Effect of Dosage of Chicken Manure and Inorganic Fertilizer on Growth and Yield of Shallots *(Allium Ascalonlcum L.)*

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Abstract

Shallots (*Allium ascalonicum* L.) is one of the most widely consumed horticultural commodities for human consumption as a mixture of cooking spices. One of the efforts to achieve optimal shallot yields is through the provision of organic matter. Utilization of chicken manure as an organic material used in fertilizing shallots can improve the physical and chemical properties of the soil. The application of chicken manure and inorganic fertilizers is expected to have a substantive effect on increasing the yield of shallots compared to the application of compound fertilizers. The purpose of this research is to increase the availability of organic matter and nutrients in the soil and to increase the yield of shallots on a field scale (wide). This research will be conducted from December 2020 to February 2021 at Pendem, Junrejo, Batu, East Java. The altitude is 550 masl and the soil type is Andosol, with air temperature 14^{o} - 32^{o} C. This research was carried out using a factorial randomized block design (RAK) with 2 factors and 3 replications. The first factor is chicken manure (K) consisting of 3 levels of treatment, namely: K0 = Chicken Manure 0 t ha^{-1}, K1 = Chicken Manure 10 t ha^{-1} and K2 = Chicken Manure 20 t ha^{-1}. While the second factor is inorganic fertilizer (nitrogen) which consists of 6 levels of treatment, namely: N1 = 120 kg ha^{-1}, N2 = 160 kg ha^{-1}, N3 = 200 kg ha^{-1}, N4 = 240 kg ha^{-1} and N5 = 280 kg ha^{-1}. Data analysis using analysis of variance (ANOVA) and testing using F table 5% level. If there is a significant effect, then it is continued with the smallest significant difference test (LSD). The results of this study showed that chicken manure 20 t ha^{-1} and inorganic fertilizer (Nitrogen) with a dose of 160 kg t ha^{-1} increased plant growth rate (LPT) aged 28-14 DAP by 90.62% compared to chicken manure 10 t ha^{-1} and inorganic fertilizer (Nitrogen) with a dose of 160 kg t ha^{-1}. Chicken manure significantly increased plant length at 42 and 56 DAP, plant dry weight at 42 and 56 DAP, fresh root weight per clump (g), dry root weight per clump (g), and tuber dry weight per clump. clumps (g), tuber dry weight (sun) (kg m^{2}) and yield (ton ha^{-1}), but did not affect the growth components of shallot plants at the beginning of the observation. Inorganic fertilizers significantly increased the growth components, namely plant length, number of leaves, number of tillers, plant dry weight at the end of observation and dry weight (g clump^{-1}) on shallot plants.

Key Words: Inorganic Fertilizer, *Allium Ascalonlcum L,* Yield of Shallots.

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Introduction

Shallots (*Allium ascalonicum* L.) is one of the most widely consumed horticultural commodities for human consumption as a mixture of cooking spices. As a flavoring, shallots are also sold in processed forms such as onion extract, powder, essential oil, fried onions and even as a medicinal ingredient to lower cholesterol levels, blood sugar, prevent blood clots, lower blood pressure and accelerate blood flow (Istina *et al*., 2016). As a horticultural commodity that is widely consumed by the public, the potential for the development of shallots is still wide open not only for domestic needs but also for foreign countries (Suriani *et al*., 2011).

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According to BPS (2020b) shallot production in Indonesia in 2015-2019 has increased steadily with a total of 1,229,184 tons (2015) to 1,580,247 tons (2019) with production growth in 2019 of 5.11% from the previous year. This increase in production yields is in line with the interest of farmers in cultivating shallots, where the shallot harvest area is still fluctuating from 2015 (122.126 ha^{-1}) to 2019 (159.195 ha^{-1}) with a growth of harvested area in 2019 of 1.54%. from the previous year (BPS, 2020a). The increase in yield and area of shallot production is still relatively insufficient to meet national shallot needs, where according to the Ministry of Agriculture of the Republic of Indonesia (2016) in 2015 the number of shallot imports amounted to 17,429 tons. The productivity of shallots for the last 3 years (2016-2019) ranged from 9.31-9.93 t ha^{-1} (BPS, 2020c). It can be said that the productivity of national shallots is still low, while the national demand for shallots continues to increase in line with the rate of population growth. The low productivity of shallots in Indonesia is caused by the decline in soil fertility due to continuous application of inorganic fertilizers and the infrequent use of organic fertilizers.

Fertilization is one of the important efforts to increase crop production, even now it is considered a dominant factor in increasing crop production (Rosmarkam *et al*., 2001). Management of soil fertility in shallot cultivation which only emphasizes the addition of inorganic fertilizers without the development of a more environmentally friendly farming business. Firmansyah *et al*., (2015) mentioned that in the Brebes area, Central Java, farmers used fertilizer doses between 135-190 N kg ha^{-1}, 90 P_2O_5 kg ha^{-1}, and 100 K_2O kg ha^{-1}. While Sumarni *et al*. (2012) reported that the best fertilizer doses for the Bima Curut variety were 180 N kg ha^{-1}, 120 P_2O_5 kg ha^{-1} and 60 K_2O kg ha^{-1}. As for the Bangkok variety, it was 270 N kg ha^{-1}, 120 P_2O_5 kg ha^{-1} and 120 K_2O kg ha^{-1}.

