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The Effect of Liquid Organic Fertilizer and Potassium Fertilizer Application on the Growth and Production of Red Onion (*Allium ascolonicum L.*)

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Abstract:
Background*: Red onion (Allium ascalonicum L) is a horticultural commodity that has the potential to be developed in almost parts of the world. Besides being used as a cooking spice, it also contains several substances that are beneficial to health. Liquid organic fertilizer and potassium fertilizers are often used to increase the growth and production of red onion plants.*
Materials and Methods*: This research used a randomized block design (RBD) with 2 factors. The first factor is liquid organic fertilizer consisting of 3 levels, namely: P1 = 210 ml of solution/plot (5cc/1 liter of water), P2= 420 ml of solution/plot (5cc/1 liter of water), P3= 630 ml of solution/plot (5cc/ 1 liter of water). The second factor is potassium fertilizer consisting of 3 levels, namely: K1 = 15 gr/plot (equivalent to 150 kg/ha), K2 = 20 gr/plot (equivalent to 200 kg/ha), K3 = 25 gr/plot (equivalent to 250 kg/ha).*
Results*: The results showed that liquid organic fertilizer had a significant effect on fresh weight of tubers per sample and dry weight of tubers per sample but had not significant effect on plant height, number of leaves, number of saplings, fresh weight of tubers per plot, and dry weight of tubers per plot. Potassium fertilizer treatment had not significant effect on plant height, number of leaves, number of saplings, tuber fresh weight per sample, tuber dry weight per sample, wet weight per plot, and dry weight per plot.*
Conclusion:*The interaction of liquid organic fertilizer and potassium fertilizer had a significant effect on tuber wet weight per sample, tuber dry weight per sample, tuber wet weight per plot, and tuber dry weight per plot but had not significant effect on plant height, number of leaves, and number of saplings.*
Key Word*:liquid organic fertilizer, potassium fertilizer, red onion*

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I. Introduction

Red onion is one of the leading vegetable commodities which has been intensively cultivated by farmers for a long time and continues to experience an increase in demand and consumption. This vegetable commodity belongs to the group of unsubstituted spices which function as food seasoning and traditional medicine. Red onion is a commodity cultivated by farmers from the lowlands to the highlands. Red onion require air temperatures ranging from 25 ^{O}C to 30 ^{O}C, an open place that is not foggy, full sun intensity, loose soil, contains enough organic matter to produce the best growth and production.[12]

Red onion have played many roles in improving human welfare and have properties as traditional medicine. Red onion bulbs are used as a medicine because they have an antiseptic effect from allin or allisin compounds by the allisinliase enzyme which is converted into pyruvic acid, ammonia and anti-microbial allisin which are bactericidal. The active compounds in the onion bulbs play a role in neutralizing harmful toxic substances and helping to remove them from the body. In this case, an important benefit of red onion bulbs is their role as natural antioxidants, which are able to suppress the carcinogenic effects of free radical compounds.[15] Other parts of the red onion plant, such as the leaves and flower stalks, are among the most delicious foods. The nutrients content in red onion bulbs can help the circulatory system and digestive system of the body. This allows the organs and tissues of the body to function properly.[15]

The Central Statistics Agency (2019) stated that the six main red onion producing provinces in 2018 were Central Java, East Java, West Nusa Tenggara, West Java, West Sumatra and South Sulawesi. The production from each of provinces reaches more than 90 thousand tons and in total these six provinces contribute 93% of the total national red onion production which reaches 1.50 million tons. National red onion production in 2018 grew by 2.26% compared to the previous year.

The Food and Horticulture Service of North Sumatra (2020) stated that red onion production in North Sumatra in 2018 was 16,337 tons and in 2019 was 18,069 tons. The data shown that red onion production in

North Sumatra is still far from demand.In increasing red onion production, it is necessary to use fertilizer. The more diverse content of liquid organic fertilizer is very good for plant growth and development. Information regarding the use of liquid organic fertilizer is still very limited, while the consumption of red onion is increasing, it is necessary to have technology to improve the quality and quantity of red onion.[9]

Along with the development of agricultural technology, natural organic fertilizers have been developed that can be used to help overcome the constraints of red onion production. Liquid organic fertilizer is 100% natural organic fertilizer from extracts of organic matter from livestock and poultry waste, waste of certain plants and other natural substances which are processed based on environmentally sound technology.[1] . The micro-nutrient content in 1 liter of liquid organic fertilizer has a function equivalent to the micro-nutrient content of 1 ton of manure.

