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# Utilization of Liquid Organic Fertilizer of Pineapple Peel Waste for Shallots Cultivation (*Allium ascalonicum* L.)

*Pemanfaatan Pupuk Organik Cair Limbah Kulit Nanas untuk Budidaya Tanaman Bawang Merah* (*Allium ascalonicum L.*)

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## ABSTRAK

Limbah kulit nanas dapat dimanfaatkan sebagai pupuk organik cair (POC) untuk menambah bahan organik dan memperbaiki kualitas tanah untuk budidaya tanaman seperti bawang merah. Bawang merah merupakan tanaman sayuran yang memiliki prospek yang besar bagi petani karena tingginya permintaan bawang merah yang tidak diimbangi dengan produksinya. Penelitian ini bertujuan untuk mengetahui pengaruh konsentrasi dan frekuensi pemberian POC limbah kulit nanas terhadap pertumbuhan dan hasil tanaman bawang merah. Penelitian ini dilaksanakan di lahan perkebunan Desa Perlang, Kecamatan Lubuk Besar, Kabupaten Bangka Tengah, dari bulan Januari sampai dengan April 2021. Penelitian ini menggunakan metode eksperimen dengan Rancangan Petak Terbagi. Petak utama adalah konsentrasi pemberian POC kulit nanas yang terdiri atas 30 ml/l dan 60 ml/l. Anak petak adalah frekuensi pemberian POC limbah kulit nanas yang terdiri atas 7 hari sekali, 14 hari sekali, dan 21 hari sekali. Hasil penelitian menunjukkan bahwa konsentrasi pemberian POC limbah kulit nanas berpengaruh tidak nyata terhadap semua peubah yang diamati. Frekuensi pemberian POC limbah kulit nanas berpengaruh nyata terhadap peubah jumlah anakan per rumpun, namun pada peubah lainnya berpengaruh tidak nyata. Interaksi antara konsentrasi dan frekuensi POC limbah kulit nanas berpengaruh tidak nyata terhadap pertumbuhan dan hasil tanaman bawang merah. Pemberian POC limbah kulit nanas dengan konsentrasi 30 ml/l dan frekuensi 7 hari sekali menghasilkan pertumbuhan dan hasil bawang merah yang cenderung lebih baik.

Kata kunci: frekuensi, konsentrasi, limbah kulit nanas, pupuk organik cair (POC), bawang merah

## ABSTRACT

Pineapple peel waste can be used as liquid organic fertilizer (LOF) to add organic matter and improve soil quality for cultivating crops such as shallots. Shallots re vegetable crops that have great prospects for farmers because of the high demand for shallots that were not in accordance with their production. This study aimed to determine the effect of concentration and frequency of application of LOF of pineapple peel waste on the growth

and yield of shallots. This research had conducted in farmer's land in Perlang Village, Lubuk Besar District, Central Bangka Regency, from January to April 2021. This research used experimental method with a split plot design. The main plot is the concentration of LOF of pineapple peel waste which consists of 30 ml/l and 60 ml/l. Sub-plots are the frequency of application LOF of pineapple peel waste which consists of once in 7 days, once in 14 days, and once in 21 days. The results showed that the concentration of LOF of pineapple peel waste had no significant effect on all observed variables. The frequency of application LOF pineapple peel waste had a significant effect on the number of tillers per clump, but had no significant effect on the other variables. The interaction between the concentration and frequency LOF pineapple peel waste had no significant effect on the growth and yield of shallot plants. LOF application of pineapple peel waste with a concentration of 30 ml/l and a frequency of once every 7 days tends to be better for the growth and yield of shallot plants.

Keywords: concentration, frequency, liquid organic fertilizer (LOF), pineapple peel waste, shallot plants

## INTRODUCTION

Waste is a substance or material that is disposed of from human activities (Satriawi et al., 2019), include from agricultural activities. One of the wastes in agriculture is pineapple peel waste, which is a waste derived from fresh pineapple. Pineapple production in Bangka in 2018 is 5,566.3 tons (Central Bureau of Statistics of Bangka Belitung Islands Province 2019). Nurhayati (2013) stated that pineapple peel waste produced from one fresh pineapple is 27%, so that the waste of pineapple peel produced is estimated at 1,502,901 tons.

Ibrahim et al. (2016) stated that the handling of pineapple peel waste is mostly used as animal feed for poultry. Pineapple peel waste that is not handled will impact the environment, such as disease attacks, polluted air, soil, and water, and the explosion of methane gas (Simanjuntak et al., 2019). The alternatives utilization of pineapple peel waste as raw materials in liquid organic fertilizers (LOF). Satriawi et al. (2019) stated that the nutrient content in liquid organic fertilizers of pineapple peel waste consists of 0.028% total nitrogen, 72.00 % C/N ratio, 3.476% organic matter, 3.9 pH, 0.026 % total $P_2O_5$, and 0.108 % $K_2O$ total.

