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EFFECT OF TOFU LIQUID WASTE LIQUID ORGANIC FERTILIZER CONCENTRATION WITH THE ADDITION OF EM_4 AND MOLASSES ON THE GROWTH AND RESULTS OF SHALLOT (*Allium ascalonicum* L.)

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ABSTRACT

Shallot (Allium ascalonicum L.) is an important horticultural crop to be developed. Efforts to increase shallot production by improving cultivation techniques and applying liquid organic fertilizer in the form of tofu liquid waste. The aim of the study was to determine the effect of adding EM4 and molasses, to determine the effect of concentration, and to determine the interaction effect of concentration of tofu liquid waste on the growth and yield of shallots. The design used is factorial RAK with two factors, the first factor is A0 (without EM4 and molasses), A1 (with EM4 and molasses), the second factor is K0 (control), K1 (21%), K2 (43%), K3 (65 %), and K4 (100%). The observed variables included total leaf length, number of leaves, number of tubers, total root length, tuber diameter, tuber fresh weight, tuber dry weight, plant fresh weight, and plant dry weight. The results of the study showed that the addition of EM4 and molasses had an effect on the growth of shallot yields, namely the total leaf length at ages 21.56, 70 and 77 dap and the total root length. Giving concentration of tofu liquid waste affected the growth of shallot yields at the number of leaves aged 56.63 , 70 and 77 dap, total leaf length aged 28 to 77 dap, tuber diameter, tuber fresh weight, and tuber dry weight. Interaction of concentration of tofu liquid waste addition of EM4 and molasses had no effect on shallot yield growth.

***Keywords**: Allium ascalonicum L, tofu liquid waste, reuse and cycle technology*

BACKGROUND

Shallot (*Allium ascalonicum* L.) is one of the important horticultural crops to be developed. Besides being used as a mixture of cooking spices, shallots are also used for medicine. In 2018 shallot production decreased by 30,751.8 tons, in 2019 it increased by 36,304 tons, then rose again in 2020 to 110,599.2 tons (Central Bureau of Statistics, 2021). According to Adiyoga (2020), the consumption of shallots by the Indonesian population averages 28.07 kg/capita/year. The demand for shallots will continue to increase every year in line with the increasing population and the development of the shallot industry. One effort to increase shallot production is by applying fertilizer in the form of liquid organic fertilizer tofu liquid waste. Fertilization is the act of providing additional nutrient elements to the soil complex, either directly or indirectly, can contribute food to plants (Afmerta, et al. 2019). The aim is to improve the level of

soil fertility so that plants get sufficient nutrients to increase the quality and quantity of plant growth (Aisyah, et al. 2008).

Processing of tofu liquid waste into liquid organic fertilizer needs to be added with EM4 and molasses so as to improve the quality of the fertilizer produced. According to Firmaniar (2017) if you only use tofu liquid waste fermentation, then the resulting liquid organic fertilizer will not produce maximum results for plants. Effective microorganisms (EM4) are bacteria that decompose organic matter which can maintain the stability of plant production. Meanwhile, molasses is a source of carbon and nitrogen for yeast which is obtained from the fermentation process (Firmaniar, 2017). According to Indriyati (2011), the anaerobic fermentation process is a waste treatment that is carried out by utilizing microorganisms to degrade organic matter in conditions where there is no or very little dissolved oxygen.

Based on this description, researchers wanted to know the effect of adding tofu liquid waste and EM4 as liquid organic fertilizer with different concentrations on plant growth and yield of shallots (Allium ascalonicum L.)

RESEARCH METHODS

This research began from March to August 2022 at Experimental Garden II, Faculty of Agriculture and Fisheries, Muhammadiyah University, Purwokerto and at the Soil Science Laboratory, Faculty of Agriculture, Jenderal Soedirman University.

Some of the tools used include a 20 liter jerry can, a 35 x 35 cm poly bag, a hoe, an anvil, a measuring cup, a ruler, a knife, a brown envelope, a shovel, a digital scale (Ohaus NV 222), an electric oven (BINDER ED 56), and caliper (Vernier Caliper 0-150 mm). The materials used included shallot seeds of the Bauji Nganjuk variety, tofu water waste obtained from a household industry in Kalisari Cilongok village, water, organic compost (SES), soil, EM4 and molasses obtained commercially.

