DEVOTION
Journal of Research and Community Service

Volume 4, Number 10, October 2023
e-ISSN: 2797-6068 and p-ISSN: 2777-0915

THE EFFECT OF VERMICOMPOST FERTILIZER AND EFFECTIVE MICROORGANISMS (EM4) ON THE GROWTH AND YIELD OF SHALLOTS (*Allium ascalonicum* L) BIMA BREBES CULTIVARS

Anggif Agistha Nurrizky, Nurul Fadilah, Ibnu Maulana, Achmad Faqih*
Faculty of Agriculture, Universitas Swadaya Gunung Jati, Indonesia
Email: achmad.faqih@ugj.ac.id*

KEYWORDS
Vermicompost Fertilizer; Effective Microorganisms (EM4); Shallot

ABSTRACT

This study aims to determine the effect of vermicompost fertilizer dose interaction and effective microorganisms (EM4) on the growth and yield of onion plants (Allium ascalonicum L.) cultivar Bima Brebes. The research was carried out in Karangwangun Village, Babakan District, Cirebon Regency – West Java, from February to May 2023. The design used is an experimental method with a factorial pattern Group Random Design (RAK), consisting of two factors, namely vermicompost fertilizer and effective microorganisms (EM4). Application of vermicompost fertilizer (K), which consists of 3 levels, namely: K1 = 5 tons / ha, K2 = 10 tons / ha, and K3 = 15 tons / ha; Effective Microorganism Factor (EM4) (E) which consists of 3 levels, namely: E1 = EM4 5 cc / Liter of water, E2 = EM4 10 cc / Liter of water, and E3 = EM4 15 cc / Liter of water. Each treatment or experimental unit was repeated three times for a total of 27 plots. Data analysis was carried out using fingerprints and follow-up tests with the Duncan Multiple Distance Test at the level of 5%. The variables observed were plant height (cm), number of leaves per clump (strands), number of saplings per clump (fruit), tuber diameter (cm), weight of fresh tubers per clump, weight of fresh tubers per plot, weight of dry tubers per clump and per plot. The results showed that: (1) there was no interaction between vermicompost fertilizer application and effective microorganisms (EM4) on all observation parameters, (2) The independent effect of vermicompost fertilizer application had a significant effect on the average variable weight of fresh tubers per plot. Meanwhile, the treatment of effective microorganisms (EM4) has an independent effect on the average plant height variable aged 21 days after planting (HST).

INTRODUCTION

Shallot is a vegetable commodity that has important meaning for the community, both in terms of its high economic value and nutritional content. In the last decade, the demand for shallots for consumption and for domestic seeds has increased, so that Indonesia has to import to meet this need (Hidayat, 2015).

According to data from the Central Bureau of Statistics of the Republic of Indonesia (BPS RI) for 2022, it is stated that the harvested area, productivity and production of shallot plants do not change much every year. It can be seen that the national shallot productivity from 2018 to 2019 has increased from 9.39 tons/ha to 9.57 tons/ha, then decreased in 2021 and in 2022 again increased from 9.54 tons /ha to 9.69 tons/ha. (RI, 2022)

The need for vegetables, especially shallots, which are commonly used as cooking spices, is increasing. Shallots are not only sold for vegetable needs, they can also be sold as plant

seeds. The price of shallots for seeds is more expensive than the price of shallots for vegetables (Pitojo, 2017).

The sub-optimal productivity of shallots is caused, among other things, by the fact that most farmers do not use superior cultivars, it is difficult to get good seeds for shallot cultivation, fertilization is not in accordance with recommendations or even does not use basic fertilizers at all and the method of farming shallots is still traditional. In addition, it is also caused by the lower level of soil fertility, because in the process of fertilizing the farmers do not add manure as an additional fertilizer to fertilize the soil. One way to improve soil fertility and increase land productivity is to fertilize according to recommendations (Effendy et al., 2019).