The application of organic fertilizers can improve soil structure, increase soil water absorption, improve living conditions in the soil, and serve as a source of food for plants. Meanwhile, the application of inorganic fertilizers can stimulate overall growth, especially branches, stems, leaves, and plays an important role in the formation of green leaves.[5]

Liquid organic fertilizer is an organic fertilizer that contains complete nutrients. According to Kurniawati liquid organic fertilizer is the result of fermentation of various organic materials that contain various kinds of amino acids, phytohormones, and vitamins which play a role in increasing and stimulating soil microbial growth.[14] The liquid organic fertilizer formula contains of 0.12% N, 0.03% P_2O_5, 0.31% K_2O, 4.6% C Organic and 41.04 ppm Zn, 8.43 ppm Cu, 2.42 ppm Mn, Co. 2.54 ppm, Al 6.38 ppm, Mo <0.2 ppm, C/N ratio 38.33 and contains growth stimulants such as auxin, gibberellins and cytokinins.[23]

Chemical fertilizers also play a role in increasing the productivity of red onions. The chemical fertilizer used to maximize production is potassium fertilizer. Potassium plays a role in metabolic processes such as photosynthesis, respiration, enzyme cofactors, stomata regulation, translocation of sugars to form starch and protein, increases plant resistance to pests and diseases, strengthens the plant body so that leaves, flowers and fruit do not fall off easily.[1]

The element potassium functions to form starch, activate enzymes, enhance resistance to drought, disease and root development. Lacking the potassium element, red onion plant leaves will wrinkle or curl and transparent yellow spots will appear on the leaves and turn brownish red.[11]

KCl fertilizer is a source of Potassium for plants. Its main function is to help the formation of proteins and carbohydrates. For sandy soils where the soil pores are large enough, the potassium fertilizer is easily washed away and carried away by the flow of water. KCl fertilizer has volatile properties, so its application must be done when the soil is still moist and not when the soil is draining water because from the research results the evaporation rate is 30%/day.[17]

II. Material And Methods

This research was conducted at UPT. BenihIndukPalawijaTanjungSelamat Jalan Pendidikan No. 23 TanjungSelamatSunggal District Deli Serdang Regency North Sumatera Province with an altitude of ±30 meters above sea level, which held in February-April 2022.

This research used a randomized block design (RBD) with two factorials. The first factor is liquid organic fertilizer consisting of three levels, namely: P1=210 ml solution/plot (5 cc/l water), P2=420 ml solution/plot (5 cc/l water), P3=630 ml solution/plot (5 cc /l of water). The second factor was potash fertilizer consisting of three levels, namely: K1=15 g/plot (150 kg/ha), K2=20 gr/plot (200 kg/ha), K3=25 gr/plot (250 kg/ha).The composted soil was analyzed at the Laboratorium Pusat PenelitianKelapaSawit (PPKS) of North Sumatra to analyze soil pH, C-Organic, N, P, and K. The red onion seeds were used the Tajuk variety.

Tubers are planted with a predetermined distance of 20 x 15 cm. The liquid organic fertilizer application was carried out by spraying the leaves and stems twice, when the plants were 10 days after planting and 20 days after planting used a hand sprayer. Meanwhile, potassium fertilization was applied twice, at the age of 7 days after planting and 21 days after planting according to the treatment dose by spreading the fertilizer around the plants. Onion plant maintenance includes watering, inserting, weeding, and controlling pests and diseases. Parameters observed were: plant height, number of leaves, number of saplings, tuber wet weight per sample, tuber wet weight per plot, tuber dry weight per sample, tuber dry weight per plot.

III. Result

Plant height

The list of variance showed that liquid organic fertilizer and potassium fertilizer had no significant effect on plant height at all ages of observation, while the interaction of the two treatments had a significant effect on plant height at 5 WAP of observation and had no significant effect at 2, 3, and 4 WAP of age. Table 1 presents the different test of red onion plant height at 2, 3, 4, and 5 WAP due to liquid organic fertilizer and potassium fertilizer treatment.

Table 1 shown that the effect of liquid organic fertilizer treatment at the age of 5 WAP the highest plant was obtained at P3 followed by P2 and P0 the lowest plant was at P1. Potassium fertilizer treatment at the age of 5 WAP obtained the highest plant in K1 followed by K2 and the lowest plant was in K3. Interaction of liquid organic fertilizer and potassium fertilizer treatment at 5 WAP obtained the highest plants at P0K2 significantly different from the combination of P0K3 treatments but not significantly different from the combination of treatments P0K1, P1K1, P1K2, P1K3, P2K1, P2K2, P2K3, P3K1, P3K2, and P3K3.

