THE IMPACT OF ORGANIC FERTILIZER ON THE GROWTH AND PRODUCTION OF ONION (ALLIUM ASCALONICUM L.)

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Abstract

Due to climate change, pest and disease attacks, unbalanced use of seeds and fertilizer use, shallot production in North Sumatra still does not meet consumer demand. This research used a Randomized Block Design with 2 factors and 2 replications. The first factor is POP (Solid Organic Fertilizer) consisting of 4 concentration levels, namely P0 = 0 kg/plot, P1 = 4.5 kg/plot, P2 = 7.5 kg/plot, and P3 = 10.5 kg/plot. The second factor is POC (Liquid Organic Fertilizer) consisting of 4 concentration levels, namely C0 = 0 ml/liter water/plot, C1 = 250 ml/liter water/plot, C2 = 450 ml/liter water/plot, and C3 = 650 ml /liter of water/plot. The results of the growth research showed that the highest POP was in P3 with a plant height of 35.76 cm, number of tillers 1.72 and tuber diameter 37.01 cm and the highest POC treatment was in C2 treatment with number of tillers 1.51 cm and tuber diameter 3.28 cm . Production showed that the highest POP was in P3 with a wet tuber weight of 45.28 gr, a dry tuber weight of 31.82 gr, and a production conversion per hectare of 55.80 kg, for the highest POC was in C2 with a wet tuber weight of 40.70 gr, tuber weight dry 31.82 gr and production conversion per hectare 51.39 kg. This research shows an increase in the growth and production of shallot plants.

Keywords: ***Shallots, POP, POC, Growth and Production***

1. INTRODUCTION

Shallots have high economic value because they can increase farmers' income, meet national consumption needs, and generate foreign exchange for the country. This is due to the fact that shallots are very popular in Indonesia because they contain many beneficial nutrients for health(Widarawati et al., 2022). Shallots are not only used as a cooking spice, but are also used as traditional medicine. Research resultAryanta, (2019)shows that red onions contain the mineral potassium which helps maintain the body's metabolism and contains active chemical compounds such as alliin, adenosine, prostaglandin and cycloaliin, which are thought to increase the body's endurance and prevent and treat diseases such as fever, hemorrhoids, canker sores, flatulence and even serious diseases such as hypertension, heart problems, diabetes mellitus, cancer, and coronary heart disease. In addition, shallots are very rich in water-soluble nutrients, such as iron, calcium, carbohydrates, protein and other vitamins(Li et al., 2020). Based on data from the Central Statistics Agency in 2022, with the population of North Sumatra increasing, demand for shallots will also increase.

However, the increase in production was not followed by an increase in demand. This is proven by data from 2018 to 2022, in 2018 shallot production reached 16,337 tonnes with a land area of 2,083 ha and consumption demand of 39,758 tonnes/year. In 2019, shallot production reached 18,072 tons with a land area of 2,246 ha and consumption demand of 40,804 tons/year. In 2020, shallot production will reach 29,222 tons with a land area of 3,060 ha and consumption demand of 39,684 tons/year. In 2021, shallot production will reach 53,962 tons with a land area of 4,339 ha and consumption demand of 43,703 tons/year. In 2022, shallot production will reach 64,472 tons with a land area of 4,245 ha and consumption demand of 45,708 tons/year. The data above shows that shallot production in North Sumatra has increased significantly for five consecutive years. However, the 3-year increase in production, from 2018 to 2020, is still not enough to meet demandpeople of North Sumatra. Several factors including climate change, disease and pest attacks, use of poor quality seeds, unbalanced use of organic fertilizers, and low use of seeds, are thought to be responsible for the decline in shallot production.(Luta et al., 2022).

However, shallot production will increase in 2021 and 2022, meeting the demand of the people of North Sumatra, reaching 43,703 tonnes in 2021 and 45,708 tonnes in 2022. However, continued efforts are needed to increase shallot production to meet the needs of the community in the following year(Harahap et al., 2020). The way to increase the quality and production of shallots is to use high quality seeds and balanced organic fertilizer.Priyadi et al., (2021)conducted previous research which found that applying organic fertilizer from goat manure and cow manure at a dose of 10 tons/ha increased the height of shallot plants up to 45 DAP with an average height of 40 cm.Hakim et al., (2022)also supports this research by finding that the use of shallot seeds and the application of POP to shallot plants produces better results. StudiesAnastasia et al., (2014)shows that the use of solid and liquid organic fertilizers can increase soil porosity and spinach plant growth. Additionally, research(Lubis et al., 2022)found that the parameters of number of tillers, wet weight of tubers per plot (g), and dry weight of tubers per plot (g) were very significantly influenced by POC treatment on fruit and vegetables. With the best POC concentration is 3%.. Organic fertilizer is made from garbage, animal waste, plant residues, wood sawdust and activated sludge. Soil that contains high organic matter will be loose and have low density. This shows that organic fertilizer can improve the chemical, physical and biological properties of soil(Tadini et al., 2018). Additionally, according toYani Kamsurya & Botanri, (2022), the absorption process, nutrients and respiration are not disturbed by this. As a result, the use of organic fertilizer will increase the growth and production of shallots.

