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Effect of Goat and Cow Manure Fertilizer on the Growth of Shallot (Allium ascalonicum L)

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Abstract

The purpose of this research is to find out the effect of the distribution of goat and cow manure on the growth and yield of shallots (Allium ascalonicum L.). The study was conducted from 28 October to 13 December 2016. This study used a randomized block design (RBD) with 2 factors consisting of 4 levels of treatment, each treatment was repeated 3 times so that 16 treatment combinations were obtained. In this experiment, 48 trial plots are needed. The results showed that in the distribution of goat manure the highest fresh tuber weight was obtained from a dose of 30 tons / ha (K3) which was 7.35 g and the oven dry weight of the tuber was obtained from administering a dose of 10 tons / ha (K1) which was 1.78 gram. Meanwhile, fresh weight and dry weight of tubers in the administration of cow manure tend to be obtained at the administration of a dose of 30 tons / ha which have values of 7.27 g and 1.65 g, respectively.

Keywords: *Cow Manure; goat Manure fertilizer; shallot*

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1. Introduction

Shallot (Allium ascalonicum L.) is one of the horticultural communities which is needed by the community. Shallot plants originated from the central Asian region, namely around India, Pakistan, to Palestine. Shallot is a spice vegetable, although not native to Indonesia, but its usage as a seasoning flavor is very attached to the tongue of the Indonesian people. Almost all dishes in Indonesia use shallots as a seasoning (Wibowo, 1999). Shallots contain sufficient nutrition, in every 100 grams of onions contain carbohydrates 9.34 g, sugar 4.24, fat 0.1 g, protein 1.1 g, water 89.11 g, and vitamin C 7.4 mg (1).

Production of shallot in Bali in 5 years (2005-2009) reached 11024.6 tons, this amount could only meet the needs of 50% of the needs of the Balinese people who reached 22050.6 tons. While its remains were imported from outside the town, especially from Brebes Regency, Central Java. The central of producing shallot in Bali are located in Songan Village, Kintamani, Bangli Regency, although the quality is still inferior to imported products. Besides in Songan Village, Bangli Regency, there are still some scattered regencies such as Karangasem, Buleleng, Klungkung and a few in Jembrana (2).

Therefore, organic matter has the ability to improve soil physical, chemical and biological properties to support soil productivity. According to (3), the role of organic matter in improving chemical properties is very important in nutrient supply. The addition of organic matter will free up nutrients such as NPK, Ca, Mg, etc. and increase the availability of nutrients for plants. In improving soil biological properties, namely organic matter, it can increase the population of soil microorganisms that play a very

important role in the decomposition process.

Decreasing levels of organic matter is one form of soil damage that is occurred in developed countries commonly and its intensity tends to increase (4). The application of organic material that is commonly done by farmers is by using manure, because manure contains a lot of N which is highly needed by plants with high amounts (5). The amount of manure needed in crop cultivation depends on the type of soil, the crop being cultivated, the cultivation technique applied, and the amount of fertilizer available (6). Manure is fertilizer derived from livestock manure such as cows, goats, chickens, horses and pigs.

Particularly, goat manure contains relatively high potassium. Potassium plays a role in the process of metabolism, helps the process of opening and closing stomata, efficient use of water, expanding root growth, increasing the resilience of plants (leaves, flowers, and fruit), not easy to fall out, and improve the size and quality of tubers (7). Furthermore, it is said that manure contains complete nutrients, both macro nutrients and micro nutrients. This condition is not owned by inorganic fertilizer. Manure contains organic acids, including humic acid, fulvic acid, hormones and enzymes that are not found in inorganic fertilizers which are very useful both for plants and the environment and microorganisms.

Similarly, cow manure is manure derived from cow dung, the excess of cow manure is able to change the structure of the soil, increases the root's development, increases the holding capacity and absorptive capacity of the soil against water, improves the life of organisms in the soil and adds nutrients to the soil (8).

2. Materials and method

Time and Location of Research

The study site is on farmland located in Subak Dalem, Kekeran Village, Mengwi sub-district, Badung Regency. The results of soil analysis and goat and cow manure can be seen in Tables 1, 2 and 3.3. This research took place from 28 October to 13 December 2016.

