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Production Test of Several Types of Lettuce on Various Planting Media with a Hydroponic System

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ABSTRACT

One of the most important factors that can affect the increase in lettuce productivity is hydroponic cultivation techniques. Hydroponic cultivation techniques can provide a more controlled growth environment. This study aims to determine the effect of several growing media and types of lettuce in a hydroponic system on the growth and production potential of lettuce (Lactuca sativa L.) and its interactions. This research method used a factorial randomized block design (RBD) with 2 factors and 9 treatment combinations. The factors studied were planting media treatment factors with the symbol "M" which consisted of 3 levels, namely M1 = Cow Manure (Cow Manure Granola Fertilizer), M2 = cocopeat, and M3 = husk charcoal. The second factor was the type of lettuce with the symbol "(S)" consisting of 3 levels, namely S1 = romaine lettuce, S2 = siomak lettuce, and S3 = curly lettuce. Parameters measured in this study were plant height, number of leaves, stem diameter 2.3 and 4 weeks after planting, root length, crown fresh weight, and plant root weight. The results showed that the application of several planting media had a very significant effect on all parameters. The use of several types of lettuce has a very significant effect on all parameters. The interaction of several planting media and several types of lettuce in the hydroponic system on growth and production had no significant effect on all observation parameters.

Keywords: Lettuce, Growing Media, Hydroponics

INTRODUCTION

Lettuce (L. sativa L.) is a short-lived vegetable plant. Lettuce plants can adapt to the lowlands and the highlands. Lettuce is widely chosen by the public because of the texture and color that makes the appearance of food attractive so that it can increase appetite (H. H. Sunarjono, 2013).

Lettuce plants are cultivated for their leaves and are used mainly for fresh vegetables, cooking supplies, and dish decoration. Lettuce also has many nutrients and vitamins including Calcium, Phosphorus, Iron, and Vitamins A, B, and C (Samadi, 2014)(Halim, 2017). Since the development of lettuce crops in 1990 in Indonesia, the demand for domestic production has tended to increase, especially from supermarkets, restaurants, and hotels.

In meeting the needs of the community's vegetable consumption, it is necessary to increase lettuce production effectively, efficiently, and sustainably. So that it can meet the needs of vegetables that have not been fulfilled. One of the most important factors that can affect the increase in lettuce productivity is hydroponic cultivation techniques (ARTININGRUM, 2020).

Hydroponic cultivation techniques can provide a more controlled growth environment. With the development of technology, the combination of hydroponic systems can utilize water, nutrients, and pesticides significantly more efficiently (minimalist system) compared to soil culture (especially for short-lived plants).

The use of hydroponic systems is seasonless and does not require large areas of land compared to soil culture to produce the same unit of productivity (Halim, 2017).

Hydroponic farming requires fertilizer as a source of nutrients for the plants. Fertilizer is given in the form of a solution that contains macro and micro elements in it. Plant fertilizer used in hydroponic cultivation is in the form of an AB mix nutrient solution. In addition to requiring adequate nutrition, plants also need an appropriate level of EC value. Electrical Conductivity (EC) in AB mix fertilizer is the concentration of nutrients in fertilizer (ARTININGRUM, 2020).

The use of media is very necessary to encourage plant growth because the media functions to help the roots absorb water and nutrients for plant growth. Growing media is the most important part of the hydroponic mechanism which functions as a substitute for soil in the hydroponic system. There are now many media that can be used as root support in hydroponic systems. The use of the right media can affect the rate and yield of a plant. The shape of the media characteristics will affect the yield and quality as well as the nutrient solution requirements of the plants. Planting media must be able to maintain the humidity of the area around the roots, provide enough air, and withstand the availability of nutrients (Siswadi, 2013).

Hydroponics produces vegetables that have better quality than conventional vegetables. The advantages of hydroponic vegetable cultivation are: the success of plants to grow and produce is more guaranteed, maintenance is more practical and pest interference is more controlled, the use of fertilizers is more efficient, dead plants are more easily replaced with new plants, plants can grow faster with conditions that are not dirty and damaged, and the selling price of hydroponic plants is higher than non-hydroponic products (Kilmanun, 2018).

