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Effectiveness of NPK Fermentation From Various Types of Plant Waste on the Growth and Production of Several Red Onion Varieties

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***Abstract**. Shallot is a horticultural commodity that has good market prospects because it contains high nutrition and can be used as spices and ingredients for traditional medicine. However, shallot production in Indonesia still often fluctuates and even experiences a shortage in meeting the needs of domestic consumers. To increase shallot production, this can be done through intensification efforts, namely by improving cultivation techniques, such as the use of organic fertilizers, proper fertilization, and the use of superior varieties. This study used a factorial randomized block design consisting of 2 treatment factors, namely factor I, fermented NPK (F) consisting of 0 ml, 250 ml, 500 ml and 750 ml. Factor II was the variety (V) of the Brebes Bima variety, the Probolinggo variety and the Nganjuk variety. The parameters of plant observation were: plant height (cm) and production per plot (g). The data analysis method was a factorial randomized block design (RBD). The results showed that the application of fermented NPK and the use of varieties had a very significant effect on the parameters of plant height (cm) and production per plot (g).*

***Keywords**: Shallots, Fermented NPK, Varieties*

INTRODUCTION

Shallot (Allium ascalonicum L) has good market prospects so that it is included in the national superior commodity. Shallots are a strategic commodity, because most Indonesian people need them, especially for their daily cooking seasoning, which affects the macro-economy and inflation rate (Handayani, 2014).

Shallot production in Indonesia still often fluctuates and even experiences a shortage in meeting the needs of domestic consumers. Based on BPS data (2019), the amount of shallot production in Indonesia in the period 2015 to 2019 experienced an increase in production from 1,229.18 tons to 1,580.24 tons. However, the domestic demand for shallots still exceeds the total production, so that in 2019 Indonesia must

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import 172 tonnes of shallots. This prompted the government to boost shallot production to meet the national shallot demand (Deden and Umiyati, 2019).

The low productivity of shallots can be minimized, among others, by improving cultivation techniques through fertilization and the use of superior varieties. Several practical steps are usually taken to increase the productivity of shallots, for example the efficient use of fertilizers, the right planting time, the carrying capacity of the appropriate land, and the use of superior varieties that have high adaptability in various agro-ecosystems. Fertilization is the main activity in plant maintenance to obtain optimal growth and production.

LITERATURE REVIEW

Shallots are one of the many types of onions in the world, shallots (Allium ascalonicum L) are annual plants that form clumps and grow upright with a height of 15 – 40 cm (Baharuddin and Sutriana, 2020). The best production of shallots is produced in the lowlands which is supported by air temperatures between 25-32 degrees Celsius and dry climates, shallots can grow and develop well in open areas with 70% lighting and 90% humidity, with rainfall of 300-2500 mm per year. Wind is a climatic factor that affects the growth of shallots because the root system of shallots is very shallow, so strong winds can cause plant damage (Wahyuni et al., 2018). Shallots need fertile soil that is loose and contains lots of organic matter with the support of dusty loam soil. Good soil types for growing shallots are latosol, Regosol, Grumosol, and alluvial soils with soil acidity (pH) of 5.5-6.5 and good drainage and aeration in the soil, the soil should not be inundated with water because can cause rotting of tubers and trigger the emergence of various diseases (Adiyoga et al, 2020). Fermented NPK is made using various types of plant wastes which are widely available around the environment such as banana cobs, pineapple skins, bamboo leaves, cassava leaves, papaya leaves, bamboo shoots and coconut coir where the waste is identified to contain elements of vegetable NPK which can be used as organic fertilizer. . Banana weevils or stems are organic materials that contain several macro and micro nutrients, some of which are macro nutrients N, P and K, and contain chemical compounds in the form of carbohydrates which can stimulate the growth of microorganisms in the soil (Suhastyo, 2011). Based on previous research, banana weevil contains 3087 ppm NO_3, 1120 ppm NH_4, 439 ppm P_2O_5 and 574 ppm

K2O. Pineapple skin is an organic waste resulting from the disposal of pineapple fruit production which contains several compounds that can be used as useful processed products. Based on its nutritional content, pineapple skin can be used as an ingredient for making organic fertilizer. Organic fertilizer from pineapple skin contains nutrients 0.70% N, 19.98% C, 0.08% S, 0.03% Na, with a pH of 7.9 (Supriyanti and Asngad, 2017).

