

Growth Response of Garlic (*Allium sativum* L.) to the Application of Supermes Liquid Organic Fertilizer Dosage

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ABSTRACT

Garlic (*Allium sativum*L.) is a horticultural commodity with high economic value in Indonesia. For optimal growth and yield, garlic plants require macronutrients and micronutrients from fertilization. Micronutrients can be met, for example, by providing organic liquid fertilizer. This study aims to determine the effect of Supermes Liquid Fertilizer dosage application on garlic plant growth. The garlic varieties planted are local varieties using a 1-factor Randomized Block Design with 6 fertilizer dosage treatments: 1) 0 ml/L; 2) 1 ml/L; 3) 2 ml/L; 4) 3 ml/L; 5) 4 ml/L and 6) 5 ml/L. Supermes liquid organic fertilizer. Each treatment was repeated three times: Garlic Response to Supermes Liquid Fertilizer, therefore, there were 18 treatment trials. The results of the Supermes POC fertilizer dosage application did not show significant differences in plant height and number of leaves. However, there was a significant increase in the number of leaves and plant height at each increase in fertilizer dosage. Further research on the application of Supermes POC dosage with various higher concentrations is needed to obtain superior results.

Keywords: Allium sativum, POC Supermes, Dosage

1. INTRODUCTION

Garlic (*Allium sativum*L.) is a horticultural commodity of vegetable type that is important to cultivate. Garlic is considered a potential commodity, especially for import substitution and is related to saving the country's foreign exchange (Harinta, 2022). In addition, garlic contains bioactive compounds containing sulfur that are effective in inhibiting the growth of bacteria, viruses, and fungi (Hasrianda and Setiarto, 2022). Garlic production from 2014 to 2016 experienced an increase of around 3-5% annually but still unable to meet market demand. This resulted in a production deficit that required the government to import to meet consumption of this commodity (BPS, 2018). Garlic imports in 2017 reached 366,753.4 tons (BPS, 2018) and garlic demand is expected to increase. The total value of garlic imports in 2018 reached 507,701 tons (BPS, 2019). This shows that more than 90% of garlic demand in Indonesia is still highly dependent on imports.

In recent years, the government has intensified garlic cultivation with the goal of increasing domestic production by expanding planting areas across the country (Setiawan et al. 2022). To support high production for commodity development, superior and location-specific technological innovations are needed. The application of superior, location-specific technologies such as the use of adaptive superior varieties, fertilization and pest and disease control, water management, and cropping pattern planning are expected to increase production, land productivity, farming efficiency, and farmer income, as well as the formation of other environmentally friendly farming systems (Syafruddin et al. 2015).

Fertilization is a crucial factor influencing plant growth in agricultural systems. Soil nutrients alone are insufficient for optimal plant growth; however, excessive application of inorganic fertilizers can lead to decreased land productivity (Hariyadi et al., 2018). One way to address the potential impacts of inorganic fertilizer use is through the application of organic fertilizers at the correct dosage. In addition to appropriate fertilizer dosages, technological innovation in fertilization practices is needed to understand the effects of fertilizer additions on growth and increased production.

Organic fertilizers contain low levels of nutrients and have a slow response, requiring a long time to improve soil fertility (Hidayah et al., 2024). Liquid organic fertilizer is one type of fertilizer that can be applied to plants. Liquid organic fertilizers are mostly applied through green leaves or are referred to as foliar liquid fertilizers, which contain essential macro and micro nutrients (N, P, K, S, Ca, Mg, B, Mo, Cu, Fe, Mn, and organic matter). Liquid organic fertilizers can not only improve the physical, chemical, and biological properties of the soil, but also help increase crop production, improve the quality of crop products, reduce the use of inorganic fertilizers, and serve as an alternative to manure (Wirayuda and Koesriharti 2020).

