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The effect of goat manure and Fortune liquid organic fertilizer on the growth and yield of leek (*Allium porrum L.*) Blaze F1 variety

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Abstract

One alternative that can be done to increase national agricultural production is to utilize dry land which has very extensive potential.However, due to low land productivity as a result of low fertility levels, fertilization efforts need to be carried out. The research aimed to determine the effect of goat manure and organic liquid fertilizer (POC) of Fortune and their interaction on the growth and yield of leek plants and to obtain the appropriate dose of goat manure and concentration of POC Fortune for leek plants. The research was carried out from January to March 2024 in Nehas Liah Bing Village, Muara Wahau District, East Kutai Regency, East Kalimantan Province. The research used a 3 x 3 factorial experiment in a Completely Randomized Design (CRD) which was repeated 5 times. The first factor is the dose of goat manure fertilizer (K) consisting of 3 levels: without goat manure fertilizer (k0), 5 tons/ha equivalent to 125 g/polybag equivalents to 5 tons/ha (k1), and 250 g/polybag equivalent to 10 tons /ha (k2). The second factor is the concentration of POC Fortune (F) consisting of 3 levels: without POC Fortune (f0), 10 ml/l water (f1), and 20 ml/l water (f2). Research activities are as follows: preparation of planting media, preparation of leek seeds, treatment with goat manure 2 weeks before planting, planting, treatment with POC Fortune, plant maintenance, harvesting, and preparation of reports. The research results showed that (1) goat manure (K) treatment had a very significant effect on plant height 60 days after planting and plant wet weight. The highest wet plant weight was produced in the 250 g/polybag (k2) treatment, namely 117.00 g/plant, while the lowest was produced in the treatment without goat manure (k0), namely 77.67 g/plant; (2) POC Fortune treatment had a very significant effect on plant height 60 days after planting, root length, and plant fresh weight. The highest wet plant weight was produced in the 20 ml/l water (f2) treatment, namely 111 g/plant, while the lowest was produced in the treatment without POC Fortune (f0), namely 70 g/plant; (3) there is no interaction between goat manure treatment and POC Fortune (KxF) on all observation parameters.

Keywords: Goat Manure, POC Fortune, Leek (*Allium porrum* L.).

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1. INTRODUCTION

Agricultural development is one of the mainstay sectors of national development to achieve food security. To increase agricultural crop production, various efforts are carried out such as agricultural intensification, diversification, and extensification. Utilization of dry land is one alternative that can be done to increase national agricultural production, the total area of dry land in Indonesia is around 144.47 million hectares (Agricultural Research and Development Institute, 2014). In general, dry land in Indonesia is dominated by soil of Ultisol (Director General of Food Crops, 2022). Ultisol soil conditions have low levels of fertility and productivity so they require quite high inputs (Murtilaksono and Anwar 2014).

To increase the availability of nutrients in Ultisols soil, fertilization can be done. In Indonesia, many farmers still carry out fertilization using inorganic fertilizers. The use of inorganic fertilizers hurts the environment which causes land productivity to decrease if its use is carried out excessively and poorly controlled by farmers. As stated by Iwuagwu et al. (2016) continuous use of inorganic fertilizers can damage the physical, chemical, and biological properties of the soil so that the level of soil fertility decreases. To overcome this problem, using organic fertilizer is an alternative.

Apart from applying goat manure, to increase plant growth and yield you can also apply fertilizer through the leaves. One type of foliar fertilizer that can be used to increase the availability of nutrients for plants is Fortune liquid organic fertilizer (POC).This POC contains 3.26% N; 4.11 % P_2O_5; 3.45 % K_2O; and 6.33% C-organic and the rest are elements Fe, Mn, Cu, Zn, Mo, and Bo (https://mitratani.co.id/fortune/).

One of the vegetable horticultural commodities that is included in one of the leek groups is leek (*Allium porrum* L.). Leeks have a specific aroma so that dishes have a fragrant aroma and provide a better and tastier taste to dishes, besides that leeks also have high nutritional value so they are liked by almost everyone because of their many benefits and high economic value. The business opportunity for cultivating spring onions is very promising because many people need it as a vegetable ingredient, especially as a seasoning.

The research aimed to determine the effect of providing goat manure fertilizer and POC Fortune and their interaction on the growth and yield of leek plants and to obtain the appropriate dose of goat manure fertilizer and concentration of POC Fortune for leek plants.

2. RESEARCH METHODS

2.1. Time and Place

The research was carried out from January until March 2024, the research location was Nehas Liah Bing Village, Muara Wahau District, East Kutai Regency, East Kalimantan Province.

