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Effect of Three Types of Planting Media and Nutrition on the Growth and Yield of Lettuce (Lactuca sativa L.)

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Abstract

The experiment was conducted for three months, from August to October 2019. At the horticultural greenhouse of the Center for Supervision and Certification of Food and Horticultural Plant Seeds (BPSBTPH) in the province of West Java. The purpose of the experiment is research to study the interaction effect of three types of growing media and nutrients on growth and yield of lettuce plants. This research is descriptive and verified by an experimental approach in the horticultural greenhouse of the Center for Supervision and Certification of Food and Horticultural Plant Seeds (BPSBTPH) in the province of West Java. The experimental design used is the "strip plot" method. The results of the experiment showed that treatment of planting media (M) had a significant effect on leaf number, root volume, plant sap weight, and root / pupil ratio. Nutrition (N) treatment significantly affected leaf area index parameters, number of leaves, root volume, fresh fruit weight of the plant, and root drop rate. The interaction between the planting medium and the nutrient intakes had a very significant effect on the number of leaves, the volume of the roots, the weight of the sap and the rate of root loss.

Keywords: Lettuce, Strip Plot Design, Planting Media, Nutrition, Interaction

Abstract

Percobaan dilakukan mulai bulan Agustus sampai dengan bulan Oktober 2019. di Rumah Kassa Tanaman Hortikultura Balai Pengawasan dan Sertifikasi Benih Tanaman Pangan dan Hortikultura (BPSBTPH) Provinsi Jawa Barat. Tujuan percobaan adalah penelitian untuk mempelajari efek interaksi tiga jenis media tanam dan nutrisi terhadap pertumbuhan dan hasil tanaman selada. Penelitian bersifat deskriptif dan verifikatif dengan pendekatan eksperimen di rumah kassa Tanaman Hortikultura Balai Pengawasan dan Sertifikasi Benih Tanaman Pangan dan Hortikultura (BPSBTPH) Provinsi Jawa Barat. Rancangan percobaan yang di gunakan adalah dengan metode rancangan petak berjalur (RPB). Hasil percobaan menunjukkan Perlakuan media tanam (M) berpengaruh terhadap jumlah daun, volume akar, bobot segar tanaman dan Nisbah Pupus Akar. Perlakuan Pemberian Nutrisi (N) berpengaruh terhadap parameter index luas daun, jumlah daun,volume akar, bobot segar tanaman dan nisbah pupus akar. Perlakuan interaksi antara media tanam dengan pemberian nutrisi terjadi pada jumlah daun,volume akar, bobot segar tanaman dan nisbah pupus akar.

Key words: Selada, Rancangan Petak Berjalur, Media Tanam, Nutrisi , Interaksi.

1. Introduction

Lettuce (Lactuca sativa L.) is a commercial horticultural commodity that has quite good development prospects in Indonesia. This is in line with the increasing population and awareness of nutritional needs, especially from vegetables, because vitamins and minerals in vegetables cannot be substituted for staple foods (Nazaruddin, 2003). Lettuce has various nutritional contents, such as fiber, vitamin A, and iron. According to USDA data (2010), the iron content in 100 g of lettuce is around 0.86 mg. It is thought that the iron content can still be increased to meet human needs for iron every day.

Nowadays industrial development is progressing rapidly, this development is shifting a lot of agricultural land, especially in urban areas, while the need for agricultural food continues to increase in direct proportion to the population and the economic value of that food. However, this increase was not matched by an increase in land area for cultivation, which ultimately became an obstacle. Various efforts have been made to overcome this in various ways, with the hope of saving land use, but being able to produce healthy and quality vegetables.

One planting system that suits this purpose is a hydroponic system. Hydroponics is a way of cultivating plants without using soil, but using media such as charcoal, sawdust, fine sand, foam, pumice, coconut fiber, fern roots, etc. The choice of media type is determined by the type of hydroponics that will be used and the type of plant that will be planted because the composition of the media chosen can have a positive influence on the cultivation process.

