Akta Agrosia

Response of Shallots of Batu Ijo Variety to Doses of N and K Fertilizers

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ABSTRACT

Shallots (*Allium cepa var. aggregatum* L.) have many varieties that can be grown in the highlands and lowlands and one of them is the Batu Ijo variety. Nutrients N and K play an important role for plant needs. This study aimed to obtain the best dosage of N and K fertilizers on the growth and yield of the Batu Ijo variety of shallots.This research was conducted from March to June 2019 in Medan Baru, Bengkulu City. This study used a completely randomized design with two factors. The first factor was the dose of N fertilizer and the second factor was the application of K fertilizer. The application of N fertilizer had a significant effect on the number of shallots at week 2. The Urea dose given decreases the number of shallots. For the best treatment at plant height is treatment of Urea 300 kg / ha and KCl 50 kg / ha. Plant growth from week 2 to 5 increased significantly. The application of K fertilizer has an effect on the number of shallots at week 2 and the number of bulbs. The longer the plant age, the more the number of leaves produced, but at higher doses, the number of leaves and the number of bulbs decreased. The best treatment to produce the number of leaves was Urea 300 kg / ha and without giving KCl. The best interaction treatment to generate fresh plant weight was Urea 300 kg / ha and KCl 150 kg / ha, to generate fresh bulb weight was Urea 300 kg / ha and KCl 150 kg / ha, to generate bulb diameter was Urea 200 kg / ha and KCl 100 kg / ha and to generate the number of bulbs was Urea 0 kg / ha and KCl 150 kg / ha.

INTRODUCTION

Shallots are superior horticultural crops and have been cultivated by farmers intensively. This commodity is pivotal in the non-substitutable spice group and functions as a food seasoning and traditional medicinal ingredients. Shallot plants are a source of income for farmers and provide a high contribution to economic development in several areas (Balitbangtan, 2006). Shallots contain the amino acid Alliin which can be used as traditional medicine such as antibiotics and currently it has been developed into a drug for various diseases such as antimicrobial, anticancer and anti-inflammatory, besides that shallots also contain calcium, phosphorus, iron, carbohydrates, vitamins such as A and C (Kuettner, 2002).

The factors that influence the low production of shallots in Bengkulu are the soil conditions that are less than the result of continuous land use by farmers, so it is necessary to make efforts to improve the cultivation system to

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increase the yield of shallots. Efforts to increase shallot production need to be continued, both through intensification and extensification. Intensification is a way to maximize the productivity of existing agricultural land by implementing integrated crop management which includes: use of superior varieties, quality and labeled seeds, balanced fertilization, control of plant pests, proper soil management and harvest on time (Suwandi*et al*., 2015).

One of the most widely used inorganic fertilizers in shallot cultivation is urea as a nutrient N. N fertilizer is an artificial organic chemical compound fertilizer with the formula $CO(NH_2)_2$. Urea has a nitrogen content of 46%. N can be completely dissolved in the water, to be absorbed by plant roots. N must first undergo ammonification and nitrification processes. Sooner or later absorption depends on several factors, including population conditions, organism activity, soil moisture content, soil temperature and the amount of fertilizer N which is given is easily absorbed because N fertilizers include hygroscopic fertilizers (attracting air vapor) (Novizan, 2002). According to Napitupulu and Winarto (2010), shallot plants in N 250 kg / ha treatment can grow faster than other plants with a plant height of 47 cm. The results of YuliWidiastutik's research (2018) stated that giving N at a dose of 285 kg / ha gave high number of leaves and bulbs per clump.

Likewise, K fertilizer is a fertilizer that contains 60% K_2O or potassium (K) as an essential nutrient such as N. K reserves in the soil are quite a lot. K content reaches 80%. Although only a small portion of K is available which can be utilized by plants, K nutrients are easy to move, leachate, and bound by soil colloid surfaces, but K deficiency affects root systems, shoots, starch formation, and sugar translocation because potassium plays a role in the plant body in general as metabolism such as photosynthesis and respiration (Novizan, 2002). Besides, generally plants that are deficient or lacking a nutrient will show symptoms in a specific organ (Suwandi*et al*., 2015). The results of Dian's (2015) study stated that giving K_2O fertilizer at a dose of 60 kg / ha increased plant height, bulb number and bulb fresh weight per plot.