Materials and Instruments of Research

The materials used in this study are: local varieties of shallot seeds, cow manure, goat manure, as a treatment and NPK pearl 16:16:16 as basic fertilizer.

The instruments needed in this study are hoes, gauges, sickles, writing instruments, documentation tools, and other tools that support this research.

Research design

This research is a factorial experiment with a randomized block design (RBD) consisting of two factors. The first factor is the dose of goat manure (K) which consists of four levels, namely K0 (0 tons / ha as a control), K1 (10 tons / ha), K2 (20 tons / ha), K3 (30 tons / ha). The second factor is the dose of cow manure (S) consisting of four levels, namely S0 (0 tons / ha as a control), S1 (10 tons / ha), S2 (20 tons / ha), S3 (30 tons / ha). Thus, there are 16 combination treatments and are repeated 3 times so that it takes 48 experimental plots, as a sample plant is taken randomly from each plot.

To determine the effect of the treatment given, then variable observations were carried out on plant height, number of leaves, number of tubers, tuber fresh weight, fresh stover weight per clump, oven dry

weight tuber and oven dry weight tuber per clump.

Data Analysis

The data were analyzed using statistical analysis of variance. For a single treatment that has significant effect to very real effect, then it is continued with LSD level of 5% to find out the closeness of the relationship among variables observed that are conducted by using correlation analysis on the growth and yield of shallots on the administration of goat and cow manure along with their interactions.

3. Results and Discussion

Research Results

The significance of the effect of the treatment of goat manure (K) and cow manure (S) doses and their interactions (KxS) on the variables observed are presented in Table 1.

Table 1
The significance of the effect of the treatment of goat and cow manure as well as their interactions on variables observed

No	Variable	Treatment		
		Goat Manure (K)	Cow manure (S)	Interaction (K xS)
1	Maximum plant height per plant (cm)	ns	ns	**
2	Number of leaves per plant (strands)	ns	ns	ns
3	Number of tubers per clump	ns	ns	*
4	Fresh weight of tubers per clump (g)	ns	ns	ns
5	Stover weight per clump (g)	ns	ns	ns
6	Oven tuber dry weight per clump (g)	ns	ns	ns
7	Oven dry weight stover per clump (g)	ns	ns	ns

Information:
* = significant effect (P <0.05)
** = very significant effect (P <0.01)
ns = no significant effect (P ≥0.05)

From Table 1 shows that the interaction between the treatment of goat manure with cow manure (KxS) has no significant effect (P> 0.05) on the number of leaves per clump, fresh weight of tubers per clump, fresh weight of stover per clump, dry weight of oven tubers per clump, the dry weight of the stover oven per clump, however, had a significant effect on interaction on the number of tubers per clump (P> 0.05) and very significant effect on maximum plant height per plant (P <0.01).

Discussion

The highest fresh weight of tubers per clump was found in the treatment of goat manure 30 tons/ha (K3), which weighed 7.35 grams, an increase of 11.7% compared to the lowest yield on the control (K0) which was 6.58 grams. The high fresh weight of tubers per clump at 30 tons/ha (K3) goat manure dose treatment supported by maximum plant height (r = 1.00 **), maximum number of leaves (r = 1.00 **), and number of tubers per clump (r = 0.97 **).

The highest dry weight of tuber ovens was obtained in the treatment of goat manure dose of 20 tons/ ha (K2), which was weighing 1.78 g, an increase of 40.1% compared to the lowest results in giving the dosage of goat manure 30 tons/ha (K3), namely 1 27 g supported by maximum plant height (r = 0.94 **), maximum number of leaves (r = 0.93 **), number of tubers per clump (r = 0.88 **), fresh tuber

weight (r = 0.91 **), and fresh stover weight (r = 98 **).

The tuber fresh weight and oven dry weight of the tuber in the treatment of goat manure are influenced by the NPK content which found in goat manure's content which is able to help respiration and also the photosynthesis process in plants, helps the formation of nucleic acids, the formation of plant seeds and the formation of tuber (7).

