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Aquaponic Alternative System by Utilizing Several Types of Media Planting To the Growth and Production of Tomato Plants

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Abstract: *The purpose of research to know the aquaponic alternative recirculation system by utilizing several types of media planting and feces of fish against the growth and production of tomato plants. This research was conducted in the research conducted in the village of Menteng VII, Kecamatan Medan Denai, City of Medan, province of North Sumatra. This research uses a complete random draft (RAL) with two factors. Test advanced using multiple Duncan distance tests. The results showed that the planting media application was very real impact on the observed parameters. Based on the results of the printing analysis can be said that the media tanks (M3) are the best medium for the parameters of the number of fruit Bunis, fruit count and weight compared with the media cocopeat, Hydroton, and gravel. While the Cantina varieties are the best varieties for the parameters of fruit count and weight of the fruits in the aquaponic system.*

Keywords: *Aquaponic, Planting Media, Tomatoes*

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I. Introduction

In line with the development of today's growing development, agricultural land is increasingly reduced and has an impact on agricultural production. Rather than the function or conversion of land into residential and urban become the main factor of the increasingly narrow agricultural land that is affected in the food needs not fulfilling the community, especially urban areas (Tricia, 2017).

There is a variety of agricultural methods developed, one of which is a method of planting cultivation with the aqueous system. The narrow land can be used optimally. This system is a combination of aquaculture with hydroponics which produces mutualism symbiosis or mutual benefit. Aquaculture is a fish farming, while hydroponics is cultivation of crops without using soil, but cultivation of plants that utilize water. Aquaponics utilizes the water continuously from the maintenance of fish to the plant and then returned to the fish pond. The basic core of this technological system is the optimum water supply for each commodity by utilizing the re-circulation system (Sastro, 2015).

Aquaculture is an integrated plant cultivation technique with aquatic animal cultivation, such as fish and shrimp. Aquaculture techniques similar to those used in hydroponic cultivation of aquaculture technology is a combination of plant planting and fish cultivation in one container. Plants serve as a filter of the cultivated wastewater reutilized for fish cultivation. Aquaculture technology is a technology that can minimize nitrogen waste from the remaining metabolism of fish through the integration of vegetable crop production system hydroponically into the aqueous system (Roosta, 2014).

This aquaponics system produces ammonia derived from fish feces and the rest of the feed, where the roots of the plant in the aqueous system serve as a filter that can convert ammonia into a dissolved ion. (Widyastuti, 2008). Aquaculture technology is a combination of planting crops and cultivating fish in one container. The plant serves as a filter of wastewater — Reutilized for fish cultivation. One of the factors that support the growth of plant roots thus affecting the absorption process ammonia is the planting medium.

The role of planting media in Aquaponic is very influential because it is a contributing factor to the absorption of ammonia levels from plants. The optimal medium for plant growth must have a requirement as a place to plant, able to control excess water and have a circulation of good air availability, able to supply the nutrients that plants need and can bind water, can retain moisture around the roots of plants. The Media used can be shaft materials such as cocopeat, sand, gravel, and charcoal depending on the type of plant and the purpose of use (Anjani et al., 2017).

Tomato plant (Lycopersicon esculentum) is a horticulture plant that is widely favored and developed in Indonesia. In addition to vegetables, tomato fruit is also used as a raw material of medicines, cosmetics, as well as food processing raw materials such as sauces, fruit juices, etc. Therefore tomato fruit is one of the multipurpose vegetables, so that has a high economic value (Wijayanti and Susila, 2013). Fish feces dissolved in

the pond maintenance of fish cultivation can be utilized as fertilizer for crops because, in the feces of fish, there are nutrients that can help plant growth. The feces of the dissolved fish in the pond have varying concentrations depending on the type of fish and feed given to the fish (Prasetyawan, 2009).

II. Methodology

This event was held in the village of Menteng VII, Kecamatan Medan Denai, City of Medan, province of North Sumatra. The ingredients used are seeds of tomatoes, cocopeat, gravel, Tanks, and Hydroton as treatment. Treatment M = Planting Medium, M1 = cocopeat, M2 = gravel, M3 = Tanks, M4 = Hydroton. The second treatment is V = varieties, V1 = Tantina varieties V2 = varieties of gems. This study uses the completely randomized design of factorial with two treatment factors.

The implementation of the research includes the preparation of places, the preparation of tomato seedlings, the thicking of fish seeds, the determination of sample crops, the maintenance of tomato plants and fish, maintaining water quality and harvesting. The parameters are observed the number of fruits per treatment (fruit), the number of fruit buns (buns), and the weight of the fruit (g). Data is analyzed using various print analyses. If there is a significant influence of the treatment factor then the data analysis is followed by a double distance test Duncan.

