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Published in:
Book of Abstracts. DTU's Sustain Conference 2015

Publication date:
2015

Document Version
Publisher's PDF, also known as Version of record

Microalgal bioremediation of nutrients in wastewater and production of food/feed ingredients

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Microalgal bioremediation (Phycoremediation) is a green process for removing nutrients from wastewater; diminish the pollution load and producing biomass which can be used as an ingredient in food/feed. Compared to conventional treatment processes it is a sustainable and economical technology for treating wastewater. Microalgae have great potential for the removal of carbon dioxide from flue gas and nutrients such as nitrogen and phosphorus from wastewater, providing a sustainable solution to the challenge of environmental pollution. Many industrial processes produce contaminated waste water capable of causing serious ecological harm if released into the environment without suitable pre-treatment. Algal bioremediation of agro-industrial waste water streams from intensive production activities, such as aquaculture, piggeries and food production, is capable of producing commercial volumes of algae biomass suitable for human and animal nutrition. Micro-algae are already used as sources of nutrition for humans and animals.

In this study, the phycoremediation of some microalgae species including *Nannochloropsis salina, Nannochloropsis limnetica, Desmodesmus sp., Chlorella vulgaris, Chlorella pyrenoidosa* and *Chlorella minutissima* was investigated in a batch culture medium containing different levels of industrial waste water. Nutrient uptake, optical density, biomass yield and chemical composition including protein (amino acid), lipids (fatty acids), tocopherols and carotenoids were analyzed during the course of cultivation.

Green algae were found as the most efficient in phycoremediation. *Chlorella minutissima, Chlorella vulgaris, Chlorella pyrenoidosa and Desmodesmus sp.* grew well on 100% industrial waste water and can therefore be used for phycoremediation purposes. The removal efficiency in all of them was high. Results also show that Chlorella spp. biomass contained higher amounts of protein (52%), Chlorella spp. biomass contained the highest amount of protein (52%), suggesting a future potential as protein source in the feed industry. Moreover, *Nannochloropsis salina* produce highest amounts of fat (40%) and EPA content (38%) when it is being cultivated on a mix of industrial waste water and normal growth media. This study also presents data on a wild type of *Desmodesmus sp.,* isolated from Kalundborg water treatment system, which showed the highest biomass production and growth rate when grown on 100% industrial waste water.