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Microalgae biomass production in municipal wastewater and use of the produced biomass as sustainable biofertilizer

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ABSTRACT

Due to the lack of natural water sources, and cost and environmental issues associated with water desalination, Qatar currently emphasizes on the reuse of current wastewater sources, which includes conventional and unconventional approaches to utilize every available water sources, and ultimately promoting the wastewater stream driving from local municipalities. Currently, very few approaches have been taken to utilize this municipal wastewater sources. Moreover, municipal wastewater can also be utilized as growth media for producing microalgae biomass. A well-known approached is to utilize wastewater stream in an integrated farming system such as open pond microalgae cultivation system. In general microalgae, cultivation system requires a large quantity of water supply where additional nutrients and carbon dioxide are needed for microalgae biomass production. Whereas, microalgae grown in municipal wastewater can utilize the available N, P and other trace metals and therefore additional nutrients are not required. The process starts with the integrated treatment of municipal wastewater by selective local microalgae strains which can tolerate the complex stress deriving from the wastewater, consequently producing valuable by-products with zero wastes. In addition, during the cultivation, flue gas can be injected to enhance the biomass productivity. The aims of this study were to screen and optimize native microalgae strains growth in the wastewater stream from Al-Khor municipality. After screening microalgae strains with closed controlled condition, they were tested further with the ambient outdoor conditions in High Rate Algal Pond 200 L open system, using same municipal wastewater. Microalgae biomass were harvested after 10 days of experiments to utilize them as a biofertilizer. Among the microalgae strains two microalgae strain *Chlorella* sp. and *Scenedesmus* sp. shown higher biomass yield after the growth period. Overall *Chlorella* sp. gives a higher nitrogen and phosphorus uptake from the municipal wastewater effluent. Further study also showed a higher plant growth when municipal wastewater grown microalgae biomass was used as biofertilizer as compared to conventional inorganic fertilizer.

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