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APLIKASI PUPUK KANDANG DAN BIOURINE SAPI TERHADAP PERTUMBUHAN DAN HASIL BAWANG MERAH (*Allium ascalonicum L.)*

The Cow Bio urine and Manures Application Growth and Yield of Shallots (*Allium ascalonicum* L.)

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ABSTRACT

This study aims to determine the optimal dose of cow manure and cow biourine concentration for the growth and yield of shallots on ultisol soils. The research was carried out from August to October 2019 in Pekik Nyaring Village, Pondok Kelapa District, Central Bengkulu Regency, Bengkulu City with an altitude of ± 5 meters above sea level (masl). The design used in this study was a completely randomized design (CRD) with two factors and three replications. The first factor was Cow Biourine, which consisted of five (5) concentration levels, namely M0 : 0% (0 ml), M1 : 5% (50 ml), M2 : 10% (100 ml), M3 : 15% (150 ml), and M4 : 20% (200 ml). The second factor is Cow Manure which consists of four (4) dose levels, namely P0 : 0 ton/ha (0 g/polybag), P1 : 10 ton/ha (41.6 g/polybag), P2 : 20 ton/ha (83 g/polybag), and P3 : 30 tons/ha (125 g/polybag). Observational data used Analysis of Variance (ANOVA) at 5% level. The results of the F test which showed a significant effect were further tested using Orthogonal Polynomials. The results showed that the concentration of cow biourine with cow manure affected the height of shallots in Ultisol. The concentration has not been obtained. Cow biourine and the optimum dose of cow manure to increase the growth and yield of shallots in Ultisol. The dose of cow manure 30 tons/ha increased plant height, tuber weight, tuber diameter and root length of shallots in Ultisol.

Keyword: Shallots, Ultisol, Biourine, Cow Manure

ABSTRAK

Tujuan penelitian ini adalah menemukan dosis optimal pupuk kandang sapi dan konsentrasi biourin sapi untuk pertumbuhan dan hasil bawang merah di tanah ultisol. Penelitian dilaksanakan pada bulan Agustus sampai Oktober 2019 di Desa Pekik Nyaring, Kecamatan Pondok Kelapa, Kabupaten Bengkulu Tengah, Kota Bengkulu dengan ketinggian tempat ± 5 meter diatas permukaan laut. Rancangan yang digunakan dalam penelitian ini adalah Rancangan Acak Lengkap dengan dua faktor dan tiga ulangan. Faktor pertama yaitu Biourine Sapi, yang terdiri atas lima (5) taraf konsentrasi yaitu M0 :0%, M1 : 5%, M2 : 10%, M3 : 15%, dan M4 : 20%. Faktor kedua yaitu Pupuk Kandang Sapi yang terdiri atas empat (4) taraf dosis yaitu P0 : 0 ton/ha (0 g/polybag), P1 : 10 ton/ha, P2 : 20 ton/ha, dan P3 : 30 ton/ha. Hasil penelitian menunjukkan pemberian konsentrasi biourine sapi dengan pupuk kandang sapi mempengaruhi terhadap tinggi tanaman bawang merah di Ultisol. Belum diperoleh

konsentrasi biourine sapi dan dosis pupuk kandang sapi yang optimum guna meningkatkan pertumbuhan dan hasil bawang merah di Ultisol. Pemberian dosis pupuk kandang sapi 30 ton/ha meningkatkan tinggi tanaman, berat umbi, diameter umbi dan panjang akar bawang merah di Ultisol.

Kata kunci: *Bawang Merah, Ultisol, Biourine, Pupuk Kandang Sapi*

INTRODUCTION

Shallots (*Allium ascalonicum* L.) is one of the most widely developed horticultural commodities in Indonesia because it has uses as a cooking spice for various processed foods and is also efficacious as traditional medicine to treat wounds or infections and improve digestion. In addition to high economic value, shallots are one of the types of vegetables that contribute to inflation, given the very fluctuating price and increasing demand from time to time (Rukmana, 1994).