LITERATURE REVIEW

Plant Morphology

Lettuce plants have a taproot and fibrous root systems. The fibrous roots are attached to the stem, growing in all directions at a depth of 20-50 cm or more. Lettuce leaves have a wide petiole shape and pinnate leaf bones. Lettuce leaves are soft and crunchy and have a sweet taste when eaten. The leaves have a size of about 20-25 in length while the width is 15 cm or even more (H. Sunarjono & Nurrohmah, 2018). The stem of the lettuce plant includes a true stem, which is stout, sturdy, and hairy. Stems are erect, sturdy, and strong with diameter sizes ranging from 5.6-7 cm (stem lettuce), 2-3 cm (leaf lettuce), and 2-3 cm (head lettuce). The flowers of the lettuce plant are yellow and arranged in one branched flower arrangement. Lettuce flowers are hermaphrodite. Lettuce flowers that have undergone pollination will produce fruit and seeds (Samadi, 2014). Lettuce has two-parted seeds that are flat oval, rather hard, hairy and have a dark brown color and are very small about 4 mm long while about 1 mm wide. Lettuce seeds are closed seeds, so they can be used to propagate plants or for breeding (H. Sunarjono & Nurrohmah, 2018).

Planting Media

Planting media functions as a place to grow the roots of planted plants and to absorb nutrient solutions when watered or dripped the nutrient solution is absorbed by the roots. The requirements used for planting media include sterile, light porous, easy to obtain, and cheap. Plants need the right nutrients to meet the needs of plants (ARTININGRUM, 2020).

Husk Charcoal

Husk charcoal is porous, which makes it easy to absorb water with high air cavities, light, not dirty, and has good drainage, which can bind water. Rice husks have good aeration and drainage, but still contain organisms that can inhibit plant growth. The use of rice husk charcoal as a planting medium is burned first to destroy pathogens (Sarwono, 2013).

Cocopeat

Cocopeat is one of the industrial waste products that is abundant and has the potential to be used as a planting medium. Cocopeat planting media has the advantages of high water absorption and binding capacity, loosens the soil with a neutral pH, is beneficial because fertilization can be reduced, contains nutrients from nature that plants need, and supports rapid root growth. Another advantage of cocopeat planting media is that it can bind and hold water strongly and contains essential nutrients such as calcium (Ca), magnesium (Mg), potassium (K), sodium (N), and phosphorus (P) (Artha, 2014).

Cow Manure

One of the wastes from cattle farming is cow dung which is solid and in the disposal process is often mixed with urine and gases, such as methane and ammonia. The nutrient content in cow dung varies depending on the level of production, type, amount of feed consumption, and the individual cattle themselves (Dianawati, 2014).

Hydroponics

The hydroponic system is a way of cultivating plants by using water that has been dissolved with nutrients needed by plants as a growing medium to replace soil. Hydroponics can be an alternative to limited agricultural land and can be practiced on land with low fertility or densely populated areas (Susila, 2013). Modern hydroponic techniques consist of 8 types, namely Nutrient Film Technique (NFT), Static Aerated Technique (SAT), Ebb and Flow Technique (EFT), Deep Flow Technique (DFT), Aerated Flow Technique (AFT), Drip Irrigation Technique (DIT), Root Mist Technique (RMT) and Frog Feed Technique (FFT) (Istiqomah, 2007).

MATERIALS & METHODS

Time and Place

This research will be carried out in the village of Suka Damai District Kuala Langkat Regency with an altitude of 125 meters above sea level This research was conducted in April-June 2023

Tools and Materials

The tools used are paralon (3 inches, ½ inch, and ¼ inch), aquarium pump, mild steel verang, transparent zinc, drill, drill bit, Grenda, styrofoam, water pump machine, small hose, kabelti, pipe glue, silicon, timer outlet, ice cup, solder, sprout rack, hand sprayer, stationery, and lamp. The materials used in this research are husk charcoal, cocopeat, cow dung, green, red, and brown lettuce seeds, and AB mix nutrient solution.

Data Analysis Technique

The Data Analysis Technique used in this research is Factorial Randomized Group Design (RAK) consisting of 2 treatment factors with 9 treatment combinations and 3 blocks so that a total of 27 planting holes are obtained.

Factor I: some planting media with the symbol "M" consists of 3 levels, namely:

M1 = Cow Manure (Granola Cow Manure Fertilizer)
M2 = Cocopeat
M3 = Husk charcoal
Factor II: The type of lettuce with the symbol "S" consists of 3 levels, namely:
S1 = Romaine lettuce
S2 = Siomak lettuce
S3 = Curly Lettuce

a. Number of replicates is 3, which is obtained from the following formula:
   $(t -1) (n-1) \geq 15$
   $(9 - 1) (n-1) \geq 15$
   $9 (n – 1) \geq 15$
   $9n – 9 \geq 15$
   $9n \geq 9 + 15$
   $9n \geq 24$
   $n \geq 24/9 = 2,67$ (rounded up to 3 blocks)

b. There were 9 treatments and 3 replicates:

M_1S_1	M_2S_1	M_3S_1
M_1S_2	M_2S_2	M_2S_2
M_1S_3	M_2S_3	M_3S_3

Data Analysis Method

The linear model assumed to conclude the factorial randomized design (RAK) is :

Where:

$Y\ i\ j\ k = \mu + pi + \alpha j + \beta k + (\alpha\beta)jk + \varepsilon ijk$

Y_{ijk} = Observation result in the i-th block, j-th planting media, and lettuce type at the kth level

μ = Effect of center value

p_i = The effect of the i-th block

α_j = Effect of planting media at level j

βk = Effect of lettuce type at level k

$(\alpha\beta)jk$ = Interaction between factors of planting media at level j and type of lettuce at level k

εijk = The effect of error in the i-th block, the factor of planting media at the j-th level, and type of lettuce at the k-th level. (Hanafiah, 2014).

RESULT

The results of the study after statistical analysis showed that the provision of some planting media had a very significant effect on the parameters of plant height (cm) at 2, 3, and 4 weeks after planting. The treatment of using several types of lettuce had a very real effect on the parameters of plant height (cm) at 2, 3, and 4 weeks after planting.

The interaction due to the use of several planting media and types of lettuce had no significant effect on the parameters of plant height (cm) at 2, 4, and 6 weeks after planting.

Plant Height

The results of the average plant height (cm) of lettuce due to the application of several planting media and lettuce types at 2, 4, and 6 weeks after planting can be seen in Table 1

Table 1. Mean Plant Height (cm) of Lettuce as a Result of Application of Several Planting Media and Several Lettuce Types at 2, 4, and 6 Weeks After Planting.

Treatment	Plant Height (cm)		
	2 MST	3 MST	4 MST
M = Planting Media			
M_1 = Cow Dung Fertilizer	8,68 aA	13,18 aA	19,74 bA
M_2 = Cocopeat	7,32 bB	11,82 bB	18,58 cB
M_3 = Husk Charcoal	9,16 aA	13,70 aA	20,91 aA
S = Type of Lettuce			
S_1 = Romaine Lettuce	7,03 cB	11,53 cB	18,83 bB
S_2 = Siomak Lettuce	8,59 bA	13,09 bA	19,37 bB
S_3 = Curly Lettuce	9,53 aA	14,08 aA	21,03 aA

Notes: Numbers followed by the same letter in the same column indicate that they are not significantly different at the 5% (lower case) and 1% (upper case) levels based on Duncan's Distance Test (DMRT).

Table 1 explained that the treatment of some planting media has a very significant effect on plant height. The highest plant height was obtained in M3 = Husk charcoal which is: 20.91 cm significantly different from M1 = Cow dung fertilizer, namely: 19.74 cm, and very significantly different from the treatment of M2 = cocopeat which is 18.58 cm.

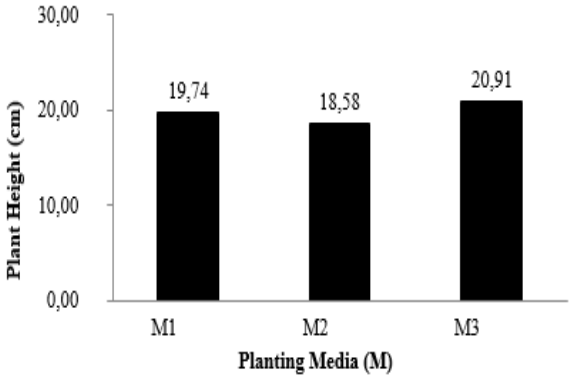

Figure 1. The relationship between the provision of planting media and plant height (cm) 4 weeks after planting.

Figure 1 can be explained that the use of lettuce types has a very significant effect on plant height. The maximum plant height was obtained in S3 = Curly lettuce, namely: 21.03 cm significantly different from S2 = Lettuce siomak which is 19.37 cm, and S1 = Lettuce romaine which is 18.83 cm.

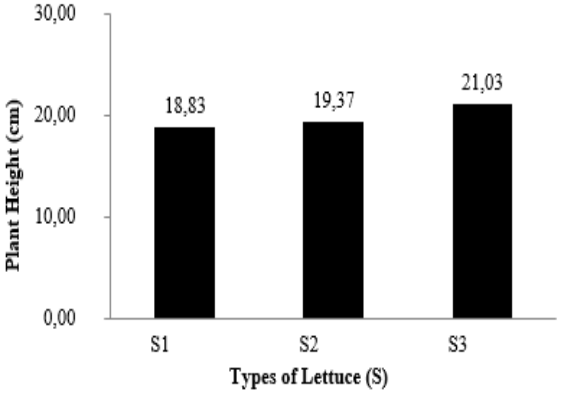

Figure 2. Relationship between the use of several types of lettuce and plant height (cm) 4 weeks after planting

Number of Leaves (Blade)

The average number of leaves (strands) of lettuce due to the provision of some planting media and types of lettuce aged 2, 4, and 6 weeks after planting can be seen in Table 2.

