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Effect of Liquid Organic Fertilizer Concentration and NPK Fertilizer Dosage On the Growth and Yield of Pakcoy Plants (Brassica rapa L.)

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Abstract

Pakcoy cultivation can not only be done on a large land, but for people who only have a narrow land such as urban communities can cultivate pakcoy using pots/polybags. Optimization of pakcoy plant production can be achieved when the need for macro and micro nutrients of the plant is met. By applying liquid organic fertilizer combined with inorganic fertilizer (NPK), it is hoped that it can increase plant productivity and efficiency in fertilizer use, so that the right formula is obtained between the mixture of liquid organic fertilizer and inorganic fertilizer (NPK). The experiment was carried out in Cibiru Wetan Village, Cileunyi District, Bandung Regency., 660-705 meters above sea level an order of Inceptisol soil, starting from October 2022 to November 2022. This study aims to study the interaction between the concentration of liquid organic fertilizer and the amount of inorganic fertilizer (NPK) on the growth and yield of pakcoy plants and to determine the optimal concentration of liquid organic fertilizer at each dose of inorganic fertilizer (NPK). The results of the experiment showed that there was an interaction between POC concentration and NPK dosage on plant height and leaf count, 15 HST, 20 HST and 25 HST, and no interaction occurred in plant height 10 HST, leaf count 10 HST, fresh weight, fresh plant yield weight, dry weight and NPA.

Keywords: POC, NPK, Pakcoy Seed Nauli F1

Abstract

Budidaya pakcoy tidak hanya dapat dilakukan di lahan yang luas, tapi bagi masyarakat yang hanya memiliki lahan sempit seperti masyarakat perkotaan dapat membudidayakan pakcoy menggunakan pot/polybag. Optimalisasi produksi tanaman pakcoy dapat dicapai ketika kebutuhan akan unsur hara makro dan mikro tanaman tercukupi. Dengan pemberian pupuk organik cair yang dipadukan dengan pupuk anorganik (NPK) diharapkan dapat meningkatkan produktivitas tanaman dan efisiensi penggunaan pupuk, sehingga didapat formula yang tepat antara paduan takaran pupuk organik cair dan takaran pupuk anorganik (NPK). Percobaan dilaksanakan di Desa Cibiru Wetan Kecamatan Cileunyi Kabupaten Bandung., 660-705 mdpl an ordo tanah Inceptisol , mulai dari bulan Oktober 2022 sampai November 2022 . Penelitian ini bertujuan untuk mempelajari interaksi antara konsentrasi pupuk organik cair dan takaran pupuk anorganik (NPK) terhadap pertumbuhan dan hasil tanaman pakcoy serta mengetahui konsentrasi optimum pupuk organik cair pada setiap takaran pupuk anorganik (NPK). Hasil percobaan menunjukkan Terjadi interaksi antara konsentrasi POC dan takaran NPK terhadap tinggi tanaman dan jumlah daun, 15 HST, 20HST dan 25 HST, dan tidak terjadi interaksi pada tinggi tanaman 10HST, jumlah daun 10 HST, bobot segar, ,bobot hasil tanaman segar, bobot kering dan NPA.

Key words: POC, NPK, Pakcoy Benih Nauli F1.

1. Introduction

Indonesia is a fertile country because it is located in a tropical area and is crossed by a series of active volcanoes. The fertile land in Indonesia makes the agricultural sector the main sector in development. However, currently there is a decline in land quality, which is often referred to as land degradation in the form of land quality and quantity. The transition from organic to inorganic crop cultivation over a relatively long period of time has had a negative impact, namely soil degradation which reduces productivity. The occurrence of soil degradation in Indonesia began with the launch of the green revolution with the introduction of various types of artificial fertilizers (chemical in nature) and medicines to eradicate pests, diseases and weeds with high yields, resulting in a high increase in plant productivity compared to before.

Fertilizer is one of the main production factors that plays an important role in efforts to increase agricultural yields. The success of agricultural production through agricultural intensification activities cannot be separated from the contribution and role of production facilities, especially fertilizer. Fertilizer is material added to planting media or plants to meet the nutrient requirements needed in the soil to increase plant production. One of the relatively high uses of chemical fertilizers and pesticides is in the cultivation of horticultural crops such as pak choy (Brassica rapa L). This is done so that production can meet increasing market demand. Therefore, there must be improvements in the implementation of cultivation.