The technology that can be applied to improve the cultivation of shallots on Ultisol soil is fertilization with organic matter. Fertilizer is a major source of nutrients for plants. Organic fertilizers can overcome the negative impact of using inorganic fertilizers. There are two kinds of organic fertilizers derived from animal waste, namely solid organic fertilizers and liquid organic fertilizers (Rizki et al., 2014). The advantage of liquid organic fertilizer is that the nutrients contained in it are more easily absorbed by plants. Liquid organic fertilizer is a solution resulting from the decay of organic materials, both from plant residues and animal waste. Organic matter contains more than one element, does not damage the soil and can be used as often as possible (Lingga and Marsono, 2013). The use of solid organic fertilizer aims to add nutrients, although it takes a longer time to be available to plants (Nasution et al., 2014). So that the combination of liquid organic fertilizer and solid organic fertilizer can increase the yield of shallots.

Utilization of cow manure and cow urine as organic materials used in fertilizing shallots can improve the physical and chemical properties of the soil. The existence of livestock owned by farmers if left alone will pollute the environment. Biourine is organic plant fertilizer derived from anaerobic fermentation of fresh cow urine and feces with additional nutrients using nitrogen-fixing microbes and other decomposer microbes. Cow urine contains N, P, K, and auxins which are very important for plant growth and development (Wati, et al., 2014). So it is beneficial for the vegetative growth of plants. Hidayati et al. (2011) study, stated that the nutrient content of cow feces that had been processed into liquid fertilizer had a N content of 0.44%, P2O5 0.53% and K2O 1.04%.

Several studies have used cow biourine as organic fertilizer combined with solid organic fertilizer to increase crop yields. The combination of solid organic fertilizer and liquid organic fertilizer (RB 5 t ha-1 + 7500 l ha-1 cow urine, 20% concentration) gave the highest shallot production of 10.37 tonha-1 or an increase of 60.77% compared to no organic fertilizer (Adijaya, 2010). The results of Hariadi's research (2011) showed that the application of a dose of cow urine 1,200 ml-1 was the best treatment for rosella plant height at the age of 13 weeks which was 59.47 cm compared to 1,600 ml-1 treatment which was 59.15 cm and the control treatment was 54.47 cm.

The purpose of this study was to determine the interaction of cow biourine concentration with a dose of cow manure on the growth and yield of shallots, determine the optimum concentration of cow biourine on the growth and yield of shallots and determine the optimum dose of cow manure on the growth and yield of shallots in Ultisol.

RESEARCH METHODS

This research was carried out from August to October 2020 at Pekik Nyaring Village, Pondok Kelapa District, Central Bengkulu Regency, Bengkulu Province with an altitude of ± 5 meters above sea level.

The materials used in this study were shallot seeds of Bima Brebes variety, cow urine, manure, fungicide active ingredient mankozeb 80%, EM – 4, brown sugar, coconut water. The design used in this study was a completely randomized design arranged in a factorial manner. The first factor is the concentration of cow biourine (M), which consists of five (5) levels of concentration which can be seen in: M0:0%, M1:5%, M2:10%

M3 :15%, M4 :20%. The second factor is the application of cow manure (P) used, which consists of four (4) dose levels which can be seen in: Po: 0 tons/ha, P1: 10 tons/ha, P2: 20 tons/ha, P3 : 30 tons/ha. The two treatments used obtained 20 treatment combinations, each treatment was repeated 3 times so that 60 experimental units were obtained where each plant would have one spare plant so that there would be 120 polybags.

The research stage is an analysis of the water content of cow manure by baking the existing cow manure and then calculating the water content by dividing the wet weight by dry weight divided by 100% so that the treatment given is the amount of organic matter according to the predetermined dose. Making biourine through fermentation of fresh cow urine is mixing 20 l of cow urine, 100 ml of EM-4, 200 g of brown sugar, 4 liters of coconut water into a vat/jerry and covered for 21 days. After 21 days of fermentation of liquid organic fertilizer, analysis was carried out, N, P, K and C. Preparation of planting media used in this study was a mixture of Ultisol soil, manure, and basic fertilizer. The application of cow manure and basic fertilizer is carried out at the time of planting. Ultisol soil is filled into polybags with a size of 10 kg dry weight intact. With a distance between polybags 15 cm.

Variable measured were plant height (cm), number of leaves in the clump (strands), number of tubers in the clump (tubers), tuber diameter (mm), wet weight of tubers per clump (g), root length (cm), root wet weight (g) . The supporting variables in this study were ultisol soil analysis and cow biourine. The analysis carried out included soil pH, C-organic content, N content, P content and K content. Data on rainfall, air humidity, air temperature and duration of sunlight during the study were obtained from the BMKG class I station on Baai Island Bengkulu. The data obtained were analyzed statistically by Analysis of Variance (ANAVA) using the 5% F test. The results of the F test which showed a significant effect were further tested using Orthogonal Polynomials.