This study used a factorial randomized block design (RBD) with 2 factors. The first factor is A (EM4 and molasses) with 2 levels (A0 = without the addition of EM4 and molasses; A1 = with the addition of 500 ml of EM4 and 500 ml of molasses) and the second factor is K (Concentration) with 5 levels (K0 = Control; K1 = 21%; K2 = 43%; K3 = 65%; K4 = 100%), so that 10 treatments were obtained. Each treatment was repeated 4 times, each repetition consisting of 3 samples.

The variables observed included total leaf length, number of tubers, number of leaves, total root length, tuber diameter, tuber fresh weight, tuber dry weight, plant fresh weight, plant dry weight. The data obtained were in the form of quantitative data which were analyzed using the DMRT level of 5% in the CoStat application (Statistical Software).

RESULTS AND DISCUSSION

Number of Leaves

Leaves are important plant organs, because leaves are the main place for the photosynthesis process to take place (Santoso, B. B. and Hariyadi, 2008). Based on Table 4.1, it shows that the treatment

with the addition of EM4 and molasses which was given at the age of 7 to 77 DAP did not show a significant difference. It is suspected that the nutrient requirements for the growth and development of various plants are not even the same and require different times. POC without the addition of EM4 and molasses and POC with the addition of EM4 and molasses have the same total N value of 0.07%, while the quality standard for liquid organic fertilizer is 0.40%, this amount indicates the total N content of tofu liquid waste. lower than the quality standards set in the National Standardization Agency (2004). Therefore, the application of POC tofu liquid waste has not been able to increase the number of leaves on shallot plants.

Table 4.1 The effect of applying organic fertilizer tofu liquid waste on the amount of Shallot Leaves (A Addition of EM4+Molasse (A)llium ascalonicum L.)

Treatment	**Number of Leaves (strands)**										
	7 hst	14 hst	21 hst	28 hst	35 hst	42 hst	49 hst	56 hst	63 hst	70 hst	77 hst
Addition of EM4+Molasse (A)											
A0	6.50	10.75	13.95	17.95	22.65	28.90	32.55	36.60	43.00	52.75	57.15
A1	6.30	9.90	12.10	16.15	19.30	25.65	29.95	31.50	37.40	45.55	49.35
	tn	tn	tn	tn	tn	tn	tn	tn	tn	tn	tn
Concentration of liquid organic fertilizer (K)											
K0 (0%)	6.62	10.87	15.12	19.12	23.50	30.37	33.75	40.12 a	43.25 ab	53.87 ab	55.12 ab
K1 (21%)	6.50	10.50	14.12	18.87	21.62	29.62	25.50	41.50 a	50.87 a	63.37 a	66.50 a
K2 (43%)	7.25	10.62	13.75	18.00	23.12	29.12	34.25	40.12 a	45.37 ab	55.25 ab	56.62 ab
K3 (65%)	5.75	10.25	11.25	15.75	20.62	23.87	26.25	27.62 b	35.12 bc	39.37 bc	45.62 b
K4 (100%)	5.87	9.37	10.87	13.50	16.00	23.37	27.50	20.87 b	26.37 c	33.87 c	42.37 b
	tn	tn	tn	tn	tn	tn	tn	*	*	*	*
A X K interactions											
A0K0	6.75	11.25	16.50	19.50	24.00	31.00	34.50	41.50	47.50	58.25	58.00
A0K1	6.50	10.50	14.75	19.00	22.25	32.00	36.25	43.50	52.00	66.25	70.50
A0K2	7.00	10.75	14.00	19.00	23.75	31.00	35.75	43.50	47.00	57.75	58.50
A0K3	6.00	11.25	12.75	18.25	27.50	27.00	30.00	32.25	42.50	45.25	52.75
A0K4	6.25	10.00	11.75	14.00	15.75	23.50	26.25	22.25	26.00	36.25	46.00
A1K0	6.50	10.50	13.75	18.75	23.00	29.75	33.00	38.75	39.00	49.50	52.25
A1K1	6.50	10.50	13.50	18.75	21.00	27.25	32.75	39.50	49.75	60.50	62.50
A1K2	7.50	10.50	13.50	17.00	22.50	27.25	32.75	36.75	43.75	52.75	54.75
A1K3	5.50	9.25	9.75	13.25	13.75	19.75	22.50	23.00	27.75	33.50	38.50
A1K4	5.50	8.75	10.00	13.00	16.25	24.25	28.75	19.50	26.75	31.50	38.75
	tn	tn	tn	tn	tn	tn	tn	tn	tn	tn	tn