Kascing contains various materials needed for plant growth, namely hormones such as giberlin, cytokinins, and auxin, containing nutrients (N, P, K, Mg, and Ca). and Azotobacter sp, which is a non-symbiotic N-fixing bacteria that will help enrich the N elements needed by plants. Thus vermicompost can increase soil fertility (D., 2013)

EM4 is one of the soil biological solutions, accelerating the decomposition of organic matter because it contains lactic acid bacteria which can ferment available organic matter and can be absorbed directly by plant roots. The use of EM4 has several advantages which can increase crop production and regulate the balance of soil microorganisms, EM4 can increase the decomposition of waste and organic waste, increase the availability of plant nutrients and suppress the activity of insect pests and pathogenic microorganisms. EM4 can also be used to speed up the composting of organic waste or animal waste. (Budyanto, Aziz, 2019).

RESEARCH METHOD

This experiment was carried out in Karangwangun Village, Babakan District, Cirebon Regency - West Java. The experimental location is an area under the guidance of BPP (Agricultural Extension Center) in Babakan District, which is located at an altitude of ± 12 m above sea level (asl), the air temperature in the area is around 270C - 330C. The time of implementation of the experiment was carried out from February to May 2023.

The materials used for this experiment were shallot cultivar Bima Brebes, vermicompost fertilizer at an appropriate dose of treatment, effective microorganism (EM4) at an appropriate dose of treatment, urea fertilizer, SP-36 fertilizer, Antracol fungicide, and arjuna insecticide (Sarjono & Suherman, 2022).

The design used was an experimental method with a randomized block design (RBD). This study consisted of two factors, namely vermicompost fertilizer and effective microorganism (EM4). The first factor of vermicompost fertilizer (K) consists of three levels: K1 (5 tons/ha), K2 (10 tons/ha), and K3 (15 tons/ha). The second factor EM4: (E) consists of three levels: E1 (5 cc/liter of water), E2 (10 cc/liter of water), and E3 (15 cc/liter of water). Each treatment or experimental unit was repeated three times so that there were a total of 27 plots (Damayanti, 2020).

Tillage is done twice. The first tillage is ten days before planting by plowing the land to a depth of ±20 cm into lumps of soil, along with making plots with a size of 200 cm × 100 cm, spacing 30 cm between plots, and 60 cm spacing between replicates which are used as drains or drainage. Furthermore, the soil is allowed to stand for one week.

Parameters observed included plant height, number of leaves per hill, number of tillers per hill, tuber diameter, fresh tuber weight per hill and per plot, and dry tuber weight per hill

and per plot. Data analysis was performed using variance and follow-up tests with Duncan's Multiple Range Test at the 5% level.

RESULTS AND DISCUSSION

Plant Height (cm)

There was no interaction between the application of vermicompost fertilizer and EM4 on the average height of shallot plants aged 21, 28 and 35 HST, and the vermicompost fertilizer did not significantly affect the average plant height but there was an independent effect on the effective factor of microorganisms (EM4). .

Table 1. Application of Vermicompost Fertilizer and Effective Microorganisms (EM4) on Average Plant Height (cm)

Treatment	Plant Height (cm)		
	21 HST	28 HST	35 HST
K1 (5 tonnes/ha)	29.52 a	32.65 a	36.72 a
K2 (10 tonnes/ha)	29.06a	32.31a	35.93a
K3 (15 tonnes/ha)	29.30a	32,13 a	35,24 a
E1 (5 cc/liter of water)	29.66b	33.02a	36.96a
E2 (10 cc/liter of water)	28.20 a	31.33 a	34.65 a
E3 (15 cc/liter of water)	30.02c	32.74 a	36,28 a

Note: The average number accompanied by the same letter in the same column is not significantly different according to Duncan's Multiple Range Test at the 5% level

Marsono, (2016), that organic fertilizers have low macro and micro nutrients, and cannot be directly absorbed by plants, so that the nutrient needs of plants are still not met as a result of which plant growth is stunted. Growth media inocated with EM4 can stimulate plant growth, because the microbes contained in it can dissolve nutrients from low solubility parent aid (phosphate rock), inhibit the uptake of heavy metals in plant roots, increase plant immunity (immunity) against pests. and diseases, can improve the physical and chemical properties of the soil and can decompose organic matter into residues or accelerate the recycling of nutrients (Wididana, 2014).