Shallots need balance of NPK nutrient supply to get optimal plant growth and bulb yield (Sumarni *et al*., 2012). Fertilization is required to support nutrition, endurance, and plant production. Inorganic fertilizer application at a dose of plant needs will not disturb the balance of the environment (Izhar *et al*., 2013).

This study aimed to obtain the best dosage of N and K fertilizers on the growth and yield of the BatuIjo variety of shallots.

MATERIAL AND METHODS

The research was conducted from March to June 2019 in Medan Baru, Muara Bangkahulu sub-district, Bengkulu city. The research design used in this study was a completely randomized design with two factors and three replications. The first factor is the application of N fertilizer (urea), which consists of four (4) treatment levels, namely: N0 = 0 Kg N / ha (control); N1 = 100 Kg N / ha; N2 = 200 Kg N / ha; N3 = 300 Kg N / ha (Balitsa, 2013). The second factor is the application of K (KCl) fertilizer which consists of four (4) treatment levels, namely: K0 = 0 Kg K / ha (control); K1 = 50 Kg K / ha; K2 = 100 Kg K / ha; K3 = 150 Kg K / ha (Balitsa, 2013). From the two treatments, 16 treatment combinations were obtained and each treatment was repeated 3 times so that 48 experimental units were obtained. Each experimental unit consisted of two polybags, each consisting of one plant.

The materials used were shallot bulbs of BatuIjo variety, inorganic N and K fertilizers, cow manure, roasted husks, soil, TSP fertilizer, 35 x 45 cm polybags and fungicide with 80% active ingredient Mankozeb.

The research stages started from the preparation of planting media to harvesting. Initial soil analysis was carried out in the Soil Science laboratory of the Faculty of Agriculture, Bengkulu University to determine soil acidity, C-organic content, total N, total P and total K available in the soil. Planting media are prepared from the soil to dry then sieved and then mixed with cow manure and roasted

husk. The ratio of the planting medium is 1: 1: 1 (soil, roasted husk and cow manure) and put in the prepared poly bag. The distance between the polybags is 20 cm. Shallots come from good and not defective bulbs from Curup, RejangLebong.Planting the shallot with the bulb cut 1/3 from the top of the bulb. The bulbs were soaked with a fungicide with 80% Mankozeb active ingredient at a concentration of 2 g / l for 5 minutes then the bulbs were planted in polybags filled with planting media. Fertilization of N (Urea) and K (KCl) is given according to the treatment and TSP is given at the beginning of planting at a dose of 150 kg / ha. N and K fertilizers were given 2 times at planting time and another half dose was given at the age of 4 weeks after planting. Harvesting is done when the shallot plant is 60 days after planting and the leaves begin to turn yellow and dry (Hidayat*et al*., 2018).

Observations included plant height (cm), number of leaves per plant (strands), fresh plant weight (g), number of bulbs per plant (bulbs), freshbulb weight per plant (g), bulb diameter (mm). Data analysis used analysis of variance (ANOVA) with F test of 5% level. The results that had a significant effect were further tested using Orthogonal Polynomials.

RESULTS AND DISCUSSION

During the research, the average rainfall in March, April and May was 459 mm, 60mm, and 92mm, while for the air temperature, respectively, were 27.0 ° C, 27.2 ° C, and 27.8 ° C. The average humidity of the air is 83%, 85%, 83% and the average irradiation is 63%, 73%, and 84%.

Effect of N and K Fertilizer Doses on the Growth of Shallots

The results of the regression analysis showed that the response of the number of leaves to fertilizer N formed a negative linear curve with the line equation Y = -0.002x + 12.01 (R2 = 0.0216) (Figure 1). The application of N fertilizer with different doses to the number of shallot leaves forms a negative linear curve pattern. The response of the number of leaves to various doses of N given has not yet reached