The results of the analysis at the age of 56 to 77 DAP showed a significant difference with the treatment with a concentration of 21% POC tofu liquid waste. This is because with increasing age of the plant so that the need for plant nutrients also increases and not all of these can be met by the planting medium for plant growth. This is in accordance with the opinion of Mulyani Sutejo (2002) that the older the

plant, the more nutrients it needs to process its growth and development. The interaction between the addition of EM4 and molasses and POC concentration based on 5% DMRT analysis showed no significant difference at the age of 7 to 77 dap. This shows that the addition of EM4 and molasses and POC concentration did not affect the growth and yield of shallot plants.

The K1 concentration (21%) had the highest number of leaves compared to the K4 concentration (100%) which had the lowest number of leaves. It is suspected that giving a concentration of 21% POC tofu liquid waste can increase the number of leaves with sufficient nutrient content for the growth of shallot plants. In addition, the soil used has a high level of NPK nutrients. So that at a concentration of 100% POC, tofu liquid waste has the lowest number of leaves, this is in line with the research of Nuryani et al., (2019), that excessive or inappropriate fertilizer application results in a concentrated soil solution which in the end the plants are unable to absorb it.

Based on Table 4.2 it shows that the addition of EM4 and molasses at the age of 21, 56, 70 and 77 dap had a significant effect. It is suspected that A0 (pure waste) has a greater N content than A1 (tofu liquid waste with the addition of EM4 and molasses). This happens because the decomposition process in tofu liquid waste causes the microorganisms contained therein to develop properly. These microorganisms are the only organisms capable of decomposing organic matter in anerobic environments and also using molecules as hydrogen acceptors. While the treatment of giving EM4 and molasses at ages 7, 14, 28, 35, 42, and 63 was not significantly different. It is suspected that a deficiency or excess of nutrients given to plants results in the photosynthesis process not running effectively and the photosynthate produced is reduced, and causes the amount of photosynthate translocated to decrease. The results of the analysis from 7 to 21 HST showed no significant difference with the POC concentration treatment of tofu liquid waste.

Total Leaf Length

Table 4.2 The effect of applying liquid organic fertilizer tofu waste on the total length of shallot leaves (Allium ascalonicum L.)

Treatment	Total Leaf Length (cm)										
	7 hst	14 hst	21 hst	28 hst	35 hst	42 hst	49 hst	56 hst	63 hst	70 hst	77 hst
Addition of EM4+Molasse (A)											
A0	66.69	180.58	281.47 a	416.01	543.93	828.22	1018.38	1195.68 a	1429.62	1711.38 a	1862.81 a
A1	60.21	162.36	232.04 b	369.95	468.14	723.75	977.55	1014.46 b	1231.90	1448.18 b	1572.43 b
	tn	tn	*	tn	tn	tn	tn	*	tn	*	*
Concentration of liquid organic fertilizer (K)											
K0 (0%)	70.24	182.99	320.49	487.08 a	636.47 a	913.13 a	1144.64 a	1317.52 a	1561.02 a	1818.53 a	1806.29 ab
K1 (21%)	62.24	171.74	291.45	430.20 abc	567.85a	880.91 a	979.75 ab	1379.96 a	1675.26 a	2022.92 a	2160.36 a
K2 (43%)	68.33	176.03	261.87	439.28 ab	576.95 a	868.67 a	1168.48 a	1318.48 a	1496.42 a	1826.04 a	1849.56 ab
K3 (65%)	56.33	168.37	204.91	317.26 bc	396.06 b	612.32 b	850.71 b	879.29 b	1123.58 b	1248.62 b	1477.98 bc
K4 (100%)	60.12	158.20	205.08	291.08 c	352.85 b	604.90 b	846.23 b	630.11 b	797.54 b	982.81 b	1293.91 c
	tn	tn	tn	*	*	*	*	*	*	*	*
A X K interactions											
A0K0	72.08	189.08	348.33	500.99	656.16	919.12	1184.07	1353.7	1727.69	1983.83	1917.03
A0K1	58.83	174.49	300.82	417.24	578.37	926.82	843.31	1447.11	1725.43	2125.50	2312.59
A0K2	70.74	180.91	286.33	449.33	608.08	949.73	1223.54	1426.26	1532.90	1884.94	1894.90
A0K3	61.58	185.41	247.83	396.49	503.04	731.25	978.67	1052.32	1353.08	1463.27	1725.11
A0K4	70.24	172.99	224.07	315.99	373.99	614.19	862.29	699.02	809.00	1099.38	1464.44
A1K0	68.41	176.91	292.66	473.16	616.79	907.14	1105.21	1281.35	1394.35	1653.22	1695.55
A1K1	65.66	168.99	282.08	443.16	557.33	835	1116.18	1312.80	1625.08	1920.34	2008.13
A1K2	65.91	171.16	237.41	429.24	545.83	787.62	1113.42	1210.71	1459.93	1767.13	1804.22
A1K3	51.08	151.33	161.99	238.04	289.08	493.38	722.75	706.25	894.09	1033.98	1230.86
A1K4	49.99	143.41	186.08	266.16	331.70	595.61	830.17	561.20	786.07	866.23	1123.39
	tn	tn	tn	tn	tn	tn	tn	tn	tn	tn	tn

