O.57. Biological saline produced water treatment, a sustainable process towards lipids production

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Oil and gas industry is responsible for the generation of large volumes of oil-contaminated wastewaters, such as saline produced water (PW), that without proper treatment can cause environmental contamination. *Alcanivorax borkumensis* SK2 is a biosurfactant producer capable of degrading and converting hydrocarbons into bacterial lipids under nutrient limiting conditions (e.g. nitrogen and/or oxygen). Recently, the industrial interest in biosurfactants and bacterial lipids for biotechnological applications (e.g. bioremediation or biofuels production) is increasing. Pursuing the interest of treating and simultaneously valorizing PW, a sequencing batch airlift reactor (SBAR) strategy consisting of sequential cycles of feast and famine stages was developed. *A. borkumensis* SK2 was used as bioreactor inoculum and the effect of cycle duration, total petroleum hydrocarbon to nitrogen ratio (TPH/N) and dissolved oxygen (DO) concentration (7-8 mg L^{-1} and 2-3 mg L^{-1} (famine and feast stage); and 7-8/1-2 mg L^{-1} (famine/feast stage)) were investigated. The system provided an efficient PW treatment, achieving TPH removal efficiencies in a narrow range from 90 ± 2.1 to 96 ± 1.8 %. Intracellular lipid production increased from 0.48 to 0.74 g g^{-1} of cellular dry weight (CDW) with the application of higher feast stage duration and lower TPH/N ratios suggesting that nitrogen availability is the most relevant factor to promote accumulation. Under 2-3 mg L^{-1} and 7-8/1-2 mg L^{-1} of oxygen, lipid accumulation dropped to 0.50 g g^{-1} of CDW. Intracellular lipid profile changed according to the DO concentration. Triacylglycerols (TAG) and wax esters (WE) were accumulated under maximum and limiting DO concentrations, while polyhydroxyalkanoates (PHA) accumulation was triggered by the application of alternated DO conditions, indicating that the type of intracellular compound can be selected by manipulating the oxygen concentration in the SBAR. Extracellular lipid production (TAG and WE) was not significantly affected by none of the operational conditions applied (0.06 g L^{-1}). Moreover, the production of a cell-bound and an extracellular glycolipid biosurfactant capable of reducing the medium surface tension from 65 to approximately 41 mN m^{-1} was observed. The proposed strategy

showed that biological PW treatment in a SBAR can be a sustainable process through the production of added-value compounds contributing to a circular economy model. This research was supported by the Portuguese Foundation for Science and Technology (FCT I.P.) and European Regional Development Fund (ERDF) under the scope of project SaltOil+ (POCI-01-0145- FEDER-030180) (Portugal 2020, COMPETE 2020); Rita M. Silva PhD grant (SFRH/BD/116154/2016) was funded by FCT.