Utilization of pineapple peel waste as LOF has been applied to various plants concerning its effectiveness. The effectiveness of the use of LOF waste of pineapple peel depends on the concentration and frequency of fertilizer given. This is following the statement Natalia et al. (2016) the fertilizer given must meet the five principles (Right dose, Right way, Timely, Right Place, and Right type), so it is effective for plants. Satriawi et al. (2019) stated the application of LOF pineapple peel waste on cucumber plants produces the highest growth at a concentration of 30 ml/l. The results of Pawarta et al. (2019) on the frequency of giving LOF to shallots plants are best given once a week during cultivation.

One of the vegetables that are widely consumed is shallots. Palupi and Alfandi (2018) stated that shallots are one of the horticultural commodities that have a high economic value and are used by the public as flavoring cuisine, food industry raw materials. and traditional medicine for health. Nasukha et al. (2015) added that the increasing number of food businesses using shallots is causing the need for shallots in the market to increase. The Central Bureau of Statistics (2019) stated that shallots consumption in 2018 amounted to 730.99 tons and increased in 2019 by 751.24 tons. Shallots production based on CBS data (2019) amounted to 1,580.24 tons. This production has not met national needs so the government still imports shallots by 172 tons or about 6.92%. The addition of organic matter was one way to improve

plant growth and yield through improvements in physical, chemical, and biological properties in the soil. Based on the description above, it is necessary to research to find out the effect of the concentration and frequency of giving LOF pineapple peel waste on the growth and yield of shallots. This study aimed to determine the effect of concentration and frequency of application of LOF of pineapple peel waste on the growth and yield of shallots.

## MATERIALS AND METHODS

### Research Materials and Tools

The materials were used in this study were shallots bulbs of Bima Brebes varieties, pineapple peel waste, sugar, EM4, agricultural lime, cow manure, SP-36 fertilizer, and NPK fertilizer. The tools used in this study were hoes, knives, measuring glasses, buckets, funnel lengths, analytical scales, ruler, silver black mulch, and Munsell color chart for plant tissue.

### Place and Design Research

This research was conducted at a farmer's plantation located in Perlang Village, Lubuk Besar Subdistrict, Central Bangka Regency with oxisol soil type. The study was conducted from January 2021 to April 2021. The Split Plot Design was used in this experiment, with four repeats. The main plot was the concentration of LOF consisting of 2 treatment levels, such as 30 ml/l (C30) and 60 ml/l (C60). The sub plot was the frequency of application of LOF pineapple peel waste, consisting of 3 levels of treatment such as once every 7 days (F7), 14 days once (F14) and 21 days once (F21). This study added control (C0) using NPK fertilizer with a dose of 0.05 kg/plot.

### Method of Research

#### 1. Making the LOF Pineapple Peel Waste

This study made LOF pineapple peel as much as 40 kg of pineapple peel, 4 kg of brown sugar, 60 l of water, and 1200 ml of EM4. Making LOF pineapple peel by chopping pineapple peel into small, 4 kg dissolved sugar added 60 l water, then add EM4 as much as 1200 ml. Put all the ingredients in a mixer bucket, then stirred until evenly mixed and the bucket was covered using a black sheet. Pineapple peel was left for 30 days and stirred once every 5 days. Mature LOF was characterized by a change in color to blackish brown, the forming material becomes soft or crushed and the aroma stings. Mature LOF was then separated between the liquid with pineapple peel dregs taken using a sieve.

#### 2. Land Preparation

Land preparations carried out include cleaning, drilling, measurement, making elongated mapped, fertilizing, making trial mapped and mulch installation.

#### 3. Seed Preparation

The shallots seeds used were red shallots seedlings of Bima Brebes variety as much as 10 kg. Seedlings were used with healthy tuber conditions such as the shape of the bulbs being pithy (dense or not wrinkled), the skin of the bulbs was not wounded and shiny in color (Dewi 2012).

#### 4. Seedling Treatment

The seedlings that have been selected were grouped based on the size of the bulbs. The bulbs that have been selected were then cleaned from the skin of the bulbs that have been mongering and then cut 1/4 part which was done one day before planting. Bulbs that have been cut were then given fungicides in the form of Dithane M-45 by spaying and mixing once a day before planting.

#### 5. Planting

Planting is done by immersing the bulbs into the soil to the extent of the piece or by movement such as turning screwsso that the tip of the bulb appears flat with the ground surface. Tubers were planted as much as one bulb per planting hole and following the distance of the mulch planting hole measuring 20 cm x 15 cm.

**6. Maintenance**

Plant maintenance includes watering, replanting, weed control, fertilization and pest and disease control. Watering was done once a day, depending on the circumstances on the soil. Replanting was done by replacing dead shallots plants with plant life of no more than 7 DAP (days after planting). Weed control was done mechanically on the surroundings of the plant. Inorganic fertilization was carried out on control treatment 2 times during the cultivation of shallots plants, there were on the $15^{th}$ and $30^{th}$ DAP. Pest and diseases control was done manually, and chemically using fungicides Dithane M-45 (2 g/l) and recomended pesticides.

**7. Application of LOF Pineapple Peel Waste**

The application of liquid organic fertilizers of pineapple peel waste was by watering directly into the plant using measuring glasses with each concentration (30 ml/l and 60 ml/l). Application of liquid organic fertilizer begins at the age of 7 DAP. The volume of LOF applied was 300 ml/plant.