Hereas at the age of 28 to 77 HST it was significantly different. The higher the concentration of tofu waste liquid fertilizer given, the more nutrient content received by leek plants, but the addition of tofu waste concentration up to 1150 ml/l (K4) actually gave lower results compared to the addition treatment without tofu waste concentration. 0% ml/l (K0). This is probably due to the limited ability to absorb nutrients due to osmotic pressure. Nutrient concentrations that are too high will not be absorbed by the root tissue. The interaction between the addition of EM4 and molasses and POC concentration based on 5% DMRT analysis showed no significant difference at the age of 7 to 77 dap. Tofu liquid waste contains nitrogen nutrients which are needed by plants for plant height growth. Ruarika et al (2017) which states that using liquid organic fertilizer must pay attention to the dosage when applying it to plants. If the dosage is too high, the plants will wilt easily.

At the concentration of K1 treatment (21%) the growth of shallot plants gave the best results compared to the concentration of K4 (100%). In the K1 treatment, the content of both micro and macro nutrients needed by shallot plants had been fulfilled from the tofu liquid waste POC, which indicated that the growth in leaf length was the best

compared to the K4 treatment. This is because plants have different concentration limits for the amount of nutrient requirements. This is in accordance with the opinion of Munawar (2011) which states that the availability of sufficient nutrients in plants will result in overall vegetative growth including plant height.

Table 4.3 Effect of POC administration of tofu liquid waste on shallot (Allium ascalonicum L.) yield variables

Treatment	Observational Variables						
	NT (fruit)	TD(cm)	TRL (cm)	FWT (g)	DWT (g)	PFW (g)	PDW (g)
Addition of EM4+Molasse (A)							
A0	11.65	2.24	456.54 a	45.08	6.93	51.68	5.71
A1	10.15	2.22	313.98 b	43.87	5.79	46.40	4.59
	tn	tn	*	tn	tn	tn	tn
Concentration of liquid organic fertilizer (K)							
K0 (0%)	12.62	2.50 a	371.78	61.86 a	9.47 a	43.29	4.48
K1 (21%)	12.25	2.36 ab	411.84	53.40 a	7.58 a	55.56	6.30
K2 (43%)	11.75	2.46 a	355.54	49.17 ab	8.34 a	55.08	5.82
K3 (65%)	8.37	1.94 bc	403.30	29.68 b	3.97 b	44.76	4.37
K4 (100%)	9.50	1.89 c	383.63	28.28 b	2.45 b	46.53	4.76
	tn	*	tn	*	*	tn	tn
A X K interactions							
A0K0	14.25	2.59	487.98	70.34	10.69	48.04	5.29
A0K1	13.75	2.28	484.60	54.91	7.91	58.36	7.90
A0K2	12.00	2.53	317.39	46.58	9.23	53.31	6.21
A0K3	9.50	1.89	487.96	32.09	4.30	41.61	4.26
A0K4	8.75	1.91	504.79	21.48	2.53	57.10	4.88
A1K0	11.00	2.40	255.57	53.38	8.26	38.53	3.67
A1K1	10.75	2.44	339.07	51.88	7.24	52.76	4.70
A1K2	11.50	2.40	393.68	51.75	7.46	56.86	5.43
A1K3	7.25	1.99	318.64	27.28	3.63	47.90	4.49
A1K4	10.25	1.87	262.47	35.08	2.37	35.96	4.64
	tn	tn	tn	tn	tn	tn	tn

