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MITIGATION OF NITROGEN DISCHARGES FROM FISH AQUACULTURE EFFLUENTS USING GREEN MACROALGAE

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Aquaculture effluents are rich in organic and inorganic nitrogen compounds that may support and enhance local primary productivity, eventually inducing eutrophication conditions that may lead to the development of harmful algae blooms. The goal of this study was to assess the potential use of naturally occurring green macroalgae (*Ulva* and *Enteromorpha*) as bioremediators for nitrogen rich effluents from a fish aquaculture plant, by evaluating their respective uptake dynamics under controlled conditions. Effluent samples were obtained from 9 m^3 tanks housing meagre (*Argyrosomus regius*) from the IPMA pilot-station in Olhão (south Portugal). Macroalgae were incubated separately in the aquaculture effluent (0.4 g of algae to 100 mL of effluent). Algae tissue and water samples were collected periodically during 4 hour incubations. At each sampling instance, nitrate, nitrite and ammonia concentrations were quantified in the effluent, while internal algae reserve pools and nitrate reductase activity (NRA) were determined within the algae tissues. *Ulva* and *Enteromorpha* absorbed all dissolved inorganic nitrogen compounds in less than 2 hours, favouring ammonia over nitrate. During that period *Ulva* stored nitrate temporarily as an internal reserve and only used it after ammonia availability decreased, whereas *Enteromorpha* stored and metabolized ammonia and nitrate simultaneously. These distinct dynamics of ammonia and nitrate uptake supported an increase in NRA during the experiment. Nitrite concentrations were very low and their effect was negligible. This study supports the hypothesis that *Ulva* or *Enteromorpha* can be used as bioremediators in aquaculture effluents to mitigate excess of dissolved inorganic nitrogen. Our results can also be eventually tied to different resiliencies of the algae species to temporal dynamics of nutrient resource availability in nature, showing that different uptake strategies might be useful in managing the bioremediators use seasonally.