The success of a hydroponic plant cultivation system is very dependent on the nutrition provided. Nutrients are given to plants by dissolving them in water to become a nutrient solution. Nutrient solutions in hydroponics are a mixture of chemicals that have been mixed and adapted to the needs of the plant. The use of foliar fertilizer has great potential to be used as a plant nutrient solution with this hydroponic system, because it contains macro and micro elements. Providing proper hydroponic nutrition will provide optimal results for plant growth.

2. Materials and Methods

Research to test the effects of three types of planting media and nutrients as well as the interaction between planting media and nutrients in a semi-hydroponic lettuce system is descriptive and verified using an experimental approach in a cash house. The experiment was carried out at the Horticultural Plant Screen House of the Food and Horticultural Plant Seed Supervision and Certification Center (BPSBTPH) of West Java Province which is located at Jl. Ciganitri 2 Bojongsoang, Bandung. The experiment was carried out for 3 (three) months, starting from August to October 2019.

The materials used in this experiment were lettuce seeds of the LE 1889 variety, seeding media, organic fertilizer from waste, cocopeat and husk charcoal, while the nutrients used were AB Mix, Multitonic Liquid Complementary Fertilizer and Super Grow Organic Liquid Fertilizer. To prevent pests and plant diseases, Sevin 85-P and Dithane M-45 are used. The tools used in this research were seeding containers, nursery babybags, pots (polybags), ropes, analytical scales, meters, sprayers, measuring cups and spets.

In the experimental approach, a Randomized Block Design with a divided plot pattern (Strip Plot Design) was used. The Horizontal Factor in this experiment is the type of planting medium and the Vertical Factor is the type of nutrition used in the lettuce hydroponic system. The treatment factor for the type of planting media consisted of 3 levels and the type of nutrition 3 levels so that there were 9 treatment combinations with 4 (four) replications to obtain 36 treatment plots. Each treatment combination consists of 10 plant polybags. Sample plants for observation variables were taken from 3 polybags of plants. The placement of each treatment plot in each replication was carried out in rows (blocks).

Table 1. Variable Operationalization

No	Variable	Sub Variable	Concept Sub Variable	Indicator
I	Treatment Variables	1. Type mediaplant	Type of planting medium used	m1 = compost from waste m2 = cocopeat m3 = husk charcoal n1 = AB Mix
		2. Types of hydroponic nutrition	Nutrient ingredients for hydroponics	n2 = PPC (Liquid Complementary Fertilizer) n3 = Super Grow Organic Liquid Fertilizer
	Response Variables	1. Character growth	Growth, namely the increase in size and weight of the vegetative part of the plant	Number of leaves, Leaf Area Index (ILD), root volume, plant fresh weight, root loss ratio (NPA)
		2. Result components	Parameters that determine the level of crop yield per unit area	Fresh weight per plant
		3. Lettuce yield per unit area	Obtaining the economic share of plants per unit area	

Table 2. Analysis of Variety

Source Rgam	db	Amount Square	Square Middle	F-count	F table
Group	4-1				
Planting Media Factor (M)	3-1	JKm	KTM	KTm/KTgalat m	F(α,db-M,db-Gm)
Error m	(3-1)(4-1)	JK Galat m	KT Galat m		
Nutritional Factors (N)	3-1	JKn	KTN	KTn/KTgalat n	F(α,db-N,db-Gn)
Error n	(3-1)(4-1)	JK Galat n	KT Error n		
Interaction (MN)	(3-1)(3-1)	JK mn	KT mn	KTmn/KTgmn tool	F(α,db-MN,db-How)
Error mn	(3-1)(4-1)(3-1)	JK is wrong	KTerror M N		
Total	36-1	Total JK			

Source: Gomez and Gomez (2010)

3. Results and Discussion

Number of Leaves

The results of observations after analysis using variance showed that treatment of the planting medium with nutrient solution treatment had a real effect and there was an interaction with the number of leaf parameters.

