UTILIZATION OF VARIOUS FISH DUNG ON THE GROWTH AND PRODUCTION OF LETTUCE (LACTUCA SATIVA L.) IN THE AQUAPONIC SYSTEM

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ABSTRACT

The growing population where is not followed by accretion of land and in increased and as well as the high over its role in taking function of farmland into land other uses, made of farmland are increasingly limited. Whereas the needs food and vegetableskept rising throughout. Hence aquaponic of providing an alternative farming in land limited by combining system aquatics and hydroponic in the environment symbiotic. This study aims to evaluate the effect of various types of fish dung on the growth and production of lettuce (Lactuca sativa L.) on the aquaponic system. This research conducted on Agriculture Faculty experimental land of University of Muhammadiyah Sumatera Utara. The research used Randomized Block Design (RBD) non factorial with a factor that be researched was dung of fishes of five of a kind fish, namely: K1: catfish dung of fishes, K2: tilapia dung of fishes, K3: gurame dung of fishes, K4: goldfish dung of fishes and K5: bawal dung of fishes. Parameter that measured covering: plant height, number of leaves, weight per plant. The result showed that dung of fishes had significant effect on plant height, number of leaves, and weight per plant. Thus, the various dung of fishes in aquaponic system had significant effect on the growth and yield of lettuce.
Keywords: Lettuce, Dung of Fishes, Aquaponic.

A. INTRODUCTION

Aquaponics provides alternative farming in limited land by combining aquaculture and hydroponics in a symbiotic environment. Aquaponic nutrition can be obtained easily, namely from fish droppings. Generally, the excretion of aquaculture from reared fish will accumulate in water and increase toxicity if not removed. In aquaponics, fish waste will be broken down into nitrates and nitrites through natural processes and utilized by plants as a source of nutrition (Rakhman *et al.*, 2015).

Vegetables are a source of minerals and vitamins. One type of vegetable plant that contains vitamins and iron because it has green leaves is a lettuce plant (Lactuca sativa, L.). To support the fulfillment of the community's need for balanced nutrition, it would be better if in conducting fish farming is also accompanied by the cultivation of vegetables in fish ponds known as aquaponics (Fariudin *et al.*, 2012).

Lettuce is a leaf vegetable that is loved by the community. Lettuce is usually consumed in fresh form as fresh vegetables. Lettuce has various nutritional content, such as fiber, vitamin A, and iron. It is thought that the iron content can still be increased to meet human needs for iron every day (Zuhaida *et al*., 2011).

Aquaponics is one way to reduce water pollution generated by fish farming and is also an alternative to reduce the amount of water used by the culture system. Aquaponics technology is an alternative that can be applied in the context of solving water limitations (Putra *et al*., 2013).

B. MATERIALS AND METHODS

In order to study the Utilization Of Various Fish Dung On The Growth And Production Of Lettuce (*Lactuca Sativa* L.) In The Aquaponic System an experiment was conducted on Agriculture Faculty experimental land of University of Muhammadiyah Sumatera Utara. The research used Randomized Block Design (RBD) non factorial with a factor that be researched was dung of fishes of five of a kind fish, namely: K1: catfish dung of fishes, K2: tilapia dung of fishes, K3: gurame dung of fishes, K4: goldfish dung of fishes and K5: bawal dung of fishes.

C. RESULTS AND DISCUSSION

Based on the results of analysis of variance with a Non Factorial Randomized Design showed that the treatment of fish manure significantly affected plant height.

Table 1 shows that the height of the lettuce plant aged 3 to 6 weeks after planting due to the treatment of various kinds of fish droppings gives the same growth pattern that is the height of the lettuce plant from highest to lowest respectively in the treatment of goldfish droppings (K4), pomfret (K5), catfish (K1), tilapia (K2) and carp (K3). This is because the ability of each plant to absorb nutrient elements varies depending on plant metabolism. So as to produce the highest plant growth (K4) compared to other treatments. Plant growth, besides being influenced by the type of plant itself, is also influenced by the availability of nutrient elements.

Table 1. Lettuce Height with the Treatment of Various Types of Fish Dung at 3, 4, 5 and 6 WAP.

Treatment	AGE (WAP)			
	3	4	5	6
	……cm……..			
K_1	7.07 ab	9.36 b	10.48 b	11.91 b
K_2	6.13 b	8.09 b	10.28 b	11.53 b
K_3	5.82 b	6.90 b	8.28 b	9.33 b
K_4	8.53 a	12.89 a	13.87 a	15.90 a
K_5	8.20 a	11.30 ab	11.60 ab	12.79 ab

Means the numbers followed by the same letter indicate no significant difference according to the UJD with a level 5%

According to Pracaya (1987), the level of water demand and nutrient elements of each plant varies greatly depending on the type of plant, the growth phase and the environment, so that the results of growth are different. At the age of 4-6 WAP lettuce plants enter the transition phase from vegetative to generative so that the growth pattern of plant height is almost the same.

Table 2. Number of Lettuce Leaves by Treating Various Types of Fish Dung at Ages 4, 5 and 6 WAP and Weight Per Plant

Treatment	Age (WAP)			Weight Per Plant
	4	5	6	
	……cm……			(g)
K_1	5.78ab	6.11AB	6.44 AB	14.22
K_2	5.56b	5.89AB	6.11 B	13.16
K_3	4.67b	4.34B	5.22 B	12.97
K_4	6.78a	7.44A	7.78 A	18.39
K_5	6a	6.89A	7.11 AB	15.16

Means the numbers followed by the same letter indicate no significant difference according to the UJD with a level 5% and 1%.

The age of 5-6 WAP has a very real effect except at age 4 WAP which is noticeable. This was because nutrient uptake was allocated more in the leaves so that leaf growth increases (Table 2). The high number of leaves caused by nitrogen nutrients contained in the treatment of fish droppings, because nitrogen is a major component of various important substances in the formation of plant leaves. Novizan (2007), N is also needed to form important compounds such as chlorophyll, nucleic acids and enzymes.

Based on the results of the study it can be seen that the lettuce plants responded differently to the treatment of fish droppings. This is due to the fact that (K4) has higher N nutrients than (K3) which can stimulate an increase in the number of leaves. Nitrogen is an essential nutrient element that is needed in large quantities by terurtama plants in the vegetative phase.

Based on Table 10 shows that the treatment of goldfish droppings (K4) has the highest yield of 18.39 g and the treatment of gouramy droppings (K3) has the lowest yield of 12.97 g. This is because there are different plant responses to the treatment of fish droppings. This means that fish manure fertilizers do not affect each other in observing these parameters. Plants grow maximally due to nutrient intake which is obtained. Besides nutrients, external factors such as temperature, light and humidity also affect. As stated by Campbell (2005), which states that each plant must get enough light because each plant requires a different amount of light.

Root efficiency in nutrient absorption and water greatly affect total plant weight. In this case root length, root weight and root distribution affect the weight per plant. According to Sitompul and Guritno (1995), the wider surface area of the roots will increase nutrient elements so that plants grow well.

D. CONCLUSION

the various dung of fishes in aquaponic system had significant effect on plant height, number of leaves, weight per plant of lettuce.

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