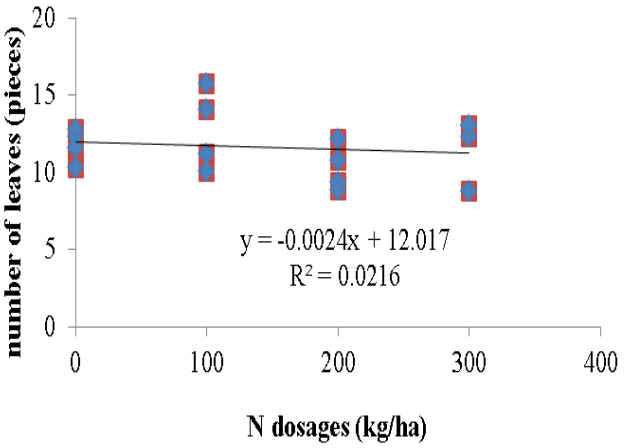

Figure 1. Curve relationship between N dosages and number of leaves at week 2

the optimum dose. The dose of N only has an effect on week 2. The R^2 value of 0.0216 indicates that 2.1% of the number of plants at week 2 is influenced by N fertilizer, while the other 97.9% is influenced by natural factors, especially high rainfall, and irradiation intensity. the short. There is a decrease in the growth rate of shallots in the treatment of higher N fertilizer doses because at that level the amount of nutrients given is in an excessive state so that it suppresses the plant growth rate. Furthermore, Suwandi *et al*. (2015) explain that giving excessive nutrients to a plant will cause poisoning so that growth will be reduced and if added continuously will result in death for the plant.

The application effect of K fertilizer at different doses on the number of shallots formed a negative linear curve pattern. The response of the number of leaves to various doses of K given was not yet getting the optimum dose (Figure 2). K dose only had an effect at week 2, with an R^2 value of 0.0039, indicating that 0.3% of the total number of plants at week 2 was influenced by K fertilizer, while 99.7% others are influenced by natural factors, especially high rainfall, short exposure intensity. From the field observation data and the results of the analysis statistically showed that the higher the dose of KCl fertilizer given will cause the number of leaves to decrease. This is in accordance with Novizan (2002) statement, giving a higher KCl dose causes a decrease in the number of leaves caused by the chlorine (Cl) content in KCl which results in soil acidity.

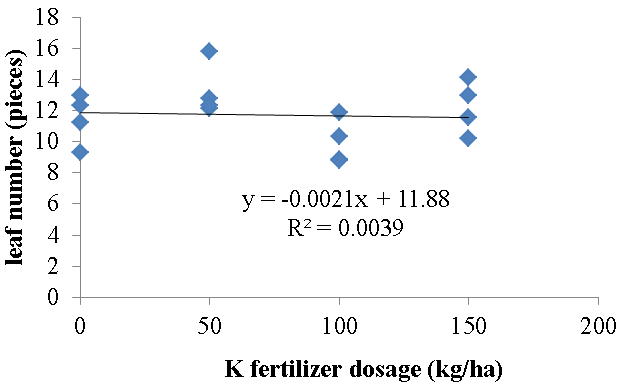

Figure 2. The curve of the relationship between the K dose and the number of leaves in the 2nd week of shallots

Effect of N and K Dosage on Shallot Plant Yield

The application of N and K fertilizer doses on shallot yield did not have a significant effects on plant fresh weight, bulb fresh weight, bulb diameter and bulb number, but K (KCl) fertilizer had a significant effect on the number of bulbs. Fresh plant weight is the weight of the plant which is weighed directly after harvest by cleaning the soil contained in the roots. It can be seen from Figure 3 that the best treatment for fresh plant weight on shallots is shown by N3K3 (N300, K150 kg / ha). This indicates that the application of high doses of N and K fertilizers increases the fresh plant weight. Plant growth and development is very influential by the available nutrients, and the ability of plants to absorb water affects the plant's fresh weight. The growth will be optimum if the available elements are in the plant. optimum and balanced state.

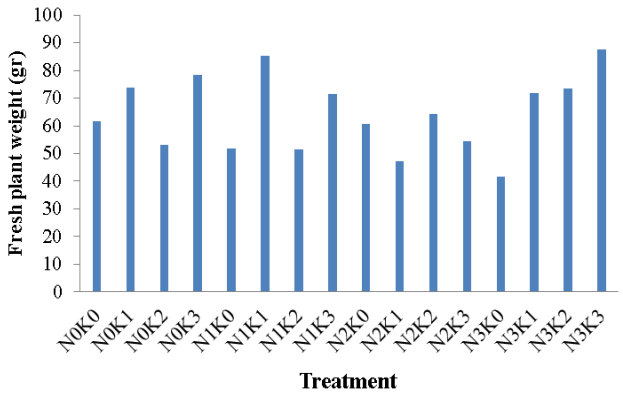

Figure 3. Wet weight of plants with treatment doses of N and K on shallots.
Note: N0 = Control, N1 = 100 kgN / ha N2 = 200 kgN / ha, N3 = 300 kgN / ha K0 = Control, K1 = 50 kgK / ha, K2 = 100 kgK / ha, K3 = 150 kgK / ha

