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# Effect Of Managing Fertilizer Types And Dosages Of $KNO_3$ on Plant Growth and Results Red Onion (Allium ascalonicum L)

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**Abstract**

This research was carried out on the basis of the increasing national market need for shallots while production still needs to be increased. This research was carried out from August 2022 to October 2022 in Semono Hamlet, Tempursari Village, Sambi District, Boyolali Regency. Altitude 184 above sea level, soil pH 6, Vertisol soil type (PPT = Grumosol). This study used a Complete Randomized Block Design (RAKL) consisting of two factors, the first factor being the type of manure which is divided into three levels, namely Fermentation of Chicken Manure, Fermentation of Goat Manure, Fermentation of Cow Manure ( P1, P2, P3). The second factor is the dose of KNO3 fertilizer which is divided into three levels, namely dose 75 kg/ha, dose 150 kg/ha, and dose 225 kg/ha (K1, K2, K3). each with 3 replications. The parameters observed in this study were the response of shallot plants to each type of manure to the addition of KNO3 fertilizer including Growth Parameters which included plant height, number of tillers (Kaplings), Fresh Stove Weight, and Stove Weight dry while the plant yield parameters include wet tuber weight per sample (g), dry tuber weight per sample (g), tuber wet weight per plot (g), tuber dry weight per plot (g), tuber diameter (cm) to determine the most effective dosage of manure in combination with KNO3 doses to increase shallot crop yields. The results showed that the KNO3 dose of 225 kg/ha had a significant effect on the parameters of wet stover weight and dry stover weight.

**Keywords:** Shallots, Manure, $KNO_3$.

## Introduction

Shallots are one of the leading vegetable commodities that have been intensively cultivated by farmers for a long time. Because of their high economic value, shallot cultivation has spread to almost all provinces in Indonesia. Even though farmers' interest in shallots is quite strong, in the process of cultivating them there are still various obstacles, both technical and economic ones. The shallot plant originates from Syria, where several thousand years ago it was known to mankind as a food flavoring (Abdurrosyid. 2018). The government's role in empowering a number of shallot production centers has recently stopped producing due to commodity prices which have been declining in recent years. SPI's National Seed Center (P2N) recorded a number of production centers that had stopped occurring in West Nusa Tenggara and Bali. As a consequence, national shallot production is vulnerable to being carried out when hit by prolonged bad weather if it is centered on the island of Java. Based on data from the Ministry of Trade as of Thursday (10/3/2022), the price of shallots is already at IDR 37,000 per kilogram, up 13.85 percent on a monthly basis. The increase in the price of shallots was due to a decrease in shallot productivity which reached 50 percent to 4 tons

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per hectare in most production centers such as Brebes, Bima, Solok, Nganjuk, and Probolinggo due to bad weather in early 2022.

As the demand for the national market continues to increase in improving the quality and yield of shallots, several obstacles need to be considered, including the provision of nutrients for plants through fertilization. The purpose of this study was to determine the effect of the interaction of doses of chicken, goat, cow manure, and white $KNO_3$ fertilizer on the growth and production of the Bima Brebes variety of Shallot (Allium ascalonicum L.). This research was carried out from August 2022 to October 2022 in Semono Hamlet, Tempursari Village, Sambi District, Boyolali Regency. Altitude 184 above sea level, soil pH 6, soil type Vertisol (PPT=Grumosol). White $KNO_3$ fertilizer (potassium nitrate also called potassium nitrate) is a fertilizer containing potassium (K) and nitrogen (N). $KNO_3$ fertilizer is a combination of the elements N (nitrogen) and potassium in the form of $K_2O$ (potassium oxide or potassium oxide). Potassium and Nitrogen are very important nutrients for plants. The content contained in white $KNO_3$ fertilizer is 45-46% $K_2O$ and 13% N. (Saprotan Utama 2016) The advantage of using this fertilizer is that it is used very effectively because the needs of K and N elements can be provided with one application. So that it can help the process of forming onion bulbs more optimally. The recommended dose for shallot plants is 400 kg/H with a spacing of 20 x 20. In this case, it is necessary to conduct research using three kinds of manure and white KNO3 on shallots of the Bima Brebes variety.

