturally occurring mixed algal species reared in mixotrophic growth modes have been deployed to remove recalcitrant organics and recover high nutrient concentrations (N and P) from three increasingly complex wastewaters at short residence times of 6-7 days. Results from pilot scale operation show that the cultivation methods adopted and the use of naturally selected species lead to a tendency among these species to clump at certain stages of growth that in turn float or settle rapidly making algal harvest and thereby the nutrient recovery processes energy efficient. Biomass productivity of the consortia varied with season and was highest in the liquid from anaerobic digestor with a maximum of 6.3 g/m2/d. N recovery from synthetic sewage was c.30% and anaerobic digestor effluent c.50%, solid waste leachate c.42% while the N removal reached 95%. P recovery ranged between 50-70%, and the removal achieved was 90%. The use of mixed algal consortia in mixotrophic mode greatly enhanced the simultaneous removal of organic matter and recovery of mineral nutrients and is therefore suggested as a strategy for sustainable wastewater treatment units of the future.