Crop Agro, 17(1): 1-10 (Jan 2024)
https://cropagro.unram.ac.id/index.php/caj (EISSN: 2621-5748)

APPLICATION OF ORGANIC FERTILIZER FROM RABBIT AND CATTLE FARM WASTES ON SHALLOTS GROWTH AND YIELD (*Allium cepa* var. *ascalonicum* L.)

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ABSTRACT

Abstract. Shallots are one of the important vegetable commodities for society in terms of their economic values and nutritional contents. Shallots are usually consumed as a spice to add flavor to dishes. Various methods of cultivating shallots are used to increase yields both in quantity and quality, including the use of various organic fertilizers such as those made from rabbit and cattle farming waste. This research aimed to determine the effectiveness of organic fertilizer from rabbit farm wastes combined with organic fertilizer from cattle farm wastes on growth and yield of shallots. The research was carried out according to an experimental method, and the experiment was designed with Randomized Block Design with three replications and two treatment factors. The first factor was type of organic fertilizer (P) consisting of two types (R= rabbit; C= cattle farm waste manure). The second factor was dosage (D) of each fertilizer type consisting of three levels (D1= 10; D2= 20; D3= 30 tons/ha). The results of this study indicated that the interaction of these factors did not have a significant effect on all observation variables, and only the dosage of cattle manure showed significant effect on the tuber fresh and dry weights. The effectiveness of rabbit manure showed a tendency for a dose of 30 tons/ha to produce the highest oven dry weight of tubers per hill, namely 29.503 g. Cattle manure application at a dose of 30 tons/ha resulted in the highest oven dry weight of tubers per hill, namely 27.003 g.

Keywords: Organic fertilizers; cattle farm manure; rabbit farm manure; shallots

INTRODUCTION

Shallots are a vegetable commodity that has an important meaning for society, both in terms of its high economic value and nutritional content. In the last decade, demand for shallots for domestic consumption and for bulb seeds has increased, so Indonesia had to import shallots to meet these domestic needs. To reduce the volume of imports, increasing production and quality of shallots must always be improved through intensification and extensification (Sumarni & Hidayat, 2005; Fajjriyah, 2017).

Shallots are commonly consumed as a spice to add flavor to dishes, and are also used as traditional medicine to treat various diseases such as: dizziness, boils, coughs, constipation, insomnia and colds. In general, shallots contain nutrients and active compounds that have preventive and curative functions when used as herbal medicine. Some of the active chemical

compounds in shallots that have pharmacological effects on health include: alliin, allicin, adenosine, diallyl-disulfide, diallyl-trisulfide, ajoene, prostaglandin A-1, diallyl-sulfide, phloroglucinol, kaempferol, cycloaliin, and diphenyl-amine . Medical therapy with shallots has long been carried out in Indonesia and in several other countries aimed at preventing or treating various diseases (Mohammadi-Motlagh et al., 2011; Lawalata, 2017; Aryata, 2019; Thamrin et al., 2019).

Various methods of cultivating shallots continue to be used to increase yields both in quantity and quality, including by applying various organic fertilizers. The use of organic fertilizer from rabbit farming waste has been widely applied to various types of plants and has shown results that can increase production (Ruminta et al., 2017; Fitriasari & Rahmayuni, 2018; Nubriama et al., 2019). Apart from that, it is also widely known that organic fertilizer made from cattle farming waste has also been proven to increase the yield of various types of cultivated plants (Prasetya, 2014; Hendri et al., 2015; Purba et al., 2018).

Based on the description above, research was conducted to determine the effectiveness of organic fertilizer from rabbit farm waste combined with organic fertilizer made from cattle farm waste on the growth and yield of shallots (*Allium cepa* var. *ascalonicum* L.).

RESEARCH METHODS

The experiment in this research was carried out in an experimental garden located on Jalan Sedap Malam Denpasar at an altitude of approximately 55 m above sea level, starting from January to November 2023.