Number of Leaves per Clump (strands)

There was no interaction between the application of vermicompost fertilizer and EM4 on the average number of shallot leaves aged 21, 28 and 35 DAP.

Table 2. Application of Vermicompost Fertilizer and Effective Microorganisms (EM4) on the Average Number of Leaves per Clump (strand)

Treatment	Number of Leaves per Clump (strands)		
	21 HST	28 HST	35 HST
K1 (5 tonnes/ha)	21.94 a	31.06a	39,24 a
K2 (10 tonnes/ha)	21.69 a	31.11 a	41.04a
K3 (15 tonnes/ha)	21.78 a	31.74 a	38.13 a
E1 (5 cc/liter of water)	21.61 a	31.31 a	40.04a
E2 (10 cc/liter of water)	21.83 a	31.72 a	39.59a
E3 (15 cc/liter of water)	21.96a	30.87a	38.06a

Note: The average number accompanied by the same letter in the same column is not significantly different according to Duncan's Multiple Range Test at the 5% level

This is because the vermicompost fertilizer given has not been able to be absorbed optimally by plant roots. The nutrients have not occurred in young plants, so the plants do not require the availability of large amounts of food to carry out their growth rate.

Number of tillers per clump (fruit)

There was no interaction between the application of vermicompost fertilizer and EM4 on the average number of tillers per clump aged 21, 28 and 35 DAP. This shows that the availability of nutrients contained in organic fertilizers is less when compared to inorganic fertilizers and organic fertilizers have drawbacks, including being available to plants slowly so that it takes quite a long time to be available to plants and results in plant growth being stunted.

Table 3. Application of Vermicompost Fertilizer and Effective Microorganisms (EM4) on the Average Number of Saplings per Cluster (fruit)

Treatment	Number of tillers per clump (fruit)		
	21 HST	28 HST	35 HST
K1 (5 tonnes/ha)	6.31 a	7.43 a	8.06a
K2 (10 tonnes/ha)	6,13 a	7.50a	8.06a
K3 (15 tonnes/ha)	6,65 a	7.52 a	8.24 a
E1 (5 cc/liter of water)	6.50 a	7.44 a	8.15 a

E2 (10 cc/liter of water)	6.30a	7.63 a	8.37 a
E3 (15 cc/liter of water)	6,20 a	7,37 a	7.83 a

Note: The average number accompanied by the same letter in the same column is not significantly different according to Duncan's Multiple Range Test at the 5% level

Tubers Diameter (cm)

There was no interaction between the application of vermicompost fertilizer and EM4 on the average diameter of shallot bulbs (cm).

Table 4. Application of Vermicompost Fertilizer and Effective Microorganisms (EM4) on Average Tubers Diameter (cm)

Treatment	Tubers Diameter (cm)
K1 (5 tonnes/ha)	2.41 a
K2 (10 tonnes/ha)	2.37 a
K3 (15 tonnes/ha)	2.39 a
E1 (5 cc/liter of water)	2.47 a
E2 (10 cc/liter of water)	2.36 a
E3 (15 cc/liter of water)	2.34 a

Note: The average number accompanied by the same letter in the same column is not significantly different according to Duncan's Multiple Range Test at the 5% level

This shows that the fruit produced by plants is influenced by the growth period of the plant where it is known that plant growth from the start of the vegetative phase has shown results that are not significantly different. In line with the opinion of Mardjuki, (2020), states that plant yields are affected by the vegetative growth period experienced by plants, if the growth period is good, the results obtained will be maximum (Yasin, 2013). In addition, the amount of fertilizer given is related to the plant's need for nutrients, the nutrient content in the soil, and the nutrient content contained in the fertilizer.