RESULTS AND DISCUSSION

This research was conducted from August to October 2019 in Pekik Nyaring Village, Pondok Kelapa District, Central Bengkulu Regency, Bengkulu Province with an altitude of ± 5 meters above sea level (m asl). Initial soil analysis, cow biourine and cow manure moisture content were carried out at the Soil Science Laboratory, Faculty of Agriculture, Bengkulu University (UNIB) with the results presented in Table 1. Results of initial soil analysis and cow biourine.

Table 1. Results of preliminary soil and cow biourine analysis

Characteristics	Soil		Biourine	
	Value	Criteria	Value	Criteria
N (%)	0,240	moderate	0,49	Low
P (ppm)	1,72	low	0,18	Low
K (me/100)	0,190	low	0,62	Low
C (%)	2,90	moderate	4,19	Low
pH Ultisol	4,76	acid	-	-

Data obtained at the Class 1 Meteorology, Climatology and Geophysics Station on Baai Island Bengkulu 2019, shows that monthly rainfall is 0.12 mm, 0.3 mm, and 3.12 mm (Appendix 6), respectively. 82.09%, 82.5%, and 86.03% (Appendix 6), the monthly air temperature is 26.09oC, 26.17oC, and 26.10oC (Appendix 6), and the duration of monthly solar radiation is respectively participated in 78.67%, 87.63%, and 68% (Appendix 6). The pH of the soil during the study was 4.76 (acidic) and did not do liming, while a good pH for the cultivation of shallots was 5.5 – 7.2. Shallots

require maximum sunlight (at least 70% irradiation), air temperature of 25 – 32°C, and relative humidity of 50 – 70% (Sutarya and Grubben 1995).

In general, the growth of shallots a week after planting, the growth power reached 90% and the dead seedlings were replanted. In the second week after planting, the shallot plants grew well. After the fourth week, several shallot plants were attacked by Fusarium disease with symptoms such as drooping and suddenly wilting of the leaves and yellowing of the shallots, rotting of the roots and tubers of the shallot plants. Control of plant-disturbing organisms is carried out by removing plants affected by Fusarium disease and spraying using fungicides with the active ingredients of Mefenoxam 4% and Mankozeb 64% with a dose of 3g/liter of water.

The summary of the results of the analysis of variance for the combination of cow biourine and cow manure on vegetative growth variables (plant height and number of leaves), as well as yield components (number of tubers, tuber weight, tuber diameter, tuber length and root weight) is presented in Table 2.

Table 2. Data from the analysis of variance for all variables

No	Variable	Calculated F value 5%			Coefficient diversity (%)
		Cow Biourine	Manures	Interaction	
1	Plant height	1.47^{ns}	33.66*	2.00*	7.62
2	Number of Leaves	1.13^{ns}	2.45^{ns}	0.96^{ns}	23.53
3	Number of Bulbs	2.51^{ns}	2.28^{ns}	1.83^{ns}	21.69
4	Bulb Weight	0.15^{ns}	7.19*	1.22^{ns}	29.33^{t}
5	Bulb Diameter	1.96^{ns}	21.93*	1.89^{ns}	17.49
6	Root Length	0.35^{ns}	10.70*	1.12^{ns}	25.17^{t}
7	Root Weight	1.51^{ns}	1.90^{ns}	1.33^{ns}	14.24^{t}

Notes: (ns) does not have a significant effect, (*) has a significant effect, and (t) data is transformed

The results of the analysis of variance on all observed variables showed that the administration of cow biourine had no significant effect on all observed variables. Manure application had a significant effect on the variables of plant height, tuber weight, tuber diameter, and root length. The interaction between cow urine and manure treatments had a significant effect on plant height. The coefficient of diversity (KK) for the observed variables ranged from 7.62 to 29.33%. The coefficient of diversity is a measure used to compare the level of variability of data observation values with the level of variability of other data observation values (Murray and Larry, 2007). The results of data analysis showed that the coefficient of variation for the mass of tubers was 45.64%, root length was 31.91% and root weight was 32.99% which had not been transformed. For these observation variables, after being transformed into tuber weight 29.33%, root length 25.17%, and root weight 14.24%. The application of cow biourine and cow manure did not significantly affect the number of leaves, number of tubers, tuber weight, tuber diameter, root length and root weight (Table 2).