Table 1. Average Plant Height (cm) as a result of liquid organic fertilizer and potassium fertilizer treatment

Treatments	Plant height (cm)			
	2 WAP	3 WAP	4 WAP	5 WAP
P0	19.06	22.63	25.02	26.12
P1	18.80	21.89	24.99	26.11
P2	18.89	22.50	25.37	26.40
P3	18.84	22.35	25.79	26.86
K1	18.97	22.4	25.49	26.52
K2	19.19	22.63	25.36	26.42
K3	18.53	22.00	25.03	26.18
P0K1	19.34	22.19	24.94	25.86 ab
P0K2	19.73	23.84	26.18	27.86 b
P0K3	18.11	21.87	23.94	24.63 a
P1K1	18.32	21.93	25.70	26.72 ab
P1K2	19.42	21.68	24.80	25.92 ab
P1K3	18.66	22.04	24.48	25.71 ab
P2K1	18.69	22.21	24.82	25.88 ab
P2K2	19.17	22.74	24.96	25.71 ab
P2K3	18.81	22.56	26.32	27.61 b
P3K1	19.54	23.26	26.49	27.63 b
P3K2	18.46	22.24	25.48	26.21 ab
P3K3	18.53	21.56	25.39	26.76 ab

Numbers followed by the same letter in the same column are not significantly different at the 5% test level

Figure 1 shows that the higher the liquid organic fertilizer dose, the red onion plant height increases following a linear regression curve. The increase in red oion plant height will be faster if the application of liquid organic fertilizer is combined with K3 (Potassium Fertilizer 25 gr/Plot) while the lowest plant is in the K2 treatment (Potassium Fertilizer 20 g/Plot). This shown that the application of liquid organic fertilizer and high doses of potassium fertilizer has a positive effect on red onion plant height.

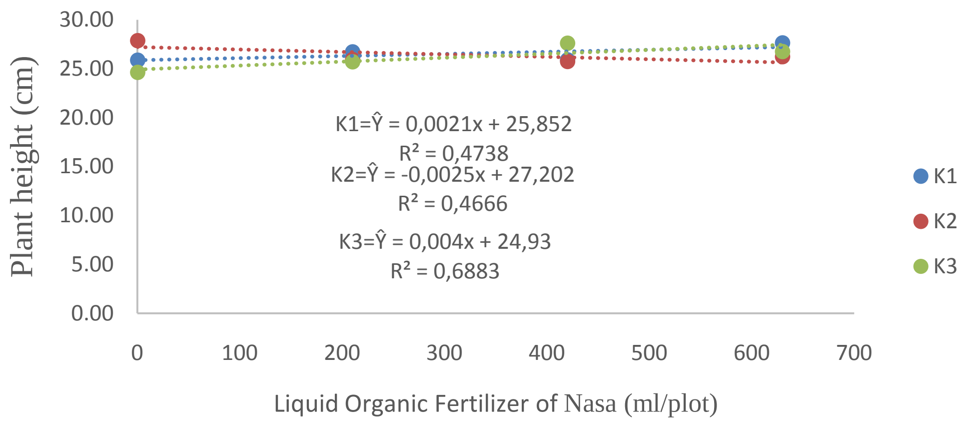

Figure 1. Interaction of liquid organic fertilizer and potassium fertilizer on red onion plant height at 5 weeks after planting

Number of Leaves

The list of variance showed that liquid organic fertilizer, potassium fertilizer and the interaction of the two treatments had no significant effect on the number of leaves at all ages of observation. Table 2 presents the average number of red onion leaves at 2, 3, 4, and 5 WAP due to liquid organic fertilizer and potassium fertilizer treatment.

Table 2. Average number of leaves as a result of liquid organic fertilizer and potassium fertilizer treatment

Treatments	Number of leaves			
	2 WAP	3 WAP	4 WAP	5 WAP
P0	24.00	25.57	25.43	26.06
P1	23.15	24.70	25.87	26.26
P2	23.30	25.89	26.37	26.85
P3	24.04	26.15	26.96	29.50
K1	23.86	25.61	26.44	27.74
K2	24.11	25.85	26.40	27.35
K3	22.89	25.28	25.63	26.42
P0K1	22.72	23.89	24.00	25.22
P0K2	25.67	27.72	27.67	28.56
P0K3	23.61	25.11	24.61	24.39
P1K1	24.61	26.39	28.00	29.39
P1K2	24.44	24.67	25.89	26.67
P1K3	20.39	23.06	23.72	22.72
P2K1	22.39	24.50	25.17	25.28
P2K2	22.83	25.61	25.61	25.11
P2K3	24.67	27.56	28.33	30.17
P3K1	25.72	27.67	28.61	31.06
P3K2	23.50	25.39	26.44	29.06
P3K3	22.89	25.39	25.83	28.39