Fermented NPK is obtained from fermented green leaf plants (wedusan), banana stems/gedebok bananas, and cocopeat. Green leafy plants have a high nitrogen (N) element, banana stems have a high phosphorus (F) element and cocopeat has a high potassium (K) element. The element nitrogen (N) stimulates plant growth, especially stems, branches and leaves, is useful in the growth of green leaves, protein, fat and other organic compounds. The element phosphorus (P) stimulates roots, especially the roots of seeds and young plants, accelerates flowering and ripening of seeds and fruit. The element potassium (K) is an important part in regulating the transition from the vegetative period to the generative period so that the flowers and buds do not fall, and the color of the fruit is evenly distributed (Kaleka, 2020).

Variety is a group of plants of a plant species that has certain characteristics such as shape, plant growth, leaves, flowers and seeds that can distinguish them from other plant species, and when reproduced do not change. Variety is also an important technological component that has a major contribution in increasing crop production. High-yielding varieties are breeding lines that have one or more special advantages such as high yield potential, resistance to pests and diseases, resistance to environmental stress and good product quality (Department of Food and Agriculture Security, 2020).

RESEARCH METHOD(S)

This research will be carried out in Wampu District, North Sumatra Province. This research was carried out in November 2022 until it was completed. This study used local varieties of shallots, the Bima Brebes, Nganjuk and Probolinggo varieties. This study was an experimental study using a factorial randomized block design (RBD) consisting of 2 treatment factors and 2 blocks. so as to get 24 research plots. Planting media factor with symbol (F) which consists of 4 levels, namely: F0 : 0 ml/liter of water/plot, F1 : 250 ml/liter of water/plot, F3 : 500 ml/liter of water/plot, F4 : 750 ml/lot liters of water/plot.

Factor II. Varieties with symbol (V) which consists of 3 varieties, namely: V1: Bima brebes variety, V2 ; Nganjuk variety, V3: Probolinggo variety.

FINDINGS AND DUSCUSSION

Observation data on plant height (cm) of the effect of NPK fermented various types of plant waste and the use of varieties on the growth and production of shallots (Allium ascalonicum L.) at the age of 2, 3, 4 and 5 weeks after planting showed a very significant effect.

The results of the average plant height (cm) of NPK fermented various types of plant waste and the use of varieties on the growth and production of shallots (Allium ascalonicum L.) aged 2, 3, 4 and 5 weeks after planting (MST), after different tests The mean using the Duncant test is shown in Table 1 below:

Table 1. Average Plant Height (cm) of Shallots Due to the Application of NPK from Fermentation of Various Types of Plant Waste and the Use of Age Varieties 2, 3, 4 and 5 MST.

Treatment	Plant Height (cm)			
	2 MST	3 MST	4 MST	5 MST
F0: 0 ml/liter of water/plot	25,82 cC	29,15 cC	31,98 cC	34,82 cC
F1: 250 ml/liter of water/plot	27,22 bB	30,72 bB	33,72 bB	36,72 bB
F2: 500 ml/liter of water/plot	27,25 bB	30,75 bB	33,92 bB	36,92 bB
F3: 750 ml/liter of water/plot	28,58 aA	32,25 aA	35,42 aA	38,75 aA
V1 : Bima Brebes	28,70 aA	32,20 aA	35,33 aA	38,58 aA
V2 : Nganjuk	26,14 bB	29,51 cC	32,51 cC	35,39 cC
V3 : Probolinggo	26,81 aB	30,44 bB	33,44 bB	36,44 bB

Note: Numbers followed by the same letter in the same column are not significantly different at the level of 5% (lowercase) and 1% (uppercase) based on the Duncan's Range Test.

