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# Effects of stocking density of tilapia on the performance of a membrane filtration–recirculating aquaponic system

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**ABSTRACT**

The discharge of water effluents from aquaculture systems pollutes the waters of the ambient environment and is a major concern in the development of sustainable aquaculture. In this study, we examined the effects of fish stocking density on water quality and biomass yields in a recirculating aquaponic–membrane filtration system used for co-culturing tilapia (*Oreochromis niloticus*) and water spinach (*Ipomoea aquatica*). The system was composed of a fish tank, sludge tank with a filtration membrane, and hydroponic tank. Tilapia (average initial weight, 1.8 g) was examined at three densities: 450 (low), 600 (medium), and 750 (high) individuals per tank. The initial density of water spinach was 8.3 g $m^{-2}$. The experimental period with no water exchange lasted for 12 weeks. Our results revealed that the increasing density of tilapia correlated positively with the increasing weight gain of water spinach but negatively with the growth of tilapia. The average weight gains were 10.8, 8.3, and 4.0 g in the low-, medium-, and high-density groups, respectively. The levels of $NH_4^+$–N, $NO_2^-$–N, $NO_3^-$–N, orthophosphate, biochemical oxygen demand, total bacterial counts, and turbidity in the fish and plant tank effluents were significantly higher in the high-density group than in the low-density group. The total weight gains of plants were 1,204, 1,402, and 1,708 g in the low-, medium-, and high-density groups, respectively. These results indicated that membrane filtration combined with a hydroponic component maintained a suitable water quality in the system for the survival of fish. However, the highest fish biomass gained was observed in the medium-density group, and the highest plant yield was obtained in the high-density group.

*Keywords:* Aquaponic; Membrane filtration; Stocking density; Tilapia; Water spinach

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