**Method**

This study used a Completely Randomized Block Design (RAKL) consisting of two factors, the first factor was the type of manure which was divided into three levels namely Fermentation of Chicken Manure, Fermentation of Goat Manure, Fermentation of Cow Manure (P1, P2, P3). The second factor was the dose of $KNO_3$ fertilizer which was divided into three levels, namely a dose of 75 kg/ha, a dose of 150 kg/ha, and a dose of 225 kg/ha (K1, K2, K3). This study consisted of 9 treatment combinations, each with 3 replications. This research was conducted in Semono Hamlet, Tempursari Village, Sambi District, Boyolai Regency with a height of 184 meters above sea level and Vertisol soil type (PPT=Grumosol). This research was conducted from August to October 2022.

**RESULT AND DISCUSSION**

The Effect of Types of Manure and $KNO_3$ Dosage on the Growth of Shallot Plants.

To find out the results of observing the growth parameters of shallot (Allium ascalonicum l) plants which include plant height, number of leaves, fresh stover weight, and dry stover weight, an analysis of variance was carried out at the 5% level which is presented in table 2. Table 2. Multiple range test ducan levels of 5% Effect of manure and KNO3 dosage on shallot (allium ascalonicum l)

**Table 1**. (Ducan multiple range test at 5% level Effect of manure and $KNO_3$ dosage on The growth parameters of the shallot (Allium ascalonicum l) plant

| Perlakuan *(Treatment)* | Tinggi Tanaman (cm) | Jumlah Daun (helai)/rumpun | Berat Brankasan Segar (g)/rumpun | Barat Brangkasan Kering |
|---|---|---|---|---|
| Parameter Pertumbuhan | | | | |
| Macam pupuk kandang | | | | |
| P1 | 30.6300a | 23.0633a | 61.9400a | 34.0633a |
| P2 | 29.3633a | 21.0833b | 57.8133b | 29.7467b |
| P3 | 28.9567a | 20.9133b | 53.7100c | 26.0467c |
| Dosis KNO3 | | | | |
| K1 | 28.7700a | 16.0633c | 49.5400c | 21.8400c |
| K2 | 30.0600a | 23.1533b | 59.2400b | 31.3267b |
| K3 | 30.1200a | 25.8433a | 64.6833a | 36.6900a |
| Perlakuan kombinasi Antara Macam pupuk kandang dan dosis KNO3 | | | | |
| P1K1 | 29.310a | 16.890c | 51.180e | 23.360f |
| P2K1 | 28.760a | 15.430c | 49.380ef | 21.490f |
| P3K1 | 28.240a | 15.870c | 48.060f | 20.670f |
| P1K2 | 30.590a | 25.770a | 62.590b | 34.770bc |
| P2K2 | 29.500a | 22.130b | 59.360c | 31.580cd |
| P3K2 | 30.090a | 21.560b | 55.770d | 27.630e |
| P1K3 | 31.990a | 26.530a | 72.050a | 44.060a |
| P2K3 | 29.830a | 25.690a | 64.700b | 36.170b |
| P3K3 | 28.540a | 25.310a | 57.300cd | 29.840de |

The manure (P) treatment did not affect plant height as well as the KNO3 (K) fertilizer treatment. Meanwhile, the combination of manure (P) and KNO3 (K) treatments also did not significantly affect plant height, but there was a difference in the average plant height, ranging from 28 to 31 cm. These results showed that various levels of manure and KNO3 treatment did not give significant results in the growth of plant height. dry weight of plants (Winarso, 2006) Nutrient N plays a very important role in the process of cell division and enlargement, so a deficiency of N elements can inhibit the vegetative formation of plants stating that the most influential nutrient on the growth and development of plant height is nitrogen. The content of N nutrients contained in the soil will be utilized by plants in cell division and enlargement. Lakitan (2006) The average number of leaves in Table 1 shows that the number of leaves in each plant family ranges from 15.43 to 26.53 strands. In the treatment of manure types it has a significant effect, namely on the parameter of the highest number of leaves in chicken manure (P1) 23.06 strands was significantly different from the cow manure treatment (P3) 20.91 strands. But the chicken manure treatment (P1) was not significantly different from the goat manure

treatment (P2) 21.08 this was due to the influence of equal distribution of sunlight in the Photosynthesis process. for the treatment of $KNO_3$ (K) fertilizer doses Giving Parameters the highest number of leaves in treatment (K3) 25.84 strands significantly different from treatment (K1) 16.06 strands but treatment (K3) is not significantly different from treatment (K2) 23.15 while the combination treatment of the type of manure (P) and the dose of $KNO_3$ (K) had no significant effect on the number of shallot leaves (appendix 2b).

