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The Effectiveness of Giving Various Planting Media to the Floating Raft Aquaponics System on the Growth of Shallots

Devi Andriani Luta
Universitas Pembangunan Panca Budi
Email: deviluta@dosen.pancabudi.ac.id
Maimunah Siregar
Universitas Pembangunan Panca Budi
Email: mainumahsiregar@gmail.com

Corresponding author: deviluta@dosen.pancabudi.ac.id

Abstract*. Aquaponics consists of fish farming and plant maintenance. Water, which is a medium for fish cultivation, is used as a source of nutrition in plant maintenance, while plants function as a biofilter for water. This study used red onion seeds of the Sanren variety. This study was an experimental study using a non-factorial randomized block design (RBD) consisting of 1 treatment factor and 5 blocks. to get 20 research plots. Planting Media Factor with a symbol (M) which consists of 4 levels, namely: M1: Compost, M2: Chaff Charcoal, M3: Cocopeat, M4: Rice Husk. The results showed that the use of several growing media in the floating raft aquaponic system had a very significant effect on plant height (cm) and the number of leaves (strands).*

Keywords*: Aquaponics, Floating Rafts, Growing Media, Shallots*

INTRODUCTION

The urban farming system known as urban gardening is an urban agricultural system that utilizes narrow land. Urban farming can be used as an alternative to meeting food needs. This cultivation technique is expected to obtain high productivity with limited land. Besides being able to meet food needs, it can also provide aesthetic value and environmental cleanliness in urban areas (Pujiastuti, 2017).

Floating rafts have a system that works where plants are placed and raised in Styrofoam holes. The position of the Styrofoam hangs so that there is a distance between the surface of the water and the base of the roots. The disadvantages of this system include very poor nutrient intake for plants and the installation of separate filters.

Shallots are one of the leading horticultural and vegetable commodities that have long been cultivated by farmers. This vegetable commodity is included in the group of spices that function as food flavoring spices and traditional medicinal ingredients. In general, in determining the right planting media, planting media must have requirements

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*Devi Andriani Luta, deviluta@dosen.pancabudi.ac.id

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such as a place for plants, able to maintain the humidity of the area around the roots, provide enough air, can withstand the availability of nutrients, be able to control excess water and have the ability to bind water and is not easily weathered or brittle (Salwa, 2013).

LITERATURE REVIEW

Aquaponics is a way of growing crops that combines aquaculture and hydroponics, the goal of which is to maintain fish and plants in a circulating environment and interconnected systems. The interaction between fish and plants results in a mutually beneficial relationship. Fish manure provides nutrients to plants while plants function as filters for ammonia and other nitrogen compounds from water so that recirculated water becomes safe for fish (ECOLIFE, 2011).

Red onions contain proteins, fats, carbohydrates, vitamins and minerals, and compounds that function as anti-mutagens and anti-carcinogens. From every 100 grams of onion bulbs, the water content reaches 80-85 g, protein 1.5 g, fat 0.3 g, and carbohydrates 9.3 g. The other components are beta carotene 50 IU, thiamine 30 mg, riboflavin 0.04 mg, niacin 20 mg, ascorbic acid (vitamin C) 9 mg. The minerals include potassium 334 mg, iron 0.8 mg, and phosphorus 40 mg, and produce energy 30 calories (Tarmizi, 2010).

Planting media is a medium used to grow plants, where roots or future roots will grow and develop. Planting media is also used by plants as a place to hold roots so that the plant crown can stand firmly on the media and as a means to support plants (Fahmi, 2018). The selection of good planting media is based on four criteria as follows: (1) can be a nutrient storage place for plants, (2) can store water for plants, (3) does not prevent air exchange between the roots and the atmosphere above the media and (4) can carry mechanical capacity for plants. According to Febriani, et.al. (2017) that planting media is one of the factors that affect the quality of seedlings. Nowadays many planting media are used as a substitute for soil, which can be in the form of husk charcoal, cocopeat, compost, and so on.

Compost is a fertilizer derived from the decomposition of organic materials by microorganisms (Warjoto, et al., 2018). Organic compost is an environmentally friendly fertilizer that has a variety of benefits such as increasing soil fertility, as a stabilizer of

soil aggregates, a source of nutrients for soil and plants, and can increase land productivity in the long term (Puspadewi, et al., 2016). The process of making compost can be done by adding bio activators whose role is to decompose organic matter into elements N, P, K, Ca, and Mg which are returned to the soil and nutrients CH4 and CO2 that can be absorbed by plants (Rahmawanti and Dony, 2014). One of the activators used in composting is Effective Microorganism-4 (EM-4). The definition of EM-4 according to Jalaluddin, et al. (2016) is a mixed culture of microorganism variations such as photosynthetic bacteria, lactic acid bacteria, actinomycetes yeast, and fermented fungi that play a role in multiplying varieties of soil microorganisms. The addition of an EM-4 bioactivation in composting serves to accelerate the decay process and can eliminate odors that appear during the composting process (Dahlianah, 2015).