2. IMPLEMENTATION METHOD

The research was conducted at the Panca Budi Development University Medan research area in Hamlet 3, Sampe Cita Village, Kutalimbaru District, Deli Serdang Regency, North Sumatra Province with an altitude of ± 142 meters above sea level. The materials used are red onion seeds of the Sanren F1 Cap Panah Merah variety, water, cow dung, chicken dung, goat dung, palm oil tankos waste, burnt husk charcoal, coconut dregs, EM4 and molasses, fruit waste, palm oil tankos waste. , trembesi leaves, and rice washing water. The tools used in this research were hoes, gembors, scales, stationery, meters, knives, containers, tarpaulins, scales, drums and hoses.

2.1 Research Methods

The research began with sowing the Sanren F1 variety of red onion seeds sourced from the Red Arrow producer PT. East West Seed Indonesia (Ewindo) uses a pot tray with a planting medium mixed with top soil and compost. Sowing seeds takes 40-45 days to be ready for transplanting. According to researchBolly et al., (2021)making POP using materials from livestock manure, this research used 34 kg cow dung, 34 kg chicken manure, 34 kg goat manure, 34 kg palm oil tankos waste, 34 kg burnt husk charcoal, 34 kg coconut dregs waste, EM4 and molasses. According to researchPutra & Ratnawati, (2019)making POC using 14 kg of fruit waste, 14 kg of oil palm tankos waste, 14 kg of tamarind leaf waste, 14 kg of rice washing water waste, 14 kg of chicken manure waste, 14 kg of burnt husk charcoal, EM4, and molasses.

This research used a factorial Randomized Block Design consisting of two factors. The first factor is POP which consists of 4 concentration levels, namely P0 = 0 kg/plot, P1 = 4.5 kg/plot, P2 = 7.5 kg/plot, and P3 = 10.5 kg/plot. The second factor is POC which consists of 4 concentration levels, namely C0 = 0 ml/liter water/plot, C1 = 250 ml/liter water/plot, C2 = 450 ml/liter water/plot, and C3 = 650 ml/liter water/ plots. So there are 16 combinations with 2 repetitions, a total of 32 experimental units. The growth parameters observed were plant height, number of tillers per plot and tuber diameter based onRaharja et al., (2022). Meanwhile, the production parameters observed were wet tuber weight, dry tuber weight, production conversion and profit and loss based on(Hakim et al., 2022).

3. RESULTS AND DISCUSSION

3.1 Height of Shallots

Based on the results of analysis of variance in plant height at the age of 2-6 WAP, it can be seen that various organic fertilizer treatments have a significant effect on plant height. The average height of shallot plants can be seen in Table 1.

Table 1. Height of shallots treated with POP and POC at the age of 2-6 WAP

Treatment	Week - 2 WAP	3 WAP	4 WAP	5 WAP	6 WAP
Solid Organic Fertilizer					
P0 = 0 kg/plot	20.26 aA	21.91 aA	23.90 aA	26.81 aA	29.93 aA
P1 = 4.5 kg/plot	22.56 bB	24.53 bB	26.30 bB	28.91 bB	32.04 bB
P2 = 7.5 kg/plot	22.50 bB	25.04 bcB	27.04 bB	30.39 cC	33.46 cC
P3 = 10.5 kg/plot	23.48 cC	26.73 dC	28.56 cC	31.43 dB	35.76 dD
Liquid Organic Fertilizer					
C0 = 0 ml/l water/plot	21.01 aA	23.26 AA	25.18 aA	27.78 aA	30.87 aA
C1 = 250 ml/l water/plot	22.05 bB	4.11 chAP	25.98 bA	29.00 bB	32.38 bB
C2 = 450 ml/l water/plot	22.71 bcB	25.08 cBC	27.04 cB	29.96 cC	33.21 cC
C3 = 650 ml/l water/plot	23.03 cC	25.75 cC	27.61 cB	30.80 dD	34.71 dD