Experimental design

The experiment was designed according to the Randomized Complete Block Design with a 2x3 factorial treatment factors, and each treatment combination was replicated in three blocks (replications). There were two factors studied. The first factor was type of organic fertilizer (P) consisting of 2 levels, namely: R (rabbit farm waste manure) and C (cattle farm waste fertilizer under the trade mark “Bio Alam Asri”). The second factor was the doses (D) of each type of organic fertilizer consisting of three levels, namely: D1 (10 tons/ha); D2 (20 tons/ha); and D3 (30 tons/ha).

Tools and materials used

The materials used are shallot cloves for seeds, the fertilizer used is organic fertilizer, organic fertilizer from rabbit farm waste, "Bio Alam Asri" Cattle Farm Waste Fertilizer, and pesticides. The tools used are a hoe, rake, handsprayer, vernier caliper, tape measure, measuring cup, bench scale, watering tool, scissors and a nameplate.

Implementation of the experiment

For the preparation, land cultivation was carried out using a tractor to a depth of approximately 30 cm. After the land has been processed, the land was divided into 27 plots with the size of each plot being 1.5 m x 1.5 m with a bund height of 30 cm. The distance used between plots was 40 cm while the distance between blocks was 50 cm. Next, basal fertilizer was applied, using pearl NPK (16-16-16) before planting. The Rabbit and cattle manure was applied one week before planting shallots with the treatment doses: D1= 2.25 kg/plot; D2= 4.5 kg/plot, and D3= 6.75 kg/plot.

Planting the shallot bulb seeds was done in the afternoon. Before planting 1/3 of the tip of the shallot bulb was cut and then planted in the planting hole of 3 cm deep. Bulb planting was done by inserting the bulb seeds in the planting hole, 1 seed per planting hole according to the specified planting distance and covering it with soil and covering it again with straw mulch. The planting distance used was 20 cm × 20 cm.

Crop maintenance included irrigation, replanting and weeding. Irrigation was carried out according to conditions in the field, and it was carried out twice a week, and if the soil looks dry, irrigation was carried out once a week. Irrigation was carried out by flooding the beds with irrigation water. Replanting for replacing the dead bulb seeds was carried out 7 – 10 days after the first planting using the same bulb seeds. Weeding was done every 2 days by pulling out the weeds using hands (hand weeding) or a small hoe. Pest and disease control were done routinely if shallot plants are attacked by pests and diseases. The control was carried out by spraying the fungicide “Score 250 EC” according to the recommended dose. Spraying was done once a week.

Measurement variables and data analysis

The variables measured are maximum plant height and leaf number, fresh and dry weight of tubers per hill, harvest index. Data were analyzed using analysis of variance (ANOVA) followed by least significant difference (LSD) at 5% significance level for the means comparison.

RESULTS AND DISCUSSION

Results

Based on the summary of the ANOVA results in Table 1, the interaction between the dose of rabbit manure and the dose of cattle manure (RxC), the treatment dose of rabbit manure (R) and the treatment dose of cattle manure (C) had no significant effect (P≥0.05) on all observed variables, except for the significant effects of cattle manure doses on fresh and dry weight of tubers per hill.

Table 1. The significance of the influence of the type of rabbit manure and cattle manure on all observed variables.

Variables	Treatments		
	Rabbit manure	Cattle manure	Interaction (R×C)
Maximum plant height	ns	ns	ns
Maximum number of leaves	ns	ns	ns
Fresh weight of tubers per hill	ns	s	ns
Oven dry weight of tubers per hill	ns	s	ns
Harvest index	ns	ns	ns

Remarks: ns= non-significant; s= significant effects

Maximum plant height and leaf number

Interaction between doses of rabbit manure and cow manure (RxC); Treatment dose of rabbit manure (R) and treatment dose of cow manure had no significant effect (P≥0.05) on maximum plant height (Table 1). The average maximum plant height in the treatment with rabbit manure dose (R) and cow manure dose (C) is presented in (Table 2). The average maximum plant height was higher at a rabbit manure dose of 300 tons/ha (R3), namely 35,467 cm, which was not significantly different from other treatments (Table 2). The average maximum plant height was higher when the cow manure dose was 300 tons/ha (C3), namely 34,841 cm, which was not significantly different from other treatments (Table 2).

