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## Comparison of efficiency and nitrification process in an aquaponic system using two types of hydroponic subsystems

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### Abstract

In aquaponic systems, the difference in the specific design of the hydroponic subsystems causes a difference in the rate of nitrate uptake by the plant and subsequently, changes in the nitrification process and production efficiency of these culture systems. In this experiment, the efficiency and nitrification process in a lab-scale aquaponic system using two different hydroponic subsystems including the deep water culture (DWC) and nutrient film technique (NFT) were evaluated for 8 weeks. Each system consisted of 3 replicates and in total 6 separate aquaponics culture systems were designed. Common carp juveniles (*Cyprinus carpio*- with an average initial weight of  $9.34 \pm 0.06$ g and a density of 300 juveniles per cubic meter in fish culture tanks) and mint (*Mentha spicata*- 6 plants in each hydroponic subsystem) were cultured in a green house facility. Water quality parameters such as pH, nitrate and ammonia levels were measured and compared at the end of every week. At the fourth week of the experiment, the pH of the DWC system was significantly higher than that in the NFT ( $P < 0.01$ ). Ammonia levels did not show any significant difference between the two types of aquaponic systems during the experiment ( $P > 0.05$ ). In both systems, nitrate values showed an increasing trend from the third week to the end of the fourth week, followed by limited fluctuation until the end of the experiment. The nitrate levels in the NFT system were higher in the fourth, fifth, sixth and eighth week. The average total weight of the mint plant in the DWC system was higher than that in the NFT system. Based on the results, the use of the DWC is recommended due to the better efficiency of the experimental culture system and the better growth performance of fish and mint plant.

**Keywords:** Aquaponic, Common carp (*Cyprinus carpio*), Hydroponic, Mint (*Mentha spicata*), Nitrification

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