2.2. Materials and Tools

The materials used in this research include 10 cm leek seeds, ready-to-use goat manure fertilizer, and Fortune liquid organic fertilizer. The tools used include 30 x 40 polybags, hoes,

machetes, digital scales, a hand sprayer, research labels, measuring tape, stationery, and a camera.

2.3. Experimental Design

The research used a 3 x 3 factorial experiment in a Completely Randomized Design (CRD) which was repeated 5 times. The first factor is the dose of goat manure fertilizer (K) consisting of 3 levels: without goat manure (k0), 125 g/polybag equivalents to 5 tons/ha (k1), and 250 g/polybag equivalent to 10 tons /ha (k2). The second factor is the concentration of POC Fortune (F) consisting of 3 levels: without POC Fortune (f0), 10 ml/l water (f1), and 20 ml/l water(f2).

2.4. Research Stages

Research activities are as follows: preparation of planting media, preparation of leek seeds, giving goat manure treatment 2 weeks before planting, planting, giving POC Fortune treatment in 8 stages (ages 7, 14, 21, 28, 35, 42, 49, and 56 days after planting), plant maintenance (watering, replanting, and weed control), harvesting, and preparing reports.

2.5. Data Collection

Data collection consisted of plant height and number of leaves at 30 and 60 days after planting, number of shoots and root length at 60 days after planting, and wet weight at 60 days after planting.

2.6. Data analysis

To determine the effect of providing goat manure fertilizer and POC Fortune and their interaction, the observational data was analyzed using analysis of variance. If the analysis of variance test results have no significant effect (F-count < F-table 5%) no further tests are carried out, whereas if the variance test results have a real effect (F-count > F-table 5%) or very significant effect (F-count > F-table 1%), then to compare the two treatment averages, a follow-up test was carried out with the Least Significant Difference (LSD) level of 5%.

3. RESULTS AND DISCUSSION

3.1. Soil Chemical Properties before Treatment

The results of the analysis of the chemical properties of the soil in the laboratory are as follows: the soil reacts acidic with pH = 4.7; 1.42% C-organic; 0.12% N-total; C/N ratio = 11.82; 1.88 ppm P available; 78.33 ppm K available; 1.89 me/100 g soil Ca^{++}; 0.94 me/100 g soil Mg^{++}; 0.73 me/100 g soil K^{+}; 0.57 me/100 g soil Na^{+}; Cation Exchange Capacity = 9.21 me/100 g soil; and base saturation = 44.77%. Based on the soil chemical properties assessment criteria of the Bogor Soil Research Institute (1983), the soil has the property of being acidic; organic C and total N content (low); C/N and Mg^{++} ratios as well as base

saturation (classified as moderate), P-available and Ca^{++} (classified as very low); K^{+} and Na^{+} cations (classified as very high); and CEC (classified as low), in general the soil has a low level of chemical fertility. Fertilization is a good step to increase soil fertility.

3.2. Effect of the Goat Manure Fertilizer Application

The results of variance analysis showed that the application of goat manure fertilizer (K) had a very significant effect on plant height at 60 days after planting and fresh weight per plant, but had no significant effect on plant height at 30 days after planting, number of leaves at 30 and 60 days. Days after planting, number of tillers at harvest and root length at harvest. The results of research on the effect of goat manure on the growth and yield of leek plants are presented in Table 1.

Table 1. Research Results on the Effect of Goat Manure Fertilizer on the Growth and Yield of Leek Blaze F1 Variety.

Treatment Factors	Plant Height (cm)		Number of Leaves (pieces)		Number of Tillers (chicks)	Length Roots (cm)	Wet Weight Per Plant (g)
	30 DAP	60 DAP	30 DAP	60 DAP			
Goat Manure Anova	tn	**	tn	tn	tn	tn	**
0 g/polybag (k_0)	27,20	50,27 b	9,60	20,33	3,53	35,73	77,67 b
125 g/polybag (k_1)	26,53	54,60 ab	11,60	23,60	3,80	36,67	93,00 b
250 g/polybag (k_2)	24,40	58,53 a	12,13	24,07	4,30	37,53	117,00 a

Source: Processed Primary Data (2024) DAP = days after planting

The data in Table 1 shows that goat manure fertilizer treatment had no significant effect on plant height at 30 days after planting and the number of leaves at 30 and 60 days after planting, number of tillers, and root length, but had a very significant effect on plant height at 60 days after planting. There was no real effect of goat manure treatment on plant height and number of leaves 30 days after planting because the plant growth was still young and nutrient requirements were still relatively small, nutrient requirements could be met by the growing medium. Furthermore, at the age of 60 days after planting, the vegetative growth of plants occurs rapidly and the amount of nutrients in the soil is no longer sufficient, so applying goat manure can stimulate the vegetative growth of plants. In general, the research results showed that the application of goat manure (125 and 250 g/polybag) produced taller plants, a greater number of leaves, and number of tillers, and longer roots compared to treatment without goat manure (k0). This is because providing goat manure fertilizer can increase the availability and uptake of nutrients, especially N, by plants, and in turn can encourage plant vegetative growth. As stated by Munawar (2011), an adequate supply of N elements for plants can stimulate/encourage plant vegetative growth. In line with the

research results reported by Mukhlison, (2018) that the application of goat manure of 20 tons/ha tends to increase the growth and yield of leek plants. It was reported by Dewi et al (2021) that the treatment of providing goat manure fertilizer had a significant effect on the plant height and number of leaves of leek plants, giving various doses of goat manure fertilizer resulted in taller plants and a greater number of leaves.