Note: Numbers in the same column followed by letters that are not the same are significantly different at the 5% level (lower case letters) and very significantly different at the 1% level (upper letters) in DMRT

POP treatment had a very significant effect on plant height. The POP treatment of 0 kg/demplot gave a yield of 29.93 cm which was lower than the 4.5 kg/demonstration treatment which gave a yield of 32.04 cm, the 7.5 kg/demplot treatment which gave a yield of 33.46 cm and the 10.5 kg treatment. /demplot with results of 35.76 cm. The POP treatment with 10.5 kg/demonstration plot gave the highest yield, namely 35.76 cm in shallot plant height and was significantly different from the other treatments. POC treatment had a very significant effect on shallot plant height. The POC treatment of 0 ml/liter of water/demonstration plot gave a result of 30.87 cm lower than the treatment of 250 ml/liter of water/demonstration plot which gave a result of 32.38 cm, the treatment of 450 ml/liter of water/demonstration plot which gave a result of 33.21 cm, and treatment of 650 ml/liter of water/demonstration plot gave results of 34.71 cm. The 650 ml/liter water/demonstration plot treatment gave the highest results, namely 34.71 cm and was significantly different from the other treatments. Table 1 shows the results of adding treatment concentration which also provides an increase in the height of shallot plants for both POP and POC treatments.

3.2 Number of tillers per plot

Observation data and variance testing of the average number of shallot seedlings with POP and POC treatment on shallot growth and production can be seen in Table 2. The results of the data analysis show that the provision of POP and POC fertilizer has a very significant effect on the parameter number of shallot saplings. Table 2 shows that the plant with the highest number of tillers in the POP treatment was P_3= 10.5 kg/demplot amounted to 1.72 tillers and the lowest was in the P0 = 0 kg/demonstrator treatment at 0.64 tillers. Meanwhile, the plant with the highest number of tillers in the liquid organic fertilizer treatment was C2 = 450 ml/liter of water/demonstration plot of 1.51 and the lowest was in the treatment of C1 = 250 ml/liter of water/demonstration plot of 0.82.

Table 2. Number of tillers per shallot plot with POP and POC treatment.

Treatment	Number of Cubs	
Solid Organic Fertilizer		
P0 = 0 kg/plot	0.64	A A
P1 = 4.5 kg/plot	1.09	A A
P2 = 7.5 kg/plot	1.02	a A
P3 = 10.5 kg/plot	1.72	bB
Liquid Organic Fertilizer		
C0 = 0 ml/l water/plot	0.86	a A
C1 = 250 ml/l water/plot	0.82	a A
C2 = 450 ml/l water/plot	1.51	aAbB
C3 = 650 ml/l water/plot	1.28	bB

Note: Numbers in the same column followed by letters that are not the same are significantly different at the 5% level (lower case letters) and very significantly different at the 1% level (upper letters) in DMRT

3.3 Tuber Diameter

The results of the research analysis on the diameter parameters of shallot bulbs treated with solid organic fertilizer and liquid organic fertilizer can be seen in Table 3. The average diameter of shallot bulbs in Table 3 can be explained that the highest diameter in the solid organic fertilizer treatment is P3 = 10.5 kg/ demonstration plot was 37.01 and the lowest was in the P0 = 0 kg/demplot treatment of 23.93. The diameter of shallot bulbs in the liquid organic fertilizer treatment was the highest, namely C2 = 450 ml/liter of water/demonstration plot, 32.88 and the lowest in the treatment C1 = 250 ml/liter of water/demonstration plot, 28.73.