**8. Harvesting**

Harvesting of the shallots plant of Bima Brebes variety at the age of 55-60 DAP. Shallots plants in this study were harvested earlier at the age of 50 (days after planting/DAP, due to high rainfall and pest and disease attacks.

**Observed Parameters**

The parameters observed in this study were growth and yield of shallots. Parameter of growth were plant height, number of leaves, number of sprouts, dry weight of shoots, dry weight of roots, and shoot-root ratio. The parameters observed after harvesting were the color of the bulbs, the diameter of the bulbs, the yields of the bulbs per plant, and the yields of the bulbs per plot.

**Data Analysis**

Data obtained from observations were analyzed using statistical analysis of F-test with a 95% confidence level. If the F-test was a significant effect in the observed variables, then analized by DMRT (Duncan Multiple Range Test).

## RESULTS

The effects of concentration, frequency, and the interaction of LOF pineapple peel waste on the cultivation of shallots plants was presented in Table 1.

Table 1. The results of various effects of concentration, frequency, and interaction of LOF of pineapple peel waste to the growth and yield of shallots plants

| Observed Parameters | Concentration | Frequency | Interaction | CV |
|---|---|---|---|---|
| | Pr > f | Pr > f | Pr > f | (%) |
| | $0,53^{ns}$ | $0,76^{ns}$ | $0,95^{ns}$ | 12,32 |
| Number of Leaves (strands) | $0,47^{ns}$ | $0,99^{ns}$ | $0,16^{ns}$ | 16,20 |
| Number of Sapves (clumps) | $0,90^{ns}$ | $0,01^{*}$ | $0,21^{ns}$ | 13,55 |
| Dry Weight Header (g) | $0,89^{ns}$ | $0,54^{ns}$ | $0,08^{ns}$ | 16,46 |
| Dry Weight of Roots (g) | $0,42^{ns}$ | $0,16^{ns}$ | $0,54^{ns}$ | 51,02 |
| Shoot-Root Ratio (g) | $0,57^{ns}$ | $0,71^{ns}$ | $0,40^{ns}$ | 52,41 |
| Bulb Diameter (mm) | $0,27^{ns}$ | $0,23^{ns}$ | $0,52^{ns}$ | 15,14 |
| Bulb Yield Per Plant (g) | $0,17^{ns}$ | $0,07^{ns}$ | $0,46^{ns}$ | 22,11 |
| Bulb Yield Per Block (g) | $0,17^{ns}$ | $0,12^{ns}$ | $0,42^{ns}$ | 23,44 |

Note: Pr > f : Probability value, CV: Coefficient of Variability (%), *: significant effect, $^{ns}$: no significant effect

The results of the ANOVA showed that the concentration of LOF pineapple peel waste had no significant effect on all observations. The application frequency of LOF pineapple peel waste has a significant effect on the number of saplings per clump, but in plant height, the number of leaves, the weight of dry headers, the dry weight of roots, the ratio of shoot-root, the diameter of bulbs, the yield of tubers per plant and the yield of bulbs per plot have no significant effect. The interaction between the concentration and frequency of LOF of pineapple peel waste had no significant effect on all observed variables.

**Effect of LOF Concentration on Shallots Plant Growth**

The average increase in the height of shallots plants with the concentration of LOF administration of pineapple peel waste tends to increase for 49 days after planting (DAP). High shallots plants with a concentration of 30 ml/l tend to be higher compared to the concentration of 60 ml/l every week (Figure 1).

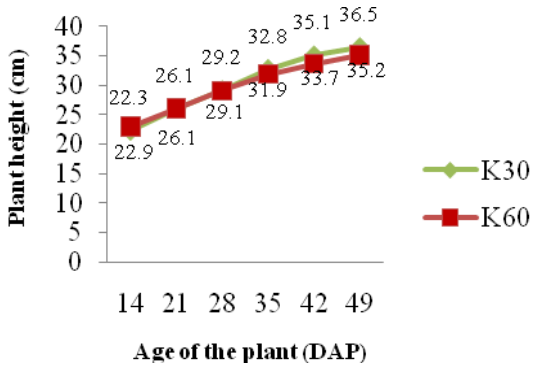



Figure 1. The average height of shallots plants with LOF concentration of pineapple peel waste

The number of leeks of the shallots plant tends to increase every week. The number of leaves has increased relatively high from the age of 14 DAP to 28 DAP. Treatment with a concentration of 60 ml/l tends to have the highest number of leaves with an average value of 29 strands compared to a concentration of 30 ml/l which was 28 strands (Figure 2).