The results of variance analysis showed that goat manure fertilizer treatment had a very significant effect on the wet weight of the plants. The research results presented in Table 1 show that administration of various doses of goat manure (125 and 250 g/polybag) resulted in a higher fresh weight per plant compared to treatment without goat manure (k0). The highest wet weight per plant was produced in the 250 g/polybag (k2) treatment, namely 117.00 g, followed by the 125 g/polybag (k1) treatment, namely 93.00 g polybag-1, while the lowest was produced in the treatment without goat manure (k0) is 77.67 g. This is because by providing goat manure fertilizer, the macronutrients, and micronutrients needed by plants can be met, apart from that there is also improvement in the physical properties of the soil and the biological properties of the soil so that plants can grow well and provide high wet plant weight. According to the research results reported by Yulhasmir (2021), the treatment of 37.5 g/polybag or 15 tons/ha of goat manure is the best in increasing the growth and production of leek plants. Dewi et al (2021) reported that increasing the dose of goat manure 40, 80, and 120 g/polybag) was followed by an increase in the wet weight of the leek plants produced, namely 97.27; 99.11; and 101.96 g/polybag.

4.2. Effect of the POC Fortune Application

The results of variance analysis showed that giving POC Fortune (F) had a very significant effect on plant height at 60 days after planting, root length, and fresh weight per plant, but had no significant effect on plant height at 30 days after planting, number of leaves at 30 days. and 60 days after planting, and number of tillers and root length. The results of research on the influence of POC Fortune on the growth and yield of leek plants are presented in Table 2.

Table 2. Recapitulation of Research Results on the Effect of Fortune Liquid Organic Fertilizer on Growth and Yield of Leek Plants Blaze F1 Variety

Treatment Factors	Plant Height (cm)		Number of Leaves (pieces)		Number of Tillers (chicks)	Length Roots (cm)	Wet Weight Per Plant (g)
	30 DAP	60 DAP	30 DAP	60 DAP			
POC Fortune Anova	tn	**	tn	tn	tn	*	**
0 ml/l water (f_1)	25,13	50,13 b	9,93	20,40	3,53	33,27 b	70,00 b
10 ml/l water (f_2)	26,20	56,33 a	11,46	23,13	4,00	38,33 a	106,67 a
20 ml/l water (f_3)	26,80	56,93 a	11,93	24,47	4,13	38,33 a	111,00 a

Source: Processed Primary Data (2024) DAP = days after planting

The research results in Table 2 show that the giving of various concentrations of POC Fortune (10 and 20 ml/l water) resulted in better vegetative growth of leeks, namely taller plants, a greater number of leaves, and number of tillers and longer roots compared to treatment without POC Fortune (f0). This is because administering various concentrations of POC Fortune can meet the needs of nutrients such as Nitrogen (N) which is very necessary for plant vegetative growth. As stated by Prihmantoro (2006), the nutrient element nitrogen plays a very important role in stimulating plant vegetative growth. The research results also showed that the POC Fortune treatment had a very significant effect on the wet weight of the plants. The highest wet plant weight was produced in the 20 ml/l water (f2) treatment, namely 111.00 g, followed by the 10 ml/l water (f1) treatment, namely 106.67 g, and the lowest in the treatment without POC Fortune (f0) which is 70.00 g. This is because by providing POC Fortune it can meet the needs of macro and micro nutrients for plants, so plants can grow and produce good results.

