JOURNAL OF
NATURAL SCIENCES AND MATHEMATICS RESEARCH

Available online at http://journal.walisongo.ac.id/index.php/jnsmr

The effect of Rabbit urine and Bokashi addition on the stem growth of Shallots (*Allium ascalonicum* L.)

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Received : 20 March 2021
Revised : 20 May 2021
Accepted : 1 Juni 2021

Abstracts

Bokashi is a fermented rice straw. It is widely used as an organic fertilizer in Indonesia. It maintains the porosity of the soil, so the plant can grow perfectly. Rabbit urine on the other hand can be used as another nitrogen source. However, there is no report about the effect of both combination in shallots production (*Allium ascalonicum* L.), one of the main commodities in Magelang. For a better understanding on bokashi and rabbit urine, this experiment aims to study about its addition on the stem growth of shallots. Four dosages of rice straw bokashi were used. There are B0 (0kg/plot), B1 (3 kg/plot), B2 (4 kg/plot), and B3 (5kg/plot). While the concentration of rabbit urine are P0 (0 mL/L), P1 (175 mL/L), and P2 (250 mL/L). The growth of the stem is measured every one week until it reached the full growth. This study showed that the addition of bokashi hinder the stem's growth. It turned out that too many bokashi will raise the temperature of the soil and inhibit the plant's growth.

Keywords: Rabbit urine, Bokashi, Shallot, Stem growth.

1. Introduction

Shallots (*Allium ascalonicum* L.) is a commodity that has been intensively cultivated by farmers for a long time, especially in Indonesia [1, 2]. Shallot production in 2021 is estimated to reach 1.70 million tons with a growth of 3.38% per year. The same thing also happens to the demand for shallots, which is expected to continue to increase with growth of 3.90% per year [3, 4]. However, the domestic production is not able to meet national demands so far.

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 have a negative impact on the environment. Other efforts need to be made, one of which is using fertilizers derived from natural ingredients. The addition of bokashi and liquid organic fertilizers has so far shown significant results in increasing

crop production [5, 8]. Their addition in crops production will increase vegetative growth [9]. Since bokashi addition will benefit for improving nitrogen availability in the soil [10]. Moreover, some scientists found that adding bokashi will be benefit to the plant against harmful microbes such as *Rhizoctonia solani* and *Pythium ultimum* [11]. Bokashi also benefited the plant by lowered the probability of getting *Vascular Streak Dieback* (VSD) [12]. Using bokashi as an addition in the plant production will benefit farmers.

Furthermore, liquid organic fertilizer has been used long time ago as the organic source of nitrogen. It is not only had enough nitrogen content, but also other nutrients such as potassium, and phosphor [7,8]. Liquid organic fertilizer as supplementation in the plant production processes will be highly recommended.

So far, research on the addition of bokashi and liquid organic fertilizer to increase the production of shallots has never been done. Bokashi used as the carbon source. While, rabbit urine can be used as nitrogen addition in the soil [9]. This study aims to determine the effect of bokashi and fermented rabbit urine on the production of shallots. The growth of the stem is measured every one week until it reached the full growth. The results of this study are expected to be used as the basis for further research on increasing shallot production.

2. Experiments Procedure

This research was conducted for three months in 2021 and located 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. Factor I was the dosage of rice straw bokashi (B), with a level of B0 (0 kg/plot); B1 (3 kg/plot); B2 (4 kg/plot); B3 (5 kg/plot), while Factor II is the concentration of liquid organic fertilizer from rabbit urine fermentation (P), with a level of P0 (0 mL/L); P1 (175 mL/L); P2 (250 mL/L).

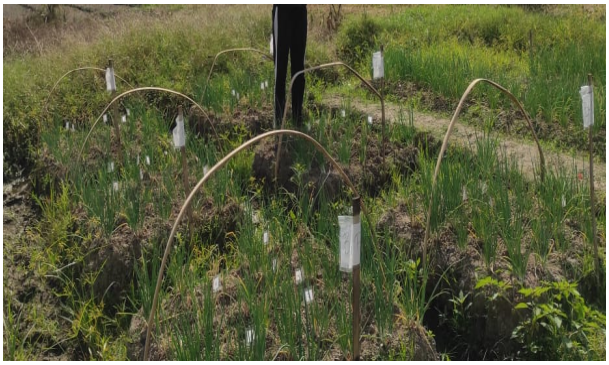
Land preparation was carried out 2 weeks before planting by tilling the soil using a hoe as deep as 20 cm. The plots of land were made with a length of 120 cm, a width of 120 cm and a height of 25 cm as many as 36 plots according to the research layout and the distance between the plots and between blocks measuring 50 cm respectively. The planting medium was not given basic fertilizer to determine the actual effect of the treatment.

Figure 1. Bokashi fermentation processes in anaerobic condition for one week before being used as one of the treatments for this experimentation.

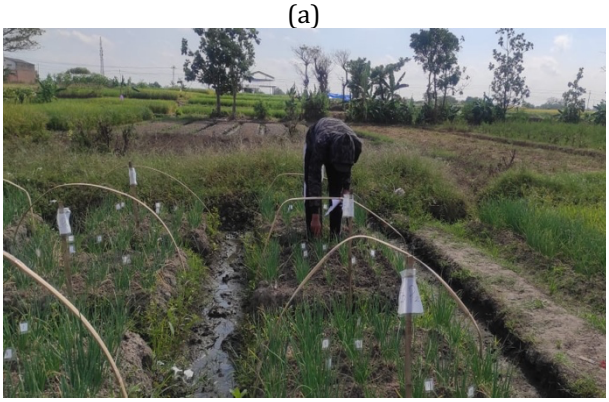
Figure 2. Bokashi addition is the first process to be done before planting shallot for the experiment.