Table 3. Results of the number of leaves from Duncan's multiple distance test, real level at the 5% level

Source	db	JK	KT	F Count	P value
Test	3	19.77778	6.592593	1.93	0.1316
Nutrition	2	155.3889	77.69444	22.8**	<.0001
Error a	6	67.72222	11.28704		
Media	2	81.5	40.75	11.96**	<.0001
Error b	6	4.055556	0.675926		
Nutrition*Media	4	141.7778	35.44444	10.02**	0.0008
Error c	12	42.44444	3.537037	1.93	0.1316
Total corrected	107	758			
K.K	24.07717				

Table 4 shows that the combination of planting media treatment with nutrients produces a large number of leaves. The leaf blade and leaf number achieved were significantly different from other treatments.

Leaf Area Index (ILD

The results of observations after analysis using variance showed that treatment of the planting medium with nutrient solution treatment had a significant effect but there was no interaction with the leaf area index parameter.

Table 4. ILD results of Duncan's multiple distance test, real level at 5% level

Types of Nutrition	Average ILD	
AB Mix	18.7778	a
PPC	16.9167	b
PCO	16.7917	b

Root Volume

The results of observations after analysis using variance showed that treatment of the planting media with nutrient solution treatment had a real effect and there was an interaction on root volume parameters.

Table 5. Duncan's multiple distance test results with 5% significance level on root volume characteristics

Types of Nutrition	Mean Root Volume	
AB Mix	5.3	a
PPC	2.4333	c
PCO	3.6778	b

Plant Fresh Weight

The results of observations after analysis using variance showed that treatment of the planting media with nutrient solution treatment had a real effect and there was no interaction with the fresh weight parameters of the plants.

Table 6. Fresh weight results of Duncan's multiple distance test plants real level at 5% level

Types of Nutrition	Average Fresh Weight of Plants	
AB Mix	25.6944	a
PPC	11	b
PCO	24,2056	a

Root Loss Ratio

The results of observations after analysis using variance showed that treatment of the planting media with nutrient solution had a real effect and there was no interaction with root volume parameters.

Table 7. NPA results of Duncan's multiple distance test real at the 5% level

Types of Nutrition	Average NPA	
AB Mix	3.9833	b
PPC	3.8361	b
PCO	5.5092	a

Advanced Test Orthogonal Contrast Test for the type of planting media factor

Table 8. Orthogonal contrast test results for types of planting media

Parameter	Contrast	DF	F Value	Pr > F	
ILD	M1 VS M2 & M3	1	0.34	0.5609	Mr
Number of Leaves	M1 VS M2 & M3	1	13.32	0.0005	**
Fresh Weight	M2 VS M1 & M3	1	30.6	<.0001	**
Root Volume	M3 VS M1 & M2	1	47.86	<.0001	**
NPAs	M2 VS M1 &M3	1	39.72	<.0001	**

Duncan Multiple Range Test (DMRT) Advanced Test for nutritional type factors

Table10. Duncan Multiple Range Test results for types of planting media

ILD

Types of Nutrition	average	
AB Mix	18.7778	a
PPC	16.9167	b
PCO	16.7917	b

Number of leaves

Types of Nutrition	average	
AB Mix	8.5833	A
PPC	5.9722	B
PCO	8.4444	A

Fresh Weight

Type Nutrition	average	
AB Mix	25.6944	a
PPC	11	b
PCO	24,2056	a

root volume

Type Nutrition	average	
AB Mix	5.3	a
PPC	2.4333	c
PCO	3.6778	b

NPAs

Type Nutrition	average	
AB Mix	3.9833	b
PPC	3.8361	b
PCO	5.5092	a

Note: The average numbers followed by the same letter are not significantly different according to the DMRT Two Mean Difference Test at α 0.05.

4. Conclusion

Based on the results of the research that has been carried out, the following conclusions can be drawn: Planting media treatment (M) has a significant effect on the number of leaves, root volume, plant seminal weight and root pudding ratio. Nutrient (N) treatment had a significant effect on the leaf area index parameters, number of leaves, root volume, plant seminal weight and root loss ratio. The interaction between the planting medium and the provision of nutrients had a significant effect on the number of leaves, root volume, plant seminal weight and root loss ratio.

After carrying out this research, the following suggestions can be made: It is necessary to carry out research to treat the concentration composition of planting media and nutrients, with concentration intervals that are not too far apart so that they can be measured.

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