Liquid organic fertilizer is organic fertilizer in the form of animal urine or leachate which comes from decomposing organic waste as well as liquid fermentation of organic material which contains good bacteria. Inorganic fertilizer is applied so that the provision of nutrients can be carried out specifically according to needs. Inorganic fertilizer is a type of fertilizer made from inorganic materials. It contains certain nutrients or minerals. This type of inorganic fertilizer is often called chemical fertilizer. One type of compound chemical fertilizer is NPK fertilizer (DPPP. 2018). NPK fertilizer is an inorganic fertilizer which is a type of compound fertilizer because it contains nutrients in the form of nitrogen (N), phosphorus (P). and potassium (K). The nitrogen element content in NPK fertilizer is 15%.

Optimizing pak choy plant production can be achieved when the need for essential macro and micro plant nutrients is met. By providing liquid organic fertilizer combined with inorganic fertilizer (NPK), it is hoped that it can increase plant productivity and efficiency of fertilizer use, so that the right formula is obtained between the mixture of liquid organic fertilizer dosage and inorganic fertilizer dosage (NPK).

2. Materials and Methods

The research uses experimental methods by conducting experiments. The experiment was carried out in Cibiru Wetan Village, Cileunyi District, Bandung Regency, West Java Province, with an altitude of 660-705 meters above sea level. The type of soil that will be used as a planting medium is Inceptisol soil in the Regency area. The research will be carried out in early October 2022. The materials used in this experiment are: Nauli F1 variant pak choy seeds, liquid organic fertilizer (Eco Farming), inorganic fertilizer (NPK Mutiara) , Alfamax insecticide, and Ecofarming Protector. The tools used were polybags,

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bamboo, pipettes, measuring cups, hand sprayers, hoes, rods, plastic ropes, ovens, analytical scales, calipers and writing tools. This research used a factorial Randomized Group Design (RAK) method consisting of two factors and repeated twice.

Table 1. Treatment Combination of Ecofarming Liquid Organic Fertilizer Concentration and Mutiara NPK Inorganic Fertilizer Dosage

Liquid Organic Fertilizer Concentration (E)	Dosage of Mutiara NPK inorganic fertilizer (M)			
	m0	m1	m2	m3
e0	e0m0	e0m1	e0m2	e0m3
e1	e1m0	e1m1	e1m2	e1m3
e2	e2m0	e2m1	e2m2	e2m3
e3	e3m0	e3m1	e3m2	e3m3

Table 2. Operationalization of Variables, Sub Variables and Indicator Variables

Variable Type	Sub-Variables	Variable Indicator
Independent Variable: - Ecofarming Liquid Organic Fertilizer Concentration - Dosage of Mutiara NPK inorganic fertilizer	Ecofarming Liquid Organic Fertilizer Concentration (E) Dosage of Mutiara NPK inorganic fertilizer (M)	e0 = 0 ml L-1 e1 = 5 ml L -1 e2 = 10 ml L-1 e3 = 15 ml L -1 m0 =0 kg ha -1 m1 =100 kg ha -1 m2 =200 kg ha -1 m3 =300 kg ha -1
Dependent Variable Growth and Results	Component Growth and Results	1. Plant height 2. Number of leaves 3. Plant fresh weight 4. Plant dry weight 5. Crop yield 6. Root loss ratio

Table 3. Types of Randomized Group Design with Factorial Pattern.

Variety Source	DB	JK	KT	Fh	F 0.05
Deuteronomy (r)	1	ΣXi..2/ t – X...2/rt	JKr/DBr	KTr/KTg	4.54
Treatment (t)	15	ΣX..jh2/ r – X...2/rt	JKt/DBt	KTt/KTg	2.41
(E)	3	ΣX.j.2/ rm – X...2/rt	JKE/DBE	KTE/KTg	3.29
NPK (M)	3	ΣX..h2/ re – X...2/rt	JKM/DBM	KTM/KTg	3.29
Interaction (Ex M)	9	JKt – JKE – JKM	JKI/DBEM	KTI/KTg	2.59
Error (g)	15	JKTotal – JKr – JKt	JKg/DBg	-	-
Total	31	ΣXijk2 – X...2/rt	-	-	-

Information : DB = Degrees of Freedom JK = Sum of Squares Fh = Fcount
KT = Middle Square F0.05 = F Table level 5%

3. Results and Discussion

Plant Height

Based on the results of statistical analysis, it shows that the concentration of liquid organic fertilizer and the dose of NPK fertilizer interacted with plant height at the ages of 10, 15, 20 and 25 HST.