The effect of the treatment of the type of manure (P) and the dose of $KNO_3$ (K), as well as the combination (P) and (K), gave results that had a significant effect on the parameters of fresh stover weight. The average fresh weight of stover from the effect of manure treatment showed the highest weight of 61 .94 g in the 2 ton/ha chicken manure type treatment (P1) and gave the lowest weight of 53.71 g in the 2 ton/ha cow manure type treatment (P3). The effect of the $KNO_3$ dose treatment showed the highest weight in the 2 ton/ha treatment. (K3) which is 64.68 g while the lowest weight in treatment (K1) is 49.54 g. The effect of the combination treatment of the type of manure (P) and the dose of $KNO_3$ (K) gives results that have a significant effect on the parameters of fresh stover weight. This shows the weight the highest was in (P1K3) namely 72.05 g and showed the lowest weight in the combined treatment (P3K1) namely 48.06 g. The increase in fresh onion stover weight was caused by the application of manure or chemical fertilizers that contain lots of N elements needed by shallot plants during the vegetative period in terms of forming plant tissue. This is in accordance with the opinion (Lingga and Marsono 2001)

The effect of the type of manure (P) and the dose of $KNO_3$ (K) or the combination (P) and (K) gave results that had a significant effect on the parameters of dry stover weight. The average weight of dry stover from the effect of the manure treatment showed that the highest weight was in treatment (P1) 34.06 g while the lowest weight was in treatment (P3) 26.04. For the effect of KNO3 doses, the highest weight was in the $KNO_3$ dose treatment of 225 kg/ ha (K3) namely 36.69 g while the lowest weight was in the $KNO_3$ dose treatment of 75 kg/ha (K1) which was 21.84 g while the effect of the combination of manure type (P) and $KNO_3$ (K) doses gave results that had a significant effect on the weight parameter dry stover showed the highest weight in the combination treatment (P1K3), which was 44.06 g while the lowest weight in the combination treatment (P3K1) was 20.67 g (Table 2). According to Lakitan (2010), dry weight of plants is the accumulation of photosynthetic products which are then translocated to the stem and leaves. The more nutrients available and the better the absorption of nutrients, the better the quality of the plants so that the physiological processes are getting better. The improved physiological processes will affect the dry weight of the plants.

The Effect of Types of Manure and $KNO_3$ Dosage on Shallot Yield

To find out the results of observations on the yield parameters of shallots (Allium ascalonicum l) including the number of tubers per clump (fruit), tuber weight per clump (g), dry tuber weight consumption per clump (g), fresh tuber weight per plot (g), Weight of Dry Tuber Consumption per plot (g), Diameter of Tuber Clump (cm) was analyzed at the 5% level of variance which is presented in (Table 2).

**Table 2**. (Ducan multiple range test at 5% level Effect of manure and $KNO_3$ dosage on yield parameters of shallot (Allium ascalonicum l) plants)

| Perlakuan *(Treatment)* | Parameter Hasil: Jumlah Umbi per rumpun (buah) | Berat Umbi per rumpun (g) | Berat Umbi Kering Konsumsi per Rumpun (g) | Berat Umbi segar per-petak (g) | Berat Umbi Kering Konsumsi per- petak (g) | Diameter Umbi Per-rumpun (cm) |
|---|---|---|---|---|---|---|
| Macam pupuk kandang | | | | | | |
| P1 | 8.4933b | 79.506b | 60.502b | 735.73b | 518.31a | 1.8167a |
| P2 | 9.9800a | 87.574a | 75.566a | 779.28a | 576.88a | 1.9500a |
| P3 | 8.9133b | 81.751ab | 65.767b | 747.51ab | 528.04a | 1.8133a |
| Dosis KNO3 | | | | | | |
| K1 | 7.2467c | 65.974c | 50.314c | 504.71c | 285.30c | 1.7333a |
| K2 | 8.8700b | 87.967b | 72.301b | 803.64b | 583.89b | 1.9100a |
| K3 | 11.2700a | 94.890a | 79.219a | 954.17a | 754.04a | 1.9367a |
| Perlakuan kombinasi Antara Macam pupuk kandang dan dosis KNO3 | | | | | | |
| P1K1 | 6.8000f | 60.910c | 41.890f | 498.12d | 280.04d | 1.6000a |
| P2K1 | 7.6700def | 71.957c | 59.960de | 516.00d | 292.14d | 1.8700a |
| P3K1 | 7.2700ef | 65.057c | 49.093ef | 500.02d | 283.72d | 1.7300a |
| P1K2 | 8.4700def | 84.750b | 65.757cd | 792.76c | 559.67c | 1.8800a |
| P2K2 | 9.3400bcd | 90.423ab | 78.423ab | 816.71c | 614.69bc | 1.9600a |
| P3K2 | 8.8000cde | 88.727ab | 72.723bc | 801.44c | 577.32c | 1.8900a |
| P1K3 | 10.2100bc | 92.857ab | 73.860bc | 916.32b | 715.23ab | 1.9700a |
| P2K3 | 12.9300a | 100.343a | 88.313a | 1005.12a | 823.81a | 2.0200a |
| P3K3 | 10.6700b | 91.470ab | 75.483bc | 941.06b | 723.09ab | 1.8200a |