Liu *et al*., (2010) stated that continuous fertilization on the same land will have an effect on changes in the physical, chemical and biological properties of the soil. In addition, the use of inorganic fertilizers causes a high level of production costs. Lee *et al*., (2012) also reported that excessive fertilization on shallot plants will reduce the yield and quality of shallots.

Organic matter is one indicator of soil health and fertility. Organic matter plays a role in improving soil physical properties, increasing nutrient availability through ion and mineral exchange and increasing the activity of soil organisms (Saidy. 2018). Mineralization of soil nutrients such as N, P and K can help the decomposition of soil organic matter with the help of soil enzymes. The increase in soil enzyme activity is the impact of high organic matter and high microbial growth so as to stimulate microorganism activity thereby increasing the availability of nutrients (Zhang *et al*., 2019). The nutrients available in the soil are not fully absorbed by plants, therefore the role of microorganisms is needed so that nutrients can be absorbed optimally by plants. The addition of organic matter alone has not been able to increase plant productivity, therefore to create integrated nutrient management it is necessary to add biological fertilizers such as bacteria in an effort to increase productivity and environmental sustainability (Simanungkalit *et al*., 2006).

The war of organic matter on the physical properties of the soil is to make the soil crumbly structure, as well as better soil aeration due to the increase in porosity or pore space. Soil aeration is related to water content, O^2, N^2 and CO^2 gases in the soil, which greatly affect root development and the life of soil microorganisms (Kresnatita *at al*., 2013). The availability of nutrients for plants can be facilitated by the existence of a symbiotic relationship between plants and microorganisms. Provision of microorganisms such as organic matter into the soil can be one way to help intensify root function and increase nutrient breakfast so that plants can produce maximum.

Based on the manure analysis conducted by Melati *et al*., (2008) the nutrient content contained in chicken manure is 1.14% N, 0.68% P, and 1.65% K. Chicken manure is relatively quickly decomposed and has sufficient nutrient levels, when compared to the number of units the same as other types of manure (Widowati et al., 2005). Fertilization treatment with chicken manure 30 t ha^{-1} and 80 kg ha^{-1} N, 20 kg ha^{-1} P_2O_5, 65 kg ha^{-1} K_2O gave a fresh weight of tubers per plant 27 g, tuber dry weight per plant 21 g, total cloves/tubers 9.3 and tuber diameter per plant 4.406 cm. The fresh weight of tubers per hectare produced was 15,097 tons in the cultivation of Lumbu Hijau variety (Wahyudi *et al*., 2014).

One of the efforts to achieve optimal shallot yields is through the provision of organic matter. Utilization of chicken manure as an organic

material used in fertilizing shallot plants can improve the physical and chemical properties of the soil. The existence of livestock that is widely owned by farmers produces chicken manure which if left alone will be able to pollute the environment because the smell caused will interfere with comfort, so it is necessary to use this chicken manure, one of which is to process chicken manure into chicken manure.

Simultaneous application of chicken manure and inorganic fertilizer to the cultivation of shallots on a wider scale (farmer scale) has not been widely carried out. The application of chicken manure and inorganic fertilizers is expected to have a substantive effect on increasing the yield of shallots compared to the application of compound fertilizers. So that by giving a combination of chicken manure and inorganic fertilizers can minimize inorganic fertilization and get high production without damaging the environment.

Materials and Methods

This research will be conducted from December 2020 to February 2021 at Pendem, Junrejo, Batu, East Java. The altitude is 550 meters above sea level and the type of soil is Andosol, with an air temperature of 14 - 32^{o}C.

This research was conducted using a factorial randomized block design (RAK) with 2 factors. The first factor is chicken manure (K) consisting of 3 levels of treatment, namely: K0 = Chicken Manure 0 t ha^{-1}, K1 = Chicken Manure 10 t ha^{-1} and K2 = Chicken Manure 20 t ha^{-1}. While the second factor is inorganic fertilizer (nitrogen) which consists of 6 levels of treatment, namely: N1 = 120 kg ha^{-1}, N2 = 160 kg ha^{-1}, N3 = 200 kg ha^{-1}, N4 = 240 kg ha^{-1} and N5 = 280 kg ha^{-1}. From the two treatments, 15 treatment combinations were obtained, repeated 3 times to obtain 45 treatment combination units. The tools used in this research include handtractor, hoe, gembor, oven, meter, raffia rope, analytical scale, digital camera and stationery. The materials used were onion bulbs of Super Philips variety, Urea and ZA fertilizers, chicken manure, harvest bags and treatment labels.

Observations of plant growth which included plant length, number of leaves, number of tillers and total dry weight of group plants were carried out non-destructively starting at the age of 14 days after planting. Meanwhile, the observation of plant dry weight and plant growth rate was carried out destructively by carefully dismantling the plant until the plant was rooted to its roots. Observations began at the age of 14 days after planting. The observation interval is every 2 (two) weeks, namely at the age of 14, 28, 42 and 56 dap. Components of crop yields were: root weight, dry root weight, number of tubers, tuber weight per grass and tuber yield per hectare (t ha^{-1}).

Growth Observation Results

a. Plant Length (cm)

The process of growth and development is part of plant life where there is a change in plant size in the form of an increase in volume and mass which is influenced by internal and external factors. Internal factors are influenced by the genetic nature of the plant while external factors are influenced by the environment in which the plant grows. The two factors that support plant growth are the provision of plant nutrients. The availability of nutrients in the soil to be absorbed by plants will affect plant growth, if it does not meet the needs of plant nutrients, the plants will show symptoms of deficiency. Plant nutrient needs are met through the provision of fertilizers. Where fertilizers based on their constituent components are divided into 2 (two), namely organic fertilizers and inorganic fertilizers.