Numbers followed by the same letter in the same column are not significantly different at the 5% test level

Table 2 shown that due to the effect of the liquid organic fertilizer treatment at the age of 5 WAP, the highest number of leaves was obtained at P3 followed by P2 and P1, the lowest number of leaves was at P0. Potassium fertilizer treatment at the age of 5 WAP obtained the highest number of leaves in K1 followed by K2 and the lowest number of leaves was in K3. The interaction of liquid organic fertilizer treatment and potassium fertilizer at the age of 5 WAP obtained the highest average number of leaves was P2K3 and the lowest was the combination P1K3.

Number of Saplings

The list of variance showed that liquid organic fertilizer, potassium fertilizer and the interaction of the two treatments had no significant effect on the number of saplings at all ages of observation. Table 3 presents the average number of saplings at the age of 6, 7 and 8 WAP due to liquid organic fertilizer and potassium fertilizer treatment.

Table 3. Average number of saplings due to liquid organic fertilizer and potassium fertilizer treatment

Treatments	Number of saplings		
	6 WAP	7 WAP	8 WAP
P0	8.30	9.22	9.48
P1	7.85	8.67	8.81
P2	8.06	9.02	9.22
P3	8.28	9.24	9.46
K1	8.10	9.03	9.32
K2	8.22	9.26	9.39
K3	8.04	8.82	9.03
P0K1	8.17	8.83	9.28
P0K2	8.83	9.94	10.11
P0K3	7.89	8.89	9.06
P1K1	7.94	9.11	9.28
P1K2	8.06	8.89	9.00
P1K3	7.56	8.00	8.17
P2K1	7.61	8.72	8.94
P2K2	7.89	9.17	9.28
P2K3	8.67	9.17	9.44
P3K1	8.67	9.44	9.78
P3K2	8.11	9.06	9.17
P3K3	8.06	9.22	9.44

Numbers followed by the same letter in the same column are not significantly different at the 5% test level

Table 3 shown that due to the effect of the liquid organic fertilizer treatment at the age of 5 WAP, the highest number of sappling was obtained at P0 followed by P3 and P2, the lowest number of saplings was at P1. Potassium fertilizer treatment at 5 WAP obtained the highest number of saplings in K2 followed by K1 and the lowest number of saplings was in K0. The interaction between liquid organic fertilizer and potassium fertilizer at 5 WAP obtained the highest average number of saplings in the P0K2 combination and the lowest in the P1K3 combination.

Tubers Wet Weight Per Sample

The list of variance showed that potassium fertilizer had no significant effect on the wet weight of tubers per sample, while liquid organic fertilizer had a significant effect and the interaction of the two treatments had a significant effect on the wet weight of tubers per sample. Table 5 presents the average tuber wet weight per sample as a result of liquid organic fertilizer and potassium fertilizer treatment.

Table 5. The average of wet weight of tubers per sample as a result of liquid organic fertilizer and potassium fertilizer treatment

Treatments	Wet weight of tubers per sample			Average
	K1	K2	K3	
P0	27.07 bcd	32.61 ef	24.40 b	28.03 b
P1	30.22 cde	25.82 b	18.82 a	24.95 a
P2	25.10 b	26.36 bc	31.03 def	27.49 ab
P3	35.27 f	31.11 def	30.00 cde	32.13 c
Average	29.42	28.97	26.06	

Numbers followed by the same letter in the same column are not significantly different at the 5% test level

Table 5 shown that the heaviest tuber wet weight per sample was found in the P3K1 treatment combination, which was significantly different from the P0K1, P0K3, P1K1, P1K2, P1K3, P2K1, P2K2, and P3K3 treatment combinations, but not significantly different from the P0K2, P2K3, and P3K2 treatment combinations. .