POC Fortune is made from 100% natural ingredients containing complete nutrients, safe and environmentally friendly, containing 6.33% C; 3.26% N; 4.11% P_2O_5; and 3.45% K_2O, and pH 5.84. (arenatani.com). The benefits and advantages of POC Fortune are: (1) accelerates the growth of plant roots, stems, and leaves, (2) increases plant resistance from disease, (3) increases crop yields, (4) increases macro & micro nutrients in the soil, (5)) reduces the use of chemical fertilizers, (6) is environmentally friendly, (6) is safe and easy to apply, and (7) can be applied by spray or spray (mitratani.co.id). The results of the research reported by Sugirno et al (2021) show that giving POC Fortune had no significant effect on height, number of leaves, fresh weight, dry weight, and number of bulbs per cluster of shallots, treatment with 20 ml/2 l water resulted in weight per wet bulb the highest is 6.05 grams. Situmorang (2023) reported that giving POC Fortune had a very significant effect on plant length 15 and 30 days after planting, plant age at flowering, and fruit weight per cucumber plant. The highest fruit weight per plant was produced in the 12 ml l l water treatment (p3), namely 1.66 kg, while the lowest was produced in the treatment without POC Fortune (p0), namely 1.43 kg. It was reported by Liah et al (2024) that giving POC Fortune had no significant effect on plant height when male flowers came out when female flowers came out, cob length, cob diameter, and cob production of sweet corn plants.

4.3. Interaction between Goat Manure Fertilizer and POC Fortune

The results of variance analysis showed that the interaction effect between goat manure and POC Fortune (F) had no significant effect on plant height at 30 and 60 days after planting, number of leaves at 30 and 60 days after planting, number of tillers at harvest, root length and wet weight per plant. The results of research on the effect of the interaction between goat manure and POC Fortune on the growth and yield of leek plants are presented in Table 3.

Table 3. Recapitulation of Research Results on the Effect of Interaction between Goat Manure Fertiizer and Fortune Liquid Organic Fertilizer on Growth and Yield of Leek Plants Blaze F1 Variety

Treatment Factor	Plant Height (cm)		Number of Leaves (pieces)		Number of Tillers (chicks)	Length Roots (cm)	Wet Weight Per Plant (g)
	30 DAP	60 DAP	30 DAP	60 DAP			
Interaction Anova	tn	tn	tn	tn	tn	tn	tn
k0f0	26,00	42,40	10,80	21,00	4,2,00	33,00	47,00
k0f1	28,60	52,40	13,20	26,80	5,00	41,40	93,00
k0f2	27,00	56,00	10,80	23,00	3,80	38,20	93,00
k1f0	27,40	51,20	10,20	20,60	4,00	38,20	80,00
k1f1	25,20	56,30	8,40	18,80	3,60	36,60	96,00
k1f2	27,00	56,40	10,20	21,60	3,80	35,20	104,00
k2f0	22,00	56,80	13,40	27,80	3,80	28,60	84,00
k2f1	24,80	60,40	14,20	27,80	3,80	37,00	131,00
k2f2	26,40	58,40	8,80	16,60	3,00	41,60	136,00

Source: Processed Primary Data (2024) DAP = days after planting

The results of variance analysis showed that the interaction between the goat manure fertilizer dosage factor and the Fortune POC concentration factor had no significant effect on the growth and yield of leek plants. This situation shows that the two treatment factors do not jointly influence the growth and yield of leek plants. As stated by Gomez and Gomez (1995), two factors are said to interact if the influence of a treatment factor changes when the level of another treatment factor changes. Steel and Torrie (1991) further stated that if the effect of different interactions is not significant then it can be concluded that the treatment factors act independently of each other.In general, the research results presented in Table 3 show that the combination treatment of various doses of goat manure with POC Fortune concentration resulted in higher growth of cucumber plants, a greater number of leaves and number of tillers, longer roots, and a higher fresh wet weight per plant was heavier than the combination without goat manure and without POC Fortune (k0f0).This is because the provision of goat manure combined with POC Fortune can increase the availability and uptake of both macro and micronutrients so that leek plants can grow better and provide high yields. As stated by Prihmantoro (2006), it is best to provide macro and micronutrients regularly so that plants can grow well. These nutrients can be provided together either through the roots or through the leaves.

4. CONCLUSION

Based on the results of the research and discussion, it is concluded as follows:

1. Goat manure fertlizer treatment (K) has a very significant effect on plant height 60 days after planting and plant fresh weight, but has no significant effect on plant height 30 days after planting, number of leaves 30 days after planting, and 60 days after planting, number of tillers and root length. The highest wet plant weight was produced in the 250 g/polybag (k2) treatment, namely 117.00 g/plant, while the lowest was produced in the treatment without goat manure fertilizer (k0), namely 77.67 g/plant.
2. The POC Fortune treatment (F) had a significant to very significant effect on plant height at 60 days after planting, root length, and plant fresh weight, but had no significant effect on plant height at 30 days after planting, number of leaves at 30 days and 60 days after planting. and number of offspring. The highest wet plant weight was produced in the 20 ml/l water (f2) treatment, namely 111 g/plant, while the lowest was produced in the treatment without POC Fortune (f0), namely 70 g/plant.
3. There was no interaction between goat manure treatment and POC Fortune (KxF) on plant height and number of leaves at 30 days and 60 days after planting, number of tillers, root length, and wet planting weight.

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