Table 2. An average number of leaves (strands) of lettuce due to the provision of some planting media and some types of lettuce aged 2, 4, and 6 weeks after planting.

Treatment	Number of Leaves (Blade)		
	2 MST	3 MST	4 MST
M = Planting Media			
M1 = Cow Dung Fertilizer	9,11 bB	13,00 bB	20,22 bA
M2 = Cocopeat	8,44 bB	12,44 bB	18,56 cB
M3 = Husk Charcoal	10,78 aA	14,67 aA	21,56 aA
S = Type of Lettuce			
S1 = Romaine Lettuce	8,78 bB	12,67 bB	18,56 bB
S2 = Siomak Lettuce	9,00 bB	13,00 bB	20,44 aA
S3 = Curly Lettuce	10,56 aA	14,44 aA	21,33 aA

Notes: Numbers followed by the same letter in the same column indicate not significantly different at the 5% (lower case) and 1% (upper case) levels based on Duncan's Distance Test (DMRT).

Table 2 can be explained that the treatment of giving some planting media has a very real effect on the number of leaves. The highest number of leaves is obtained in M3 = Husk charcoal which is: 21.56 strands significantly different from M1 = Cow dung fertilizer, namely: 20.22 strands significantly different from the treatment of M2 = cocopeat which is 18.56 strands.

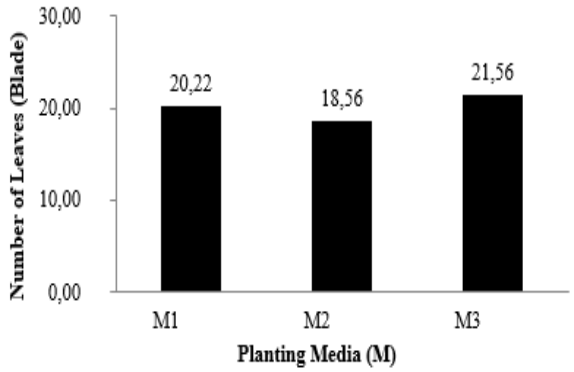

Figure 3. The relationship between the provision of some planting media and the number of leaves (strands) 4 weeks after planting.

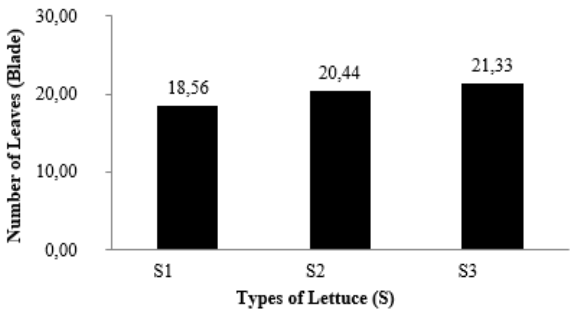

Figure 4. Relationship between the use of several types of lettuce against the number of leaves (cm) 4 weeks after planting.

Table 2 explains that the use of lettuce types has a very significant effect on the number of leaves. The highest number of leaves obtained in S3 = Curly lettuce, namely: 21.33 strands are very significantly different from S2 = Lettuce siomak which is 20.44, and S1 = Lettuce romaine which is 18.56 strands.

Stem Diameter (cm)

The average results of stem diameter (cm) of lettuce due to the provision of some planting media and types of lettuce at 2, 4, and 6 weeks after planting can be seen in Table 3.

Table 3. Average stem diameter (cm) of lettuce due to the provision of some planting media and some types of lettuce aged 2, 4, and 6 weeks after planting.

Treatment	Stem Diameter (cm)		
	2 MST	3 MST	4 MST
M = Planting Media	0,32 bA	0,66 bA	1,07 bB
M1 = Cow Dung Fertilizer	0,29 cB	0,63 cB	1,04 cB
M2 = Cocopeat	0,35 aA	0,69 aA	1,12 aA
M3 = Husk Charcoal			
S = Type of Lettuce	0,29 cB	0,63 cB	1,03 cC
S1 = Romaine Lettuce	0,32 bB	0,66 bB	1,07 bB
S2 = Siomak Lettuce	0,36 aA	0,70 aA	1,12 aA
S3 = Curly Lettuce	10,56 aA	14,44 aA	21,33 aA

Notes: Numbers followed by the same letter in the same column indicate not significantly different at the 5% (lower case) and 1% (upper case) levels based on Duncan's Distance Test (DMRT).