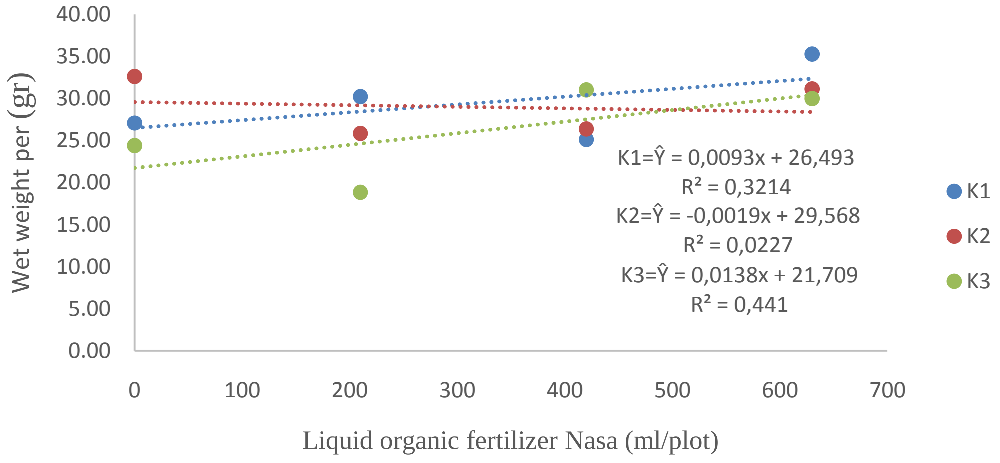

Figure 2. Interaction of liquid organic fertilizer and potassium fertilizer on wet weight of tubers per sample.

Figure 2 shown that the higher the liquid organic fertilizer dose, the tubers wet weight of red onion increases following a linear regression curve. The increase in the wet weight of red onion tubers would be faster if the addition of liquid organic fertilizer was combined with K1 (Potassium Fertilizer 15 g/Plot) while the tuber wet weight was lowest in the K2 treatment (Potassium Fertilizer 20 g/Plot). This shown that the application of liquid organic fertilizer and potassium fertilizer has a positive effect on the wet weight of red onion tubers.

Tuber Dry Weight Per Sample

The list of variance showed that potassium fertilizer had no significant effect on dry weight of tubers per sample, while liquid organic fertilizer had a significant effect and the interaction of the two treatments had a significant effect on dry weight of tubers per sample. Table 5 presents the average tuber dry weight per sample as a result of liquid organic fertilizer and potassium fertilizer treatment.

Table 5. Average dry weight of tubers per sample as a result of liquid organic fertilizer and potassium fertilizer treatment

Treatments	Dry weight of tubers per sample			Average
	K1	K2	K3	
P0	25.28 bcd	30.64 ef	22.79 b	26.24 b
P1	28.01 cde	24.44 bc	17.62 a	23.36 a
P2	23.33 b	24.89 bc	28.96 de	25.73 b
P3	33.15 f	28.73 de	27.89 cde	29.92 c
Average	27.44	27.18	24.32	

Numbers followed by the same letter in the same column are not significantly different at the 5% test level

Table 6 shows that the heaviest tuber dry weight per sample was found in the P3K1 treatment combination which was significantly different from the P0K1, P0K3, P1K1, P1K2, P1K3, P2K1, P2K2, P2K3, P3K2 and P3K3 treatment combinations but not significantly different from the P0K2 treatment combination.

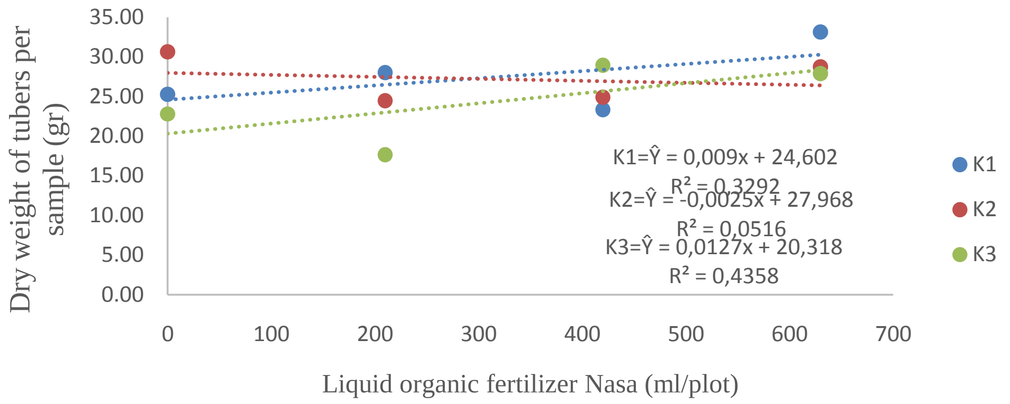

Figure 3. Interaction of liquid organic fertilizer and potassium fertilizer on tubers dry weight per sample

Figure 3 shown that the higher the liquid organic fertilizer dose, the dry weight of red onion tubers increases following a linear regression curve. The increase in the dry weight of red onion tubers would be faster if the application of the liquid organic fertilizer was combined with K1 (potassium fertilizer 15 gr/plot), while the lowest tuber dry weight was in the treatment of K2 (potassium fertilizer 20 g/plot). This shown that the provision of the liquid organic fertilizer and potassium fertilizer has a positive effect on the dry weight of red onion tubers.

