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Viability of Constructed Wetlands for saline wastewater treatment and plant biomass energetic valorization

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Wastewater derived from marine fish farming requires treatment before discharge to comply with environmental and legislative issues. However, conventional treatment methodologies are not fully developed for high salinity effluents and represent an added-cost for the farmer. More performing and cost-effective techniques are needed.

Constructed Wetlands (CW) are effective and low cost systems for effluent treatment, offering some valorization possibilities via biomass production. Some experiments with freshwater fish farm effluents are reported, but very few data exist with saline wastewater [1]. Hence, this study aims to test the feasibility of treating the final effluent from a marine Recirculating Aquaculture System (RAS) with salt tolerant *Typha latifolia* in a VSSF (vertical subsurface flow) constructed wetland configuration. Furthermore, through a novel and untested new methodology, this study seeks to test the feasibility of converting the produced vegetative biomass into biofuel [2].

The experimental methodology comprehends laboratory scale CWs with VSSF configuration using *Typha latilofia* planted in a substrate of expanded clay. Tests in triplicate with either RAS saline wastewater or a low concentration of a commercial nutritional solution without salt (3% N, 1,5% P_2O_5, 3% K_2O, 0,015% Fe and trace metals) are being applied. Temperature and humidity are monitored daily and treatment efficiency is evaluated for nitrate, nitrite, ammonia, phosphate, TN and TP in water samples collected weekly. Plant growth rate is also weekly evaluated.

A methodology for a methanogenic inhibited anaerobic fermentation of the produced vegetative biomass is currently under development.

Preliminary tests with *T. latifolia* grown under laboratory conditions irrigated with a commercial nutritional solution show an average growth of 18,00 ± 15,86 cm (43,20 cm maximum height) over a period of one and half months. These findings reveal a good adaptation of the plants to the laboratory conditions, the artificial substrate, as well as to the low dosage of the tested nutritional solution.

Based on these promising preliminary findings it is expected a good biomass production with aquaculture effluents to be used in fermentation tests currently under development.

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