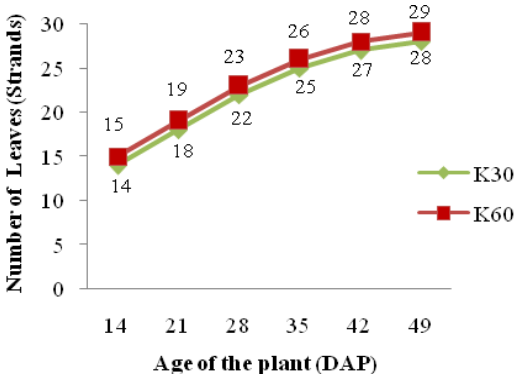



Figure 2. The average number of leeks with LOF concentration of pineapple peel waste

The number of shallots plant saps with a concentration treatment of 60 ml/l tends to be higher compared to the concentration of 30 ml/l at the age of 14 DAP. Shallots plants at the age of 35 days after grown experienced an increase in the number of saplings at both concentrations. Treatments with concentrations of 30 ml/l and 60 ml/l have relatively similar numbers of sap bulbs from the age of 21 days after grown to 49 days after grown (Figure 3).

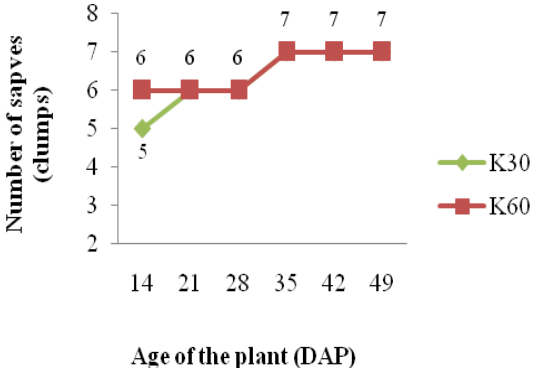



Figure 3. Average number of shallots plant sapleds with LOF concentration of pineapple peel waste

The average growth of shallots plants with a concentration of LOF of 30 ml/l pineapple peel waste tends to be higher compared to the concentration of 60 ml/l. Shallots plants on dry weight changer shoot and dry weight roots with a concentration of LOF pineapple peel waste 30 ml/l tend to be higher than the concentration of 30 ml/l. But in the ratio of shoot-root with a concentration of 30 ml/l tends to be lower than the concentration of 60 ml/l (Table 2).

Table 2. Average weight-dry weight of headers, dry weight of roots, and Shoot-Root Ratio at various concentrations of applicationof LOF pineapple peel waste

| Parameters | Concentration of Pineapple Peel Waste LOF | |
|---|---|---|
| | 30 ml/l | 60 ml/l |
| Weight Dry shoot | 1,49 | 1,47 |
| Weight Dry Root | 0,23 | 0,19 |
| Shoot-Root Ratio | 9,11 | 9,98 |

The yield of shallots plants with LOF concentrations of pineapple peel waste showed no significant effect. The provision of LOF pineapple peel waste with a concentration of 30 ml/l tend to have a higher yield of shallots plants compared to the concentration of 60 ml/l (Table 3).

Table 3 The average in bulb diameter, bulb yield per plant, and bulb yield per plot of shallots plant at various concentrations of LOF application of pineapple peel waste

| Parameters | Concentration of Pineapple Peel Waste LOF | |
|---|---|---|
| | 30 ml/l | 60 ml/l |
| Bulbs Diameter (mm) | 16,44 | 15,32 |
| Bulbs Yield Per Plant (g) | 33,00 | 26,15 |
| Bulbs Yield Per Plot (g) | 131,97 | 105,85 |

## Effect of LOF Frequency of Pineapple Peel Waste on Shallots Plant Growth

The result of high growth of shallots plants could be seen in Figure 4 that the more frequent the application of LOF, the higher the growth of shallots plants the better. The height of the shallots plant increases every week. The high growth of shallots plants with watering every 7 days tends to be higher compared to watering every 14 days and every 21 days (Figure 4).

The number of leeks of the shallots plant with various frequencies of LOF of pineapple peel waste has increased every week.Shallots plants from the age of 14 DAP to 49 DAP have a relatively equal number of leaves on all the frequency treatment of LOF watering of pineapple peel waste. However, at the age of 28 DAP and 49 DAP each shallots plant had a difference in the number of leaves on a frequency treatment of once every 7 days and a frequency of 14 days once (Figure 5).

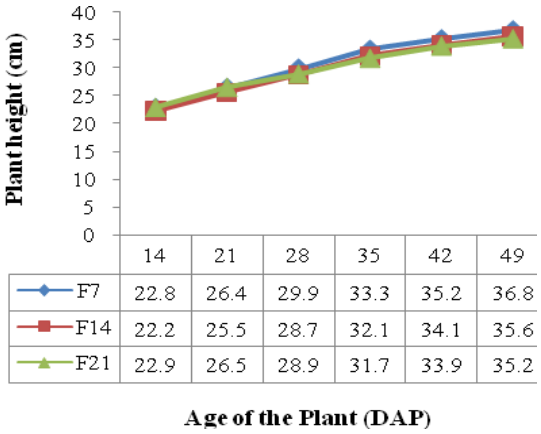



Figure 4. The average height of shallots plants with LOF frequency of pineapple peel waste