Table 3. Diameter of shallot bulbs using POP and POC

Treatment	Tuber diameter (cm)	
Solid Organic Fertilizer		
P0 = 0 kg/plot	23.93	a A
P1 = 4.5 kg/plot	31.45	bB
P2 = 7.5 kg/plot	29.51	bB
P3 = 10.5 kg/plot	37.01	CC
Liquid Fertilizer		
C0 = 0 ml/l water/plot	28.73	a A
C1 = 250 ml/l water/plot	28.69	a A
C2 = 450 ml/l water/plot	32.88	abA
C3 = 650 ml/l water/plot	31.61	bA

Note: Numbers in the same column followed by letters that are not the same are significantly different at the 5% level (lower case letters) and very significantly different at the 1% level (upper letters) in DMRT

The number of tillers per plot, height and diameter of shallot bulbs are really influenced by POP and POC, as shown in the data in Table 1, Table 2 and Table 3. This shows that shallot growth can be increased by a dose of POP from waste such as cow, chicken, goat dung, palm oil tangkos, grilled husk charcoal, and coconut dregs. Organic fertilizer can improve the chemical and physical properties of soil as well as its biological activity. The soil becomes fertile and suitable for plant

growth, and the availability of nutrients in the soil tends to increase the rate of plant growth(Sudirman et al., 2022). Previous research shows that POP with high levels of nutrients helps plant growth.Vermicompost contains 2.03% N, 1.16% P2O5, and 0.54% K2O. Another study bySyafria & Farizaldi, (2022)found that organic fertilizer made from palm fronds, cow dung and bran contains quite high levels of macro nutrients, including N of 1.54-1.94%, P of 0.27-0.40%, K of 0. .45-0.95%, and C of 25.13-32.74%. This is also in accordance with Priyadi's 2021 research which shows that the use of solid organic fertilizer obtained from cow, goat and chicken waste really affects the diameter, number of bulbs per hill and height of shallot bulbs. This is in accordance with research conducted that solid organic fertilizer affects the growth of plant height, number of tillers and diameter of shallot bulbs.

Cow dung fertilizer is a complete type of fertilizer consisting of macro and micro nutrient components. Cow dung fertilizer can physically improve soil structure, increase aeration, and increase the soil's ability to store water. Research byIndriyana et al., (2020)found that cow dung fertilizer can increase plant height and number of leaves of shallot plants. According toIswahyudi et al., (2020), cow dung waste contains macro nutrients such as Ca, Mg, Fe, Mn, Bo, S, Zn, and Co. In addition, cow dung contains 1.3% N, 0.52 P, and 0.95% K. When the liquid part (urine) is mixed with the solid part (feces), manure derived from poultry droppings such as chickens has a higher nutrient content compared to other livestock manure. This fertilizer has a composition of N (1.72%), P (1.82%), K (2.18%), Ca (9.23%), Mg (0.86%), and a water content of 55%(Walida et al., 2020). Goat manure can be used as raw material to make high quality organic fertilizer using decomposer technology called biostarter(Tri Pamungkas & Pamungkas, 2019). According to(FS et al., 2020), goat manure contains a lot of nitrogen (3.22%), K2O (4.47%), P2O5 (3.24%), S (0.18%), Mg (0.86%), CaO (0.66 %), ppm molybdenum (0.2%), SiO2 (30.32%), iron (0.15%) and water content (12.15%). The nutrients contained in goat manure can improve soil structure, increase humus, and help neutralize soil pH.

Empty palm oil bunches are solid waste produced from the palm oil processing process. If available in large quantities, it can be used as compost in the hope of improving the physical, biological and chemical properties of ultisol subsoil. According toAgung et al., (2019), empty oil palm fruit bunches contain total nitrogen; 6.79% P2O5; 3.13% K2O; and 8.33% with a pH of 9.59. Husk charcoal is a planting medium that contains about 52% SiO2, about 31% C elements, and other compositions such as Fe2O3, K2O, MgO, CaO, MnO, and Cu in very small amounts, making it an excellent choice as a medium. plant. Apart from that, husk charcoal also contains important nutrients, including nitrogen (N) around 0.32%, phosphate (P) around 0.15%, potassium (K) around 0.31%, calcium (Ca) around 0, 96%, iron (Fe) around 180 ppm, manganese (Mn) around 80.4 ppm, zinc (Zn) around 14.10 ppm, and has a pH level ranging from 8.5 - 9.0(Listiana et al., 2021).

