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Assessment of plausible bioindicators for plant performance in advanced wastewater treatment systems

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ABSTRACT

Three full-scale advanced biological systems for nitrogen removal showing different efficiencies were assessed during one year, to investigate the protist communities supported in these wastewater treatment plants (WWTP). The main goal of this research was to explore the differences of these communities from those observed in conventional activated sludge systems. The final objective was to provide background support for the proposal of bioindicators in this type of biological systems, where scarce information was available until now, since only conventional systems had been previously studied from this point of view.

Results obtained indicate that, in fact, protist population density and diversity in advanced systems for N-elimination are quite different from other wastewater systems studied before. A statistical approach through multivariate analysis was developed to search for association between protist species and physical–chemical system performance, and specifically N-removal efficiencies. The original hypothesis proposing that previous indicators from conventional systems are not adequate in advanced N-removal mechanisms was proved to be correct. Efficient processes on N-removal, despite what it had been usually found in conventional systems, show important flagellate and amoeba populations and these populations tend to reduce their abundances as nitrogen removal performance decreases (moderate to low). Ciliates are however less abundant in these N-removal efficient systems. Certain groups and genera of protist such as flagellates and small amoebae are thus proposed as indicative of high performance N-removal, while in this case the appearance of certain ciliates were indicative of low performance on N- or high organic matter removal (as COD) efficiencies.

1. Introduction

Protist populations play a major role on the microbial food webs from the biological treatment of wastewater treatment plants (WWTP). Their predatory activities on bacteria have been directly linked to effluent quality (Curds and Cockburn, 1970b; Salvadó et al., 1995; Lee et al., 2004). However, these activities might also be involved in shaping the bacterial

Abbreviations: A2O, anaerobic/anoxic/aerobic treatment; AO, anoxic/aerobic treatment; OD, oxidation ditch treatment ; WWTP, wastewater treatment plant.

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