Based on Table 3, the average results of the interaction of cow biourine with cow manure on the growth and yield of shallots had a significant effect on plant height and no significant effect on the number of leaves, number of tubers, tuber weight, tuber diameter, root length and root weight. . The 150 ml biourine concentration treatment with a dose of 30 tons ha-1 of manure was the best treatment for plant height (28.33 cm), number of leaves (17.00 strands), tuber weight (4.08 g), tuber diameter (19 .41 mm) and root length (3.43 cm) and had the lowest values for the number of tubers (4.33 bulbs) and root weight (1.09 g). This is in line with the research of Wati et al. (2014) stated that the application of

1000 liter ha-1 cow biourine can increase plant height, number of leaves, number of bulbs and yield of shallots and research by Supriadi et al. (2017) stated that the combination of giving 30 tons ha-1 of cow manure with inorganic fertilizers can increase the growth and yield of shallots.

Based on the research conducted that there is an interaction between the concentration of cow biourine and the dose of cow manure given to plant height (Table 2). Polynomial Orthogonal regression analysis showed that, the response to shallot plant height to the application of cow biourine concentration and cow manure dose of 0 tons/ha formed a linear curve pattern with the equation y = -0.005x + 20.467 with a coefficient of determination R2 = 0.0389.

Table 3. Interaction Effect of Cattle Biourine Application with Manure on growth and yield of shallots

Biourine (ml)	manures (ton/ha)	Plant height (cm)	Leaf numbers	Bulb numbers	Bulb weight (g)	Bulb diamter (mm)	Root length (cm)	Root weight (g)
0	0	20,83	11,17	8,67	1,72	8,55	1,47	0,95
50	0	19,83	12,00	7,00	2,05	9,39	1,78	0,96
100	0	20,50	11,50	7,33	1,98	8,20	1,68	1,13
150	0	18,33	10,67	5,67	1,72	8,66	1,88	0,97
200	0	20,33	12,67	6,00	2,61	9,87	2,62	1,08
0	10	24,50	11,17	5,67	2,28	12,74	1,99	1,04
50	10	22,67	15,33	8,83	3,69	11,93	2,80	1,28
100	10	23,17	13,33	7,17	2,77	11,10	2,63	1,21
150	10	25,50	15,00	7,33	2,85	11,07	2,61	0,94
200	10	20,50	12,67	5,50	2,45	9,72	2,87	1,21
0	20	25,33	15,50	7,00	3,66	12,45	3,41	1,29
50	20	24,00	11,67	6,67	2,51	11,56	2,86	1,00
100	20	22,83	13,00	6,83	3,35	12,18	3,28	1,17
150	20	24,17	16,33	6,50	3,18	14,00	2,67	1,05
200	20	25,83	16,17	7,00	3,25	14,34	3,18	1,16
0	30	26,17	10,67	6,00	3,38	13,44	3,21	1,10
50	30	26,33	13,33	5,33	3,26	16,05	3,41	1,15
100	30	24,33	15,17	8,17	2,83	12,23	2,75	1,16
150	30	28,33	17,00	4,33	4,08	19,41	3,43	1,09
200	30	26,67	13,83	5,00	2,82	13,63	2,59	0,97

When given the concentration of cow biourine and a dose of 10 tons/ha of cow manure, it formed a linear curve pattern with the equation y = -0.0103x + 24.3 with the coefficient of determination R2 = 0.1162. When given the concentration of cow biourine and a dose of 20 tons/ha of cow manure, it formed a quadratic curve following the equation y = 0.0002x2 - 0.0462x + 25,414 with a coefficient of determination R^2 = 0.3882. The minimum concentration of cow biourine was 115.5 ml and the dose of manure was 20 tons/ha with a plant height of 22.74 cm. The concentration of 200 ml cow biourine with a dose of 20 tons/ha of cow manure for shallot plant height reached 24,174 cm. When given the concentration of cow biourine and a dose of 30 tons/ha of cow manure, it formed a linear curve pattern with the equation y = 0.006x + 25.767 with a coefficient of determination R2 = 0.0405. The higher the concentration of 200 ml cow biourine with cow manure 20 tons/ha and 30 tons/ha can increase onion plant height. It is suspected that the nutrients have not been decomposed properly so that the nutrients cannot be absorbed by plants. Allegedly other factors that affect the height of shallot plants, namely the relatively low rainfall (dry season) and acidic soil pH (4.76) can affect the growth of shallot plants so that it is not optimal. Giving the concentration of cow biourine during the dry season and full exposure time can accelerate the evaporation of the biourine itself. Triatmojo et al. (2016) stated that in addition to liquid organic fertilizer, it has more macro-