Several studies have shown that applying liquid organic fertilizer to the leaves results in better plant growth and yield than applying it to the soil (Sasi 2016). Liquid organic fertilizer made from eggshell waste contains nutrients that can support the growth and yield of garlic plants. Fertilizer concentration significantly increases yield, particularly in terms of fresh weight of garlic bulbs per plant (Pradita 2023).

One of the new liquid fertilizers on the market is Supermes Fertilizer, which contains macro and micro nutrients and microbes that are beneficial to plants. Supermes fertilizer is used as a supplement to organic and inorganic fertilizers, applied before planting and during maintenance. This liquid fertilizer has become widely used. conducted on food crops, but has not been tested on

horticultural crops such as garlic, so research was conducted with the aim of obtaining information on the growth response of garlic (*Allium sativum*L.) on the application of the Supermes liquid organic fertilizer dose.

2. RESEARCH METHOD

Time and Location of Research

The research was conducted at the Experimental Garden of the Faculty of Agriculture, Merdeka University, Surabaya, at an altitude of ±5 m above sea level from June 2024 to July 2024.

Tools and materials

The tools used were 30x30 cm polybags, labels, measuring tools, writing instruments, and a hand sprayer. The materials used were garden soil, garlic seeds, and Supermes liquid organic fertilizer.

Experimental Design

This study used a 1-factor Randomized Block Design (RAK) with six doses of Supermes liquid organic fertilizer concentration, namely: (P0) 0 ml/L; (P1) 1 ml/L, (P2) 2 ml/L; (P3) 3 ml/L, (P4) 4 ml/L and (P5) 5 ml/L. Each treatment was repeated 3 times with each treatment containing 3 sample plants, so that 18 experimental samples were obtained.

Experimental Procedures

a. Preparation of planting media

Fill 6 kg of 30x30 cm polybags with a 2:1 mixture of soil and compost. Incubate for approximately 7 days.

b. Planting

The prepared garlic seeds are then cut off at the end of one third of the bulb and planted as deep as the bulb, with the cut side facing upwards and the base or rooted part of the bulb at the bottom, after which it is covered with a thin layer of soil.

c. Watering

Watering is done every morning and evening, with field capacity

d. Replanting

Replanting is done in the first week after planting. If there are tubers that do not germinate or do not grow, they should be immediately replaced or replanted with prepared plants

e. Weeding

Weeding is done with the aim of removing nuisance plants or weeds, and the frequency of weeding cannot be determined depending on whether or not weeds grow.

f. Fertilization

The application of Supermes fertilizer as a treatment was given according to the fertilizer treatment dosage. The concentration of the Supermes liquid organic fertilizer solution as a treatment was given by spraying and watering the POC solution with various concentrations studied into the planting medium which was carried out once a week, namely during transplanting at 14 days, 21 days, 28 days, 35 days and 42 days after planting.

g. Pest and disease control

Pest control on garlic plants is done manually, by removing and killing pests such as caterpillars. Disease control, on the other hand, involves spraying fungicide on all parts of the plant

Growth Observation

a. Plant height (cm)

Measure by folding all the leaves upwards and then measuring the length from the ground surface to the tip of the highest leaf.

b. Leaf Number (leaves)

Count based on the number of leaves that have opened completely.

Data Analysis

Observation data were subjected to analysis of variance (ANOVA) at a 5% significance level. When significant differences among treatments were detected, means were further separated using the Least Significant Difference (LSD) test to determine which treatments differed significantly from one another.

3. RESULTS AND DISCUSSION

Plant Height (cm)

The results of observations of plant height parameters are shown in Table 1. The table shows that the treatment of different doses of Supermes liquid fertilizer did not produce significant differences in garlic plant height. This is in line with the results of research by Hermanto et al. (2021) which stated that the application of a combination of NPK fertilizer and banana peel POC did not have a significant effect on garlic plant height. Similarly, the results of research by Rizkia (2021) which stated that the nutrients of goat manure POC, cow manure, and

AB mix did not have a significant effect on the height parameters of garlic plants grown using a hydroponic system. Liquid organic fertilizer is a growth regulator that, when administered in optimal amounts, will stimulate cell division activity in meristematic tissue, which can affect plant growth (Siagian et al. 2016).