Note: The numbers followed by different letters show significantly different according to the DMRT test at the 5% level

NT : Number of Tubers

TD : Tuber Diameter

TRL : Total Root Length

FWT : Fresh Weight of Tuber

DWT : Dry Weight of Tuber

PFW : Plant Fresh Weight

PDW : Plant Dry Weight

Number of Tubers

Based on the analysis of the 5% DMRT test data in table 4.3, the treatment with the addition of EM4 and molasses had no significant effect on the number of tubers. This is due to a lack of supply of nutrients needed for plant growth and development, especially for the formation of tubers. According to Suryana (2008), the treatment of differences in POC concentrations did not significantly affect the number of shallot bulbs. This is presumably due to the inability to produce tubers with the yellowing of shallot plant leaves, the yellowing of plant leaves causes reduced chlorophyll and reduced photosynthesis so that photosynthate production decreases (Gardner, 2006). According to Gough (2002), the number of leaves formed during vegetative growth greatly affects the number of tubers.

The interaction between the addition of EM4 and molasses and POC concentration based on 5% DMRT analysis showed no significant difference. Although the concentration of POC given varies, it is not sufficient for the availability of nutrients for the formation of tubers. In line with the results of Makmur's research (2010) which states that the number of cluster tubers produced by shallot plants is determined by genetic and environmental factors. This is related to the number of clump leaves because this organ has an important role in photosynthesis. The process of photosynthesis that occurs in the leaves will affect the amount of food that will be stored in the tubers and will also affect the weight and number of tubers produced.

Tuber Diameter

Based on the analysis of the 5% DMRT test data in table 4.3, the treatment with the addition of EM4 and molasses and their interactions did not significantly affect tuber diameter. It is suspected that photosynthetic activity is increased by solar radiation and temperature, so that nutrient translocation activity will increase so that plants will absorb more nutrients. Air temperature can also affect the size and quality of fruit and tubers (Jumin, 2008). POC concentration treatment based on 5% DMRT analysis showed significantly different. This is because plants can grow well with the role of fertile soil. The growth of a plant is influenced by the level of soil fertility. According to Utami and Soewandita (2018) stated that the nutrient content in the soil will change, depending on the season, soil management, and plant types. The greater the nutrients contained in the soil, the more fertile the soil will be.

In treatment K2 with a concentration of 43% POC of tofu liquid waste showed the highest treatment with a value of 2.46 cm compared to treatment K4 with a concentration of 100% POC of tofu liquid waste showed the lowest treatment with a value of 1.89 cm. At the concentration of 100% it is suspected that shallot plants cannot be utilized optimally because it has a saturation limit in absorbing nutrients contained in the POC of tofu liquid waste. This is in line with Syafruddin et al (2012) that if the nutrient needs of plants have been fulfilled, then the plants cannot provide a high response to fertilizer application.

Total Root Length

Roots are one of the plant organs that are very important in the process of plant growth. Based on the analysis of 5% DMRT test data Table 4.3 In the treatment the addition of EM4 and molasses had a significant effect. This happens because the application of the right POC results in optimal root growth so that nutrient and water uptake is also optimal. With the availability of CO2, water, chlorophyll, and the role of potassium, which is to transfer carbohydrates and protein optimally, there is an increase in the weight of the dry tubers of the clump. POC concentration treatment based on 5% DMRT analysis showed no significant difference. This is because each plant that is given POC with different concentration levels will affect the size of the nutrient content in the fertilizer, but it cannot be guaranteed that the larger the dose given will further increase plant growth. Because plants also have limits in absorbing nutrients for their life needs.

