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Universität Stuttgart · WAREM · Pfaffenwaldring 7a · 70569 Stuttgart

Pfaffenwaldring 7
70569 Stuttgart
Telefon: (0711) 685 - 66615 / 66616
Telefax: (0711) 685 – 66600
warem@iws.uni-stuttgart.de
http://www.warem.uni-stuttgart.de/

Anne Weiss M.A., M.Sc.
(Durchwahl: - 66616)

Master Thesis Abstract

of Md. Hasibur Rahman Lemon

Microbial EPS Secretion and Topography of Quasi-Naturally Grown Biofilm Originating From a Eutrophic Lake

The fine sediments are stabilized by biofilms ("biostabilization") has various economic and ecological consequences. The complex sediment-water interactions are estimated by several modelling methods simplified by considering characteristics of the sediment grains. The microbial biostabilization significantly impacts fine sediments which complicates simplified modelling solutions for sediment dynamics and management strategies. Thus, these modelling approach is not applicable for sediments with strong biological influence, such as eutrophic reservoir: where biofilms effect are involved on sediment stability. The insights for freshwater such as eutrophic lakes are limited, since enormous research are already performed on marine water as it has long been believed that biostabilization rest on largely on the amount of ions to help binding, though principally occurs due to microbially secreted sticky polymers,. Consequently, the understanding of growth biofilm and their response with several conditions due to environmental or anthropogenic in fresh water are urged. In the case of the reservoir, especially having several hydrodynamic events, for instance sediment flushing, pump storage reservoir etc., biostabilization becomes more interested to the researcher. In order to understand the formation of biofilm and its stability better, it seems important to have also a closer look at the composition of the EPS. This research demonstrate the importance of biostabilization for fine sediment dynamics and effect of hydrodynamic change on EPS matrix in freshwater biofilms. To investigate natural biofilm growth in freshwater sediments under controlled boundary conditions, experiment is run for growth period (8 weeks) and treatment period (2.5 weeks) in six straight flume experiments with natural freshwater, collected from Altmühlsee in Bavaria, were performed under identical boundary conditions. Equivalent biofilm growth under controlled hydrodynamic and environmental conditions are allowed by this unique setup, which helps for future research on the ecological importance and effect of biostabilization at varying environmental conditions. Biofilms are cultivated in this sophisticated setup over glass beads (d_{50} = 0.15 mm, ρ = 2.5 t m^{-3}). The impact of hydrodynamics on the EPS of the developed biofilms are analyzed as a proxy of biostabilization. Total EPS is measured responsive with hydrodynamic regime. More precisely, while the proteins are fluctuating, carbohydrates are detected as main keyplayer for significant response of total EPS with hydrodynamic regime. How these responses take place depending on quality of EPS and restructuring internal EPS matrixes are discussed. This findings emphasize the importance of detailed analyses of the EPS components of the biofilm system.

Keywords: *Biofilm; Biostabilization; Extracellular polymeric substances (EPS); Proteins; Carbohydrates; Microbial; Sediment stability; Exopolymers; Bacteria.*