Tabel 1. Average height of garlic plants days after transplanting (DAP)

POC Supermes Dosage (ml/L)	Plant Height (cm)				
	14DAP	21DAP	28DAP	35DAP	42DAP
0	1,33	2,55	3,11	3,11	3,11
1	1,78	3,11	3,67	3,67	3,67
2	1,66	3,00	3,56	3,56	3,56
3	1,89	3,00	3,78	3,78	3,78
4	2,00	3,11	3,89	3,89	3,89
5	2,11	3,56	4,22	4,22	4,22
LSD 5 %	tn	tn	tn	tn	tn

Description: tn (not significantly different)

Plant height can be used as an indicator of plant growth and development, which can determine plant productivity because increasing plant height is a vegetative growth activity of a plant (Hermanto et al. 2021). However, the height of garlic plants in this study ranged from 25-36 cm, while the description provided by Rahayu et al. (2015) states that the height of garlic plants of the Sangga Sembalun variety ranges from 43-48 cm. Another possible reason for the lack of effect is that the concentration used was according to the recommended dosage on the product packaging, namely 2 mL.L-1 of water, which may be too low compared to that used in other studies, such as those reported by (Parwati 2021) in which the Lumbu Putih variety of garlic produced a plant height of 68.53 cm, far above the plant height based on the variety description (52-65 cm). This is likely due to the use of liquid fertilizer with a high concentration of up to 75 mL.L-1 of water.

Leaf Number (Leaves)

The results of observations obtained to determine the number of leaves at each dose of Supermes liquid organic fertilizer on the growth of garlic (*Allium sativum L.*) can be seen in table 2. The results of the analysis of variance show that the treatment of various doses of Supermes liquid organic fertilizer on the number of leaves of garlic plants at all observation ages shows no significant difference.

Tabel 2. Average leaf number of garlic plants days after transplanting (DAP)

POC Supermes Dosage (ml/L)	Leaf Number (Leaves)				
	14DAP	21DAP	28DAP	35DAP	42DAP
0	1,33	2,55	3,11	3,11	3,11
1	1,78	3,11	3,67	3,67	3,67
2	1,66	3,00	3,56	3,56	3,56
3	1,89	3,00	3,78	3,78	3,78
4	2,00	3,11	3,89	3,89	3,89
5	2,11	3,56	4,22	4,22	4,22
LSD 5 %	tn	tn	tn	tn	tn

Description: tn (not significantly different)

The use of increasingly higher fertilizer doses was followed by an increase in the number of leaves in each treatment. It is possible that the concentration of Supermes Organic Fertilizer used was too low compared to that used in other studies. Research by Parwati (2021) showed that liquid organic fertilizer from fruit produced a significant difference in the number of leaves on garlic plants, but the concentration used was 50 mL/L of water.

Data analysis of observations of plant height and leaf number showed that the application of Supermes liquid organic fertilizer at various concentrations did not produce statistically significant differences in all measured parameters. Based on the results of the study, treatment P5 with a POC concentration of 5 ml/liter of water performed best in increasing plant growth compared to the other treatments. These results align with research by Hidayah et al. (2021) that found that the application of POC from goat manure (21 mL/L of water) and cow manure (18 mL/L of water) significantly affected garlic growth. Meanwhile, the research results of Karomah (2022) stated that the provision of tofu dregs waste POC at a concentration of 10 to 40% did not have a significant effect on the growth of garlic plants.

4. CONCLUSIONS

The application of Supermes liquid fertilizer did not significantly affect plant height and leaf number. However, spraying Supermes POC at the highest concentration resulted in the greatest increase in plant height and leaf number. Further research is needed on the application of Supermes liquid fertilizer at higher concentrations than previously described for garlic plants.

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