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Membrane biofouling retardation and improved sludge characteristics using quorum quenching bacteria in submerged membrane bioreactor

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Abstract

N-acyl homoserine lactones (AHLs) based quorum sensing has been reported to be one of the main causes of biofouling in membrane bioreactor (MBR) for wastewater treatment. In this study, *Rhodococcus sp*. entrapped in sodium alginate beads with effective volume of 0.1% of bioreactor were used for the degradation of signal molecules to stop quorum sensing mechanism in MBR. QQ-MBR (with quorum quenching beads) experienced less biofouling as compared to C-MBR (without beads) leading to significant decrease in AHLs concentration in QQ-MBR. Less production of soluble extracellular polymeric substance (EPS) was witnessed in QQ-MBR, while loosely and tightly bound EPS were almost of similar concentrations in parallel semi pilot-scale MBRs. Trans-membrane pressure profile of C-MBR was steeper than QQ-MBR, having short filtration durations, depicting profound biofouling in C-MBR. Less AHLs concentration was observed in QQ-MBR extract than C-MBR confirmed by high performance liquid chromatography and bioassay. AHLs degradation along with EPS reduction increased the dewaterability in terms of capillary suction time and improved specific cake resistance in QQ-MBR. Organics and nutrients removal efficiencies of both MBRs were found to be more or less