Potential of Macroalgae Ulva lactuca for Municipal Wastewater Treatment and Fruitfly Food

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Abstract: Macroalgae are considered a promising approach for wastewater treatment as well as an alternative animal feed in addition to a biofuel feedstock. Their large size and/or tendency to grow as dense floating mats or substrate-attached turfs lead to lower separation and drying costs than microalgae. In this study, the macroalgae species Ulva lactuca (U. lactuca) were used to investigate their capacity for treating municipal wastewaters, and the feasibility of using the harvested biomass as an alternative food source for the fruitfly Drosophila melanogaster, an animal model for biological research. Results suggested that U. lactuca could successfully grow on three types of wastewaters studied with biomass productivities of 8.12-64.3 g DW (dry weight)/(m²·d). The secondary wastewater (SW) was demonstrated as the most effective wastewater medium for U. lactuca growth. However, both high nitrogen (92.5-98.9%) and phosphorus (64.5-88.6%) removal efficiencies were observed in all wastewaters, particularly in primary wastewater (PW) and SW, however, in central wastewater (CW), the highest removal rates were obtained (N 24.7 ± 0.97 and P 0.69 ± 0.01 mg/(g DW·d)). Additionally, the inclusion of 20% washed U. lactuca with 80% standard fruitfly food (w/w) resulted in a longer lifespan and more stable body weights in flies. On the other hand, similar results were not obtained for the food treatment with the addition of 20 % unwashed U. lactuca. This study suggests a promising method for the macroalgae-based treatment of municipal wastewater and the biomass for animal feed.

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Keywords : animal feed, flies, macroalgae, nutrient recovery, Ulva lactuca, wastewater

Conference Title : ICEB 2019 : International Conference on Environment and Biotechnology

Conference Location : Vancouver, Canada

Conference Dates : August 07-08, 2019