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The Effect of Bokashi and Rabbit Urine Addition on The Tubber of Shallots (*Allium ascalonicum* L.)

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ABSTRACT
Shallots (*Allium ascalonicum* L.) have been cultivated intensively in Indonesia for a long time. These horticultural crops have high potential and economic value. However, the domestic production itself is not able to meet national demands. Continuous use of chemical agents will negatively impact the environment, so other efforts need to be made, one of which is the development of organic agriculture using fertilizers derived from natural ingredients. This study aims to determine the effect of giving bokashi and liquid organic fertilizer on the production of shallots. This study was structured using a Completely Randomized Block Design (CRBD) consisting of two treatments and three replications. The dosage of rice straw bokashi with a level of B_0 (0 kg/plot); B_1 (3 kg/plot); B_2 (4 kg/plot); B_3 (5 kg/plot), while Factor II is the concentration of liquid organic fertilizer from rabbit urine fermentation with a level of P_0 (0 mL/L); P_1 (175 mL/L); P_2 (250 mL/L). The parameter is the number of tubers per clump. Harvesting is done by 60 days after planting. This study showed that interaction between rice straw bokashi at a 4 kg/plot dose and rabbit urine 175 mL/L (B_2P_1) produced the best average of 8,5 bulbs.

Keywords: *Bokashi, Rabbit urine, Shallot, Yield.*

1. INTRODUCTION

Shallots (*Allium ascalonicum* L.) is a commodity that has been intensively cultivated by farmers for a long time [1]. Shallots are also one of Indonesia's horticultural crops with high potential and economic value [2]. This commodity is not only used as a flavoring. Still, it is also efficacious as a medicine because it contains enzymes that improve health, antibacterial, and anti-regeneration [3]. Shallot production from 2017 to 2021 is expected to increase. Whereas output in 2021 is estimated to reach 1.70 million tons, with a growth of 3.38% per year. The shallots demand is expected to grow by 3.90% per year [4]. However, the need for shallots is currently still being fulfilled by increasing imports every year. It means that domestic production is not able to meet national demands.

Many efforts have been made to increase the production of shallots. One of them is by adding chemical fertilizers and controlling pests using pesticides. Continuous use will harm the surrounding environment, so other efforts need to be made, one of which is the development of organic agriculture using fertilizers derived from natural ingredients. The addition of organic fertilizers from bokashi and liquid organic fertilizers has so far shown significant results in increasing crop production [5,6,7,8]. So far, research on the addition of bokashi and liquid organic fertilizer to increase the output of shallots has never been done. Bokashi is used as the source of carbon so that a while fermented rabbit urine can be used as nitrogen supplementation in the soil. This study aims to determine the effect of giving bokashi and liquid organic fertilizer on the production of shallots. One of the parameters of increasing shallot production that will be observed is the addition of the number of bulbs per plant clump. Shallots are harvested after 60 days after planting. Harvesting is done by digging the edge of the soil near the plant so that no tubers are left in the ground and pulling them out. The number of shallot bulbs was counted and will be analyzed statistically. The results of

this study are expected to be used as the basis for further research on increasing shallot production.

2. METHODOLOGY

This research was conducted for three months, between June 2021 to August 2021. The study was conducted on agricultural land in Turus Village, Polanharjo District, Klaten Regency.

This study was structured using a Completely Randomized Block Design (CRBD) consisting of two treatments and three replications. The factor I was the dosage of rice straw bokashi (B), with a level of B_0 (0 kg/plot); B_1 (3 kg/plot); B_2 (4 kg/plot); B_3 (5 kg/plot), while Factor II is the concentration of liquid organic fertilizer from rabbit urine fermentation (P), with a level of P_0 (0 mL/L); P_1 (175 mL/L); P_2 (250 mL/L).

Two weeks before planting, land preparation was carried out by tilling the soil using a hole as deep as 20 cm. The plots were made with 120 cm (length) × 120 cm (width) × 25 cm (height). The distance between the plots and blocks measured 50 cm, respectively, and resulted in 36 plots. The medium has not applied any fertilizer to determine the actual effect of the treatment.

Bokashi fertilizer (self-made from rice straws fermentation) was given once during land cultivation (2 weeks before planting) by mixing topsoil with fermented rice straw bokashi. Then, adjusted to the levels made previously, namely 0 kg/plot, 3 kg/plot, 4 kg/plot, and 5 kg/plot, each repeated three times. The liquid organic fertilizer of rabbit urine was administered when the plants were 2 WAP and 4 WAP by watering according to the treatment dose. Shallots are harvested after 60 days after planting. Harvesting is done by digging the edge of the soil near the plant so that no tubers are left in the ground and pulling them out. The number of shallot bulbs was counted and analyzed statistically.

3. RESULTS AND DISCUSSION

The analysis of variance showed that the addition of rice straw bokashi and liquid organic fertilizer from rabbit urine did not affect the number of tillers per clump. However, in this study, the number of bulbs per clump was found in the interaction between rice straw bokashi at a dose of 4 kg/plot and rabbit urine at 175 mL/L provided the best average result of 8,5 bulbs. Both bokashi and fermented rabbit urine provide additional nutrients for the plant. Bokashi provides extra carbon nutrients to the soil. Carbon can be used as an energy source for microorganisms in the plant rhizosphere. Some rhizosphere microorganisms are known to increase plant growth.