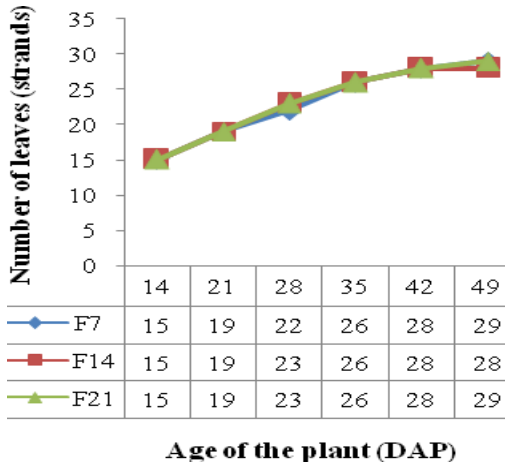



Figure 5. Average number of leeks with frequency of LOF pineapple peel waste

The frequency of watering every 7 days and every 21 days has the same number of saplings at every age of the plant.The increase in the number of sapouts at the frequency of 7 days and 21 days was at the age of 21 DAP and 35 DAP, while at the frequency of 14 days once the number of shallots plant sapouts increases at the age of 28 DAP.The number of shallots crop sapouts was relatively constant from the age of 35 DAP to harvest (Figure 6). DMRT (Duncan's Multiple Range Test) results on various frequencies of pineapple peel waste LOF could be seen in Table 4. The number of saprings per clump of shallots plants at the frequency of LOF pineapple pel waste

every 7 days showed higher results and was not significantly different from the frequency of LOF every 14 days. However, both LOF frequencies were significantly different from the frequency of giving LOF once every 21 days.

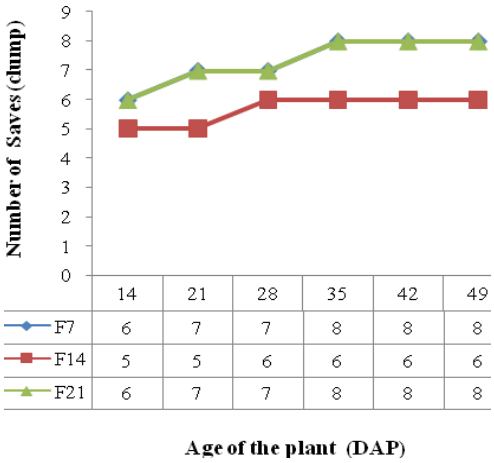



Figure 6. Average number of shallots plant sapleds with frequency of LOF pineapple peel waste

Table 4. DMRT further test results on various frequencies of giving LOF pineapple peel waste to the number of shallots plant saplings

| Frequency of LOF Pineapple Peel Waste | Number of Sapves Per Clump |
|---|---|
| 7 days | 7,62 $_{a}$ |
| 14 days | 7,25 $_{a}$ |
| 21 days | 6,00 $_{b}$ |

Note: Numbers followed by the same letter in the same column showed no real difference in the DMRT test with a confidence level of 95%

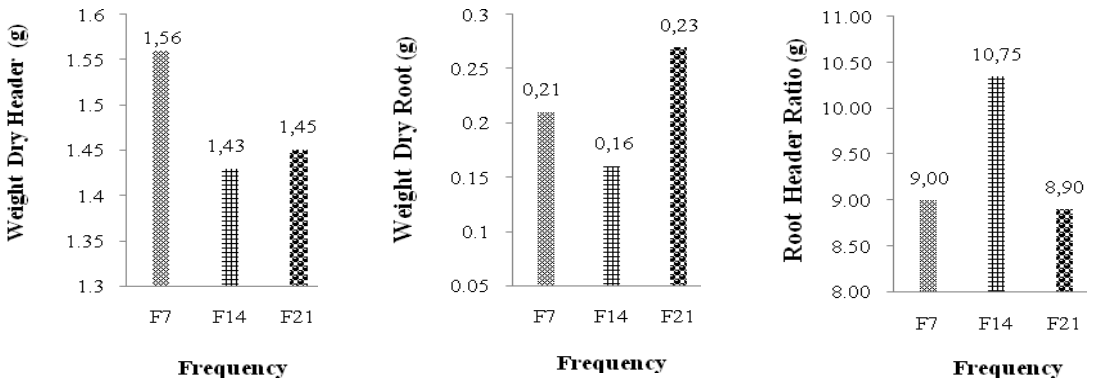
The POC of pineapple peel waste with different frequencies indicates a dry weight changer header (Figure 7a), a dry weight of roots (Figure 7b) and a different root header ratio (Figure 7c). LOF waste pineapple peel with a frequency of 7 days once tends to be better on dry weight change headers, However, with less frequent LOF frequency, it has a different response to the dry weight of the root and the root header ratio. The dry weight of the roots with the application of LOFpineapple peel wastes at a rare frequency (21 days) tends to be better than the application of LOF pineapple peel waste at a more frequent frequency. The ratio of shallots plant root headers tends to be better at giving LOF pineapple peel waste with a frequency of 14 days compared to other LOF frequency giving (Figure 7).

**Effect of LOF Frequency of Pineapple Peel Waste on Shallots Crop Yields**

The application of LOF waste of pineapple peell with different frequencies has no significant effect on the yield of shallots plants. The provision of LOF of pineapple peel waste with a frequency of 7 days tends to have a bulb diameter, bulb yield per plant and bulb yield per plot was higher compared to the frequency of 14 days and 21 days (Figure 8).