Treatment of the type of manure (P) and the dose of $KNO_3$ (K) gave results that had a very significant effect on the parameter number of tubers per hill. The average number of tubers per clump from the effect of manure treatment showed that the highest amount was in the goat manure treatment 2 tons/ha (P2) 9.98 pieces, while the lowest amount was in the chicken manure treatment 2 tons/ha (P1) 8, 49 fruit. for the effect of $KNO_3$ dose showed the highest number in the treatment of $KNO_3$ dose of 225 kg/ha (K3), namely 11.27 fruit. while the lowest amount was in the treatment of $KNO_3$ dose of 75 kg/ha (K1) 7.24 fruit. The combination of the type of manure (P) and $KNO_3$ (K) doses did not have any effect on the parameter number of tubers per clump. According to Darmawan and Baharsjah (2010), the correlation between plant growth is influenced by the availability and distribution of food to parts of different plants, the use of more water or nutrients in a part of the plant, the presence of growth regulators, or the formation of certain substances in the plant. The number of tubers is determined by the number of lateral shoots found on the seedlings, these shoots will later form new tubers.

The results of the analysis of variance (Appendix 9b) show the effect of the type of manure (P) treatment. It had a significant effect on the weight of fresh tubers per clump with the highest weight being the goat manure treatment of 2 tons/ha (P2) 87.57 g and the lowest weight being a treatment of chicken manure 2 tons/ha (P1) 79.50 g. For the effect of the treatment the dose of $KNO_3$ gave a very real effect, namely on the weight of fresh tubers per clump, the highest was in the treatment of the dose of $KNO_3$ 225 kg/ha (K3) 94.89 g while the weight of fresh tubers per clump was the lowest at the $KNO_3$ dose of 75 kg/ha (K1) 65.97 g. In the combined treatment, the type of manure and the dose of $KNO_3$ did not have a significant effect. Fresh weight is an indicator of the quality of a

horticultural commodity because only certain organs are harvested in plants, for example, seeds, stems, leaves, flowers, and roots or tubers. The fresh weight of the tuber is closely related to the size of the tuber where the larger the size of the tuber automatically the fresh weight also increases. The increase in the fresh weight of the tuber is affected by water absorption and the accumulation of photosynthetic products in the leaves so that they can be translocated for tuber formation (Setyowati, 2010).

The effect of type of manure treatment (P) had a significant effect on the weight of dry tuber consumption per clump with the highest weight being the goat manure treatment of 2 tons/ha (P2) 75.56 g and the lowest weight being the chicken manure treatment of 2 tons/ha (P1) 60.50 g. For the effect of The $KNO_3$ dose treatment, it had a very significant effect, namely on the weight of dry tuber consumption per clump, the highest was in the treatment of $KNO_3$ dose of 225 kg/ha (K3) 79.21 g while the weight of dry tuber consumption per the lowest clump was in the treatment of $KNO_3$ dose of 75 kg/ha (K1) 50.31 g. In the combination treatment of manure types and $KNO_3$ doses, there was no significant effect on the dry weight parameter of consumption per clump.

While the drying process is carried out, shallots are still undergoing metabolic processes. The process that is still actively carried out is respiration. During this process, an enzymatic chemical reaction occurs which breaks down starch, sugar, protein, fat, organic acids, and carbon dioxide compounds. With this release, there is a decrease in weight loss in the dried shallot bulbs (Rustini and Prayudi, 2011).

Applying goat manure (P2) and giving $KNO_3$ doses of 225 kg/ha, it can increase the K nutrients needed by plants during the tuber formation process. The formation of shallot bulbs comes from enlargement of the leaf layers which then develop into shallot bulbs. The high K content causes K ions to bind water in the plant body which will accelerate the process of photosynthesis (Bayu. A., Syafrinal, Isna. R, 2018).