Table 3 can be explained that the treatment of giving some planting media has a very real effect on the diameter of the stem. The largest stem diameter is obtained in M3 = Husk charcoal which is: 1.12 cm significantly different from M1 = Cow dung fertilizer, namely: 1.07 cm significantly different from the treatment of M2 = cocopeat which is 1.04 cm.

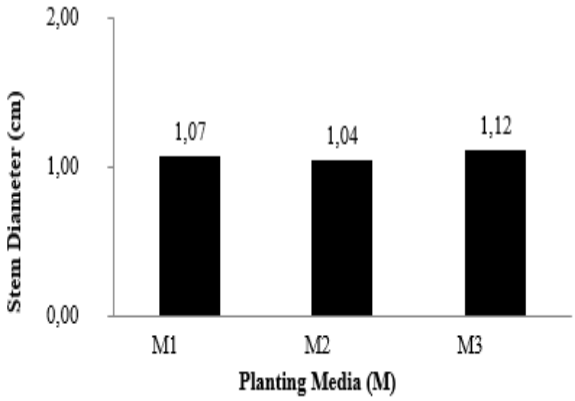

Figure 5. The relationship between the provision of some planting media and stem diameter (cm) 4 weeks after planting

Table 3 can be explained that the use of lettuce types has a very significant effect on stem diameter. The largest stem diameter obtained in S3 = Curly lettuce, namely: 1.12

cm is very significantly different from S2 = Lettuce siomak which is 1.07 cm, and S1 = Lettuce romaine which is 1.03 cm.

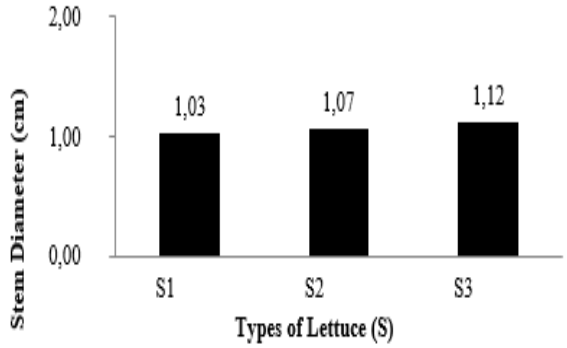

Figure 6. Relationship between the use of several types of lettuce and stem diameter (cm) 4 weeks after planting.

Root Length (cm)

The average root length (cm) of lettuce due to the provision of several planting media and types of lettuce can be seen in Table 4.

Table 4. Average root length (cm) of lettuce due to the provision of some planting media and some types of lettuce.

Treatment	Root Length (cm)
M = Planting Media	
M1 = Cow Manure Fertilizer	10,33 bB
M2 = Cocopeat	9,86 bB
M3 = Husk Charcoal	12,81 aA
S = Type of Lettuce	
S1 = Romaine Lettuce	9,66 bB
S2 = Siomak Lettuce	10,51 bB
S3 = Curly Lettuce	12,83 aA

Notes: Numbers followed by the same letter in the same column indicate significant differences at the 5% (lower case) and 1% (upper case) levels based on Duncan's Distance Test (DMRT).

Table 4 can be explained that the treatment of giving some planting media has a very significant effect on root length. The longest root length is obtained in M3 = Husk charcoal which is: 12.81 cm, very significantly different from M1 = Cow dung fertilizer, namely: 10.33 cm, and M2 = cocopea which is 9.86 cm.

Table 4 explains that the use of lettuce types has a very significant effect on root length. The longest root length is obtained in S3 = Curly lettuce which is: 12.83 cm significantly different from S2 = Lettuce siomak which is 10.51 cm and S1 = Lettuce romaine which is 9.66 cm.

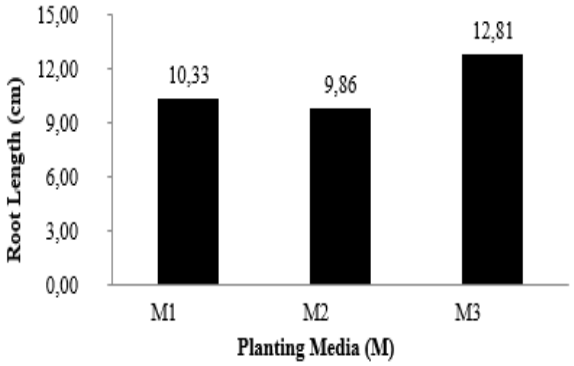

Figure 7. The relationship between the provision of some planting media and root length.

