Targeting Aerobic Granular Sludge Microbiome Salt Adaptation

Ana M. S. Paulo[1], Catarina L. Amorim[1], Paula M. L. Castro[1]

[1]Universidade Católica Portuguesa, CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Rua de Diogo Botelho, 1327, 4169-005 Porto, Portugal

Introduction

Saline wastewaters can result from food and chemical industries, as well as from coastal municipalities, where seawater can be used for cleaning processes. **Aerobic granular sludge (AGS)** has been appointed as the best technology for treating industrial wastewater, presenting a higher bacterial aggregation level compared to conventional activated sludge systems. As a result, bacteria present in the aerobic granules can be more resistant to saline wastewater. Due to the existence of different microbial metabolic layers within the granules, the AGS technology is used for removing organic carbon as well as nitrogen and phosphorous from wastewater. The main objective of this work follow the **microbiome changes of an AGS reactor** relating it with the increase of the salt content of the wastewater, while evaluating the effect of salt on reactor removal performance.

Methods

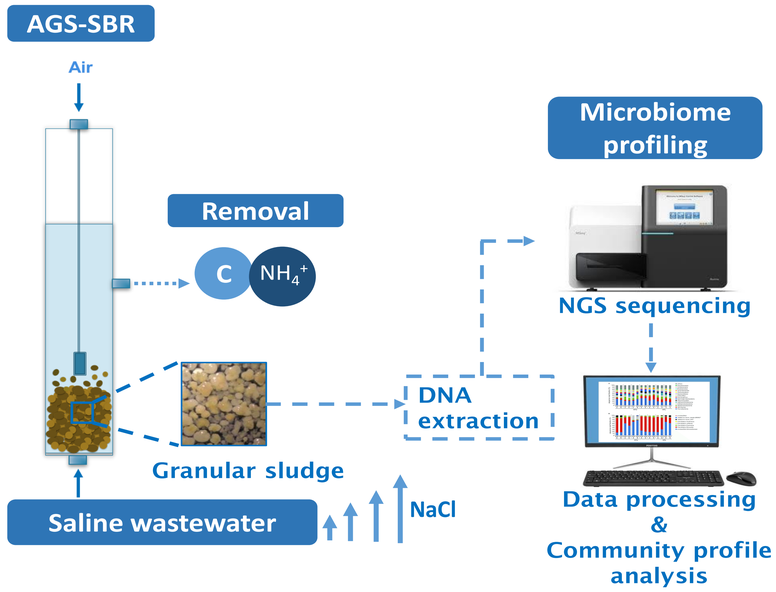

Table 1 – Salinity applied to the AGS reactor during 249 days of operation, divided into IX operational phases

Phases	I	II	III	IV	V	VI	VII	VIII	IX
Days	0 - 7	8 - 21	22 - 35	36 - 64	65 - 90	91 - 124	125 - 168	169 - 203	204 - 249
NaCl (g L^{-1})*	0	2.7	4.4	6.0	6.8	8.5	10.0	11.6	14.0

*Average values

Results

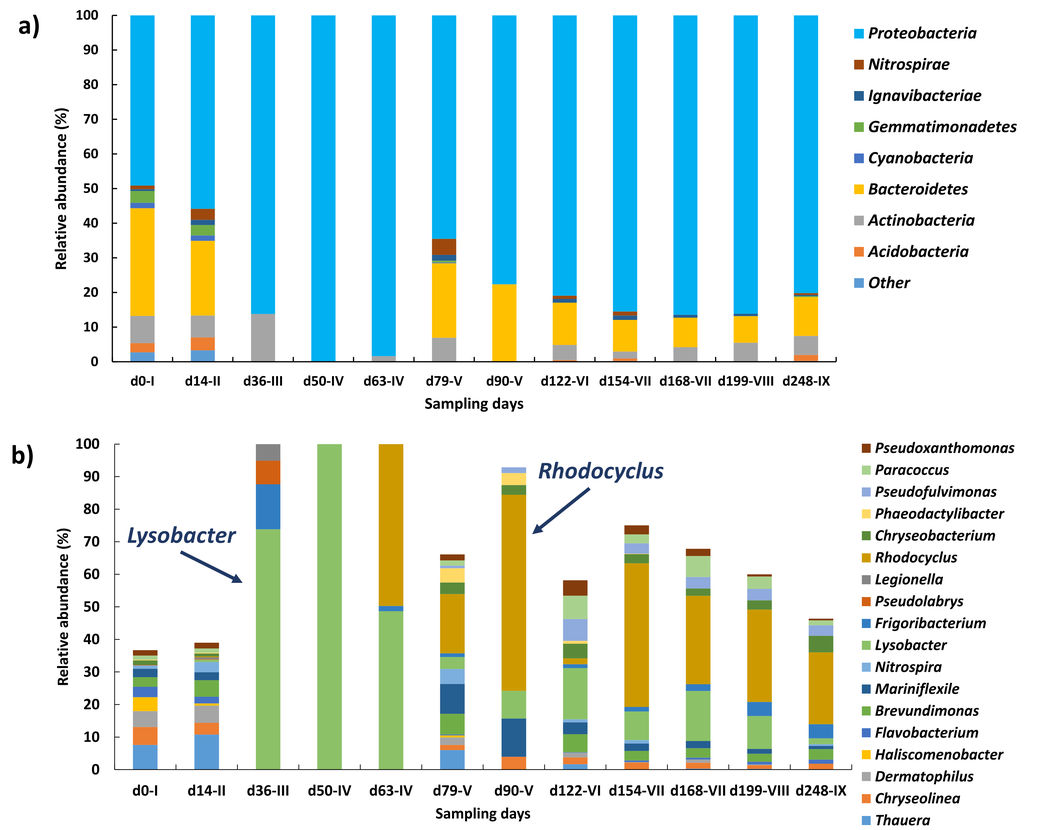

Figure 1 – Relative abundance of bacterial phyla (a) and top 12 bacterial genera (b) presenting the highest relative abundances in the AGS biomass along the reactor operational phases.

Conclusions

- Higher bacterial diversity observed while treating wastewater up to 3 g NaCl L^{-1};
- Salinity increase up to 6 g NaCl L^{-1} led to a relevant microbial diversity reduction;
- Salt increase led to the dominance of *Proteobacteria*, namely of *Lysobacter* and *Rhodocyclus* bacterial genera, associated to carbon-nitrogen removal and EPS production in AGS processes, respectively;
- The AGS process was able to adapt to salt by preserving the metabolic diversity required for performing different biological removal processes.

Acknowledgements

This work was financed by FCT through the project GReAT-PTDC/BTA-BTA/29970/2017 (POCI-01-0145-FEDER-029970). Authors thank the CBQF scientific collaboration under the FCT project UIDB/50016/2020.