Weight of Fresh Tubers per Clump (g) and per Plot (kg)

There was no interaction between the application of vermicompost fertilizer and EM4 on the average fresh tuber weight per clump (g) and per plot (kg).

Table 5. Application of Vermicompost Fertilizer and Effective Microorganisms (EM4) on the Average Weight of Fresh Tuber per Clump (g) and per Plot (kg)

Treatment	Fresh Tubers Weight per Clump (g)	Weight of Fresh Tubers per Plot (kg)
K1 (5 tonnes/ha)	64.54 a	3.41 a
K2 (10 tonnes/ha)	67.59 a	3.63 b
K3 (15 tonnes/ha)	63.65 a	3,19 a
E1 (5 cc/liter of water)	67.83 a	3.52 a
E2 (10 cc/liter of water)	64,69 a	3.51 a
E3 (15 cc/liter of water)	63,26 a	3,20 a

Note: The average number accompanied by the same letter in the same column is not significantly different according to Duncan's Multiple Range Test at the 5% level

This shows that EM4 given through the leaves has no significant effect on the averageweight of fresh onion bulbs per hill (g) because the application of fertilizer through the leaves is often lost due to evaporation of the leaves or exposure to rainwater before it can be absorbed by the leaves.Applying fertilizer that exceeds the limit can reduce yields and will only increase production costs, in line with the opinion of Rosmarkam & Yuwono, (2002), that application of nutrients that are increased beyond the optimal point can reduce plant carbohydrate levels so that production decreases.

Dry Tuber Weight per Clump (g) and per Plot (kg)

There was no interaction between the application of vermicompost fertilizer and EM4 on the average dry tuber weight per clump (g) and per plot (kg).

Table 6. Application of Vermicompost Fertilizer and Effective Microorganisms (EM4) on the Average Weight of Dry Tuber per Clump (g) and per Plot (kg)

Treatment	Dry Tuber Weight per Clump (g)	Dry Tuber Weight per Plot (kg)
K1 (5 tonnes/ha)	58.61 a	3.04a
K2 (10 tonnes/ha)	62,17 a	3,26 a
K3 (15 tonnes/ha)	58.35 a	2.87 a
E1 (5 cc/liter of water)	62.15 a	3,14 a
E2 (10 cc/liter of water)	60,37 a	3,18 a
E3 (15 cc/liter of water)	56,61 a	2.84 a

Note: The average number accompanied by the same letter in the same column is not significantly different according to Duncan's Multiple Range Test at the 5% level

This is because the nutrients in the vermicompost fertilizer have not been optimally absorbed by the shallot plants. Saifudin Sarief (2006), organic fertilizer has drawbacks, including: low nutrient content and is available to plants slowly so it takes longer time.

CONCLUSION

There was no interaction between the application of vermicompost fertilizer and the effective microorganism (EM4) on all observed parameters of the Bima Brebes cultivar Shallot (Allium ascalonicum L.).

The application of vermicompost fertilizer and effective microorganism (EM4) did not have a significant effect on the growth and yield of shallot (Allium ascalonicum L.) Cultivar Bima Brebes, but independently gave a significant effect, including: a. The treatment of effective microorganism (EM4) independently had a significant effect on the average height of shallot plants aged 21 days after planting (HST), where the treatment of effective microorganism (EM4) 15 cc/liter of water gave the highest average plant height and significantly different from the treatment of EM4 5 cc/liter of water and EM4 10 cc/liter of water. b. The treatment of 10 ton/ha vermicompost fertilizer independently had a significant effect on the weight of fresh tubers per plot, which was significantly different from the 5 ton/ha vermicompost fertilizer and the 15 ton/ha castor fertilizer application.

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