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Composition of EPS in biofilm depending on type of treated wastewater

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Extended Abstract

Extracellular polymers (EPS) play a key role in the formation of technical biocenoses in wastewater treatment plants. The EPS content in the biomass determines its morphology and stability. The main components of EPS are proteins (PN), polysaccharides (PS), humic acids, lipids and nucleic acids [1]. EPS include soluble EPS and bound EPS. The soluble EPS can move between the biofilm/sludge and the medium. The bound EPS are classified as loosely bound EPS (LB-EPS) and tightly bound EPS (TB-EPS). The aim of the study was to determine the effects of dairy wastewater and synthetic municipal wastewater on the composition of extracellular polymers in the biofilm that forms in the trickling filter. Dairy wastewater was diluted (to a COD value of about 1000 mg/L) to obtain the same load of organic compounds in the wastewater and to show differences in the effect of wastewater composition on extracellular polymers. EPS were isolated using ion exchange resins [2], using a Dowex 50 × 8, Na+ form cation exchange resin. The ratio of rinsed cation exchange resin to VS of biomass was 35 g to 0.5 g. The Lowry method [3] was used to measure the amount of protein relative to a standard curve prepared with bovine serum albumin (BSA). The amount of carbohydrate was determined using the Anthrone method [4] in relation to a standard curve generated with glucose. The EPS content was expressed as mg of total organic carbon (TOC)/g biomass.

The biofilm grown on synthetic municipal wastewater was characterized by a higher EPS content, reaching about 652.6 ± 93 mg TOC/g VSS than the biofilm grown on dairy wastewater (412.5 ± 78 mg TOC/g VSS). Sodium acetate, which is present in synthetic municipal wastewater, is a better carbon source for biofilm formation than lactose, which is present in dairy wastewater. In addition, the biofilm that formed on synthetic municipal wastewater contained more LB-EPS, which contained both PN and PS. In contrast, the biofilm grown on dairy wastewater contained more TB-EPS with a PN/PS ratio of 2. The ratio was similar for both types of biofilms. The results suggest that the LB-EPS depends on the type of wastewater and the compounds available to the microorganisms forming the biofilm. TB-EPS is an internal fraction whose composition is independent of the type of wastewater, but whose size is influenced by the availability of compounds.

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