It can be seen from Figure 4 that the best treatment for fresh bulb weight in shallots is shown by N3K3 (N300, K150 kg / ha). This indicates that the application of high doses of N and K fertilizers increases fresh bulb weight. Fresh bulb weight per plant is influenced by the amount of nutrients absorbed by the plant. According to Suwnadi*et al*., (2015), the element of potassium plays a role in increasing photosynthetic activity so that the accumulation of photosynthate can be translated into generative organs, especially shallot bulbs. Increasing the process of plant metabolism will have a positive impact in the formation of shallot bulbs. Setiyowati et al., (2010) stated that bulb enlargement is caused by cell enlargement which is more dominant than cell division.

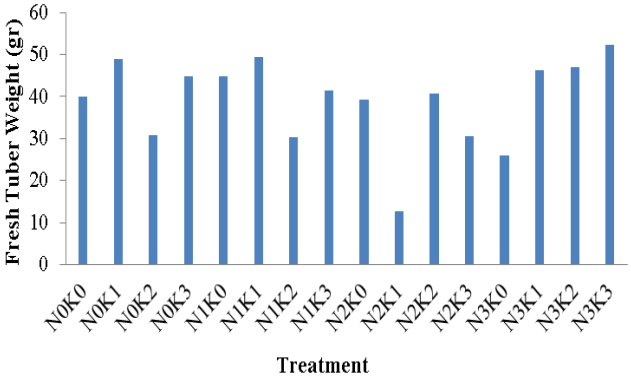

Figure 4. Bulb wet weight with N and K dosage treatment on shallots
Note: N0 = Control, N1 = 100 kgN / ha N2 = 200 kgN / ha, N3 = 300 kgN / ha, K0 = Control, K1 = 50 kgK / ha, K2 = 100 kgK / ha, K3 = 150 kgK / ha

One of them is the loose soil and the ability of the soil to bind nutrients (Sumarni, *et al*., 2012), making it easier for the roots to absorb nutrients, water from the soil. This is in accordance with the opinion of Latarang and Syakur (2006) that the weight of shallot bulbs is determined by soil fertility, elemental concentration and water content that can be absorbed by plants. Baswarsiati (2003) states that K fertilizer has an effect on increasing the weight of shallots.

It can be seen from Figure 5 that the best treatment for bulb diameter in shallots is shown by N2K2 (N200, K100 kg / ha), the N and K contents are balanced compared to other fertilizers. Sutrisna*et al*. (2003) stated that the balance of nutrients, especially in the soil,

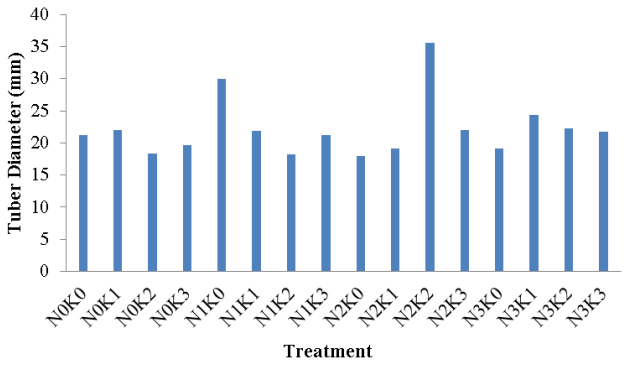

Figure 5. Bulb diameter treated with N and K doses on shallots
Note: N0 = Control, N1 = 100 kgN / ha N2 = 200 kgN / ha, N3 = 300 kgN / ha K0 = Control, K1 = 50 kgK / ha, K2 = 100 kgK / ha, K3 = 150 kgK / ha