The real effect on the parameter of fresh tuber weight per plot occurred in the type of manure (P) treatment. It had a significant effect on the weight of fresh tubers per plot with the highest weight, namely in the treatment of goat manure 2 tons/ha (P2) 779.28 g, and the lowest was in the chicken manure treatment of 2 tons/ha (P1) 735.73g. For the effect of the $KNO_3$ dose treatment, it had a very significant effect on the weight of fresh tubers per plot, the highest was in the $KNO_3$ dose treatment of 225 kg/ha (K3) 954, 17 g while the weight of fresh tubers per plot was the lowest at the KNO3 dose of 75 kg/ha (K1) 504.71 g. The combined treatment of manure types and KNO3 doses, it did not have a significant effect on the parameters of fresh tuber weight per plot. Plant fresh weight is closely related to the water content contained in plants, this can also be suspected as one of the factors in the application of high $KNO_3$ fertilizer doses. produce a very significant difference in fresh weight. This is in accordance with Backgrounding (2006) the weight of shallot bulbs is determined by the water content contained in the cells that make up the tuber layer. The dosage of $KNO_3$ fertilizer had a significant effect, the highest dry tuber consumption per plot was the highest in the $KNO_3$ dose treatment of 225 kg/ha (K3) 754.04 g. 285.30 g. in the type of manure (P) treatment, and the combination treatment of the type of manure and the $KNO_3$ dose treatment did not have a significant effect on the parameter of dry tuber weight consumption per plot. The highest averages were plant height, number of leaves, number of tillers, fresh tuber weight, and total production of fresh and dry shallots.

By applying $KNO_3$ fertilizer at a dose of 225 kg/ha, it can increase the K nutrients needed by plants during the formation of bulbs. The formation of shallot bulbs comes from enlargement of the leaf layers which then develop into shallot bulbs. The high K

content causes K+ ions to bind. water in the plant body will accelerate the photosynthesis process (Bayu.A, Syafrinal, Isna.R, 2018). Photosynthesis results are what stimulate the formation of tubers to become larger so as to increase the dry weight of plants. Based on the research results of Napitupulu and Winarto (2009) Provision of sufficient K elements provides more optimal shallot growth and shows good results.

Various types of manure (P) treatment, $KNO_3$ (K) dose treatment, and the combination of the two did not have a significant effect on the shallot bulb diameter parameter. Knowing the diameter of the tuber is the same as knowing the size of the tuber produced by the plant, and the distribution of photosynthesis to supply food for the shoots that will become new plants. (Rahayu and Berlian, 2004). The dominant composition of shallots is carbohydrates which are raw materials for growth and the development of seed tubers in the next period, so the larger the size of the seed tubers, it is assumed that the more carbohydrate content will be (Sumiati, 2007). According to Putrasamedja and Soedomo (2007) apart from the environment, tuber size is also influenced by genetic factors, so there is no different response to shallot bulb diameter.

**Conclusion**

From the results of the study entitled Effect of Types of Manure and $KNO_3$ Dosage on the Growth and Yield of Shallots (Allium ascalonicum L) it can be concluded as follows:

1. The type of manure (P) as much as 2 tons/ha which has the best effect on the growth and yield of shallot (Allium ascalonicum L) plants is in the application of goat manure. This is because the element K content in goat manure is greater in comparison to chicken manure and cow manure. The element potassium acts as an activator of various enzymes in photosynthetic and respiration reactions, as well as for enzymes involved in protein and starch synthesis (Lakitan 2011).
2. The best dose of $KNO_3$ that affects the growth and yield of shallots (Allium ascalonicum L) is the dose of $KNO_3$ 225 kg/ha. The combination treatment of types of manure and $KNO_3$ dose (PxK) Gives the highest yield on the weight of dry tuber consumption per plot in the treatment (P2K3) goat manure 2 tons/ha + $KNO_3$ dose 225kg/ha, namely 823.81g equivalent to (4.10 tonnes/ha). The lowest yield was in the treatment (P1K1) of chicken manure 2 tons/ha + $KNO_3$ dose of 75 kg/ha, which is 280.04 g, equivalent to (1.39 tons/ha) the highest yield mentioned above when compared with the description of Brebes shallots, it is still below the standard, this is influenced by the number of fertilizer doses used. given is still below the standard recommendation for shallot fertilizer.

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