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Effect of flow rate on water quality parameters and plant growth of water spinach (*Ipomoea aquatica*) in an aquaponic recirculating system

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ABSTRACT

Recirculating aquaculture–hydroponic systems were designed to provide an artificial, controlled environment that optimizes the growth of fish (or other aquatic species) and soil-less plants, complete control of water quality, the production schedule and the fish product, while conserving water resources. Nutrients removal such as inorganic nitrogen and phosphate is essential for aquaculture wastewater treatment to protect receiving waters from eutrophication as well as for potential reuse of the treated water. In this study, a prototype of an aquaponic system was built at the Freshwater Hatchery Unit on the University Malaysia Terengganu campus. The system consists of a fish culture tank, hydroponic trough, sump, sand filter and water holding tank. Hydroponic troughs were planted with water spinach (*Ipomoea aquatica*) that been used to treat wastewater from an aquaculture system stocked with African catfish. The unplanted hydroponic trough was concurrently run as a control unit. The effect of five different water flow rates was tested in order to relate nutrients removal, water quality with plant growth. The results showed that the aquaponic recirculating system removed 5-day biochemical oxygen demand (47–65%), total suspended solids (67–83%), total ammonia nitrogen (64–78%), and nitrite-nitrogen (68–89%), and demonstrated positive correlated with flow rates. Total phosphorus and nitrate-nitrogen removal rates varied from 43% to 53% and 42% to 65%, respectively, and were negatively correlated with flow rates. It was found that all flow rates were efficient in nutrient removal and in maintaining the water quality parameters within the acceptable and safe limits for growth and survival of fish.

Keywords: Flow rate; Water quality parameters; Water spinach; Aquaponic; Recirculating systems

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