**NUSANTARA BIOSCIENCE**
Vol. 9, No. 1, pp. 83-85
February 2017

ISSN: 2087-3948
E-ISSN: 2087-3956
DOI: 10.13057/nusbiosci/n090114

# Short Communication: Water quality improvement of Nile tilapia and catfish polyculture in aquaponics system

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Manuscript received: 21 December 2016. Revision accepted: 10 February 2017.

**Abstract.** *Hasan Z, Dhahiyat Y, Andriani Y, Zidni I. 2016. Water quality improvement of Nile tilapia and catfish polyculture in aquaponics system. Nusantara Bioscience 8: 83-85*. Research on the improvement of polyculture water quality in aquaponics system was conducted from July 2014 to August 2014. This study aims to improve the water quality in Nile tilapia and catfish polyculture by applying the aquaponics system. The results show that several water quality parameters increase, such as dissolved oxygen, ammonia, and nitrate. Meanwhile, Orthophosphate tends to be similar both in aquaponics system and control. The study is conducted experimentally by using completely randomized design. The cultured fish are catfish and Nile tilapia while the aquatic plants are water spinach and lettuce. At the end of the study the concentration of dissolved oxygen in the aquaponics system ranges from 5.3 to 7.6 mg/L, while in the media control ranges from 4.2 to 4.3 mg/L. Average concentrations of ammonia, nitrate and orthophosphate in the aquaponics system range from 0.003 to 0.25 mg/L, 10.0 to 50.7 mg/L and 3.0 mg/L-5.0 mg/L respectively. Meanwhile, in media control, concentration of those three parameters are 0.003 to 0.35 mg/L, 10.0 to 60.0 mg/L and 3.0 to 5.0 mg/L respectively. Based on this study, it is concluded that the polyculture water quality can be improved through the application of the aquaponics system.

**Keywords:** Aquaponics, catfish, polyculture, tilapia

## INTRODUCTION

Aquaculture is an industrial activity that is undergoing 7% increase each year and is projected to replace conventional fish catching in meeting the need for fish (FAO 2009). According to the Ministry of Marine and Fishery (2010), the fishery production in Indonesia in 2010 amounted to 10.83 million tons, 50.55% of which derives from aquaculture. The availability of land and water for aquaculture is getting more limited due to population growth and physical development. Besides the communal activities that cause pollutions, the fish culturing activity also produces waste such as feed leftover, feces, and residue of fish metabolism, high in ammonia content that is toxic to the cultured organisms and decreases the concentration of dissolved oxygen. These will later ignite domino effects that are both economically and ecologically devastating.

Innovation and technological inputs are required to anticipate the decline in aquaculture production and productivity due to the decrease of land availability and water quality. One technological innovation is the integration of fish culturing with a plant growing called the aquaponics system (Diver 2010). Somerville et al.(2014) stated that the aquaponics system is a solution due to growing price of land, limited water source, and infertile land. It is further stated that aquaponics is suitable for sandy areas as well as urban farming. Most plants can be grown in the aquaponics system, among which are water spinach and lettuce. These plants are biofilter alternatives in absorbing nitrogen in form of ammonium ($NH4^+$) and nitrate ($NO_3^-$), in order to reduce the nitrogen content in water (Rakocy et al. 2006; Rakocy 2007).

Most plants can be grown in the aquaponics system. Based on Diver (2010) the selection of plant species adapted to hydroponic culture in aquaponic greenhouses is related to stocking density of fish tanks and subsequent nutrient concentration of aquacultural effluent. Lettuce, herbs, and specialty greens (spinach, chives, basil, and watercress) have low to medium nutritional requirements and are well adapted to aquaponic systems. Meanwhile Pantanella (2010) stated that plants performance is specific for each cultivar and the same aquaponics nutrient pool may not be totally applicable to others plant varieties for optimal growth due differences nutritional needs. to In this research water spinach and lettuce be chosen as plants tested. These plants are biofilter alternatives in absorbing nitrogen in form of ammonium ($NH^{4+}$) and nitrate ($NO_{3-}$), in order to reduce the nitrogen content in water (Rakocy et al. 2006; Rakocy 2007). A simplified nitrogen cycle in an aquaponic system that includes plants, fish and nitrifying bacteria has been stated by Tyson and Simmone (2015).

The initiation of the aquaponics system in the experiment pond the Faculty of Fisheries and Marine Sciences has begun since the study by Zidni et al. (2013). In the study the culturing of Sangkuriang catfish is integrated with growing water spinach. The results of the study show that Sangkuriang catfish can be cultured at the stocking density ratio of up to 100 fish/$m^2$ with excellent