environment than solid manure, growth-stimulating substances are used as growth regulators and have a distinctive smell of livestock urine which can prevent the arrival of plant pests. Liquid fertilizers also have a disadvantage when compared to solid fertilizers, namely they evaporate faster.

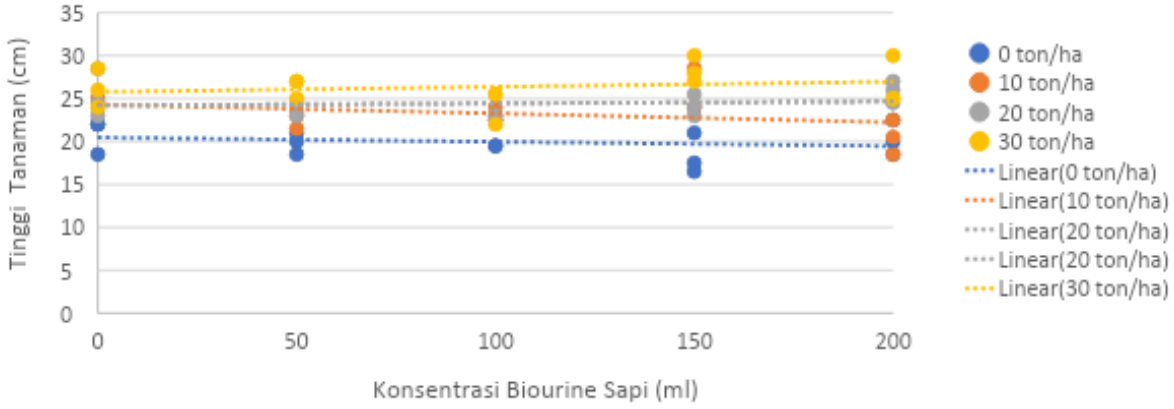

Figure 1. Interaction between cow biourine concentration and cow manure dose and its effect on shallot plant height

The Effect of Application of Beef Biourine Concentration on the Growth and Yield of Shallots. Giving cow biourine did not significantly affect all variables including plant height, number of leaves, number of tubers, tuber weight, tuber diameter, root length and root weight (Table 2) of the five concentrations (M0, M1, M2, M3 and M4).

Table 4. Effect of application of bovine biourine concentration on growth and yield of shallots

Biourine (ml)	Plant height (cm)	Leaf numbers	Bulb numbers	Bulb weight (g)	Bulb diamter (mm)	Root length (cm)	Root weight (g)
M0 = 0	24,21	12,13	6,83	2,76	11,80	2,52	1,09
M1 = 50	23,21	13,08	6,96	2,88	12,23	2,71	1,10
M2 = 100	22,71	13,25	7,38	2,73	10,93	2,59	1,17
M3 = 150	24,08	14,75	5,96	2,96	13,28	2,65	1,01
M4 = 200	23,33	13,83	5,88	2,78	11,89	2,82	1,11

Based on Table 4, the average results of the effect of bovine biourine concentration on the growth and yield of shallots did not have a significant effect on all observed variables. The M0 treatment plant height gave the highest value with a figure of 24.21 cm and the lowest value was produced by the M2 treatment with a value of 22.71 cm so that the average plant height was 23.51 cm and did not approach the description achievement of 25-44 cm. The number of leaves in the M3 treatment gave the highest value with a value of 14.75 strands and the lowest value was produced by the M0 treatment with a value of 12.13 strands so that the average for the number of leaves was 13.41 strands and was not close to the description achievement, namely 14-50 strands. The number of tubers in the M2 treatment gave the highest value with 7.38 bulbs and the lowest value was produced by the M4 treatment with a value of 5.88 bulbs so that the average number of bulbs was 6.60 bulbs. The diameter of the tubers in the M3 treatment gave the highest value with 13.28 mm and the lowest value was produced by the M0 treatment with a value of 11.80 mm so that the average tuber diameter was 12.02 mm. The wet weight of tubers in M3 treatment gave the highest tilapia with a value of 2.96 g and the lowest value was produced by M2 treatment with a value of 2.73 g so that the average tuber weight was 2.82 g and was not close to the description achievement of 9.9 tons/ Ha. The root length of the M4 treatment gave the highest value with a value of 2.82 cm and the lowest value was produced by the M0