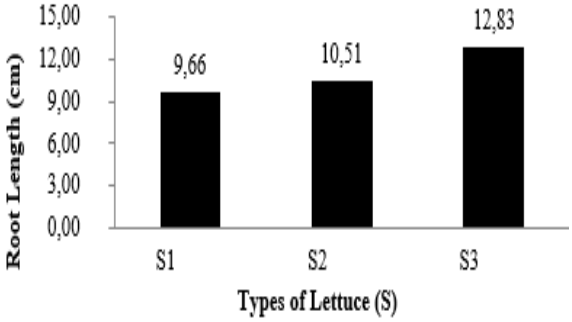

Figure 8: Relationship between the use of several types of lettuce and root length (cm).

Crown Fresh Weight (g)

The average results of crown fresh weight (g) of lettuce due to the provision of some planting media and types of lettuce can be seen in Table 5.

Table 5. Average crown fresh weight (g) of lettuce due to the provision of some planting media and some types of lettuce.

Treatment	Head Fresh Weight (g)
M = Planting Media	
M1 = Cow Manure Fertilizer	100,22 aA
M2 = Cocopeat	88,44 bB
M3 = Husk Charcoal	105,22 aA
S = Type of Lettuce	
S1 = Romaine lettuce	86,78 bB
S2 = Siomak lettuce	101,00 aA
S3 = Curly Lettuce	106,11 aA

Notes: Numbers followed by the same letter in the same column indicate not significantly different at the 5% (lower case) and 1% (upper case) levels based on Duncan's Distance Test (DMRT).

Table 5 can explain that the treatment of giving some planting media has a very real influence on the fresh weight of the crown. The heaviest crown fresh weight was obtained in M3 = Husk charcoal which is: 105.22 g, which is not significantly different from M1 = Cow dung fertilizer, namely: 100.22 g which is significantly different from and M2 = cocopeat which is 88.44 g.

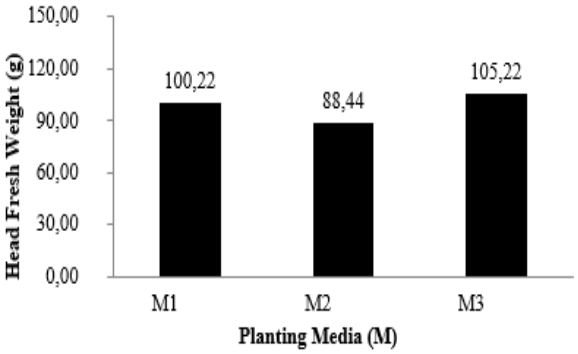

Figure 9. The relationship between the provision of some planting media to the fresh weight of the crown (g).

Table 5 explains that the use of lettuce types has a very significant effect on the fresh weight of the crown. The heaviest crown fresh weight was obtained in S3 = Curly lettuce, namely: 106 g, which is not significantly different from S2 = Siomak lettuce, which is 101.00 g, and S1 = Romaine lettuce, which is 86.78 g.

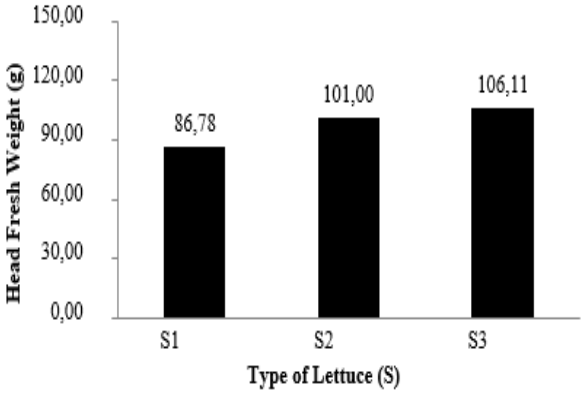

Figure 10. Relationship between the use of several types of lettuce and crown fresh weight (g).

Plant Root Weight (g)

The average results of plant root weight (g) of lettuce due to the provision of some planting media and types of lettuce can be seen in Table 6.

Table 6. Average Plant Root Weight (g) of Lettuce as a result of giving some planting media and some types of lettuce.