The highest fresh weight of tubers per clump was found in the treatment of cow manure dosages of 30 tons / ha (S3), which weighed 7.27 grams, an increase of 8.9% compared to the lowest yield on the control (S0) which was 6.67 grams. The high fresh weight of tubers per clump at 30 tons / ha (S3) cow manure dosage treatment is supported by maximum plant height (r = 1.00 **), maximum number of leaves (r = 1.00 **), and number of tubers per clump (r = 0.99 **).

The highest dry weight of tuber ovens was obtained in the treatment of cow manure dosages of 30 tons/ha (S3), which weighed 1.65 g, an increase of 16.1% compared to the lowest yield on the control (S0) of 1.42 g, supported by maximum plant height r = 0.99 **), maximum number of leaves (r = 0.99 **), number of tubers per clump (r = 0.99 **), fresh tuber weight (r = 1.00 **), and fresh stover weight (r = 0.99 **).

In addition, the tuber fresh weight and oven dry weight of tuber in cow manure treatment influenced by high NPK content. The high of NPK content in cow manure causes the formation of an enlarged leaf layer formed by the mechanism of action of the N element. Nitrogen is the main nutrient for plant growth, which is generally very necessary for the formation or growth of vegetative parts of plants, such as leaves, stems and roots (9). Potassium content contained in cow manure functions in the formation of sugar and starch protein synthesis, a catalyst for enzymatic reactions, neutralizing organic acids and plays a role in the growth of meristem tissue. Potassium also determines root growth, accelerating the maturity and production of fruit and seeds.

On the variable maximum plant height per clump, there was a very significant interaction ($P < 0.01$) in the treatment of goat and cow manure highest obtained without giving goat manure (K0S2) that is 35.17 cm which increased by 28.6% when compared with the lowest is in the control (without fertilizer) which is 27.33 cm. This is caused by cow manure in the soil can increase nutrients both macro and micro, improve soil structure, increase water holding capacity, increase cation exchange capacity and stimulate the activity of microorganisms involved in the process of overhaul (10).

Further, in the variable number of tubers per clump, there was a real interaction ($P < 0.05$) in the treatment of goat manure 30 tons / ha and cow manure 20 tons / ha (K3S2), namely 4.27 tubers increased by 12.9% when compared to the lowest that is in the control (without fertilizer) which is 1.86 tubers. This is because the element of potassium contained in goat and cow potassium manure is the third most important element after nitrogen and phosphorus. Potassium is absorbed by plants in large enough quantities, and sometimes is greater than nitrogen in tuber plants.

Providing fertilizer optimally can affect the growth of shallot plants. The main macro nutrient that affects yield and quality of shallots is NPK. These nutrients are needed more because plants often experience these nutrient deficiencies. Therefore, shallot requires the addition of nutrients from the outside to be able to live optimally (11). NPK fertilizer is a compound fertilizer consisting of NPK, the function of the nitrogen element as fertilizer is to improve the vegetative growth of plants (plants that grow on sufficient soil N elements will be greener) and help the process of protein formation (12).

Additionally, the phosphorus contained in goat and cow manure is very high, phosphorus is the second nutrient needed by plants in large amount after nitrogen, phosphorus is also known as the key to life because of its function is very central in the process of plants' life. It is very influential on growth and development plant.

4. Conclusion

Based on the results of this study, it can be conclude that the distribution of goat manure and cow manure does not show any influence on all variables. The interaction between the treatment of goat manure with cow manure has a significant effect on the number of tubers per clump, has a very significant effect on the maximum plant height and no significant effect on other variables. The results showed that the highest fresh tuber goat manure was obtained from the distribution of a dose of 30 tons / ha that is 7.35 g and the oven dry weight of the tuber was obtained from administering a dose of 10 tons / ha which was 1.78 g. Fresh weight and dry weight of tubers in the distribution of cow manure tends to be obtained at the distribution of a dose of 30 tons / ha which respectively have values of 7.27 g and 1.65 g.

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