The results of the analysis of variance showed that there was no interaction between the plant length parameters between the dose of chicken manure and the dose of inorganic fertilizer at the observational ages of 14, 28, 42 and 56 DAP, there was only a single effect of the treatment of the dose of chicken manure and the dose of nitrogen fertilizer on each. treatment. In the treatment, the dose of chicken manure had a very significant effect on plant length parameters at the age of 42 and 56 DAP, while the inorganic fertilizer (nitrogen) treatment had a very significant effect on plant length parameters at the age of 14, 28, and 42 DAP. The average plant length at various doses of chicken manure and inorganic fertilizer doses is presented in Table 1.

Table 1. Average Plant Length at Various Doses of Chicken Manure and Inorganic Fertilizer Doses at various Ages of Observation

Treatment	Plant Length (cm) at Age (DAP)							
	14		28		42		56	
Dosage of Chicken Manure								
K0	22,29		32,58		35,62	a	41,03	a
K10	21,19		34,60		38,73	a	43,63	ab
K20	21,56		34,65		42,40	b	45,82	b
BNT 5%	**ns**		**ns**		**3,20**		**3,62**	
Dosage Inorganic Fertilizer								
N120	21,40	ab	30,77	a	35,14	a	38,56	
N160	20,36	a	32,39	a	38,26	ab	41,39	
N200	21,30	ab	34,09	ab	39,01	ab	42,76	
N240	22,60	b	36,34	b	41,26	b	45,91	
N280	22,72	b	36,12	b	40,91	b	42,06	
BNT 5%	**1,66**		**3,36**		**4,13**		**ns**	
CV (%)	**7,94**		**10,26**		**10,99**		**11,13**	

Note: Numbers followed by the same letter in the same column and treatment are not significantly different based on the LSD test at 5% level, DAP = days after planting, CV = coefficient of variation, ns = no significant effect

Plant length at 42 DAP showed that plants given a dose of chicken manure 20 t ha^{-1} plant (42.13 cm) could increase plant length by 17.04% and 8.71% when compared to a dose of 0 t chicken manure. ha-1 and 10 t ha-1 (35.62 and 38.73 cm), while at the age of 56 DAP, a dose of chicken manure 20 t ha^{-1} (45.82 cm) could increase plant length by 10.45% compared to the dose of chicken manure 0 t ha^{-1} or without chicken manure (41.03 cm) but not significantly different from the dose of chicken manure 10 t ha^{-1} (43.63 cm). Stated that in the study the application of chicken manure gave a good plant response, this happened because chicken manure decomposed faster and had nutrients of 7% H2O, 29% organic matter, 1.5% N, 1.3% P2O5, 0, 8% K 2O, 4% CaO with a C/N ratio of 9-11 which is relatively larger than other manures. (Latarang, B. *et al*., 2006; Antonious et al., 2009; Shedeed, *et al*., 2014; Ravindran *et al.*, 2017; Yoldas *et al*., 2019; Yoldaş *et al*., 2020; Sulasmi *et al*.,2020) Observation of the age of 14 DAP, plant length with a dose of inorganic fertilizer 240 kg ha-1 was not significantly different from 280 kg ha^{-1} (22.60 and 22.72 cm). The plant length produced was 10.39% higher than the inorganic fertilizer dose of 160 kg ha-1 (20.36 cm). At the age of 28 DAP, plant length with a dose of inorganic fertilizer 280 kg ha^{-1} was not significantly different from 240 kg ha^{-1} (36.12 and 36.34 cm). The resulting plant length was 15.33% and 10.87% higher than the doses of inorganic fertilizers 120 and 160 kg ha^{-1} (30.77 and 32.39 cm). At 42 DAP, plant length with doses of inorganic fertilizers 240 and 280 kg ha-1 was significantly different from doses of inorganic fertilizers at 120 kg ha^{-1} (35.14 cm), namely 41.26 and 40.91 cm, but not significantly different. With doses of 160 and 200 t ha^{-1} inorganic fertilizers. The length of the resulting plant was 14.83% higher than the dose of inorganic fertilizer 120kg ha^{-1} (35.14 cm). According to Hariodamar et al,. (2018), which stated that the application of urea 300 kg ha^{-1} had a significant effect on increasing the growth and yield of mustard plants in the parameters of plant height, number of leaves, leaf width, fresh weight and plant dry weight. In line with the research of Herwanda, R et al,. (2017) that the application of 80% Urea + 20% Zak + Growmore Leaf Fertilizer (10-55-10) gave better results on plant length, fresh tuber weight and post-harvest loss weight during a 1-month shelf life. (Asaad, M. 2010; Askari et al., 2020; Khan et al., 2021).

b. Number of Leaves (Strand)

The results of the analysis of variance showed that there was no interaction between the number of leaves on the parameter of the number of leaves between the dose of chicken manure and the dose of inorganic fertilizer at the observational ages of 14, 28, 42 and 56 DAP, there was only a single effect of treatment of the dose of chicken manure and the dose of inorganic fertilizer on each treatment. In the treatment, the dose of chicken manure had a very significant effect on the number of leaves at 42 DAP, while the inorganic fertilizer

treatment had a very significant effect on the number of leaves, namely the observed ages of 14, 28, 42 and 56 DAP. The average number of leaves at various doses of chicken manure and inorganic fertilizer doses is presented in Table 2.