Interaction between doses of rabbit manure and cow manure (RxC); The treatment dose of rabbit manure (R) and the treatment dose of cow manure had no significant effect (P≥0.05) on the maximum number of leaves (Table 1). The average maximum number of leaves in the treatment with rabbit manure dose (R) and cow manure dose (C) is presented in (Table 2). The average maximum number of leaves was obtained at a rabbit manure dose of 300 tons/ha (R3), namely 24.481, which was not significantly different from other treatments (Table 2).

The average maximum number of leaves was obtained at a dose of 200 ton/ha (C2) cow manure, namely 23.963, which was not significantly different from other treatments (Table 2).

Table 2. Average plant height and leaf number per clump in the rabbit manure and cattle manure treatments

Treatments	Plant height (cm)	Leaf number per clump
Rabbit manure (R):		
R1 (10 tons/ha)	33.089 a	21.741 a
R2 (20 tons/ha)	33.252 a	21.481 a
R3 (30 tons/ha)	35.467 a	24.481 a
LSD 0,05	ns	ns
Cattle manure (C):		
C1 (10 tons/ha)	33.089 a	20.148 a
C2 (20 tons/ha)	33.967 a	21.481 a
C3 (30 tons/ha)	34.467 a	24.481 a
LSD 0,05	ns	ns

Remarks: Mean values followed by the same letters in each column are non-significantly different

Fresh and dry weight of tubers

Interaction between doses of rabbit manure and cow manure (RxC) as well as the treatment dose of rabbit manure (R) had no significant effect ($P \geq 0.05$), but the treatment dose of cattle manure had a significant effect on the fresh weight of tubers per hill (Table1). The average fresh and dry weight of tubers per hill in the treatment with rabbit manure dose (R) and cow manure dose (C) is presented in (Table 3).

The average fresh weight of tubers per hill was heavier at a rabbit manure dose of 30 tons/ha (D3), namely 77.400 gram, but this was not significantly different from other treatments (Table 3). The average fresh weight of tubers per hill was also heavier at a cattle manure dose of 30 tons/ha (D3), namely 76.159 gram, which was not significantly different from that in D2 treatment but significantly higher than that in the D1 treatment (Table 3).

Similarly, the average oven dry weight of tubers per hill was heavier at a rabbit manure dose of 30 tons/ha (D3), namely 29,503 gram, which was not significantly different from other treatments (Table 3). The average dry weight of tubers per hill was heavier at a cattle manure dose of 30 tons/ha (D3), namely 27,003 g, which was not significantly different from D2 treatments but significantly higher than that in the treatment D1 (Table 3).

Harvest index

Interaction between doses of rabbit manure and cattle manure (RxC); treatment dose of rabbit manure (R) and treatment dose of cow manure had no significant effect (P≥0.05) on harvest Index (Table 1). The average harvest index for treatment with rabbit manure dose (R) and cow manure dose (C) is presented in Table 3. The highest average harvest index obtained at a rabbit manure dose of 10 tons/ha (R1) i.e. 79.739% which was not significantly different from other treatments (Table 3).