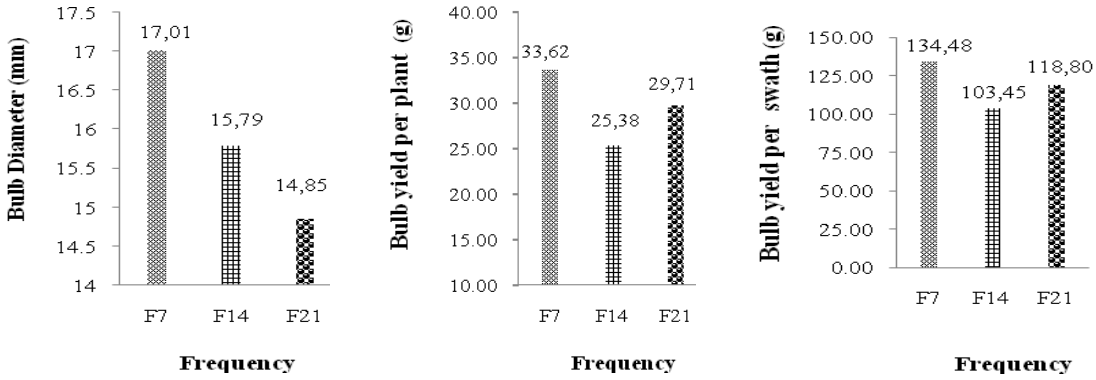
Interaction Between Concentration and Frequency of LOF of Pineapple Peel Waste on Shallots Plant Growth Results in Table 5 showed that the height of shallots plants with the administration of LOF wastes pineapple peel at lower concentrations (30 ml/l) but the frequency of giving more often tends to be higher than shallots plants with higher concentrations (60 ml/l) with less frequent administration. The administration of LOF pineapple peels wastes at a concentration of 30 ml/l as much as 7 times tend to be higher than shallots plants with NPK fertilizer 16:16:16 (control).

However, the treatment of POC administration of other pineapple peel waste tends to be lower compared to the treatment of N-P-K fertilizer 16:16:16 (control). Shallots plants with a concentration of 30 ml/l pineapple peel waste LOF indicate the number of leaves and the number of saplings that tend to be more with the less frequent application of LOF. The application of LOF pineapple peel waste with a concentration of 60 ml/l in shallots plants showed that the more frequent the provision of LOF pineapple peel waste, the more the number of leaves and springs tends to increase. The number of leeks with NPK fertilizer 16:16:16 tends to be more than the provision of LOF pineapple peel waste.




(a) (b) (c)

Description: Dry weight of header (a), dry weight of root (b) and root header ratio (c).
Figure 7. Average growth of shallots plants at various frequencies of giving LOF pineapple peel waste




(a) (b) (c)

Description: Bulb diameter (a), tuber yield per plant (b) and tuber yield per plot (c)
Figure 8. Average change in shallots crop yields at various frequencies of LOFapplication of pineapple peel waste

The number of shallots plant sprouts with the provision of LOF pineapple peel waste at a concentration of 60 ml /l as much as 7 times tend to be higher than shallots plants with NPK fertilizer 16:16:16. The dry weight of the shoot-root ratio of the shallots plant roots at the concentration of LOF application of pineapple peel waste of 30 ml/l with a rare frequency of application tends to be better compared to the frequency of more frequent LOF application.

The provision of LOF pineapple peel waste with a concentration of 60 ml/l in shallots plants showed that the more frequent the provision of LOF pineapple peel waste, the shoot dry weight of the shallots plant tend to be better, but at dry weight, the roots with a concentration of 60 ml/l tend to be the same at 7 days and every 21 days. The dry weight of shoot and the dry weight of root of the shallots plant roots with the application of LOF. The ratio of shallots plant root headers in the application of LOF pineapple peel waste with a concentration of 30 ml/l as much as 4 times tends to be higher than the application of LOF as much as 7 times and 3 times. The application of LOF pineapple peel waste with a concentration of 60 ml/l indicates that the more frequent the provision of LOF pineapple peel waste, the root shoot ratio tends to be higher. The ratio of the root header of the shallots plant to the application of LOF pineapple peel waste at a concentration of 30 ml/l as much as 4 times tends to be higher than the shallots plant with the provision of NPK fertilizer 16:16:16 (control). However, the treatment of POC of other pineapple peel waste tends

to be lower than the treatment of npk fertilizer 16:16:16.

**Interaction Between Concentration and Frequency of LOF of Pineapple Peel Waste on Shallots Crop Yields**

The results in Table 6 showed that the interaction between the concentration and frequency of POC of pineapple peels waste against the skin color of shallots bulbs in all treatments was almost the same i.e. Red Purple color. The difference was only seen in its brightness level. The brightness levels of shallots bulb skins on the C30F7, C60F7 and C60F14 treatments tend to be brighter compared to other treatments. The skin color of the shallots plant bulbs with the application of POC pineapple skin waste on the interaction of treatment C30F14, C60F21 and treatment of fertilizer NPK 16:16:16 (control) tends to be more concentrated.

