

Bioremediation of aquaculture wastewater with different microalgae species

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Current aquaculture practices have a detrimental impact on the environment, in particular due to the release of high concentration of nitrogen and phosphorus that can induce eutrophication. To improve the sustainability of aquaculture, the treatment of the wastewater and the recycling of nutrients have been recently recommended by EU regulations. The aim of this study was to investigate and compare the capacity of three microalgae species, *Tetraselmis suecica*, *Isochrysis galbana* and *Dunaliella tertiolecta*, in the bioremediation of grey mullet *Mugil cephalus* wastewater. The experiment was conducted in batch conditions for 7 days using completely mixed bubble column photobioreactors of 6 L. The removal efficiency of Dissolved Inorganic Nitrogen (DIN) and Dissolved Inorganic Phosphorous (DIP) was calculated daily, as well as the dry weight biomass yield. After two days, *T. suecica* and *D. tertiolecta* were able to remove more than 90% of DIN and DIP, whereas *I. galbana* removed only 32% and 79% of DIN and DIP, respectively. At the end of the experiment, *T. suecica* and *D. tertiolecta* showed a significantly higher removal efficiency of DIN, $94.4 \pm 1.0\%$ (mean \pm SE) and $95.4 \pm 0.3\%$, respectively, than *I. galbana* ($66 \pm 1.5\%$). A higher biomass yield resulted for *T. suecica* (0.60 ± 0.03 g/L, mean \pm SE) than *I. galbana* (0.16 ± 0.02 g/L), while no significant differences resulted among *D. tertiolecta* (0.38 ± 0.04 g/L) and the other two species. This study confirms the potential to employ *T. suecica* in an Integrated Multi Trophic Aquaculture system (IMTA) for bioremediation of *M. cephalus* wastewater and identifies *D. tertiolecta* as another valid candidate species, that could be reused like resources, for example as fish feed. Both species, moreover, are able to grow well in no sterilized culture media, contaminated with bacteria and zooplankton (*Paramecium* spp.). Thank to this capacity it could be reduced the resource consumption like energy costs and work effort.