RESEARCH METHOD(S)

This research will be carried out in Medan, North Sumatra Province. This research will be carried out in December 2023 until it is completed. This study used onion seeds of the Sanren variety. This study is an experimental study using a Non-Factorial Group Randomized Design (RAK) consisting of 1 treatment factor and 5 blocks. thus getting 20 research plots. The planting media factor with the symbol (M) consists of 4 levels, namely: M1: Compost, M2: Husk charcoal, M3: Cocopeat, and M4: Rice husk.

FINDINGS AND DUSCUSSION

Plant Height (cm)

Observation data based on statistical analysis of plant height (cm) observations of shallots due to the provision of planting media with the aquaponics method floating raft method at the age of 1, 2, and 3 weeks after planting (WAP). Based on the results of observations and statistical analysis, it is known that the planting media has a very real effect on the plant height (cm) of shallots at the age of 1, 2, and 3 weeks after planting (WAP).

The average yield of shallot plant height (cm) due to the provision of planting media with the floating raft aquaponics method aged 1, 2, and 3 weeks after planting (MST), is shown in Table 1.

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Table 1. Average Plant Height (cm) of Shallots Due to Provision of Planting Media with the Floating Raft Aquaponics Method at the Age of 1, 2, and 3 Weeks After Planting (WAP)

Treatment	Weeks (cm)		
	1	2	3
M1	9.04 a	14.24 a	23.84 a
M2	7.92 b	12.98 b	20.98 b
M3	6.93 c	11.81 c	19.01 c
M4	6.65 d	11.80 d	18.30 d

Remarks: Numbers followed by unequal letters in the same column show a marked difference at the level of 5% based on the Duncan Distance Test (DMRT)

In Table 1, it can be explained that the highest plant (cm) is found in the M1 planting media application, which is 23.84 cm, and the lowest plant is found in the M4 treatment, which is 18.30 cm. This is because good planting media is a medium that can provide water and nutrients in sufficient quantities for plant growth. It can be determined on soils with good air and water management, stable aggregates, good water-holding ability, and sufficient space for roots. Compost has advantages in providing nutrients, such as levels of Nitrogen (N), Phosphorus (P), Potassium (K), iron (Fe), manganese (Mn), and Calcium (Ca) which have the property of relatively quickly decomposing to help in plant growth (Mubarok, et al, 2016). This is the opinion of Siswadi and Yuwono (2013), who said that planting media greatly determines its ability to absorb water so media that are not able to absorb water need repeated watering to provide ideal media moisture for plant growth and development.

Number of Leaves (strands)

Observational data based on a statistical analysis of the observation of the number of leaves (strands) of shallots due to the provision of planting media with the aquaponics method floating raft method at the age of 1, 2, and 3 weeks after planting (WAP).

Based on the results of observations and statistical analysis, it is known that the planting media has a very real effect on the number of leaves (strands) of shallots at the age of 1, 2, and 3 weeks after planting (WAP).

The average yield of the number of leaves (strands) of shallots due to the provision of planting media for the floating raft aquaponics method at the age of 1, 2, and 3 weeks after planting (WAP), is shown in Table 2.

Table 2. Average Number of Shallot Leaves (Strands) Due to Provision of Planting Media with the Floating Raft Aquaponics Method at the Age of 1, 2, and 3 Weeks After Planting (WAP)

Treatment	Weeks (sheet)		
	1	2	3
M1	2.28 a	3.68 a	5.84 a
M2	1.76 b	3.16 b	4.96 b
M3	1.20 c	2.80 c	4.40 c
M4	1.08 d	2.60 d	4.24 d

Remarks: Numbers followed by unequal letters in the same column show a marked difference at the level of 5% based on the Duncan Distance Test (DMRT)

In Table 2 it can be explained that the largest number of leaves in the M1 planting media is 5.84 strands and the lowest number of leaves is found in the M4 treatment which is 4.24 strands. This is also because nutrients in the form of nitrogen owned by compost media and fecal waste from pond water that has been decomposed through the nitrification process with the provision of probiotics can meet plant growth. According to Sutrisno, et. al., (2015), nitrogen elements spur the growth of organs related to photosynthesis and according to Amitasari (2016) states that nitrogen for plants serves to increase plant growth, increase the yield of foliage-producing plants, and can nourish leaf growth, wide plant leaves with a greener color.

CONCLUSION AND RECOMMENDATION

The results in this study show the effectiveness of onion plant growth on the provision of compost planting media floating raft system.

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