treatment with a value of 2.52 cm so that the average root length was 2.66 cm. The wet weight of the roots of the M2 treatment gave the highest value with a value of 1.17 g and the lowest value was produced by the M3 treatment with a value of 1.01 g and the average root weight was 1.10 g.

Effect of Dosage Application of Cow Manure on Onion Growth and Yield

The application of cow manure has a significant effect on plant height (Table 2). The results of the orthogonal polynomial test of the relationship between cow manure dosage and onion plant height formed a linear relationship with the line equation y = 0.2037x + 20.4532 with the coefficient of determination R2 = 0.959. The highest plant height of shallot based on the curve was 26.56cm with a yield at a dose of 30 tons/ha. The coefficient of determination shows that the relationship between cow manure dose and shallot plant height can be explained at 95.9% (Fig. 2).

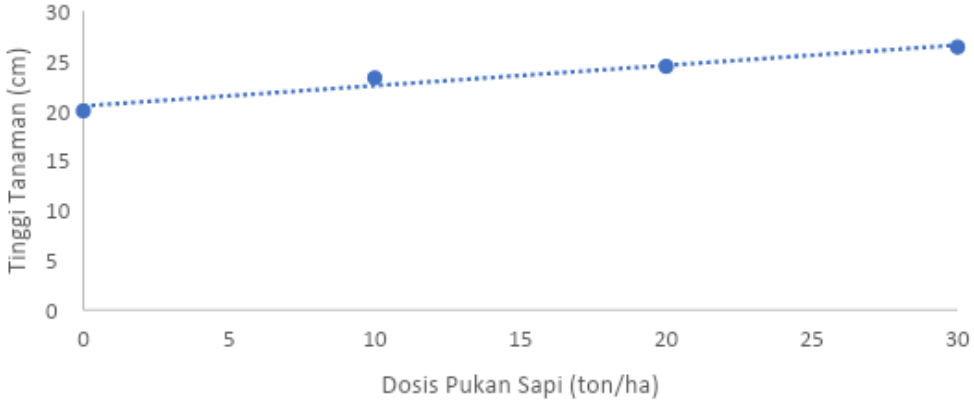

Figure 2. Relationship curve of cow manure dose to plant height

The results of this experiment show that the use of cow manure up to a dose of 30 tons/ha still shows an increase in plant height. Therefore, the optimum dose has not been found to get the maximum shallot plant height. It is suspected that up to a dose of 30 tons/ha plants shallots have not reached the maximum dose. The treatment of cow manure has a significant effect on the plant height of shallots seen at each application of various doses of cow manure, indicating that the growth of shallots increased in plant height.

Setiawan (2014) stated that the function of manure is to improve soil structure, provide a source of nutrients, increase the ability of the soil to hold water, and increase the ability of the soil to hold nutrients. Gardner et al. (1991) stated that nitrogen plays a role as an important constituent of plant substance, the optimal availability of nitrogen elements results in an increase in plant height. According to Afrilliani et al. (2017) stated that plant vegetative growth is strongly influenced by nitrogen supply, plants absorbing sufficient nitrogen will have good vegetative growth.

The application of cow manure had a significant effect on tuber weight (Table 2). The results of the orthogonal polynomial test of the relationship between the dose of cow manure and the weight of the onion bulbs formed a linear relationship with the line equation y = 0.0415x + 2.202 with the coefficient of determination R2 = 0.8723. The highest bulb weight of shallot based on the curve was 3.44 g with yield at a dose of 30 tons/ha. The coefficient of determination showed that the relationship between the dose of cow manure and the weight of shallot bulbs could be explained at 87.23% (Fig 3).