The results of Table 7 showed that the diameter of shallots plant bulbs at the concentration of LOF application of pineapple peel waste of 30 ml/l with frequent giving frequency tends to be greater than the high concentration with rare giving frequency. The diameter of the shallots plant bulbs with a concentration of LOF of 60 ml/l pineapple peel waste as much as 4 times tends to be greater than the giving 7 times and 3 times. The application of LOF pineapple peel waste at a concentration of 30 ml /l as much as 7 times tends to have a larger bulb diameter compared to the application of NPK fertilizer 16:16:16 (control). However, the treatment of other pineapple peel waste LOF tends to be smaller than the treatment of NPK fertilizer 16:16:16 (control).

Table 5. Interaction between concentration and frequency of LOF of pineapple peel waste against shallots plant growth

| Observed Parameters | Concentration (C) | Frequency (F) | | |
|---|---|---|---|---|
| | | F7 | F14 | F21 |
| Plant Height | C30 | 37,67 | 36,25 | 35,50 |
| | C60 | 35,85 | 34,82 | 34,92 |
| | Control | | 36,80 | |
| Number of Leaves | C30 | 27 | 26 | 30 |
| | C60 | 31 | 29 | 27 |
| | Control | | 33 | |
| Number of Sapves | C30 | 7 | 6 | 8 |
| | C60 | 8 | 6 | 7 |
| | Control | | 6 | |
| Dry Weight Shoots | C30 | 1,45 | 1,40 | 1,62 |
| | C60 | 1,67 | 1,47 | 1,27 |
| | Control | | 1,28 | |
| Dry Weight of Roots | C30 | 0,22 | 0,15 | 0,32 |
| | C60 | 0,20 | 0,17 | 0,20 |
| | Control | | 0,15 | |
| Root Shoot Ratio | C30 | 6,75 | 12,00 | 8,60 |
| | C60 | 11,25 | 9,50 | 9,20 |
| | Control | | 10,00 | |

Table 6. The results of observation of the skin color of shallots bulbs using the book munsell color chart

| Treatment Interaction | Bulb Color Code | Bulb Color Image |
|---|---|---|
| C30F7 | *Red Purple* (5/10 5RP) |  |
| C30F14 | *Red Purple* (4/12 5RP) | |
| C30F21 | *Red Purple* (4/10 5RP) | |
| C60F7 | *Red Purple* (5/10 5RP) | |
| C60F14 | *Red Purple* (5/10 5RP) | |
| C60F21 | *Red Purple* (4/12 5RP) | |
| Control | *Red Purple* (4/12 5RP) | |

Table 7. Interaction between concentration and frequency of LOF of pineapple peel waste in shallots crop yields

| Observed Parameters | Concentration (C) | Frequency (F) | | |
|---|---|---|---|---|
| | | F7 | F14 | F21 |
| Bulb Diameter | C30 | 18,32 | 15,74 | 15,26 |
| | C60 | 15,70 | 15,84 | 14,44 |
| | Control | | 15,95 | |
| Bulb Yield Per Plant | C30 | 38,95 | 26,57 | 33,47 |
| | C60 | 28,30 | 24,40 | 25,95 |
| | Control | | 23,75 | |
| Bulb Yield Per Block | C30 | 155,80 | 106,30 | 133,80 |
| | C60 | 113,15 | 100,60 | 103,80 |
| | Control | | 94,98 | |

The application of LOF pineapple peel waste with concentrations of 30 ml/l and 60 ml/l in shallots plants showed that the more frequent the provision of LOF pineapple peel waste, the yield of tubers per plant and tuber yield per plot of shallots tends to be higher. Tubers per plant and bulb yields per plot of shallots plants with higher concentrations (60 ml/l) but the frequency of giving more often tends to be lower than shallots plants with lower concentrations (30 ml /l) with less frequent giving. The yield of bulbs per plant and per plot with a concentration of LOF application of pineapple peel waste of 30 ml/l as much as 7 times tends to be higher which was 64% compared to shallots plants with the provision of NPK fertilizer 16:16:16 (control).

## DISCUSSION

The provision of liquid organic fertilizers of pineapple peel waste gives no significant effect to all growth and yields of shallots plants (Table 1). This is thought to be due to rainfall and a fairly high rainy day during the study. The intensity of rainfall at the time of the study is 39.5 mm with the number of rainy days of 11 days in February, in March which is 338.3 mm with the number of rainy days by 15 days and in April it is 211.7 mm with the number of rainy days by 14 days. The rainfall is quite high when compared to the rainfall needed by shallots plants. Ralahalu et al. (2017) state that good rainfall for shallots plants ranges from 300-2500 mm/year. The intensity of rain is high enough to cause the water to be flooded so that the LOF given is easily washed. Junaidi (2021) stated that the high rainfall causes the nutrient content in liquid organic fertilizers to be washed by water so that the nutrient is not absorbed maximally by the roots. Insufficient availability of nutrients will affect the physiological processes of a plant so that plant growth and production become disrupted. Novriani (2014) states that the growth of a plant will be optimal if the

required nutrients are available in quantities and shapes that suit the needs of the plant. Nurman et al. (2017) added that the fulfillment of nutrient needs in plants will increase the metabolic process of plants for the better.