Table 3. Average fresh weight and oven dry weight of tubers per hill, and the harvest index in the treatments of rabbit manure and cattle manure

Treatments	Tuber fresh weight (g/hill)	Tuber oven dry weight (g/hill)	Harvest index (%)
Rabbit manure (R):P			
R1 (10 tons/ha)	71.567 a	25.519 a	79.739 a
R2 (20 tons/ha)	65.426 a	23.053 a	79.351 a
R3 (30 tons/ha)	77.400 a	29.503 a	77.930 a
LSD 0.05	-	-	
Cattle manure (C):			
C1 (10 tons/ha)	63.463 b	24.303 b	79.963 a
C2 (20 tons/ha)	74.770 ab	26.769 ab	78.798 a
C3 (30 tons/ha)	76.159 a	27.003 a	78.259 a
LSD 0.05	12.164	2.671	-

Remarks: Mean values followed by the same letters in each column are non-significantly different

Discussion

The interaction between rabbit manure dose and cow manure dose (RxC); The treatment dose of rabbit manure (R) and the treatment dose of cow manure (C) had no significant effect (P≥0.05) on all observed variables. According to Rubatzky and Yamaguchi (2010), rabbit urine organic fertilizer has no real effect, this is because the use of rabbit manure apart from having limited nutrients that can be absorbed by plants from the roots so that it does not show significant differences in the various doses, also because the onion plants Red has reached its genetic optimum potential in responding to each dose of fertilizer used for plant growth and production (Sari, 2017; Budianto, 2018). The availability of nutrients that can be absorbed by plants is one of the factors that can influence the level of productivity of a plant.

The reaction effect of organic fertilizer will be slower on plants, making it suitable for long-term use. This long-lasting property makes fertilizer able to help loosen the soil, as well as increase the soil's ability to store water and maintain soil fertility (Glio, 2015). The role of

organic fertilizer can improve the physical and chemical conditions of the soil, add nutrients to the soil, including those found in rabbit urine fertilizer, and the availability of nutrients that can be absorbed by plants is one of the factors that can influence plant growth (Kusnendar, 2013). Basically, the type and amount of nutrients available in the soil must be sufficient and balanced for growth so that the expected level of productivity can be achieved well.

Organic fertilizer in terms of effectiveness of use will trigger the development of soil organisms that are able to provide nutrients to the soil. This is because soil organisms will continuously break down a number of nutrients that are important for plants (Buntoro et al., 2014; Thomas et al., 2019; Shaji et al., 2021; Ma et al., 2021; Liang et al., 2022).\

The results of statistical data analysis show that the effectiveness of giving cow manure on the growth and production of shallots (*Allium ascalonicum* L.) has no significant effect on all parameters observed. This is related to nutrient levels, where the nutrient levels in cow manure are 2.16% N, 0.0513% P and 0.0626% K. Meanwhile, according to Berlian (2009), shallot plants need nitrogen (N), phosphorus (P) and potassium (R) in quite large amounts, namely N 2.5%, P 2% and K 2%. Thus, the nutrients in cow manure do not meet the nutritional needs of shallots. The availability of nutrients from the use of cow manure is slow, because nutrients derived from organic materials require soil microbial activity to decompose complex organic bonds that cannot be utilized by plants into simple organic and inorganic compounds that can be absorbed by plants. According to Suryana (2018), a plant will grow and develop fertilely if the nutrients provided can be absorbed by the plant and are in a form suitable for the roots to absorb and in sufficient condition.

Specifically, the oven dry weight of shallot bulbs in the treatment of organic fertilizer made from rabbit urine and cow dung obtained in this study was very high, namely 29.50 g per hill and 27.003 g per hill, which was much higher than the general results, namely around 20.42 g per clump (Neneng et al., 2016). This high tuber dry weight seems to be the optimum result of the genetic potential of the Bima variety this study, so that the treatment doses of rabbit urine and cattle manure did not show big differences between doses, except for the effect of cattle manure doses. This indicates that organic fertilizer treatment with cattle manure is very effective in obtaining high yields of shallot bulbs of the Bima variety.

CONCLUSION

There was no significant interaction between the treatment facros on all variables. The effectiveness of the rabbit manure doses also had no significant effect on all observed

variables, but there was a tendency for a dose of 30 tons/ha to produce the highest yield of 29,503 g. However, cattle manure doses had a significant effect on fresh and dry weight of bulbs with the dose of 30 tons/ha gave the highest 27.003 g.

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