Coconut pulp is waste that has the potential to be reprocessed because it contains beneficial nutrients. According toAdi H et al., (2020)Coconut dregs contain nutrient elements of 1.119% N, 1.748% P, and 1.19% K which are good for making organic fertilizer. Apart from that, coconut dregs also contain around 12.2% fat, 20% crude fiber, 4.9% ash, 18.2% protein and 6.2% water content. In the POC treatment, the concentration of C2 = 450 ml/liter of water/demonstration plot was higher than in the treatment of C3 = 650 ml/liter of water/demonstration plot. This may happen because fertilizer doses that are too high will have a negative impact or are ineffective on plants according to the concentration. This is also in line with opinionIndriyana et al., (2020)that fertilizer must be given in the right dose, no less and no more, so that it produces good growth results and is completely absorbed. The absorption of other elements is inhibited by the presence of one of the elements in larger quantities. Because they have similar physicochemical properties, these elements compete for placement on the root surface(Putra & Hanum, 2018). In each procedure there are hormonal differences, excess or lack of growth hormone can inhibit cell division and enlargement. Excess hormones cause the number of leaves to increase, while hormone deficiencies inhibit the growth of new shoots(Santos et al., 2018). In research conducted byPutra & Ratnawati, (2019)namely making POC using banana and papaya peels with a fermentation process for 24

days, showing that fruit waste produces concentrations consisting of organic C: 3.96-7.34; N: 1.37-3.21; P: 2.22-3.81; and K 2.48-4.2.

Rice washing water, also known as leri, is the liquid produced from the process of washing rice. When compared to brown rice washing water, white rice washing water has a higher nutrient content, including nitrogen, phosphorus, magnesium and sulfur. The nutrient content of white rice washing water is 0.015% nitrogen, 16.306%, 0.02% potassium, 2.944% calcium, 14.252%, and 0.02% sulfur. Trembesi (Samanea saman Jacq Merr) is a plant that is often planted in urban forests or in urban areas as a road shade tree. Leaves that are removed or cut from branches every day can be used as green manure or made into compost. In terms of chemical properties, tamarind leaf waste has a pH of around 7.9 and contains nutrients of around 1.98% nitrogen (nitrogen), 0.98% phosphorus (phosphorus), and 0.57% potassium (potassium). Fe has 150 ppm, Mn has 80 ppm, and Cu has 32 ppm, and the C/N ratio is 51. Apart from being a source of nutrient-rich organic material, trembesi tree leaf litter can be used to produce compost(Jadhav et al., 2023). POC is a liquid resulting from the fermentation of organic materials originating from plant remains, animal and human waste which contains more than one type of nutrient. Using this fertilizer can overcome nutrient deficiencies, does not cause problems with leaching of nutrients, and does not damage the planting medium even if used frequently. In addition, liquid organic fertilizer has the ability to increase the quality and quantity of agricultural products, improve soil conditions, and increase the efficiency of nutrient absorption by plants.(Irsyad & Kastono, 2019).

3.4 Wet tuber weight per plot (g)

Data on variations in plant wet weight resulting from the application of solid organic fertilizer and liquid organic fertilizer had a very real influence on the parameter of wet tuber weight (g). Below are presented in Table 4 the results of the test for the difference in average wet tuber weight (g) in the POP and POC treatments.

Table 4. Fresh weight of shallots with POP and POC treatment

Treatment		Wet Tuber Weight
Solid Organic Fertilizer		
P0 = 0 kg/plot	22.03	a A
P1 = 4.5 kg/plot	36.84	chapter
P2 = 7.5 kg/plot	32.46	bcB
P3 = 10.5 kg/plot	45.28	CB
Liquid Organic Fertilizer		
C0 = 0 ml/l water/plot	26.86	a A
C1 = 250 ml/l water/plot	29.35	a A
C2 = 450 ml/l water/plot	39.69	bA
C3 = 650 ml/l water/plot	40.70	bA

Note: Numbers in the same column followed by letters that are not the same are significantly different at the 5% level (lower case letters) and very significantly different at the 1% level (upper letters) in DMRT

The data in table 4 above shows that the wet tuber weight (g) due to administration of POP and POC has a very significant effect. The heaviest mean in the POP treatment was found in P3 which was very significantly different from P2, P1, and P0. Next, table 4 shows the heaviest average POC treatment at the C3 level which has a very significant effect on C1 and C0 and has no real effect on the C2 treatment. This is because the use of liquid organic fertilizer has a real effect. This is because the use of liquid organic fertilizer has a real effect. According toHakim et al., (2022), with high nutrient levels, organic fertilizer can increase soil fertility and weaken the soil with the role of microorganisms. The role of N in the development of leaves is to make them larger

and longer, increase the number of stomata on the leaves, and facilitate the photosynthesis process. The role of phosphate and potassium also increases the growth of shallot bulbs.

3.5 Dry tuber weight per plot (g)

Data on variations in plant wet weight resulting from the application of solid organic fertilizer and liquid organic fertilizer had a very real influence on the dry tuber weight parameter (g). Below are presented in Table 4 the results of the difference test in the average dry tuber weight (g) in the POP and POC treatments.