Rainfall is quite high at the time of research also causes pest attacks and diseases in shallots plants. Pests that attack the shallots plant are shallots caterpillars Spodoptera exigua. Symptoms of this caterpillar are the onset of transparent white patches on the leaves, perforated leaves, drooping, and dry out. Symptoms of caterpillar attack begin to appear at the age of 22 DAP with an attack intensity of 5%. Shallots plants are also stricken with fusarium withered diseases. Symptoms of this disease are characterized by rolling leaves and yellow from the tip of the leaf to the base of the leaf. Symptoms of fusarium attack begin to appear at the age of 8 DAP as many as 8 plants out of 840 shallots plant populations. The intensity of fusarium attacks at the age of 35 DAP continues to increase until the age of 49 DAP. This is thought to be because the humidity of the air in the rainy season is higher than the dry season. Air humidity at the time of the study ranged from 83.3-89.7%. The humidity of the air is quite high compared to the humidity needed by shallots plants. Sumarni and Hidayat (2005) stated that the humidity of the air is good for the growth of shallots plants which is 50-70%. Triwidodo and Tanjung (2020) stated that high air humidity causes disease mushrooms to be able to grow and develop in plants. Ralahalu et al. (2017) explained that less supportive environmental conditions cause crop growth and production to be disrupted.

The concentration of LOFapplication of pineapple peel waste has no real effect on the shallots plant but there is a tendency that the concentration of 30 ml/l is better than the concentration of 60 ml/l. This can be seen from the height of the plant (Figure 1), the dry weight of the header, the dry weight of the roots, the ratio of root headers (Table 2) and the cultivation of shallots plants (Table 3). This is thought to be due to the difference in the concentration of LOF application of pineapple peel waste between treatments of only 30 ml/l. The difference is to small so it has not been able to show a noticeable difference to the growth and yield of shallots plants. This is in accordance with the results of research from Hakim and Anandari (2019) stating that the application of LOF weevil bananas with a dose difference of 150 ml/l of water/plot has an unreal effect on all shallots plant growth and production. Nurlailah et al. (2016) states that the application of fertilizer doses that are too low causes no effect on plant growth.

The frequency of giving LOF pineapple peel waste once every 7 days has a tendency to increase the growth value and production of shallots plants. This is seen from the tall peubah of the plant (Figure 4), the number of leaves (Figure 5), the number of saprings (Figure 6), the dry weight of the header (Figure 7) and the shallots plant yield (Figure 8). This is thought to be because the frequency of 7 days is able to provide nutrients that tend to be higher than the frequency of once every 14 days and once every 21 days. Pasaribu et al. (2017) stated that the more often the frequency of fertilizers given, the higher the nutrient content received.

Jamilah and Novita (2016) added that plants that are fertilized every week more often get nutrients so as to encourage the acceleration of plant metabolism. Atmaja (2017) states that the provision of fertilizer causes metabolic processes in plants to run well.The results of metabolism (the process of photosynthesis) will then be translocated to all plant organs so as to increase plant growth and production.

The interaction between the concentration and frequency of LOF application of pineapple peel waste exerts an unreal influence on the growth and yield of shallots plants. The application of LOF pineapple peel waste on shallots plants tends to give better results than NPK fertilizer (16: 16: 16). The application of

LOF pineapple peel waste on shallots plants has the potential to approach chemical fertilizers.

LOF pineapple peel waste has a micro nutrient content that is not found in NPK fertilizer. Plants not only need macro nutrients but need micronutrients for their metabolic processes. Jovita (2018) states that plant growth and yield require macro and micro nutrients such as hydrogen (H), carbon (C), oxygen (O), nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), iron (Fe), manganese (Mn), sulfur (S), Mo, boron (Br), copper (Cu), zinc (Zn) and chlorine (Cl). Some of these nutrients are found in POC pineapple skin waste. This is in accordance with the statement of Susi et al. (2018) that macro nutrients contained in pineapple peel waste LOF are Phosfat, Potassium, Nitrogen, Calcium and Magnesium, while micronutrients are Iron, Manganese, Copper and Zinc.

## CONCLUSSION

The concentration of LOF waste of pineapple peel does not affect the growth and yield of shallots plants. The LOF concentration of 30 ml/l pineapple peel waste tends to produce better growth and yield of shallots plants compared to the concentration of 60 ml/l. The frequency of LOF waste of pineapple peel has no effect on the growth and yield of shallots plants except the number of saprings. The frequency of LOF waste of pineapple peel once every 7 days tends to produce better growth and yield of shallots plants compared to the frequency of 14 days once and the frequency of 21 days. The interaction between the concentration and frequency of LOF of pineapple peel waste did not affect the growth and yield of shallots plants. The administration of LOF pineapple peel waste with a concentration of 30 ml/l and a frequency of 7 days once tends to be better for the growth and yield of shallots plants.

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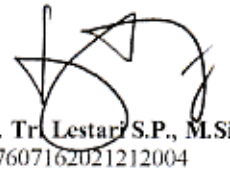

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