

A simultaneous *Spirulina* biomass production and brine desalination in an auto trophic culture

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ABSTRACT

The simultaneous *Spirulina* biomass production and wastewater treatment have already been the subject of several investigations in the past; however, treatment of the brine effluent by photosynthetic microorganisms was rarely studied due to the brine's harsh condition as a medium for cellular growth. This study has investigated an auto trophic cultivation of *Spirulina* in various brine-based culture media, in order to illustrate its viability for simultaneous *Spirulina* biomass production and brine treatment. The laboratory experiments were conducted in a 3 l inverted pyramid photo bioreactor. Seven various brine compositions were analyzed as culture media and the Zarrouk culture medium was used as the control. To assess the process efficiency, the *Spirulina* dry biomass and brine treatment quality were monitored during the cultivation period. The total cellular density increased in the brine-based culture media during 16 days of cultivation, and reached up to 0.6 g·l⁻¹ in the diluted brine. Meanwhile, the electrical conductivity (EC) and the total dissolved solids (TDS) of the brine-based culture media decreased to 43.5% and 71%, respectively. By using brine and Zarrouk culture media, it was found that cellular density was lower in the brine culture medium when compared to the Zarrouk control culture medium. In conclusion, the inhibitory effects of the brine culture components could be the cause of such inhibition in cell growth. Cellular adaptation to the brine culture medium takes approximately two days during the initial lag phase of growth of the primary cultures. The results of this study, indicate the potential of *Spirulina* for brine desalination.

Keywords: Cyanobacteria biomass; Nutrient removal; Brine discharge; Tolerant microorganisms; Microalgae cultures

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