Table 2. Average number of leaves at various doses of chicken manure and doses of inorganic fertilizer at various ages of observation

Treatment	Number of Leaves (Strands) at Age (dap)							
	14		28		42		56	
Dosage of Chicken Manure								
K0	10,44		16,75		24,21	a	29,97	
K10	10,69		17,56		25,77	ab	31,19	
K20	10,84		17,85		26,31	b	30,56	
BNT 5%	**ns**		**ns**		**1,66**		**ns**	
Dosage of Inorganic Fertilizer								
N120	9,80	a	15,76	a	22,84	a	28,11	a
N160	9,44	a	16,84	a	24,98	ab	30,00	ab
N200	10,00	a	17,29	b	25,29	b	30,33	ab
N240	11,95	b	18,62	b	27,00	b	32,40	b
N280	12,09	b	18,42	b	27,04	b	32,02	b
BNT 5%	**0,98**		**1,37**		**2,14**		**2,95**	
CV (%)	**9,50**		**8,18**		**8,71**		**9,99**	

Note: Numbers followed by the same letter in the same column and treatment are not significantly different based on the LSD test at 5% level, DAP = days after planting, CV = coefficient of variation, ns = no significant effect

At the age of observation 42 DAP, it showed that the treatment of chicken manure 20 t ha^{-1} produced a significantly higher number of leaves 7.98% when compared to the treatment without manure or 0 t ha^{-1}, but not significantly different from the manure treatment chicken 10 t ha^{-1}.

At the age of observation 14 DAP, the treatment of 240 kg ha^{-1} of inorganic fertilizer (nitrogen) and 280 kg ha^{-1} of inorganic fertilizer resulted in significantly more leaf number values of 21.00% and 21.99% when compared to inorganic fertilizers. 160, 120 and 200 kg ha^{-1}. At the age of 28 DAP, the treatment with 200 kg ha^{-1} of inorganic fertilizers, 240 kg ha^{-1} of inorganic and 280 kg ha^{-1} of inorganic fertilizers resulted in significantly higher leaf numbers of 7.93%, 15.36% and 14.44% when compared with the inorganic fertilizer (nitrogen) treatment of 120 kg ha^{-1}, but not significantly different from the inorganic fertilizer treatment of 200 kg ha^{-1}. At the age of 42 DAP, the treatment with 200 kg ha^{-1} of inorganic fertilizer (nitrogen), 240 kg ha^{-1} of inorganic and 280 kg ha^{-1} of inorganic fertilizer resulted in significantly higher leaf count values of 9.69%, 15.41% and 15.53% when compared with the inorganic fertilizer treatment of 120 kg ha^{-1}, but not significantly different from the inorganic fertilizer treatment of 200 kg ha^{-1}. Furthermore, at the last observation 56 DAP, the treatment of inorganic fertilizers 240 kg ha^{-1} and inorganic fertilizers 280 kg ha^{-1} resulted in significantly more leaf count values of 13.24% and 12.21% when compared to the inorganic fertilizer treatment of 120 kg ha^{-1}, but not significantly different from the inorganic fertilizer treatment of 160 and 200 kg ha^{-1}. (Table 3). Research (Nanesa Tufa, K. 2019; Zhong *et al*., 2021; Chakraborty, T., & Akhtar, N. 2021). That nitrogen is a nutrient that forms amino acids and proteins as the basic ingredients of plants in making leaves.

c. Number of Tillers

The results of the analysis of variance showed that there was no interaction between the parameters of the number of shallots between the dose of chicken manure and the dose of inorganic fertilizer at the observational ages of 14, 28 and 42 DAP, there was only a single effect of the treatment of the dose of chicken manure and the dose of inorganic fertilizer on each. each treatment. In the treatment, the dose of chicken manure had no effect on the number of tillers at all ages of observation, while in the inorganic fertilizer treatment it had a very significant effect on the parameters of the number of tillers at all ages. The average number of tillers at various doses of chicken manure and inorganic fertilizer doses is presented in Table 3.

Table 3. Average Number of Tillers at Various Doses of Chicken Manure and Inorganic Fertilizer Doses at Various Ages of Observation

Treatment	Number of tillers (clump^{-1}) at age (dap)					
	14		28		42	
Dosage of Chicken Manure						
K0	4,44		6,69		7,75	
K10	4,71		6,85		7,67	
K20	4,73		7,04		7,62	
BNT 5%	**ns**		**ns**		**ns**	
Dosage of Inorganic Fertilizer						
N120	4,18	a	6,42	a	7,34	a
N160	4,24	a	6,58	ab	7,50	ab
N200	4,58	ab	6,73	abc	7,39	ab
N240	4,95	b	7,20	bc	8,01	bc
N280	5,17	b	7,38	c	8,15	c
BNT 5%	**0,66**		**0,68**		**0,64**	
CV (%)	**14,87**		**10,19**		**8,64**	

Notes: Numbers followed by the same letter in the same column and treatment are not significantly different based on the LSD test at 5% level, DAP = days after planting, CV = coefficient of variation, ns = no significant effect

