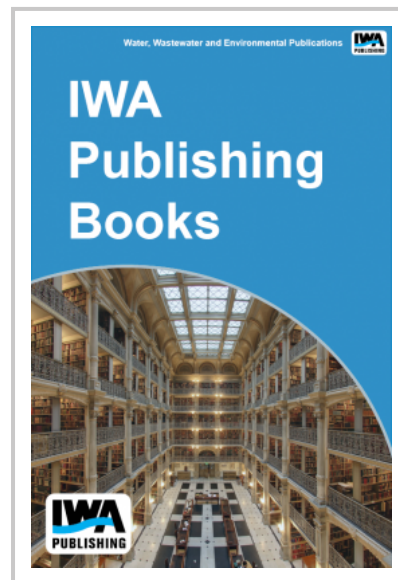


Uptake by Algae of Dissolved Organic Nitrogen from BNR Treatment Plant Effluents

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The importance of dissolved organic nitrogen (DON) in wastewater treatment effluent has dramatically increased as permitted effluent total nitrogen (TN) concentrations have been decreased to very low levels in response to problems with impaired surface water quality from eutrophication. For conventional secondary treatment, DON typically accounts for less than 10% of the effluent TN, but it is a major component (>50%) in effluents from advanced biological nutrient removal (BNR) treatment plants, for which most of the inorganic nitrogen species and effluent suspended solids are removed. DON persists in effluents from BNR systems and little is known about the potential impact of the effluent DON from these facilities on surface water quality. Of particular interest is what portion of DON is readily available for algae consumption or can be converted to forms to support algal growth, and what type of substances compose DON. To develop a better understanding of the occurrence and bioavailability of DON in effluents from advanced BNR systems, a new protocol was developed for measuring the readily bioavailable DON and forms of DON that are not readily taken up by algae (recalcitrant DON). An anion exchange resin was used to remove nitrate while an XAD-8 resin was used to remove hydrophobic forms of DON. To assess the bioavailability of wastewater-derived DON, algal growth assays were performed in the presence of bacteria in effluents from ten municipal BNR wastewater treatment plants. The results showed only minor difference in the algal growth and DON consumption between the untreated and XAD-8 treated samples. Growth of algae and DON consumption were not observed in the eluent from XAD-8 resins, despite the fact that this fraction contained up to approximately 30% of the DON. These findings indicate that the hydrophobic DON retained on the XAD-8 resin is not bioavailable to algae over periods of several weeks and that the XAD-8 treatment combined with an anion exchange resin can be used to quantify and separate this recalcitrant form of DON from bioavailable DON and nitrate.

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