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. Before being used, rice straw was fermented in anaerobic condition for one week

(Figure 1). After that, we can harvest it and use it for the experiment.



(a)



(b)

Figure 3. Complete Randomized Block Design Model (CRBD) was used in this experiment. (a) Each block used as replicates for the treatments; (b) one of the researchers doing some plant weeding activities.

Figure 4. The measurement process during the research. Shallot height measured manually using a ruler once a week to study about the effect of bokashi and rabbit urine addition

The provision of rice straw bokashi was adjusted to the levels that had been made previously, namely 0 kg/plot, 3 kg/plot, 4 kg/plot and 5 kg/plot, each repeated 3 times. The administration of liquid organic fertilizer of rabbit urine was carried out when the plants were 2 weeks after planting (WAP) and 4 WAP by watering according to the treatment dose.

The growth of the stem is measured once a week until it reached the full growth (Figure 4). This parameter was measured and analysed statistically.

3. Result and Discussion

The results of the analysis of variance showed that giving bokashi rice straw had a significant effect on plant height (Table 1). It is not suspicious anymore, because many experimental results that we used before proposed that the use of bokashi is highly recommended [13]. However, this study revealed that its addition of bokashi lowered the height of the plant significantly (Figure 5).

Table 1. Analysis of variance shallot's stem growth

Vegetative growth	Treatment		
	B	P	BxP
Stem growth	3.75*	0.95^{ns}	$0,71^{ns}$

*significant ^{ns}non-significant

The orthogonal polynomial test shows that the addition of rice straw bokashi inhibits plant height growth, by equation $y= 0.526 x^2 – 4.554 x + 54.27$ with R^2 value 0,996 (Figure 5). This can occur due to the addition of bokashi were excessive. Fertilizing too much can influence the microorganisms in the soil because it can make the soil sour, so the texture tends to be harder and not friable which can interfere with the activity of microorganisms in the soil [14]. Soil mixed with rice straw bokashi in this study has a pH of 5.5. Besides, the addition of bokashi without the right procedure turns out can make a non-significant result too [15].

In this experiment, we used a fermented rice straw as called bokashi. The role of soil microorganisms when there is an excess of rice straw bokashi is more likely to decompose it than to help plants absorb nutrients in the soil [16]. Microorganisms in the decomposition process of rice straw bokashi take a long time so that the higher the dose of bokashi, the longer

the decomposition process so that the available nutrients will be less [17, 18].

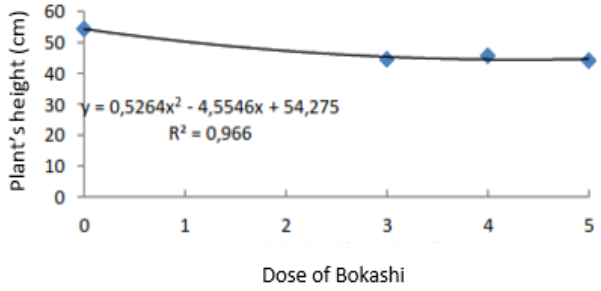


Figure 5. The effect of giving rice straw bokashi on plant's height (cm)

Bokashi can improve soil fertility and increase plant's vegetative growth [19, 20]. However, in order to get to this condition, it should be fermented approximately 21 days using the formulation of effective microorganisms in anaerobic condition [21]. In this experiment, the bokashi is suspected not ready to used since its fermentation is just one week.

Figure 6 shows that addition of fermented rabbit urine in concentration of 175 ml/l (B0P1) gave the highest results at plant height parameters with an average of 39. 35 cm and the lowest was obtained in the combination treatment of 5 kg/plot bokashi rice straw with rabbit urine POC 250 ml/L.

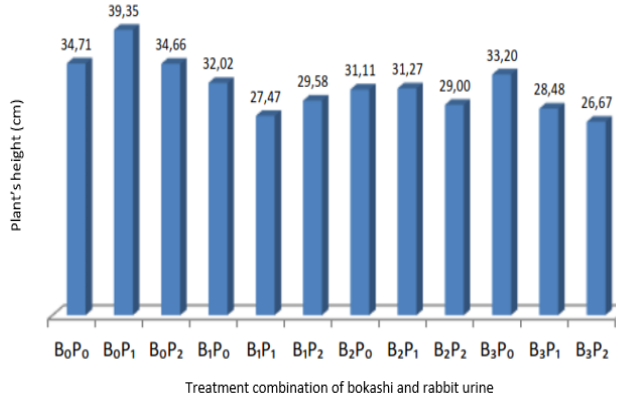


Figure 6. Shallot plant's height on straw bokashi treatment, rabbit urine POC, and the interaction between the two.

The results can be occurred due to the addition of fermented rabbit urine at 175 ml/L (B0P1) provides the nutrient requirements of shallot itself. Fermented rabbit urine contains a bunch of nutrients which help the plant to grow its stem, such as nitrogen, phosphorus, and potassium [22, 23, 24]. It also contains the growth-supporting hormones that increase plant height of shallot [25]. Nitrogen is a component of constituent of amino acids, proteins and forming cell protoplasm serves to stimulate the increase in plant height. That is why the interaction between the two treatments can increase the height of the shallot.

4. Conclusion

The conclusion of this study was that the addition of bokashi from rice straw and fermentation of rabbit urine as liquid organic fertilizer was not able to increase the growth of the stem of shallots. However the addition of fermented rabbit urine itself at 175 mL/L can be used as a nitrogen supplementation on shallots production.

Acknowledgment

I would like to thank the supervisor of my department, without whom I would not have been able to complete this manuscript. Thank you for the dedication during this research.

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