Table 3 explains that the treatment of chicken manure did not have a significant effect on the observed ages of 14, 28 and 42 DAP, while the inorganic fertilizer treatment gave a significant effect on the number of chicks at the age of 14, 28 and 42 DAP. Furthermore, table 4 at the observational age of 14 DAP, shows that the application of inorganic fertilizers 240 kg ha^{-1} and inorganic fertilizers 280 kg ha^{-1} resulted in significantly more tillers of 15.55% and 19.15% when compared to inorganic fertilizers. 120 kg ha^{-1} and inorganic fertilizer 160 kg ha^{-1}, but not significantly different from the application of inorganic fertilizer 200 kg ha^{-1}. The number of red onion tillers is determined by genetic factors rather than fertilization factors. (Sumarni et al., 2012; Fauziah et al., 2017; Kharisma et al., 2021)

Observation age 28 DAP, inorganic fertilizer treatment of 280 kg ha^{-1} produced significantly more tillers of 10.84% and 13.01% when compared to inorganic fertilizers 160 kg ha^{-1} and inorganic fertilizers 120 kg ha^{-1}, but not significantly different from the application of inorganic fertilizers 200 kg ha^{-1} and inorganic fertilizers 240 kg ha^{-1}, the treatment of inorganic fertilizers 240 kg ha-1 resulted in a significantly higher number of tillers by 10.83% when compared to inorganic fertilizers 120 kg ha^{-1}. Observation age 42 DAP, treatment of inorganic fertilizer 280 kg ha^{-1} produced significantly more tillers by 9.94%, 7.97% and 9.32% when compared to inorganic fertilizer 120 kg ha^{-1}, inorganic fertilizer 160 kg ha^{-1} and inorganic fertilizers 200 kg ha^{-1}, but not significantly different from the application of inorganic fertilizers 240 kg ha^{-1}. The inorganic fertilizer treatment of 240 kg ha^{-1} resulted in a significantly higher number of tillers by 8.36% when compared to inorganic fertilizers at 120 kg ha^{-1}, but it was not significantly different from the inorganic fertilizer treatment of 160 kg ha^{-1}, 200 kg ha^{-1}. 1 and 280 kg ha^{-1} (Table 3). Fertilizer dose of 400 kg ZA/ha for plant height was 32,599 cm, number of leaves was 35,513 pieces, number of tubers was 8,803 pieces, wet weight of tubers per clump was 37,513 grams per clump, dry tuber weight was 31,279 grams per clump and production per hectare of 12,109 t ha^{-1} (Saptorini et al., 2020).

d. Plant Dry Weight (g plant^{-1})

The results of the analysis of variance showed that there was no interaction between the dry weight parameters of the plant between the dose of chicken manure and the dose of inorganic fertilizer at the observational ages of 14, 28, 42 and 56 DAP, there was only a single effect of the treatment of the dose of chicken manure and the dose of nitrogen fertilizer on each treatment. The dose of chicken manure had a very significant effect on plant dry weight parameters at the age of 42 and 56 DAP, while the inorganic fertilizer treatment had a very significant effect on plant dry weight parameters at 42 and 56 DAP. The average dry weight of plants at various doses of chicken manure and inorganic fertilizer doses is presented in Table 4.

Table 4. Average Dry Weight of Plants at Various Doses of Chicken Manure and Inorganic Fertilizer Doses at Observation Ages 14, 28, 42 and 56 DAP

Treatment	Dry Weight of Plants (g plant^{-1}) at age (DAP)			
	14	28	42	56
Dosage of Chicken Manure				
K0	0,88	2,06	4,97 a	8,96 a
K10	1,02	1,98	6,19 b	10,06 b
K20	0,94	2,29	6,65 b	10,82 c
BNT 5%	**ns**	**ns**	**0,48**	**0,73**
Dosage of Inorganic Fertilizer				
N120	0,88	2,01	5,46 a	9,46 a
N160	0,91	1,89	5,52 a	9,43 a
N200	0,98	2,02	5,91 ab	9,80 ab
N240	1,00	2,26	6,40 b	10,47 b
N280	0,97	2,37	6,40 b	10,59 b
BNT 5%	**ns**	**ns**	**0,62**	**0,94**
CV (%)	**23,55**	**24,65**	**10,82**	**9,82**

Notes: Numbers followed by the same letter in the same column and treatment are not significantly different based on the LSD test at 5% level, DAP = days after planting, CV = coefficient of variation, ns = no significant effect

At the age of observation 42 DAP, it showed that the treatment of chicken manure 10 and 20 t ha^{-1} resulted in plant dry weight which was significantly greater by 19.71% and 25.26% when compared to the treatment without chicken manure or 0 t ha^{-1}. 1. Then at the observation age of 56 DAP, it showed that the treatment of chicken manure 20 t ha^{-1} resulted in plant dry weight which was significantly greater by 17.19% and 7.02% when compared to the treatment of chicken manure 0 t ha^{-1} and treatment chicken manure 10 t ha^{-1}, but the treatment with chicken manure 10 t ha^{-1} resulted in plant dry weight which was significantly greater by 10.93% when compared to treatment without chicken manure or 0 t ha^{-1}. The dry weight of the plant (g plant^{-1}) describes the assimilate contained in the plant. Assimilate is the result obtained from the photosynthesis process carried out by the leaf organs of the shallot plant, so the role of the leaves is very important in the production of plant biomass. According to Susilo (2015) the role of leaves in plant growth is to determine the production of plant biomass caused by differences in the ability of leaves to produce reduced carbon to produce plant biomass. While the results of the analysis of variance obtained that the treatment of chicken manure had a significant effect on the dry weight of shallot plants at the age of 42 and 56 DAP. The results of the analysis showed that chicken manure which was able to increase dry weight more was the treatment of chicken manure by 17.19% and 7.02%, respectively. In line with the results of research by Jazilah *et al*., (2007) chicken manure increased the wet weight of tubers per clump, dry weight of tubers per clump and tuber volume.

