UNDERGRADUATE THESIS

PRODUCTION OF WATER CONVOLVULUS (*Ipomoea aquatica*) AND DAITOKYO BEKANA (*Brassica rapa* L. Chinensis) IN AQUAPONIC SYSTEM

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DEPARTMENT OF AGRONOMY
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SUMMARY

CHAERU ANUGRAH UTAMA. Production Of Water Convolvulus (*Ipomoea aquatica*) And Daitokyo Bekana (*Brassica rapa* L. Chinensis) In Aquaponic System (Supervised by **ANDI WIJAYA**).

The objectives of this research were to observe the production of Daitokyo Bekana (*Brassica rapa* L. Chinensis), Water Convolvulus (*Ipomoea aquatica*), and Tilapia (*Oreochromis niloticus*) in a small-scale aquaponic system, as well as the dynamics of nutrient in the system. Only initial organic micronutrients were added to the system. The production of Daitokyo Bekana and Water Convolvulus decreased until the end of experiment. Some nutritional disorders were found during second and third harvesting including chlorosis, interveinal chlorosis, stunted growth, wilting, and curly leaves. Electrical conductivity increased even very low (535 µS/cm at final measurement). Water sample was taken every week. Nine elements analyzed were ammonium (NH_4^+), nitrate (NO_3^-), potassium (K^+), phosphorus ($H_2PO_4^-$), calcium (Ca^{2+}), magnesium (Mg^{2+}), sulfur (SO_4^{2-}), sodium (Na^+), and chloride (Cl^-). Sea coral was good source for calcium. pH was unstable but tended to increase, followed by water temperature and other elements composition. Nitrogen and potassium were found as limiting factor in the systems.

Keywords: Water Convolvulus, Daitokyo Bekana, Tilapia, Aquaponic

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Submitted to the Faculty of Agriculture Sriwijaya University
As Partial Fulfillment of the Requirements for the Degree of
Bachelor of Agriculture

Chaeru Anugrah Utama
05081001017

DEPARTMENT OF AGRONOMY
FACULTY OF AGRICULTURE
SRIWIJAYA UNIVERSITY

2015

SHEET OF VALIDATION

PRODUCTION OF WATER CONVOLVULUS (*Ipomoea aquatica*) AND DAITOKYO BEKANA (*Brassica rapa* L. Chinensis) IN AQUAPONIC SYSTEM

UNDERGRADUATE THESIS

Submitted to the Faculty of Agriculture Sriwijaya University As Partial Fulfillment of the Requirements for the Degree of Bachelor of Agriculture

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Indralaya, July 2015

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Undergraduate Thesis "Production Of Water Convolvulus (*Ipomoea aquatica*) And Daitokyo Bekana (*Brassica rapa* L. Chinensis) In Aquaponic System" by Chaeru Anugrah Utama was approved by Final Examination Committee in 1st of July 2015 and had been revised as advice from committee members.

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BIOGRAPHY

Chaeru Anugrah Utama was born on 27 September 1990 in Palembang. He is the first child of five children from Khoirul Saleh and Yut Holina.

He completed his elementary school in SDN 1 Sukajadi, Banyuasin. Then, He joined SMPN 51 Palembang. After He finished his education in Junior High School, He continued his study in SMAN 13 Palembang. On 2008, He continued his study to Department of Agronomy, Faculty of Agriculture, at Sriwijaya University.

Author joined Mobile Exchange Student Program for one semester sponsored by DIKTI on 2011 at Universiti Putra Malaysia (UPM). He continued to study abroad on 2013 to Walailak University,Thailand for Undergraduate Research Program, Sponsored by Sriwijaya University. During his time in Thailand Author enhanced his knowledge and skills in Soilless Culture vegetable production, especially Hydroponic and Aquaponic method.

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Indralaya, Juli 2015

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CHAPTER I
INTRODUCTION

1.1. Background

Aquaponic is an integrated farming systems combining aquaculture and hydroponic. The principle of the system was based on reusing water and nutrients from aquaculture into a crop production system, utilising the nutrients in the aquaculture effluent (Rakocy *et al*., 2006).

Aquaculture is defined as the production of living organisms in water which encompasses both plants and animals in fresh, marine or brackish water (Jasper, 1992). The products from aquaculture are usually targeted for food and fiber, but as the industry has developed products suited for the ornamental, pharmaceutical and medical industries have resulted. Different systems of aquaculture are segregated based on their levels of intensity ranging from extensive systems where human input is minimal, followed by semi-intensive and then intensive systems where man has the upper hand in controlling both water quality and availability of food (Brown *et al*., 1986). Tilapia (*Oreochromis niloticus*) is the fish species most commonly cultured in aquaponic systems. It is hardy and resistance to diseases (Rakocy *et al*, 2006). Therefore, it is a good consideration rearing tilapia for small scale aquaponic system.

The principle of using fish waste as plant fertilizer in the farm has been used by some traditional societies around the world. For example, Aztec civilization, today Mexico, cultivated crops in the "island" created in shallow lakebeds. These islands called *chinampas*, or floating garden, were planted which were watered with lake water and fertilized with sediment. In this lake system, fish were wild and not explicitly cultivated. An integrated system of aquaculture and agriculture where fish are grown in rice paddy-fish farming system has been employed in Malaysia since the 1930's. The same system is practiced extensively in the North Kerian area of Perak in Peninsular Malaysia. Several rice-fish system are also reported to have a long history in Indonesia. These include *minapadi, penyelang,* in West Java and *sawah tambak* in coastal East Java, which employs a brackish

water-fresh water containing prawns, fish, and rice. The FAO publication also reports that rice-fish systems have existed in China for over 1.700 years. Long history of aquaculture-farm system also found in Philippine (Goodman, 2011).

Licamele (2009) has proved that aquaculture systems can provide a consistent organic source of nutrients for the hydroponics plants in an aquaponic system. It also reported can reduce the environmental impacts of conventional agriculture and aquaculture farming. This could be a chance to apply a hydroponic system in a family scale by using fish effluent as fertilizer source, replacing high-priced chemical for hydroponic solution.

From aquaculture point of view, the plant in aquaponic system is considered as a phytoremediation system. Phytoremediation uses living higher plants for cleaning up contaminated soil or water by removing, sequestering, or biochemically decomposing the pollutant (Lorenz, 2006). Many countries have established water quality regulations to protect water source from pollution. These regulations often are based on the effluent limitations into certain bodies of water relating to their use (Rahman, 2002). The treatment of wastewater using aquaponics system, one of many phytoremediation strategies, has been the focus of increasing research interest (Tokuyama *et al*., 2004).

Although it has a lot of benefit, components used in recirculating aquaponic systems need to be designed and developed to maintaining its reliability (Crab, 2007).

1.2. Objectives

The objectives of this research were to observe the production of Daitokyo Bekana (*Brassica rapa* L. Chinensis), Water Convolvulus (*Ipomoea aquatica*), and Tilapia (*Tilapia oreochromis*) in aquaponic system.

1.3. Hypothesis

Without additional nutrition, plant fresh weight and production would decrease.

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