Fertilization using organic matter is an alternative to improve soil quality by adding macro and micronutrients to plants while improving soil structure naturally [9]. Soil's physical properties influenced by the organic matter are soil porosity with the presence of organic matter, soil porosity increases. The addition of organic matter will increase the ability of the soil to hold water to increase plant growth. Soil chemical properties influenced by organic matter include cation exchange capacity, soil pH, soil buffering capacity, and soil nutrients [10].

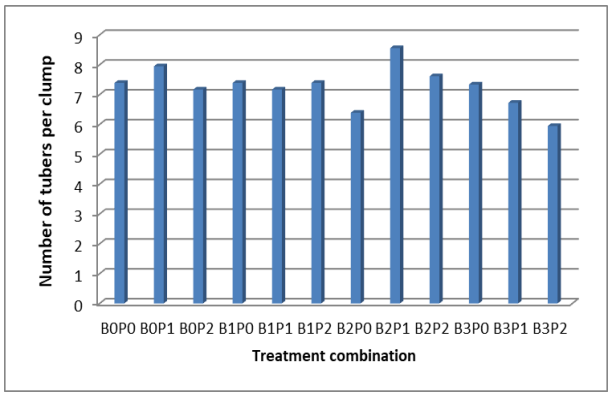

Figure 1. The number of tubers per clump after several weeks of cultivation.B_0 P_0 is the control, without any bokashi and rabbit urine addition. B_1 (3 kg/plot); B_2 (4 kg/plot); B_3 (5 kg/plot) and P_1 (175 mL/L); P_2 (250 mL/L) respectively. The best results were found in the B_2P_1, with an average of 8,5 bulbs.

Rice straw is a potential source of nutrients in adding nutrients and improving soil physical, chemical, and biological properties [11]. About 40% of nitrogen (N), 30-35% of phosphorus (P), 80-85% of potassium (K), and 40-50% of sulfur (S) are present in the remaining vegetative parts of plants. In addition, rice straw is also an essential source of micro-nutrients such as zinc (Zn). Immersing straw into the soil restores most of the nutrients that have been absorbed by plants while helping to preserve soil nutrient reserves in the long term [12].

Rice straw bokashi contains nitrogen (N) of 1.83%, phosphate (P) of 0.13%, and potassium (K) of 1.59%. These three nutrients are essential and needed by plants in large quantities [9, 10]. Liquid organic fertilizer resulted from the decomposition of organic materials derived from plant residues, animal, and human wastes containing more than one nutrient element in the form of a solution. The advantage of this organic fertilizer is that it can provide nutrients quickly and is not problematic in nutrient leaching. Compared with inorganic fertilizers, liquid organic fertilizers generally do not damage the soil and plants even if used for a long time. In addition, this fertilizer also has a binder so that the fertilizer solution applied to the soil surface can be directly utilized by plants [13].

The benefits of liquid organic fertilizers include providing nutrients for plants, improving soil structure,

suppressing harmful bacteria, improving soil physical, chemical, and biological properties, and being safe for the environment [14]. The manufacture of liquid organic fertilizer is intended to enrich the nutrients in the fertilizer. In this case, rabbit urine can be used, or it can also be referred to as bio-urine.

Rabbits have other advantages that can be used for agricultural activities, namely urine, and rabbit droppings, which are used as organic fertilizer. Rabbit urine is a liquid that can provide a high enough nitrogen supply for plants; when compared to other grass-eating animals such as cows and goats, rabbit water has high nitrogen levels because of the habit of never drinking water and only consuming it it green leaves and carrots only [15]. Liquid organic fertilizer from rabbit urine has a fairly high nutrient content of 4% nitrogen, 2.8% phosphorus and 2% potassium relatively higher than the nutrient content of cattle (1.21% nitrogen, 0.65% phosphorus and 1.6% potassium) and goats (1.47% nitrogen, 0.05% phosphorus and 1.96% potassium) [16].

The element nitrogen is one of the constituent elements of protein as a form of tissue in living things, and in the soil, the element of N greatly determines plant growth. Nitrogen plays an essential role as a constituent of chlorophyll, which makes leaves green. Plants will show a pale yellow to reddish-green leaf color if the plant is rich in nitrogen, whereas if there is an excess of N, it will be dark green [14].

Rabbit urine liquid organic fertilizer can increase the proliferation of microorganisms in the soil that actively remodel and release nutrients in the weathering process. The decomposition process will combine loose soil grains, which cause better water absorption. Giving rabbit urine liquid organic fertilizer can provide nutrients to support vegetative growth and plant production [17].

In this research, the fermentation of rabbit urine used as liquid organic fertilizer can provide additional nitrogen elements in the soil (unpublished data). It is known that the addition of nitrogen is useful in protein synthesis in the plant body. Protein biomolecules are useful in the construction of plant cells and tissues. Protein can also increase plant production, which in this study was shown by increasing the number of bulbs per clump. The number of bulbs per clump was positively correlated with the number of shallots produced.

4. CONCLUSION

This study concluded that the addition of bokashi from rice straw and fermentation of rabbit urine as liquid organic fertilizer was able to increase the production of shallots, as evidenced by the addition of the number of tubers produced per plant clump. The best results on the number of bulbs were provided in the combination between bokashi 4 kg/plot and rabbit urine at a 175 mL/L (B2P1) dose with an average of 8,5 bulbs.

AUTHORS' CONTRIBUTIONS

Muh Alwi Husen conceived of the presented idea. Under Prof. Dr. Sugiyarto, M.Si., Muh Alwi Husen developed the theory and performed the computations. Esna Dilli Novianto, M. Biotech. Verified the analytical methods and helped supervise the project. All authors discussed the results and contributed to the final manuscript.

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