The interaction between the addition of EM4 and molasses and POC concentration based on 5% DMRT analysis showed no significant difference. This is because the amount of nutrients needed to compose these plant parts is different for each type of plant or for the same type of plant but with different levels of productivity (Hardjowigeno, 1989). According to Suryana (2008), a plant will thrive and thrive if the nutrients provided can be absorbed by a plant and are in a form suitable for absorption by roots and in sufficient condition.

Treatment A0 (without adding EM4 and molasses) had a higher root length of 456.54 cm compared to treatment A1 (with the addition of EM4 and molasses) with a lower root length of 313.98 cm. In A0 (without the addition of EM4 and molasses) the total P-content was 0.01 and in A1 (with the addition of EM4 and molasses) the total P-content was 0.02. In the table above it can be seen that treatment A0 has the longest total root length. This is because the longer roots function to absorb the nutrients needed to support root growth are still not optimal, so the roots grow elongated to optimize nutrient absorption. According to Nurkholis (2014), states that plant roots that continue to grow will continue to elongate to get nutrients in the soil solution. Meanwhile, treatment A1 had the least total root length. This is due to the possibility of being caused by the ability to absorb nutrients that are limited due to osmotic pressure factors. Nutrient concentrations that are too high will not be absorbed by the root tissue. According to Nathania, et al., (2012) giving higher concentrations will cause damage to plant organs.

Fresh Weight of Tuber

Based on the analysis of 5% DMRT test data Table 4.3 In the treatment the addition of EM4 and molasses had no significant effect. This is thought to be a lack of nutrients such as N, P and K needed by plants. Nitrogen in shallot plants affects the yield and quality of the bulbs. Lack of nitrogen will cause small tuber size and low water content. While excess nitrogen will cause the tubers to be large in size and high in water content, but less pithy and easily

porous. Nitrogen can affect the yield and quality of shallot bulbs (Pitojo, 2011).

POC concentration treatment based on 5% DMRT analysis showed significantly different. This is presumably because the available nutrients such as N, P and K nutrients in the treatment of each treatment have an influence on the formation of tubers where K plays a general role in tuber formation and can increase photosynthetic activity and leaf chlorophyll content so as to increase weight. dry plants. Supriyatna et al, (2016) the presence of a fairly high inorganic content and the addition of liquid organic fertilizer gives a high tuber weight because of the role of the roots which 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. The interaction between the addition of EM4 and molasses and POC concentration based on 5% DMRT analysis showed no significant difference. According to Ralahalu et al (2017) which states that when giving POC, it is better to pay attention to the concentration of the application that will be given by the plant. Plants have a different frequency of giving fertilizers to pay attention to optimal results.

The K1 treatment with a concentration of 21% showed the highest tuber fresh weight of 53.4 grams compared to the K4 concentration treatment with the lowest concentration of 28.28 grams. With a concentration of 21% is enough to meet the needs of nutrients in shallot plants. Macro nutrients such as N,P,K contained in POC provide nutrients for plants. This is in accordance with the statement of Prastya et al, (2016) stating that plants need sufficient and balanced nutrients. The availability of nutrients in the soil in a balanced manner allows plant growth and production to take place properly. Meanwhile, K4 with a concentration of 100% showed the lowest tuber fresh weight with a weight of 28.28 grams. It is suspected that the higher the POC concentration, the less nutrients are absorbed and the photosynthesis process does not run effectively and the photosynthate produced decreases. When nutrients are given in excessive doses it will cause the plant's fresh weight to decrease.

Tuber Dry Weight

Based on the analysis of 5% DMRT test data Table 4.3 In the treatment of adding EM4 and molasses and their interactions had no significant effect. This could be caused by a lack of fulfillment of the nutrients needed by plants. This means that the tuber dry weight achieved is relatively the same. Dry weight is the accumulation of organic compounds that plants have successfully synthesized from inorganic compounds (Lakitan, 1996). The small tuber size is an indication that the content of organic compounds in the tubers such as carbohydrates, proteins, fats and others is very small, so that the dry weight components obtained are also relatively the same and small. POC concentration treatment based on 5% DMRT analysis showed significantly different. This is because the increase in tuber wet weight is influenced by the amount of water absorption and the accumulation of photosynthetic products in the leaves to be translocated for tuber formation. So the

difference in water content will affect the wet weight of the tubers produced. Ruminto and Sugandi (1988) stated that tuber enlargement was caused by cell enlargement which was more dominant than cell division.