Table 1. Number of Fruit Bunch on Multiple Media Planting Aquaponic Alternative Recirculation Systems

Treatment	Number of fruit bunch (Bunchdan)
M = Planting Media	
M_1 = Cocopeat	9,67 b
M_2= Gravel	6,92 c
M_3 = Tankos	11,17 a
M_4 = Hydroton	5,83 c
V = Varieties	
V_1= Tantina	8,25
V_2= Jewel	8,54

Description: The numbers that are followed by the letters that are not the same show differ very real according to the double Distance Test (Duncan) at 5% (lowercase)

In table 1, explained that the largest amount of fruit bunch is found in the treatment of M3 (Tanks) which is 11.17 Bundan and the lowest at M4 (Hidroton) treatment is 5.83 bunch. M3 treatment is the best treatment compared to other treatments.

Number of Pieces per Treatment (Fruit)

The results of the fingerprint test show that the application of the planting media gives a very noticeable difference to the number of fruits per treatment (table 2).

Table 2. Number of Pieces per Treatment on Multiple Media Planting Aquaponic Alternative Recirculation Systems

Treatment	Number of fruit treatment per treatment (fruit)
M = Planting Media	
M_1 = Cocopeat	13,56 a
M_2= Gravel	7,61 b
M_3 = Tankos	14,28 a
M_4 = Hydroton	8,17 b
V = Varieties	
V_1= Tantina	11,17
V_2= Jewel	10,64

Description: The numbers that are followed by the letters that are not the same show differ very real according to the double Distance Test (Duncan) at 5% (lowercase)

In table 2 It is explained that the amount of fruit per treatment is the largest in the treatment of M3 (Tankos), which is 14.28 fruit and the lowest in M2 treatment (gravel) is 7.61 fruit. The M3 treatment is the best compared to other treatments.

Weight of fruit (g)

The results of the fingerprint test show that the application of the planting media gives a very noticeable difference to the weight of the fruit per treatment (g) (table 3).

Table 3. Weight of Fruit on Multiple Media Planting Aquaponics Alternative Recirculation System

Treatment	**Weight of Fruit (g)**
M = Planting Media	
M_1 = Cocopeat	418,61 a
M_2= Gravel	197,50 b
M_3 = Tankos	428,06 a
M_4 = Hydroton	213,33 b
V = Varieties	
V_1= Tantina	11,17
V_2= Jewel	10,64

Description: The numbers that are followed by the letters that are not the same show differ very real according to the double Distance Test (Duncan) at 5% (lowercase)

In table 3 It is explained that the largest fruit weight is found in the treatment of M3 (Tankos) is 428.06 G and the lowest in the treatment of M2 (gravel) is 197.50 G. The M3 treatment is the best compared to other treatments.

III. Result and Discussion

The results of the research after the statistical analysis showed that in the parameters of the number of fruit buns, fruit and weight of fruit with different types of media planted the system of aqueous M-emgive very real influence.

Media planting M3 (Tankos) is the best planting media for the parameters of the number of fruit bunching, fruit and weight of fruit, it is in accordance with the opinions of Ahmad and Pranoto (2016) stating the empty promise has content and rich nutrient resources With potassium nutrient (K) which also serves to increase the percentage of organic matter in the soil through the process of mineralization of empty rungs by the breakdown of microorganisms. According to Pratiwi (2008), The role of potassium is cell division, photosynthesis (carbohydrate formation). Sugar translocation, nitrate reduction, and subsequent protein synthesis as well as enzyme activation. It was according to research of Amisnaipa (2009) stating that the availability of nutrients K significantly affects the height of the plant and the weight of the fruit. It is strengthened by the statement Muanawar (2011) in Revelation (2017) which says that the amount of nutrient that is sufficient to function in fruit growth and the role of improving the size, taste, and color of the fruit.

Planting Media Tanks is an organic planting media containing many microorganisms. According to Purwono and Kristianti (2007) in Afandi et al (2015) states that the role of organic matter to fertility media planting include: (1) mineralization of organic material will release plant nutrients fully (N, P, K, Ca, Mg, S, and micronutrients) , (2) Increase water restraint, so that the ability to grow media on the aquaculture system can provide more water, (3) improve the life of microorganisms in planting media that resulted in the reshuffle of organic materials Found in planting media so that crops can produce well.

According to Titiresmi and Sopiah (2006), ammonia can be decomposed by involving microorganisms attached to the growing media of plants, so that the media grows also plays a role in the process of decomposition of ammonia in the aquaculture system of plants.

IV. Conclusion

Based on the results of the printing analysis can be said that the media tanks (M3) are the best medium for the parameters of the number of fruit Bunis, fruit count and weight compared with the media cocopeat, Hydroton, and gravel. While the Tantina varieties are the best varieties for the parameters of fruit count and weight.

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