QSCIENCE PROCEEDINGS

OPEN ACCESS

Qatar University Life Science Symposium 2016: Biodiversity, Sustainability and Climate Change, with Perspectives from Qatar

# Investigating algal $CO_2$ capture through screening of Qatari desert microalgae & cyanobacteria strains

Mariam Al Muraikhi[1], Kira Schipper[1,2,*], Imen Saadaoui[1], Hareb Al Jabri[1], Maria J. Barbosa[2], Rene H. Wijffels[2]

[1]Qatar University, Center for Sustainable Development, P.O. Box 2713, Doha, Qatar
[2]Wageningen University, P.O. Box 16, 6700 AA Wageningen, The Netherlands
*Email: kira.schipper@qu.edu.qa

## ABSTRACT

$CO_2$ fixation by phototrophic microalgae has been addressed as a possible global carbon emissions reducer, whilst simultaneously producing useful products. Especially in Qatar, the prospect of using microalgae for $CO_2$ abatement is promising: high solar irradiance, large areas of non-arable land, and large amounts of $CO_2$ emissions make it seemingly the ideal place for algae cultivation. In order to promote high biomass productivities, and subsequent $CO_2$ uptake rates, effective $CO_2$ supply to the cultivation system is of high importance. However, the low solubility of $CO_2$ in water, as well as the limiting tolerance of microalgae to increased $CO_2$ concentrations, results in low efficiency of $CO_2$ capture by microalgal production systems. In order to overcome these hurdles, this research focused on selecting local desert microalgae strains with high tolerance to increased $CO_2$ levels, and developing growth media in order to increase the solubility of $CO_2$. Forty-five locally isolated marine microalgae strains were screened for growth under increased $CO_2$ concentrations, ranging from 0.04% to 30% (v/v). A number of different trends in $CO_2$ tolerance could be identified from the results; a number of strains showed a clear inhibition of growth with $CO_2$ concentrations of 5% and higher, whilst others showed increasing growth rates for increasing $CO_2$ concentrations up to 30%. The trend in growth rate suggests that even higher $CO_2$ concentration could be applied without growth-limiting effects, and could even stimulate higher growth-rates. In order to further increase the productivity of high $CO_2$-tolerant strains, as well as to investigate the effects of pH on the $CO_2$ tolerance of low-tolerant strains, various strains were cultivated in alkaline media and high $CO_2$ concentrations. Besides leading to an increased solubility of $CO_2$ in the culture media, increasing the pH is thought to balance the acidification effect of $CO_2$ – possibly leading to higher $CO_2$ tolerances. Overall, applying these strains and media adaptations for large-scale applications is expected to increase the $CO_2$ transfer efficiency to the culture, resulting in decreased operational costs and higher overall productivities.

http://dx.doi.org/10.5339/qproc.2016.qulss.24



QSCIENCE.com
An Initiative of Qatar Foundation

Cite this article as: Al Muraikhi M, Schipper K, Saadaoui I, Al Jabri H, Barbosa MJ, Wijffels RH. Investigating algal $CO_2$ capture through screening of Qatari desert microalgae & cyanobacteria strains. QScience Proceedings: Vol. 2016, QULSS 2016: Biodiversity, Sustainability and Climate Change, with Perspectives from Qatar, 24. http://dx.doi.org/10.5339/qproc.2016.qulss.24