Table 5. Dry weight of shallot bulbs with POP and POC treatment

Treatment	Dry Tuber Weight	
Solid Organic Fertilizer		
P0 = 0 kg/plot	15.81	a A
P1 = 4.5 kg/plot	29.03	bB
P2 = 7.5 kg/plot	26.03	bB
P3 = 10.5 kg/plot	32.93	bB
Liquid Organic Fertilizer		
C0 = 0 ml/l water/plot	21.65	a A
C1 = 250 ml/l water/plot	25.85	aAB
C2 = 450 ml/l water/plot	31.82	abAB
C3 = 650 ml/l water/plot	24.48	bB

Note: Numbers in the same column followed by letters that are not the same are significantly different at the 5% level (lower case letters) and very significantly different at the 1% level (upper letters) in DMRT

The data in table 5 above shows that the dry tuber weight (g) due to administration of POP and POC has a very significant effect. The heaviest average in the solid organic fertilizer treatment was found in P3 which was very significantly different from the P0 treatment but did not have a very significant effect in the P2 and P1 treatments. Next, table 5 shows the heaviest average liquid organic fertilizer treatment at the C2 level which has a very significant effect on the C3, C1 and C0 treatments. This can be explained by the increase in dry tuber production due to the role of the nutrient potassium which plays a role in maintaining plant health so that there is a risk of better tuber formation and enlargement. An increase in the number of leaves has an impact on the photosynthesis process which can change macro nutrients sourced from POC into organic compound elements that are available to shallot plants so that organic compounds are distributed to all plant organs thereby affecting the dry weight of the plant.(Susikawati et al., 2018). This is also in line with opinion(Rasyid et al., 2020)Besides being able to meet nutrient needs, cow manure can also improve the physical properties of the soil, which will facilitate the development of shallot bulbs so that the yield of the bulbs will be greater.

3.6 Production Conversion per hectare (kg)

Production conversion per Ha is used to calculate the production of cultivated shallots by calculating the average of the dry bulb parameters per plot (g). This conversion is carried out to see the average production that has been obtained and converted per Ha. The results of statistical tests show that giving POP and POC has a very significant effect on the conversion of shallot production/Ha (kg). The average results of shallot production / Ha due to the influence of solid organic fertilizer and liquid organic fertilizer can be seen in Table 6.

Table 6. Production conversion per hectare (kg) of shallot plants

Treatment	Conversion per Ha (kg)	
Solid Organic Fertilizer		
P0 = 0 kg/plot	27.53	a A
P1 = 4.5 kg/plot	44.31	bcAB
P2 = 7.5 kg/plot	38.11	abA
P3 = 10.5 kg/plot	55.80	CB
Liquid Organic Fertilizer		
C0 = 0 ml/l water/plot	34.45	a A
C1 = 250 ml/l water/plot	37.37	a A
C2 = 450 ml/l water/plot	51.39	bA
C3 = 650 ml/l water/plot	42.53	abA

Note: Numbers in the same column followed by letters that are not the same are significantly different at the 5% level (lower case letters) and very significantly different at the 1% level (upper letters) in DMRT

The data in table 6 above shows that the conversion of production per hectare (kg) due to the provision of POP and POC has a very significant effect. The heaviest average conversion of production per hectare in the solid organic fertilizer treatment was found in P_3which is very significantly different from P2, P1 and P0. Furthermore, in table 6, the heaviest average POC treatment at C2 level is very significantly different from treatments C3, C1 and C0. Organic fertilizer obtained from agricultural waste increases the quantity and quality of agricultural production, reduces environmental pollution, and improves sustainable land quality. By using organic fertilizer, clay soil becomes loose, sandy soil becomes more compact, and soil that was previously dense becomes more loose. The ability of organic fertilizers to react with metal ions to form complex compounds, which poison plants and reduce the supply of soil nutrients such as aluminum, iron and manganese. This is the reason why organic fertilizer is very important for the soil.

4. CONCLUSION

POP and POC treatments are able to provide better growth and production compared to no treatment. In POP treatment, the higher the dose given, the higher the effect, namely P3 treatment. However, POC treatment at high doses, namely C3, did not show high growth and production, but C2 treatment produced high growth and production. This shows that the application of fertilizer must be in accordance with the dosage, neither less nor more, so that it will give good results for growth and be absorbed perfectly.

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