Treatment	Plant Root Weight (g)
M = Planting Media	
M1 = Cow Manure Fertilizer	10,89 bB
M2 = Cocopeat	10,44 bB
M3 = Husk Charcoal	13,22 aA
S = Type of Lettuce	
S1 = Romaine Lettuce	10,00 bB
S2 = Siomak Lettuce	10,89 bB
S3 = Curly Lettuce	13,67 aA

Notes: Numbers followed by the same letter in the same column indicate not significantly different at the 5% (lower case) and 1% (upper case) levels based on Duncan's Distance Test (DMRT).

Table 6 can explain that the treatment of giving some planting media has a very real influence on the fresh weight of the crown. The heaviest crown fresh weight was obtained in M3 = Husk charcoal which is: 13.22 g, which is very significantly different from M1 = cow dung fertilizer, namely 10.89, and M2 = cocopeat, namely: 10,44 g.

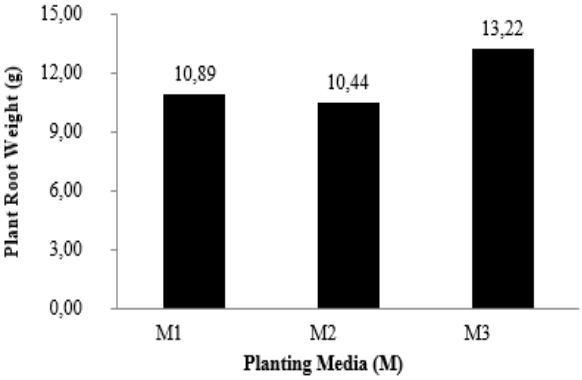

Figure 11. The relationship between the provision of some planting media and the weight of plant roots (cm).

Table 6 explains that the use of lettuce types has a very significant effect on the weight of plant roots. The heaviest plant root weight was obtained in S3
= Curly lettuce which is: 13.67 g is very significantly different from S2 = Lettuce siomak which is 10.89 g and S1 = Lettuce romaine which is 10.00 g.

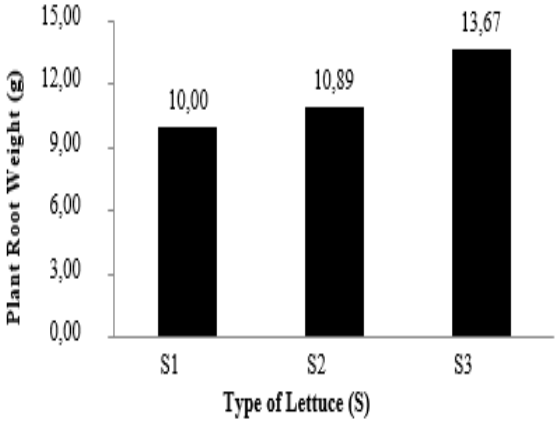

Figure 12. Relationship between the use of several types of lettuce and the weight of plant roots (g).

DISCUSSION

Testing of Several Planting Media in Hydroponic Systems on the Growth and Production of Lettuce Plants (L. Sativa L.)

The results of statistical data analysis showed that testing several planting media on the growth and production of lettuce plants (L. Sativa L.) had a very significant effect on plant height, number of leaves, and stem diameter 2, 3, and 4 weeks after planting, root length, crown fresh weight and root weight where the best treatment was M3 = Husk charcoal. This is due to the characteristics of husk charcoal which is so good, namely high air circulation, high water holding capacity, and blackish color so that it can absorb sunlight effectively. Husk charcoal has properties that easily bind water, are not easy to clot, the price is relatively cheap, the material is easy to obtain, lightweight, sterile, and has good porosity. The presence of oxygen in the planting media can make it easier for roots to respire so that it can help the process of absorbing water and nutrients (Surtinah, 2016).

The husk charcoal media also produced the highest number of leaves. The number of leaves is a component that can indicate plant growth. One sign of plant productivity is the ability of plants to produce leaves because leaves are the place where the photosynthesis process occurs (Siswadi, 2013).

The results of Ayuditya's research (2020) showed that the provision of rice husk charcoal gave significant results on plant height, stem diameter, number of leaves, and leaf area. The provision of rice husk charcoal as a planting medium is widely used to overcome problems in the planting medium, namely increasing pH, and maintaining humidity, and can also provide nutrients in N, P, and K.

Rice husk charcoal contains SiO2 (52%), C (31%), K (0.3%), N (0.18%), F (0.08%), and calcium (0.14%). It also contains other elements such as Fe2O3, K2O, MgO, and Cu in small amounts as well as several types of organic matter. High silicate content can be beneficial for plants because they become more resistant to pests and diseases due to tissue hardening (Surtinah, 2016).