Tubers Wet Weight Per Plot

The list of variance showed that liquid organic fertilizer and potassium fertilizer had no significant effect on tuber wet weight per plot, while the interaction of the two treatments had a significant effect on tuber wet weight per plot. Table 6 presents the average tuber wet weight per sample as a result of liquid organic fertilizer and potassium fertilizer treatment.

Table 6. Average wet weight of tubers per plot as a result of liquid organic fertilizer and potassium fertilizer treatment

Treatments	Wet weight of tubers per plot			Average
	K1	K2	K3	
P0	293.77 bc	358.57 def	291.17 bc	314.5
P1	352.83 cdef	310.00 bcd	206.60 a	289.81
P2	272.93 b	299.10 bcd	384.87 ef	318.97
P3	395.13 f	322.30 bcde	342.20 cdef	353.21
Average	328.67	322.49	306.21	

Numbers followed by the same letter in the same column are not significantly different at the 5% test level

Table 6 shown that the heaviest tuber wet weight per plot was found in the P3K1 treatment combination, which was significantly different from the P0K1, P0K3, P1K2, P1K3, P2K1, P2K2, and P3K2 treatment combinations, but not significantly different from the P0K2, P1K1, P2K3, and P3K3 treatment combinations. .

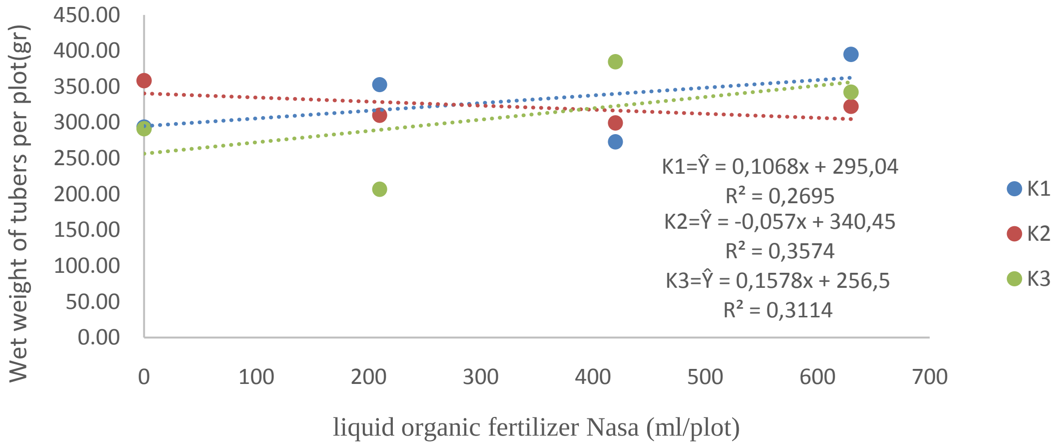

Figure 4. Interaction of liquid organic fertilizer and potassium fertilizer on wet weight of tuber per plot.

Figure 4 shown that the higher the liquid organic fertilizer dose, the wet weight of tuber per plot increases following a linear regression curve. The increase in the wet weight of tuber per plot would be faster if the addition of liquid organic fertilizer was combined with K1 (Potassium Fertilizer 15 gr/Plot) while the lowest tuber wet weight was in the K2 treatment (Potassium Fertilizer 20 g/Plot). This shown that the application of liquid organic fertilizer and potassium fertilizer has a positive effect on the wet weight of red onion tubbers.

Tuber Dry Weight Per Plot

The list of variance showed that liquid organic fertilizer and potassium fertilizer had no significant effect on tuber dry weight per plot, while the interaction of the two treatments had a significant effect on tuber dry weight per plot. Table 7 presents the average tuber dry weight per sample as a result of liquid organic fertilizer and potassium fertilizer treatment.

Table 7. Average tuber dry weight per plot as a result of liquid organic fertilizer and potassium fertilizer treatment

Treatments	Tuber dry weight per plot			Average
	K1	K2	K3	
P0	273.30 bc	336.63 def	272.23 bc	294.06
P1	328.43 cdef	290.13 bcd	192.37 a	270.31
P2	253.30 b	279.03 bcd	359.37 ef	297.23
P3	369.77 f	299.17 bcde	317.53 cdef	328.82
Average	306.2	301.24	285.38	

Numbers followed by the same letter in the same column are not significantly different at the 5% test level

Table 7 shown that the heaviest tuber dry weight per plot was found in the P3K1 treatment combination, which was significantly different from the P0K1, P0K3, P1K2, P1K3, P2K1, P2K2, and P3K2 treatment combinations, but not significantly different from the P0K2, P1K1, P2K3, and P3K3 treatment combinations.