At the age of 42 DAP, it showed that the inorganic fertilizer treatment of 240 and 280 kg ha^{-1} resulted in significantly higher plant dry weight of 14.69% and 14.69% when compared to the inorganic fertilizer treatment of 120 and 160 kg ha^{-1}, but not significantly different from the inorganic fertilizer treatment of 200 kg ha^{-1}. Furthermore, at the observational age of 56 DAP, it showed that the inorganic fertilizer treatment of 280 and 240 kg ha-1 resulted in plant dry weight which was significantly greater by 10.95% and 9.82% when compared to the inorganic fertilizer treatment of 160 and 120 kg ha^{-1} but not significantly different from the inorganic fertilizer treatment of 200 kg ha^{-1}. According to Sumarni *et al*., (2012) suggested that the formation of onion bulbs comes from the enlarged and fused leaf layers, and the formation of this enlarged leaf layer is formed from the mechanism of action of N nutrients, where N nutrients cause chemical processes that produce nucleic acids. Which plays a role in the cell nucleus in the process of cell division, so that the layers of the leaves can be formed properly which then develops into onion bulbs. Assimilate is the result obtained from the photosynthesis process carried out by the leaf organs of the shallot plant, so the role of the leaves is very important in the production of plant biomass. According to Susilo

(2015) the role of leaves in plant growth is to determine the production of plant biomass caused by differences in the ability of leaves to produce reduced carbon to produce plant biomass.

e. Plant Growth Rate (PGR)

The results of the analysis of variance showed that there was an interaction between the treatment dose of chicken manure and the dose of inorganic fertilizer on plant growth rate parameters at the age of observation 28-14 DAP (Appendix). The average plant growth rate (LPT) of shallot plants at the age of the plant. As presented in table 5.

Table 5. Average Plant Growth Rate (PGR) at Various Doses of Chicken Manure and Inorganic Fertilizer Doses at Observation Age

Dosage of Chicken Manure	**Plant Growth Rate (mg,cm^{-2}, day^{-1}) at the age of 28-14 dap**									
	Dosage of Inorganic Fertilizer									
	N120		N160		N200		N240		N280	
Umur 28-14 HST										
0 t ha^{-1}	0,22	bc	0,08	ab	0,23	bc	0,22	bc	0,24	bc
10 t ha^{-1}	0,19	bc	0,03	a	0,11	ab	0,22	bc	0,24	bc
20 t ha^{-1}	0,26	c	0,32	c	0,16	b	0,21	bc	0,27	c
BNT 5% = 0,09										
CV = 26,33%										

Notes: Numbers followed by the same letter in the same column and treatment are not significantly different based on the LSD test at 5% level, DAP = days after planting, CV = coefficient of variation, ns = no significant effect

Table 5. Explains that at the age of 14-28 DAP the plant growth rate in the factorial experiment between the treatment of chicken manure 10 t ha-1 and inorganic fertilizer treatment 280 kg ha^{-1} (0.24 mg cm^{-2} day^{-1}) can increased plant growth rate by 87.50% when compared with chicken manure treatment 10 t ha^{-1} with inorganic fertilizer treatment 160 kg ha^{-1} (0.03 mg cm^{-2} day^{-1}), but not significantly different from fertilizer treatment chicken coop 10 t ha^{-1} with inorganic fertilizer treatment of 120, 200 and 240 kg ha^{-1}. Shallots treated with chicken manure 20 t ha^{-1} with inorganic fertilizer treatment 160 kg ha-1 (0.32 mg cm^{-2} day^{-1}) can increase the plant growth rate by 50.00% when compared to the combination of fertilizer treatments sometimes chicken 20 t ha^{-1} with inorganic fertilizer treatment 200 kg ha^{-1} (0.16 mg cm^{-2} day^{-1}), but in inorganic fertilizer treatment 160 kg ha^{-1} showed no significant difference in the combination treatment of 20 t chicken manure ha^{-1} with the treatment of 120, 160, 240 and 280 kg ha^{-1} inorganic fertilizers. The treatment of manure 10 t ha^{-1} and inorganic fertilizer 160 kg ha-1 gave the highest value at the age of observation 28-14 DAP. The plant growth rate is the accumulation of plant dry matter per unit time. Plant dry matter is an illustration of the translocation of photosynthetic results (photosynthate) to all parts of the plant. (Gardner, et al. 2008; Oyewole et al., 2014; Al-Fraihat, 2016; Zewde et al., 2018). The rate of plant growth during growth is never constant (varies) even in a relatively short period of time, but always changes continuously with time due to fluctuations in environmental changes. Plant growth rate is a description of biomass production in a certain time range. The biomass is obtained mostly from photosynthesis, namely carbohydrates produced by plants during their lifetime or for a certain period and are used to form parts of plant organs (Sitompul, 2015). According to Madhu and Hatfield (2016), the ability of plant leaf area to intercept solar radiation energy and the rate of photosynthesis are factors that determine PGR (plant growth rate).

The results of the analysis of variance showed that there was no interaction between the dose of chicken manure and the dose of inorganic fertilizer on plant growth rate parameters at the observational ages of 42-28 and 56-42 DAP. However, separately, the dose of chicken manure had a significant effect on the plant growth rate for the observational age period 42-28, and had no significant effect on the observed age period 56-42 DAP, and the dose of inorganic fertilizer had no significant effect on the observed age period 42-28 and 56-42 DAP. The average plant growth rate (LPT) of shallot plants at plant age is presented in table 6.