In treatment K2 with a concentration of 43% weighing 8.34 grams while the lowest tuber dry weight was in treatment K4 with a concentration of 100%, namely 2.45 grams. This means that at a concentration of 43% it is enough to meet the needs of the nutrients contained in the POC of tofu liquid waste for the growth of shallot plants, but at a concentration of 100% there are too many nutrients contained so that the nutrients are absorbed little and can disrupt the balance of nutrients. and can poison the roots. The high wet weight and dry weight of shallot bulbs depended on the amount of carbohydrates formed in the bulbs. This is in accordance with the opinion of Faridah (1999) photosynthetic activity affects the distribution of carbohydrates formed so that the higher the fresh weight of the bulbs, the higher the dry weight of the shallot bulbs formed.

Plant Fresh Weight

Plant fresh weight shows the total weight obtained from metabolic activity during growth. Based on the analysis of 5% DMRT test data Table 4.3 In the treatment the addition of EM4 and molasses had no significant effect. It is suspected that the content of element P in the soil is high so that the control treatment gives the highest yield compared to that given the liquid organic fertilizer treatment. When nutrients are given in excessive doses or low doses it will cause the plant's fresh weight to decrease. This is in accordance with Sumarni et al (2012) which stated that the high soil P availability meant that the addition of P fertilizer did not significantly increase shallot yields. The availability of sufficient P in the soil is very important to increase plant growth, because P is needed to improve the carbohydrate content and the development of plant roots.

POC concentration treatment based on 5% DMRT analysis showed no significant difference. This is probably caused by the concentration and timing of POC which is still in low and inappropriate amounts, so it does not show any effect on plants. This is in accordance with the opinion of Damanik et al. (2010) which states that the dose of fertilizer in fertilization must be precise, meaning the dose is not too little or too much which can cause waste or can damage plant roots. If the fertilizer dose is too low, it will have no effect on plant growth, while too much dose can disrupt the nutrient balance and can poison plant roots.

The interaction between the addition of EM4 and molasses and POC concentration based on 5% DMRT analysis showed no significant difference. This is possible because the nutrients in the liquid fertilizer do support photosynthesis and produce carbohydrates, but due to the use of concentrations that are still in low amounts and are given once every 2 weeks, it is possible to have a small supply of nutrients and produce too little photosynthate. According to Jazilah (2007) that cell division that occurs in meristem tissue with an increase in the number of cells and the

expansion of these cells results in an increase in plant height.

Plant Dry Weight

Plant dry weight reflects the nutritional status of plants and plant dry weight is an indicator that determines whether or not plant growth and development is very closely related to nutrient availability. Based on the analysis of 5% DMRT test data Table 4.3 In the treatment of adding EM4 and molasses, POC concentrations and interactions had no significant effect. This shows that all of these treatments did not have an effect on plant growth, in particular the generative growth of plants, which was suspected that the administration of POC was still less than optimum both in the phase of administration, the amount of concentration, and the content of POC nutrients. The results of Novriani's research (2014), stated that sufficient nutrients in POC can increase photosynthesis thereby affecting photosynthetic results. High photosynthate results will affect plant dry weight. Plant dry weight is influenced by the availability of N nutrients in plants. Nutrient N functions to compose leaf chlorophyll. Plants that contain a lot of chlorophyll will cause the photosynthesis process to run optimally and produce photosynthates in sufficient quantities (Sultoniyah & Ambar, 2019).

CONCLUSION

The addition of EM4 and molasses had an effect on the growth and yield of shallots, namely the total leaf length at 21.56, 70 and 77 dap and the total root length. Giving the POC concentration of tofu liquid waste affected the growth and yield of shallots, namely the number of leaves at the age of 56, 63, 70 and 77 dap, total leaf length at the age of 28 to 77 dap, tuber diameter, tuber fresh weight, and tuber dry weight. The interaction of POC concentration of tofu liquid waste with the addition of EM4 and Molasses had no effect on the growth and yield of shallots.

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