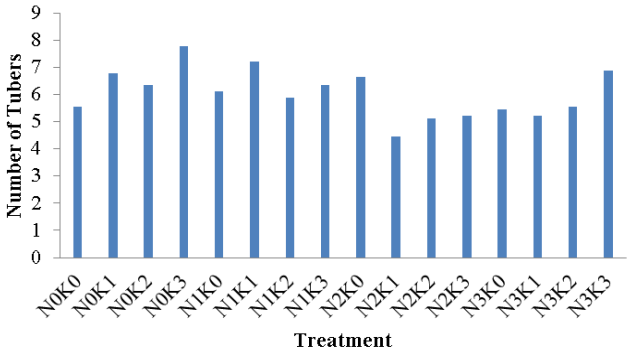

Figure 6. Number of bulbs with N and K dosage treatment on red shallots
Note: N0 = Control, N1 = 100 kgN/ha N2 = 200 kgN/ha, N3 = 300 kgN/ha K0 = Control, K1 = 50 kg K/ha, K2 = 100 kg K/ha, K3 = 150 kg K/ha

plays a very important role in the synthesis of carbohydrates and proteins so that it is very helpful in enlarging shallot bulbs. The application of N and K fertilizers to shallot plants gives high yields on total crop yields. Another thing that affects the development of bulbs is fairly good soil cultivation so that the soil is loose.

The increase in bulb diameter can also be affected by the ability of plants to absorb more nutrients if more nutrients are available. These conditions support the development of large bulbs in the soil. Suwandi *et al*. (2015) state that good soil cultivation causes nutrients in the soil, such as manure or other nutrients to mix in such a way as to fill the entire soil, so that it will affect bulb development. In addition, if the nutrients absorbed are higher, the photosynthesis process can also run smoothly so that the resulting bulb diameter is also higher.

It can be seen from Figure 6 that the best treatment for bulb diameter in shallots is shown by N0K3 (N 0, K 150 kg / ha) and the result of the number of bulbs is N2K1 treatment. According to Suwandi*et al*. (2015), plant growth and yield are closely related to the availability of nutrients absorbed by plants which are used in plant metabolic processes. Potassium functions to maintain plant water status and cell turgor pressure, regulate stomata and regulate the accumulation and translocation of newly formed carbohydrates. With the increase in plant metabolic processes will have a positive impact in the formation of shallot bulbs. Giving K to shallots affects the yield growth and bulb quality (Akhtar et al, 2002). The character of the number of bulbs in shallots is influenced by genetic factors and is slightly influenced by the environment, however, according to the results of research by Poornima (2007) the addition of K has a significant effect on the resulting shallot bulbs.

The application of N fertilizer with different doses to the number of shallot bulbs formed a negative linear curve pattern. The response of the number of bulbs to various doses of K given was not yet getting the optimum dose. K dose has an effect with R2 value of 0.211, indicating that 2.1% of the number of plant bulbs at week 2 is influenced by K fertilizer, while the other 97.9% is influenced by natural factors such as rainfall, short irradiation intensity. The decrease in the growth rate and production of shallot plants with additional doses is due to the higher the dose of potassium fertilizer given to the plants, the lower the production potential produced by these plants is because the plants are not responsive to the dosage of incorrect fertilizers. This is in accordance with the opinion of Novizan (2002). which states that one of the factors that influence plant growth and plant development is the supply of essential nutrients. The supply of nutrients can be increased by taking optimum action which will increase the potential for plant production. Sumarni et al., (2012) stated that the number of tillers or the number of bulbs was determined more by genetic factors than environmental factors including fertilization.

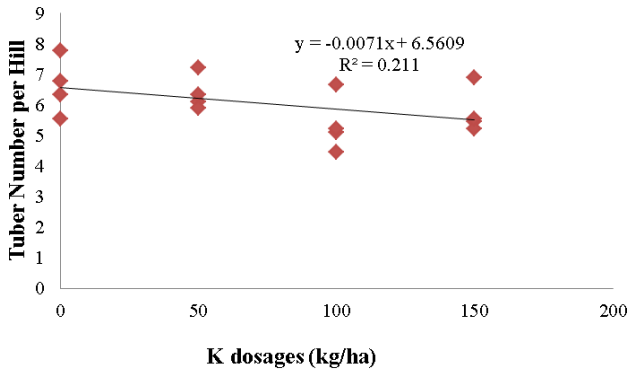

Figure 7. The curve of the relationship between K dose and the number of shallot bulbs

CONCLUSION

Based on the results of the study, it can be concluded that the combination of N and K fertilizer treatment with different doses did not have an effect on the shallot growth and yield of batuijo variety. Urea applied at 300 kg, Potassium 150 kg is the best treatment for fresh plant weight and fresh bulb weight.

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