

Effect of Aquaponics Hybrid System in Nutrient Removal from *Clarias Gariepinus* Hatchery

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Abstract: Aquaponics is an efficient method that merges both aquaculture and hydroponic in a single system for fish and crop growth. The wastewater inside the aquaponics system has created an issue of ammonia content. Managing the discharge water quality thus secure that the system will become stable and productive has been the main objective of the study. On the other hand, this study also focuses on investigating the water quality parameters. To enhance the treatment system, a hybrid of activated carbon as absorption to the system is studied. The investigated parameters are dissolved oxygen, pH, water temperature, ammonia nitrogen, total suspended solids (TSS) and chemical oxygen demand (COD). The results revealed that adding a Lettuce (*Lactuca sativa* L.) hybrid with activated carbon to the aquaponic system has greatly improved the productivity growth while reducing the ammonia nitrogen concentration at the discharge point. Besides, pH levels in aquaculture systems should be between 6.5 and 8.5. Dissolved oxygen and temperature in the aquaponic system using African catfish and lettuce throughout the experimental period were in the range of 4.0 – 6.0 mg/L of DO and 26.2°C, respectively which is suitable for both fish and plants. Besides, it was discovered that ammonia nitrogen concentration has been effectively removed by 75%, water pH increased between 6.0 -7.8. Ammonia level in aquaponics was, in fact, below 0.1 mg/L. Total suspended solids (TSS) in recirculating aquaculture systems have a potential for African catfish wealth. The Arduino microcontroller was used as the device for monitoring and controlling the conditions of water quality. Thus, the sustainability of the aquaponics system (*Clarias gariepinus* and lettuce) treated with activated carbon can be evaluated.

Keywords: Aquaponics; *Clarias gariepinus*; *Lactuca sativa* L; ammonia; activated carbon.

1. Introduction

Aquaculture is a controlled process for the cultivation of aquatic organisms, essential for human consumption. Hydroponics is a plant-growing method that uses a high nutrient solution with a water base, which means that soil does not use in a hydroponic system. The concept is similar to agriculture, but with fish instead of plants or livestock. Aquaponics is a methodology for food production that involves the combination of aquaculture and hydroponics in a single integrated method of development. Nowadays, consumers tend to use aquaponics for breeding fish, rather than the hydroponics and aquaculture systems, because this system can grow plants while at the same time filtering water from the fish tank. Aquaponics is an efficient method because it provides advantages to both plants and fishes without putting the environment at risk [1].

Principally, there are three most common types of aquaponics system designs, namely the Nutrient Film Technique (NFT), Media Bed, and Deep Water Culture (DWC). Aquaponics utilizes fish wastes in order to provide essential nutrients for the growth of plants [2]. In return, plants serve as a biofilter to take away harmful by-products from fish wastes. However, this

system required a special set of water chemistry and optimal water quality to ensure a healthy, stable and efficient system.

METHODOLOGY

This project used lettuce as the plant sample, activated carbon as median, Clarias Gariepinus and Arduino microcontroller system as a method to achieve the overall objectives. The preparation of design and implementation of the hydroponics nutrition system using Arduino and sample of plants were discussed. Real-time observations of the nutrient removal from the water inside the fish hatchery can be made for the favorable growth and survival of the fish as well as the plants associated with the complete system. The purpose of activated carbon in an aquaponics system will be observed.

Flowchart (Experimental Data)

The purpose of this flow chart in Figure 1 is to smooth the flow of the project by organizing the steps that need to be taken. This process was started by a literature review to obtain some information and better understanding from previous research papers, journals, articles and different tools relevant to the project. After the literature review, the location will be chosen to conduct the experiment. The next step is to collect pre-data of the quality and content of the water at the chosen location of the fish hatchery or fish pond. To achieve the objectives of this project, the analysis of the growth rate and efficiency of the plants selected by using Arduino system must be observed. Thus, the media and plant that has already been determined will be examined and the result will be measured.

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6. References

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