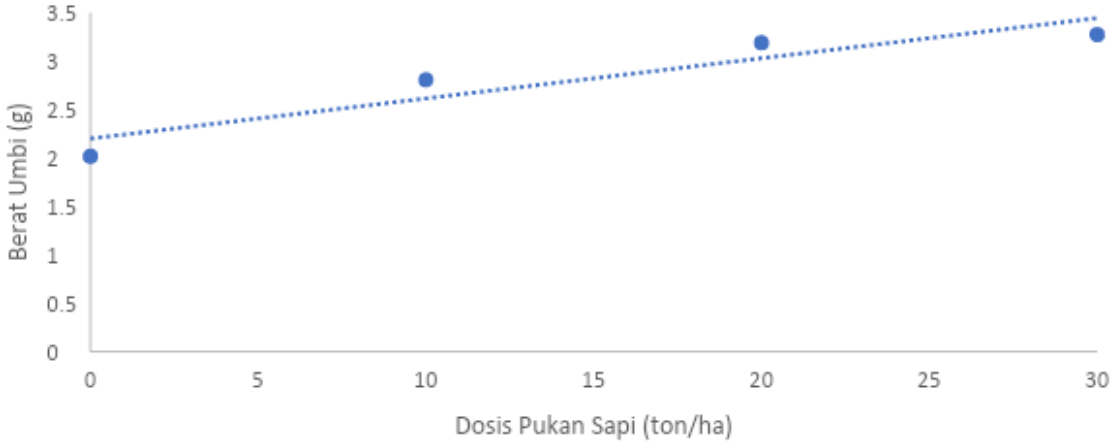

Figure 3. Relationship curve of cow manure dose to tuber weight

The results of this experiment showed that the use of cow manure up to a dose of 30 tons/ha still showed an increase in the weight of shallot bulbs. Therefore, the optimum dose has not been found to obtain the maximum tuber weight. It is suspected that up to a dose of 30 tons/ha plants shallots have not yet reached the maximum dose. The treatment of cow manure has a significant effect on the weight of the onion bulbs, it can be seen at each additional dose of cow manure there is an increase in the distance between the weight of the bulbs. Nutrients that are high enough to produce high tuber weight because of the role of roots that function to absorb nutrients from the soil to be translocated to all parts of the plant, so that it will affect the weight of the tubers produced (Supriyatna et al., 2016).

The application of cow manure had a significant effect on tuber diameter (Table 2). The results of the orthogonal polynomial test of the relationship between the dose of cow manure and the diameter of the onion bulbs formed a linear relationship with the line equation $y = 0.1965x + 9.0763$ with the coefficient of determination $R2 = 0.9947$. The highest diameter of shallot bulbs based on the curve was 14.97 mm with yields at a dose of 30 tons/ha. The coefficient of determination showed that the relationship between the dose of cow manure and the diameter of shallot bulbs could be explained at 99.47% (Fig 4).

The results of this experiment showed that the use of cow manure up to a dose of 30 tons/ha still showed an increase in the diameter of shallot bulbs. Therefore, the optimum dose has not been found to obtain the maximum tuber diameter. It is suspected that up to a dose of 30 tons/ha of shallot plants have not yet reached the maximum dose. The treatment of cow manure had a significant effect on the diameter of the onion bulbs, as seen at each addition of the dose of cow manure there was an increase in the distance between the diameter of the bulbs. The diameter of the tubers is related to the accumulation of photosynthetic results and water curing in plants so that the plant matter can absorb nutrients well from photosynthesis in the form of carbohydrates which will be accumulated in the generative part and in shallots the accumulation of carbohydrates produced is mostly used for tuber formation. Alfian et al. (2015) stated that the metabolic processes that occur in the plant body will run well if the nutrient needs are met so that it will increase the diameter of the onion bulbs.

