

Title:

Culturing Aquaponic Microalgae in Aquaponics Wastewater: Circular Economy Philosophy

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Abstract:

Aquaponics, also known as the integration of hydroponics with aquaculture, is gaining increased attention as a bio-integrated food production system. In an aquaponic system, water from an aquaculture system is fed to a hydroponic system where the by-products are broken down by nitrifying bacteria initially into nitrites and subsequently into nitrates that are utilized by the plants as nutrients. The water is then recirculated back to the aquaculture system. Nevertheless, in our system (Tilapia, *Tilapia niloticus*, was the culturing fish, and lettuce, *Lactuca sativa* was the culturing vegetable), a 2% of this water still has to be replaced with fresh one every week. The aim of this work was to use this 2% wastewater to produce microalgae biomass and remediate the wastewater.

In this way, five microalgae species previously isolated from the same wastewater aquaponic systems were used under laboratory conditions: *Chlamydomonas* sp., *Grasiela emersoni*, *Parachlorella hussii*, *Parachlorella kessleri* and a *Chlamydomonas-like* strain. Aside, forced blooms with just agitation or bubbling (Aire + 1% CO₂) were also tested. The removal of nutrients from aquaponics wastewater and the microalgae biomass production was more effective with microalgae inoculum than with just promoting natural blooms.

In conclusion, microalgae were able to remediate the aquaponics wastewater and the biomass obtained, at a higher scale production, might have different application such as fertilizers and fish feed.