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MASTER THESIS PROJECT

INDUSTRIAL BRINES BIOREMEDIATION USING *Haloferax mediterranei* R4 STRAIN: THE CASE OF DESALINATION PLANT, TEXTILE AND OLIVE PRODUCTION WASTEWATERS

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Summary

Haloferax mediterranei has shown to be an agent with high potential for brine bioremediation (e.g. of nitrates, nitrites, oxychlorides and some metals (i.e., Cu and Cd)). Thus, *a priori*, this microorganism may be of great interest for wastewater bioremediation. Therefore, the aim of this work is to evaluate the potential of this haloarchaea to be grown and bioremediate industrial wastewater from a desalination plant (DPR), a textile industry (TIR) and an olive production company (OPR). For this purpose, a physicochemical characterisation of the wastewater was carried out and *Hfx. mediterranei* was cultivated in the different waste media supplemented with the necessary nutrients to ensure the growth of the haloarchaea. To evaluate the results obtained, two culture media, "optimal" and "control", were used as reference, presenting different sources of N (NH_4^+ and NO_3^-) and percentage of salts (20 % w/v and 15 % w/v). The residues were highly heterogeneous at physicochemical level and, therefore, they were not suitable *per se* for the growth of *Hfx. mediterranei*. Consequently, it was necessary to supplement the residues with carbon, nitrogen, phosphorus and iron. Except for OPR, the results indicate that the industrial wastes studied allow the growth of *Hfx. mediterranei*. However, a decline in the physiological response is observed, decreasing its growth rate and the maximum values of optical density. In this sense, an increase in cell pellet pigmentation associated with carotenoid production is observed, suggesting an increased cellular stress compared to optimal and control conditions. In fact, variations in the elemental profile show an increase in Fe and Zn, cofactors of metalloproteins related to stress tolerance, and an increase in Ca, related to the production of exomucopolysaccharides. Despite the stress, it was demonstrated that *Hfx. mediterranei* can bioremediate 60-90 % of the NO_3^- present in the residues. Based on these results, this work suggests the use of wastewater for the growth of *Hfx. mediterranei*, waste bioremediation and production of economically/industrially valuable biomolecules (i.e. carotenoids).