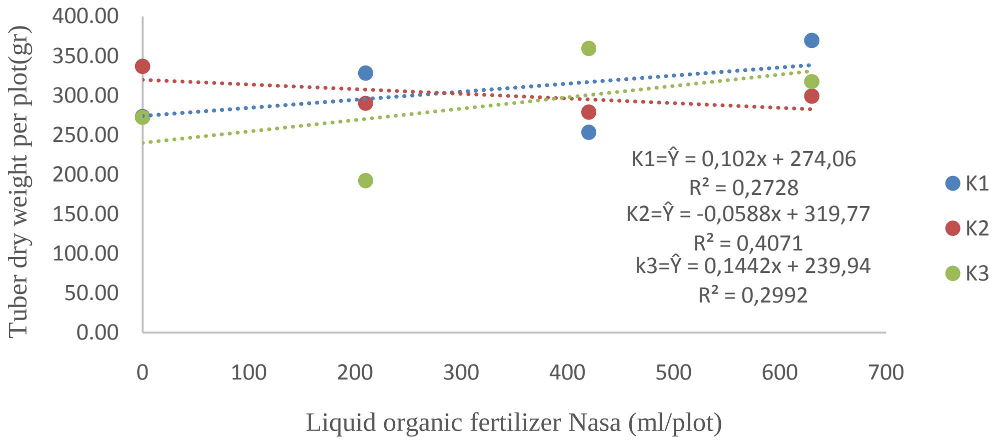

Figure 5. Interaction of liquid organic fertilizer and potassium fertilizer on the dry weight of tuber per plot.

Figure 5 shows that the higher the liquid organic fertilizer dose, the dry weight of red onion tuber increases following a linear regression curve. The increase in the dry weight of the red onion tuber would be faster if the administration of liquid organic fertilizer was combined with K1 (potassium fertilizer 15 gr/plot), while the lowest tuber dry weight was in the treatment of K2 (potassium fertilizer 20 g/plot). This shown that the provision of liquid organic fertilizer and potassium fertilizer has a positive effect on the dry weight of red onion tuber.

IV. Discussion

Effect of liquid organic fertilizer dosage on red onion growth and production

Based on the results of the test of variance, it showed that the liquid organic fertilizer dose treatment had a significant effect on the wet weight of tubers per sample and the dry weight of tubers per sample but had no significant effect on plant height, number of leaves, number of saplingss, wet weight of tubers per plot and dry weight of tubers per plot.

The results showed that the application of liquid organic fertilizer had a significant effect on the wet weight of tubers per sample. The highest wet weight was found in treatment P3 (32.13 g) which was significantly different from P0 (28.03 g), P1 (24.95 g) and P2 (27.49 g). This was thought to be due to the nutrients present in liquid organic fertilizer are able to meet the needs of plants. Stated that liquid organic fertilizer contains elements of N 0.12%, P2O50.03%, K2O 0.31%, C Organic 4.6% and micro elements Zn 41.04 ppm, Cu 8.43 ppm, Mn 2 .42 ppm, Co 2.54 ppm, Al 6.38 ppm, Mo <0.2 ppm, C/N ratio 38.33 and contains growth stimulants such as auxin, gibberellins and cytokinins.[23]

The research results also showed that the application of liquid organic fertilizer had a significant effect on the dry weight of tubers per sample. The highest dry weight was found in treatment P3 (29.92 g) which was significantly different from P0 (26.24 g), P1 (23.36 g) and P2 (25.73 g) this was allegedly due to the nutrients contained in liquid organic fertilizer sufficient and available for plants that cause plant physiological activity to increase. Potassium acts as an activator for various essential enzymes in photosynthetic and respiration reactions as well as for enzymes involved in protein and starch synthesis. In plants, P element is an important constituent of adenosine triphosphate (ATP) which directly plays a role in the process of storing and transferring energy related to plant metabolism and plays a role in increasing yield components.[10]

The effect of potassium fertilizer doses on the growth and production of red onions

Based on the results of the test of variance, it showed that the dose of potassium fertilizer had no significant effect on plant height, number of leaves, number of saplingss, tuber wet weight per sample, tuber dry weight per sample, tuber wet weight per plot and tuber dry weight per plot.