Cocopeat growing media also gives good results in lettuce plants with the advantages of cocopeat which is good at storing water, high water absorption, loosening the soil with a neutral pH, profitable because it will store liquid fertilizer so that the frequency of fertilization can be reduced and cocopeat also contains nutrients from nature that are needed by plants and support root growth quickly so it is good for seedlings. Another advantage of cocopeat as a growing medium is due to its characteristics that can bind and store water strongly, and contain essential nutrients, such as calcium (Ca), magnesium (Mg), potassium (K), sodium (N), and phosphorus (P) (Artha, 2014).

Cow dung fertilizer media gives results not much different from other media. This is because the nutrients contained in cow manure have undergone complete decomposition to release nutrients both macro and micronutrients in the amount needed for plant growth. Cow dung compost is a waste manure from cattle farms that has a high fiber content, because there are high levels of fiber or cellulose in this livestock manure both in solid form and cow urine, it is a carbon chain compound that can undergo a more complex weathering process. Cow dung fertilizer can increase nutrient content and water binding capacity in the media so that plant roots can more easily absorb nutrients increasing plant production (Jeksen, 2014).

The provision of cow dung fertilizer gives results that are not much different this is because the function of the provision of organic materials such as cow dung organic fertilizer can provide macronutrients (N, P, K, Ca, Mg, and S) and micronutrients such as Zn, Cu, Mo, Co, B, Mn, and Fe. Organic matter can also increase soil cation exchange capacity, soil pH, P nutrients, and plant yield (Pane et al., 2014).

The media in the hydroponic system only supports the plants and passes on excessive solutions (not needed by plants). The solution in the media must be rich in nutrients for plant growth. In the vegetative growth of plants shown by the increase in

length, the nutrient that plays a role is nitrogen (Nurlaeny, 2014).

Testing Several Types of Lettuce (L. sativa L.) in the Hydroponic System on Growth and Potential Production

The results of statistical data analysis showed that testing several types of lettuce on the growth and production of lettuce plants (L. sativa L.) had a very real effect on all parameters. This is because each variety of lettuce has different characteristics in each phenotype according to their respective genotypes (oldest characters) (Siswadi, 2013).

The number of leaves in each variety is not genetically the same. That is why the number of leaves on each variety tested is different. The optimum number of leaves allows for a more even distribution of light between leaves. A more even distribution of light between leaves reduces the incidence of mutual shading between leaves so that each leaf can work as it should. Fresh weight is influenced by the number and size of leaves, the greater the number of leaves and the wider the size, the greater the impact on fresh weight (Prastowo & Patola, 2013).

The fresh weight of this plant is influenced by the photosynthesis process where the photosynthesis process will produce energy and food substances using sunlight. The second factor is the genetic differences in each variety. Because each variety of lettuce gives a different response to the components of growth and yield of lettuce plants. This difference is caused by the genetics of each variety of lettuce plants which have different physical characteristics, shapes, colors, and sizes. Different varieties of lettuce plants show different growth and yield responses even though they are planted in the same environment and have the same nutritional treatment (Susilawati & Si, 2019).

Interaction Testing of Several Planting Media and Several Types of Lettuce (L. Sativa L.) in Hydroponic Systems on Plant Growth and Production

Based on the results of the analysis of variance showed that there were no significant differences in the interaction between several planting media and several types of lettuce on all observation variables studied. The absence of interaction between the treatment of several planting media and the type of lettuce used is because if one factor has a stronger influence than other factors then the other factors will be covered, and each factor has properties that are far influential from the nature of its work, it will produce a relationship that affects the growth of a plant (Siswadi, 2013).

According to Wisnuwati & Nugroho (2018), plant growth and development are influenced by two main factors, namely internal and external factors. Internal factors are factors influenced by genetic or hereditary traits such as plant age, plant morphology, yield power, capacity to store food reserves, disease resistance, and others. External factors are environmental factors such as climate, nutrients, soil, and biotic factors.

CONCLUSION

Testing several planting media in hydroponic systems on the growth and production of lettuce plants (L. Sativa L.) has a very significant effect on the parameters of plant height, number of leaves, stem diameter 2, 3, and 4 weeks after planting, root length, crown fresh weight, and root weight.

Testing several types of lettuce (L. Sativa L.) on hydroponic systems on growth and production has a very significant effect on the parameters of plant height, number of leaves, stem diameter 2, 3, and 4 weeks after planting, root length, crown fresh weight, and root weight.

The interaction between testing several planting media and several types of sealed (L. Sativa L.) in hydroponic systems on growth and production had no significant effect on all parameters.

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