

# **Title: COMPARISON OF BACTERIAL COMMUNITIES FROM TWO TRICKLING FILTERS FILLED WITH DIFFERENT PACKING MEDIA**

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## **Abstract:**

Trickling Filter (TF) is a very successful alternative for the post-treatment of anaerobic effluents and it has been applied in wastewater treatment plants in Brazil due to its operational simplicity. However, the knowledge about microbial communities present in TFs, and the influence of design factors on microbial selection are scarce and very important to identify relevant processes occurring within those systems. The objective this work was investigate and compared the bacterial communities developed in two TF filled with different packing media. Both TF had similar configurations; except that one was filled with a vertical sponge-based packing media while the other with a vertical plastic medium. The biomass was sampled at the top and bottom of each TF and bacterial community was characterized by 454-pyrosequencing of 16S rRNA gene. The principal component analysis was used to evaluate differences between the TF compartments, relating bacterial communities to parameters involved in the degradation of organic carbonaceous matter and nitrification. The results showed that bacterial community developed in each reactor was completely different (~ 66% of the variation was explained by two main components), even though the predominant phylum has been *Proteobacteria* in both reactors. Slow-growing bacteria adapted to oligotrophic conditions (e.g., *Verrucomicrobia* and *Planctomycetes*) and groups commonly found in soil (e. g., *Pedosphaerales*, *Gemmatimonadetes*, *Bradyrhizobium*) predominated within the TF-sponge. These organisms were less abundant or absent in the TF-plate, in which obligate sulfide oxidizers (*Thiotrichaceae*), fotoheterotrophs (*Chloracidobacteria*) and fast-growing fermenters (*Clostridia*) predominated. The highest hydraulic and sludge retention time within the sponges caused a strong stratification of substrates along the compartments and higher removal of organic matter (55-70%) and ammonium (81-94%). Denitrifiers decreasing substantially from top to bottom, consistent with the reduction of organic matter. We conclude that the sponge packing media promoted greater retention of micro-organisms and diversification of environmental conditions in the reactor, selecting a biomass primarily constituted of slow-growing microorganisms, adapted to oligotrophic conditions, more efficient in the removal of organic and nitrogen compounds, resulting in enhancement of TF.

**Key-words:** bacterial community composition, denitrification, 454-pyrosequencing, trickling filter, wastewater treatment

**Agências de fomento:** CNPq, FAPEMIG, CAPES, FINEP, COPASA