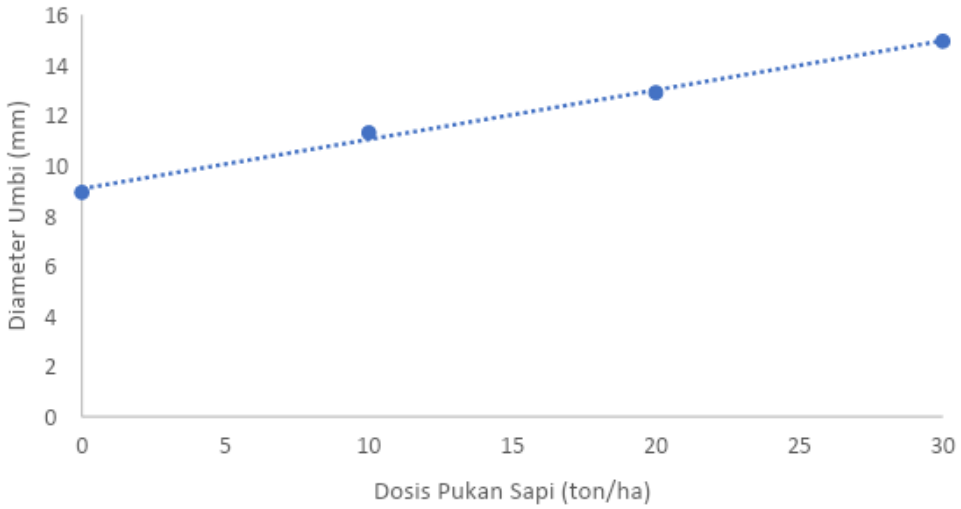

Figure 4. Relationship curve of cow manure dose to tuber diameter

Munawar (2011) states that plant growth and yield are closely related to the availability of nutrients absorbed by plants that are used in plant metabolic processes. With the increase in plant metabolic processes, it will have a positive impact on the formation of onion bulbs. The application of cow manure had a significant effect on root length (Table 2). The results of the polynomial orthogonal test of the relationship between the dose of cow manure and the root length of shallots formed a linear relationship with the line equation y = 0.0407x + 2.0456 with the coefficient of determination R2 = 0.8665 (Fig 5).

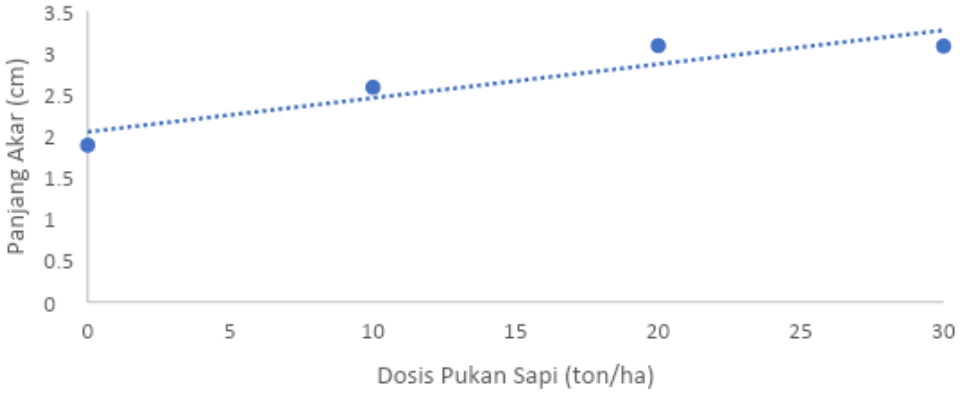

Figure 5. Relationship curve of cow manure dose to root length

The results of this experiment show that the use of cow manure up to a dose of 30 tons/ha still shows an increase in the root length of shallots. Therefore, the optimum dose has not been found to obtain the maximum root length. It is suspected that up to a dose of 30 tons/ha plants shallots have not reached the maximum dose. The treatment of cow manure has a significant effect on the root length of shallots seen at each addition of the dose of cow manure there is an increase in the distance of the increase in root length. According to Supriadi et al. (2017) Cow manure plays a role in improving soil physical properties so that infiltration, aeration, and percolation are getting better. This condition can increase the supply of oxygen for respiration and root growth due to good gas exchange, so that it can support the growth and development of shallots. Nuryani et al. (2019) states that fertilizer application must pay attention to the dose or dose that is in accordance with the needs of the plant. Fertilizing too little of the plant's needs will inhibit plant growth, while applying too much fertilizer from the requirement can cause the plant to die due to poisoning.

CONCLUSIONS

From the results of the study, it can be concluded that: Giving a concentration of cow biourine with cow manure increased the height of shallots and giving a concentration of 200 ml of biourine at a dose of 20 tons/ha and 30 tons/ha of cow manure could increase the height of shallots in Ultisol; The optimum concentration of cow biourine and cow manure dosage has not been obtained to increase the growth and yield of shallots in Ultisol; Dosage of cow manure 30 tons/ha increased plant height, tuber weight, tuber diameter and root length of shallots in Ultisol.

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