Table.5 Effect of Liquid Organic Fertilizer Concentration and NPK Fertilizer Dosage on Pakchoy Plant Height (cm) at Age 10, 15, 20, and 25 HST

Treatment	Average Plant Height (cm)			
	10 HST	15 HST	20 HST	25 HST
Factor I Liquid Organic Fertilizer Concentration				
E0= 0 ml L-1	8.50 a	13.10 a	16.05 a	16.08 a
E1= 5 ml L-1	8.81 a	13.75 ab	16.34 ab	17.78 b
E2= 10 ml L-1	8.90 a	14.04 b	17.09 b	18.16 b
E3= 15 ml L-1	8.81 a	13.49 a	16.18 a	17.50 b
Factor II: Mutiara NPK Fertilizer Dosage				
M0 = 0 kg ha-1	6.88 a	10.58 a	13.20 a	13.78 a
M1 = 100 kg ha-1	9.56 c	14.28 b	16.86 b	18.39 b
M2 = 200 kg ha-1	9.75 c	15.03 c	17.59 BC	18.93 b
M3 = 300 kg ha-1	8.88 b	14.50 BC	18.01 c	18.42 b

Note: The average number of treatments followed by the same letter in the same column is not significantly different according to the results of Duncan's Multiple Range Test at the 5% significance level.

Number of Leaves

Based on the results of statistical analysis, it shows that the concentration of liquid organic fertilizer and the dose of NPK fertilizer interact with the number of plant leaves at the ages of 10, 15, 20 and 25 HST.

Table.6 Effect of Liquid Organic Fertilizer Concentration and NPK Fertilizer Dosage on the Number of Pakcoy Plant Leaves (strands) at Age 10, 15, 20, and 25 HST

Treatment	Average Number of Leaves (pieces)			
	10 HST	15 HST	20 HST	25 HST
Factor I Liquid Organic Fertilizer Concentration				
E0= 0 ml L-1	2.59 a	2.94 a	3.19 a	3.30 a
E1= 5 ml L-1	2.60 a	3.07 b	3.24 a	3.37 ab
E2= 10 ml L-1	2.61 a	3.02 ab	3.27 a	3.42 b
E3= 15 ml L-1	2.63 a	3.02 ab	3.27 a	3.44 b
Factor II Mutiara NPK Fertilizer Concentration				
M0 = 0 kg ha-1	2.47 a	2.82a	2.94 a	3.07 a
M1 = 100 kg ha-1	2.64 b	3.05b	3.32 b	3.42 BC
M2 = 200 kg ha-1	2.68 b	3.07b	3.37 b	3.52 c
M3 = 300 kg ha-1	2.64 b	3.10b	3.35 b	3.53 c

Note: The average number of treatments followed by the same letter in the same column is not significantly different according to the results of Duncan's Multiple Range Test at the 5% significance level.

Plant Fresh Weight

Based on the results of statistical analysis, it shows that the concentration of liquid organic fertilizer and the dose of NPK fertilizer interacted with the fresh weight of the plants at the end of the experiment (25 DAP) in various treatments.

Table.7 Effect of Liquid Organic Fertilizer Concentration and NPK Fertilizer Dosage on Fresh Weight of Pakcoy Plants (g) at the end of the experiment (25 DAT)

Treatment	Average Fresh Weight (gr) 25 HST
Factor I Liquid Organic Fertilizer Concentration	

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E0= 0 ml L-1	28.57	a
E1= 5 ml L-1	31.75	a
E2= 10 ml L-1	30.15	a
E3= 15 ml L-1	26,27	a
Factor II Mutiara NPK Fertilizer Concentration		
M0 = 0 kg ha-1	8.98	a
M1 = 100 kg ha-1	29.35	b
M2 = 200 kg ha-1	37.61	BC
M3 = 300 kg ha-1	40.81	c

Note: The average number of treatments followed by the same letter in the same column is not significantly different according to the results of Duncan's Multiple Range Test at the 5% significance level.