In Table 1. it can be explained that the highest plant height (cm) was in the treatment of NPK from fermented various types of plant waste at a dose of F3: 750 ml/liter water/plot, namely 38.75 cm, very significantly different from treatment F2: 500 ml/liter water/plot which is 36.92 cm and F1: 250 ml/liter water/plot which is 36.72 cm is very significantly different from F0: 0 ml/liter water/plot which is 34.82 cm. The highest plant height (cm) was in the treatment of V1: Bima Brebes, which was 38.58 cm, very significantly different from the V3: Probolinggo treatment, which was 35.39 cm, very significantly different from V2: Nganjuk, which was 35.39 cm. This is because the provision of NPK fermented various types of plant waste with a concentration of 750 ml/liter of water/plot is able to meet the nutrients in plants that support growth and production because of the suitability of the nutrients needed by plants. This is in line with Ratnasari (2018) which states that applying fertilizer with the right concentration is able to provide the nutrients needed for plant development. The concentration of NPK fertilizer resulting from fermentation of various types of plant waste must be adjusted to the needs of plant nutrients. Plants will grow well if the amount of nutrients is given in a balanced amount and according to the needs of the plant (Kartinaty et al, 2018). Whereas in the treatment of varieties of optimal vegetative and generative growth in the Bima Brebes variety, it shows that the Bima Brebes variety has better adaptability which is influenced by its genetic factors. According to Gusti et al (2016) that different genetic potential causes differences in the competitive ability of each variety.

Production Per Plot (g)

Observation data on production per plot (g) the effect of NPK fermented various types of plant waste and the use of varieties on the growth and production of shallots (Allium ascalonicum L.) showed a very significant effect on the observed production per plot (g).

The results of the average production per plot (g) of NPK fermented various types of plant waste and the use of varieties on the growth and production of shallots (Allium ascalonicum L.), after being tested for different means using the Duncant test shown in table 2 below :

Table 2. Average Production Per Plot (g) of Shallots As a result of NPK from Fermentation of Various Types of Plant Waste and Use of Varieties.

Treatment	Production Per Plot (g)
F0: 0 ml/liter of water/plot	149,43 cC
F1: 250 ml/liter of water/plot	160,82 bB
F2: 500 ml/liter of water/plot	172,37 bB
F3: 750 ml/liter of water/plot	210,59 aA
V1 : Bima Brebes	221,45 aA
V2 : Nganjuk	141,13 cC
V3 : Probolinggo	157,34 bB

Note: Numbers followed by the same letter in the same column are not significantly different at the level of 5% (lowercase) and 1% (uppercase) based on the Duncan's Range Test

In table 2. it can be explained that the highest production per sample (g) was in the treatment of NPK from fermented various types of plant waste at a dose of F3: 750 ml/liter of water/plot, namely 210.59 g, very significantly different from treatment F2: 500 ml/lot liter of water/plot, namely 172.37 g and F1: 250 ml/liter of water/plot, namely 160.82 g, very significantly different from F0: 0 ml/liter of water/plot, which is 149.43 g. The highest production per plot (g) was in the treatment of V1: Bima Brebes, namely 221.45 g, very significantly different from the V3: Probolinggo treatment, namely 157.34 g, very significantly different V2: Nganjuk, namely 141.13 g. This is because basic nutrients such as N, P, K are fulfilled, the cell division process will run fast, but conversely, if these nutrients are not able to fulfill plant needs, then plant physiology will be disrupted. This NPK element can be obtained from organic materials in the form of plant residues. A more significant growth response to the growth and production of shallot plants (Rizal et al, 2018). The growing environment greatly influences the growth and production of plants. There are indications that the varieties Bima Brebes, Probolinggo and Nganjuk have different responses to the application of fermented NPK fertilizer for several agricultural wastes. The Bima variety generally shows better growth and production, while the Nganjuk variety produces the lowest growth and production (Gusti et al, 2016).

CONCLUSION AND RECOMMENDATION

The results of this study indicate the effectiveness of the growth and production of several shallot varieties in the application of NPK fermented various types of plant waste.

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