Table 6. Average Plant Growth Rate (PGR) of Angry Onion Plants Due to Dosage Treatment of Chicken Manure and Inorganic Fertilizer Doses at Plant Age 42-28 and 56-42 DAP

Treatment	Plant Growth Rate (mg,cm^{-2}, day^{-1}) at the age of-(dap)	
	42-28	56-42
Dosage of Chicken Manure		
K0	0,52 a	0,71
K10	0,75 b	0,69
K20	0,78 b	0,75
BNT 5%	**0,10**	**Ns**
Dosage of Inorganic Fertilizer		
N120	0,63	0,70
N160	0,64	0,71
N200	0,69	0,69
N240	0,74	0,75
N280	0,72	0,73
BNT 5%	**ns**	**ns**
CV (%)	**19,47**	**23,79**

Note: Numbers followed by the same letter in the same column and treatment are not significantly different based on the LSD test at 5% level, DAP = days after planting, CV = coefficient of variation, ns = no significant effect

At the age of observation 42 – 28 DAP, it showed that the treatment of chicken manure 10 and 20 t ha^{-1} resulted in a significantly higher plant growth rate of 30.67% and 33.33% when compared to the treatment without chicken manure or 0 t ha^{-1}. (Addai *et al*., 2014; Surawijaya *et al.*, 2019; Tripatmasari *et al*., 2021). Also stated that vegetative growth, especially good leaf growth also affects tuber growth, because leaves help plants for photosynthesis so that the assimilate results from photosynthesis in the form of carbohydrates are distributed to the tubers of plants.

f. Results

The results of the analysis of variance showed that there was no interaction between the dose of chicken manure and the dose of inorganic fertilizer on the parameters of the number of tubers (tuber clump^{-1}), wet root weight (g), dry tuber weight (g), dry tuber weight per clump (g), dry weight (sun) of tubers (kg m^2) and yield (ton ha^{-1}). Differences in the dose of chicken manure and inorganic fertilizer doses on yield components are presented in Tables 7 and 8.

Table 7. Average Weight of Wet Burnt, Weight of Dry Burnt and Weight of Dry Bulbs at Various Doses of Chicken Manure and Inorganic Fertilizer Doses

Treatment	Yield Components							
	Number of Bulbs (tuber clump^{-1})		Wet Weight (g clump^{-1})		Dry Weight (g clump^{-1})		Bulb Weight sun dry (g clump^{-1})	
Dosage of Chicken Manure								
K0	8,00		40,98	a	31,62	a	29,93	a
K10	8,09		45,79	b	34,97	b	32,57	a
K20	8,35		52,01	c	39,52	c	37,45	b
BNT 5%	tn		3,89		2,52		4,06	
Dosage of Inorganic Fertilizer								
N120	7,61	a	43,54		32,55	a	30,85	
N160	8,05	ab	45,05		34,25	ab	31,75	
N200	7,74	a	47,10		35,41	ab	33,50	
N240	8,66	b	47,95		37,47	b	36,30	
N280	8,67	b	47,65		37,15	b	34,16	
BNT 5%	0,85		tn		3,25		tn	
KV (%)	10,80		11,25		9,53		16,31	

Note: Numbers followed by the same letter in the same column and treatment are not significantly different based on the LSD test at 5% level, DAP = days after planting, CV = coefficient of variation, ns = no significant effect

Table 7. Observing the number of tubers (tuber clump^{-1}), shows that the inorganic fertilizer treatment of 280 kg ha^{-1} resulted in the number of tubers (tuber clump^{-1}) which was significantly greater by 10.73% and 12.23% when compared with inorganic fertilizer treatment of 200 kg ha^{-1} and inorganic treatment of 120 kg ha^{-1}, but not significantly different from the treatment of inorganic fertilizers 240 kg ha^{-1} and 160 kg ha^{-1}. Observation of the dry plant weight of shallots

showed that the inorganic fertilizer treatment of 240 and 280 kg ha^{-1} resulted in a significantly higher plant dry weight of 13.13% and 12.38% when compared to the inorganic fertilizer treatment of 10 t ha^{-1} and inorganic fertilizer treatment of 120 kg ha^{-1}, but not significantly different from the inorganic fertilizer treatment of 160 and 200 kg ha^{-1}. In the observation of plant fresh weight, it showed that the treatment of chicken manure 20 t ha^{-1} resulted in a significantly higher plant fresh weight of 11.96% and 21.21% when compared to the treatment of chicken manure 10 t ha^{-1}. and treatment of chicken manure 0 t ha^{-1}, but the treatment of chicken manure 10 t ha^{-1} resulted in a plant fresh weight that was significantly greater by 10.50% when compared to the treatment without chicken manure or 0 t ha^{-1}. Research Jazilah et al,. (2007) chicken manure increased tuber fresh weight per clump, tuber fresh weight per clump and tuber volume. Thus, the addition of organic matter is needed so that the soil's ability can be maintained or even increased to support efforts to increase plant productivity through the efficient use of inorganic/chemical fertilizers (Barus, 2011). The observation of plant dry weight showed that the treatment of chicken manure 20 t ha^{-1} resulted in significantly higher plant dry weight of 11.51% and 19.99% when compared to the treatment of chicken manure 10 t ha^{-1} and chicken manure treatment 0 t ha^{-1}, but the chicken manure treatment 10 t ha^{-1} resulted in a significantly greater dry plant weight of 9.58% when compared to treatment without chicken manure or 0 t ha^{-1}. Then the dry tuber weight treatment per clump showed that the 20 t ha^{-1} chicken manure treatment resulted in significantly higher dry tuber weight per clump by 13.03% and 20.08% when compared to the 10 t ha^{-1} chicken manure treatment. 1 and without chicken manure or 0 t ha^{-1}.