Weight of Fresh Plant Products per Polybag

Based on the results of statistical analysis, it showed that the concentration of liquid organic fertilizer and the dose of NPK fertilizer had an interaction with the weight of fresh plants at the end of the experiment (25 DAP) in various treatments.

Table.8 Effect of Liquid Organic Fertilizer Concentration and NPK Fertilizer Dosage On the weight of fresh plants (g) at the end of the experiment (25 DAT)

Treatment	Average weighted results	
Factor I Liquid Organic Fertilizer Concentration		
E0= 0 ml L-1	28.67	a
E1= 5 ml L-1	33.05	a
E2= 10 ml L-1	31.21	a
E3= 15 ml L-1	27.57	a
Factor II Mutiara NPK Fertilizer Concentration		
M0 = 0 kg ha-1	9,12	a
M1 = 100 kg ha-1	30.37	b
M2 = 200 kg ha-1	38.92	c
M3 = 300 kg ha-1	42.09	d

Plant Dry Weight

Based on the results of statistical analysis, it shows that the concentration of liquid organic fertilizer and the dose of NPK fertilizer interacted with the dry weight at the end of the experiment (25 DAP) in various treatments.

Table.9 Effect of Liquid Organic Fertilizer Concentration and NPK Fertilizer Dosage Against Dry Weight (g) at the end of the experiment (25 HST)

Treatment	Average Dry Weight	
Factor I Liquid Organic Fertilizer Concentration		
E0= 0 ml L-1	1.73	a
E1= 5 ml L-1	1.97	a
E2= 10 ml L-1	1.83	a
E3= 15 ml L-1	1.60	a
Factor II Mutiara NPK Fertilizer Concentration		
M0 = 0 kg ha-1	0.65	a

M = 100 kg ha-1	1.90	b
M2 = 200 kg ha-1	2.28	c
M3 = 300 kg ha-1	2.30	d

Root Loss Ratio

NPA value ofE0 is not significantly different from treatment E1, treatment E1 is significantly different from treatments E2 and E3, treatment E2 is different. The increase in root loss ratio which is significantly different is thought to be due to increased uptake of nutrients, especially N, P, K in liquid organic fertilizer.

Table.10 Effect of Liquid Organic Fertilizer Concentration and NPK Fertilizer Dosage on Pakcoy Plant Root Loss Ratio (g) at the end of the experiment (25 DAT)

Treatment	Root Loss Ratio	
Factor I Liquid Organic Fertilizer Concentration		
E0= 0 ml L-1	6.13	a
E1= 5 ml L-1	6.47	a
E2= 10 ml L-1	9.49	b
E3= 15 ml L-1	9.82	c
Factor II Mutiara NPK Fertilizer Concentration		
M0 = 0 kg ha-1	6.88	a
M1 = 100 kg ha-1	8.59	a
M2 = 200 kg ha-1	7.60	a
M3 = 300 kg ha-1	8.83	a

4. Conclusion

Based on the results of research and discussion of the effect of liquid organic fertilizer concentration and NPK dosage on the growth and yield of Pakcoy plants, it was concluded as follows: There was an interaction between POC concentration and NPK dosage on plant height, number of leaves at 15 DAP, 20 DAT and 25 DAP and no interaction occurred. at plant height 10 DAP and number of leaves 10 DAP, fresh weight, fresh plant yield weight, dry weight and NPA. There is an optimum concentration of liquid organic fertilizer at each dose of inorganic fertilizer (NPK) which can have the best influence on the yield of pak choy plants in treatments E3 (15 -1 mL/L POC concentration) and M3 (300 kg ha-1 NPK dose). Providing POC Eco Farming concentration and 15 -1 mL/which is combined with an NPK dose of 300 kg ha-1 can be a reference material in cultivating pak choy plants. To obtain more in-depth information, further research needs to be carried out on POC concentrations at larger NPK doses.

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