The results of the analysis of variance showed that there was no interaction between the dose of chicken manure and the dose of inorganic fertilizer on the dry weight (sun) of tubers (kg m^2) and yield (t ha^{-1}). The differences in the treatment of chicken manure doses and inorganic fertilizer doses on yield components are presented in Table 8.

Table 8. Average Dry Weight (Sun) of Bulbs (kg m^2) and Yield (t ha^{-1}) at Dosage of Chicken Manure and Dosage of Inorganic Fertilizer (nitrogen) 1147

Treatment	Yield Component	
	Dry Weight (Sun) Bulbs (kg m^2)	Yield (t ha^{-1})
Dosage of Chicken Manure		
K0	0,75 a	5,29 a
K10	0,82 a	5,85 a
K20	0,94 b	6,61 b
BNT 5%	**0,10**	**0,67**
Dosage of Inorganic Fertilizer		
N120	0,77	5,55
N160	0,80	5,71
N200	0,84	6,03
N240	0,91	6,36
N280	0,86	5,92
BNT 5%	**ns**	**ns**
CV (%)	**16,31**	**15,20**

Note: Numbers followed by the same letter in the same column and treatment are not significantly different based on the LSD test at 5% level, DAP = days after planting, CV = coefficient of variation, ns = no significant effect

In table 8. Observation of dry weight (sun) of tubers, shows that the treatment of chicken manure 20 t ha^{-1} resulted in dry weight (sun) of tubers which were significantly higher by 12, 76% and 20, 21% when compared to the manure treatment. Chickens 10 t ha^{-1} and chicken manure treatment 0 t ha^{-1}. Furthermore, the observation of harvest yields (t ha^{-1}) showed that the treatment of chicken manure 20 t ha^{-1} produced yields (t ha^{-1}) which were significantly higher by 11.50% and 19.96% when compared to the fertilizer treatment chicken coop 10 t ha^{-1} and treatment without chicken manure or 0 t ha^{-1}. The results showed that the application of chicken manure on the yield of

shallots had a significant effect or increased the yield component as shown in the harvest components, both fresh root weight per clump (g), dry root weight per clump (g), and dry tuber weight per clump. (g), dry weight (sun) of tubers (kg m^2) and yield (t ha^{-1}), which in the treatment of chicken manure the dose of chicken manure was increased the more it gave a significant effect on crop yields. This is presumably due to the content of organic matter in the soil. Organic matter has environmental carrying capacity which is suitable for chicken manure. Liu et al., (2010) stated that the application of organic matter to the soil not only increases the availability of nutrients for plants but also affects the development of microorganisms in the soil. Sitompul et al., (2017) said that the application of 20 tons ha^{-1} of chicken manure with 200 kg ha^{-1} of KCl fertilizer on shallots was better than other treatments because it produced tubers fresh weight (373.5 g m^{-2}) and dry weight tubers (314.4 g m^{-2}). The results of tuber dry weight per harvest plot and yield per hectare did not show any difference in the observation parameters of tuber dry weight per harvest plot and indicated a difference in the parameters of harvest yield per hectare, namely between inorganic fertilizer treatment and inorganic fertilizer treatment 240 kg ha^{-1} and 280 kg ha^{-1} given to shallot plants. According to Deden (2016), the best was obtained at a dose of 80 N kg ha^{-1} (206 N kg ha^{-1} of fertilizer) for both the Katumi and Bima varieties, with a dry tuber weight of 4.58 kg/plot or equivalent to 9. 16 t ha^{-1} and 4.52 kg/plot or the equivalent of 9.08 t ha^{-1}. The application of ZA 20 kg ha^{-1} fertilizer resulted in a fresh weight of harvested tubers of 2144.83 g m^2, a dry weight of harvested tubers of 1678.70 g m^2 and a total dry weight of 1711.53 g m^2 (Halifah, *et a*l 2014). In line with the research of Nori *et al*., (2012) said that the administration of ammonium sulfate at a dose of 200 kg N ha^{-1} gave a yield of 17,050 kg ha^{-1} and was higher when compared to the administration of urea fertilizer at the same dose.

g. Conclusion

Chicken manure 20 t ha^{-1} and inorganic fertilizer (Nitrogen) with a dose of 160 kg t ha^{-1} increased the plant growth rate (PGR) aged 28-14 DAP by 90.62% compared to chicken manure 10 t ha^{-1} and inorganic fertilizer (Nitrogen) with a dose of 160 kg t ha^{-1}.

1. Chicken manure significantly increased plant length at 42 and 56 DAP, plant dry weight at 42 and 56 DAP, fresh root weight per clump (g), dry root weight per clump (g), and tuber dry weight per clump. Clumps (g), dry weight (sun) of tubers (kg m^2) and yield (ton ha^{-1}), but had no effect on the growth components of shallot plants at the beginning of the observation.
2. Inorganic fertilizers significantly increased the growth components, namely plant length, number of leaves, number of tillers, dry weight of plants at the end of observation and dry weight (g $clumps^{-1}$) of shallot harvest.

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