Potassium fertilizer had no significant effect on all observations, presumably because the dose of potassium fertilizer was too low. According to Amir, applying potassium fertilizer to plants at the right dosage can increase the production of red onion plants. Meanwhile, low or too high dosage levels will result in inhibition of plant growth and development.[1]

The effect of interaction between liquid organic fertilizerand potassium fertilizer on red onion growth and production

Based on the results of the test of variance, it showed that the interaction between doses of liquid organic fertilizer and potassium fertilizer had a significant effect on the wet weight of tubers per sample, the dry weight of tubers per sample, the wet weight of tubers per plot and the dry weight of tubers per plot but had no significant effect on the number of leaves and number of saplings.

The results showed that application of liquid organic fertilizer liquid organic fertilizer in combination with giving doses of potassium fertilizer increased the wet weight of tubers per sample. The highest wet weight was found in the combination of 630 ml/plot liquid organic fertilizer treatment with 15 gr/plot potassium fertilizer (P3K1) resulting in a wet tuber weight per sample of 35.27 g while the lowest tuber wet weight per sample was in the liquid organic fertilizer 210 ml/plot combination with fertilizer potassium 25 gr/plot (P1K3) of 18.82 gr. This shown that the addition of liquid organic fertilizer doses can increase red onion production. Macro nutrients such as N contained in liquid organic fertilizer and application of potassium fertilizer provide nutrients for plants. According to Efendi by fulfilling the needs of N and K elements in plants, the process of plant growth and development will provide optimum results so that it can affect plant wet weight which has a positive impact on production yields.[6]

The results also showed that giving liquid organic fertilizer combined with giving potassium fertilizer increased the dry weight of tubers per sample. The highest dry weight was found in the combination treatment of liquid organic fertilizer 630 ml/plot with potassium fertilizer 15 gr/plot (P3K1) resulting in a dry tuber weight per sample of 33.15 gr. While the lowest dry plant weight per sample was found in the combination of 210 ml/plot liquid organic fertilizer with 25 gr/plot potassium fertilizer (P1K3) of 17.62 gr. This shows that liquid organic fertilizer has a complete nutrient content but the nutrient content is small, so it must be given in large quantities, as well as the addition of inorganic fertilizers such as potassium to increase red onion production. According to Pratiwi (2019) that the use of organic fertilizer alone cannot increase crop productivity and food security. Therefore an integrated nutrient management system that combines the application of organic fertilizers and biological fertilizers as well as inorganic fertilizers in order to increase land productivity and environmental sustainability.

The results showed that the application of liquid organic fertilizer combined with the application of potassium fertilizer doses increased the wet weight of tubers per plot. The highest wet weight was found in the combination of 630 ml/plot liquid organic fertilizer treatment with 15 gr/plot potassium fertilizer (P3K1) resulting in a tuber wet weight per plot of 395.13 gr. Meanwhile, the lowest weight of wet weight tubers per plot was the combination of liquid organic fertilizer 210 ml/sample with 25 gr/plot potassium fertilizer (P1K3) of 206.60 gr. This shows that the P3K1 treatment combination was able to increase tuber weight because the nutrients from each treatment were sufficient for plant needs. According to Prastya, (2016) states that, plants need sufficient and balanced nutrients. When nutrients are given in excessive doses or low doses it will cause the plant's wet weight to decrease. Lack or excess of nutrients given to plants results in the photosynthesis process not running effectively and the photosynthate produced is reduced, causing the amount of photosynthate translocated to decrease. The availability of nutrients in the soil in a balanced manner allows plant growth and production to take place properly.[21]

The results also showed that giving liquid organic fertilizer combined with giving doses of potassium fertilizer increased the dry weight of tubers per plot. The highest dry weight was found in the combination of 630 ml/plot liquid organic fertilizer treatment with 15 gr/plot potassium fertilizer (P3K1) resulting in a dry weight tuber per plot of 369.77 gr while the lowest dry weight tuber per plot was in the 210 ml/plot liquid organic fertilizer combination with fertilizer potassium 25 gr/plot (P1K3) of 192.37 gr. It is suspected that the application of liquid organic fertilizer and the application of potassium fertilizer at a dose of 15gr/plot (equivalent to 75kg/ha) is the right dose to increase crop production. Vidya et al, (2016) stated that the application of potassium fertilizer as much as 75 kg/ha is the best dose to increase the growth and yield of red onion plants. 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.[30]

V. Conclusion

1. Liquid organic fertilizer treatment significantly affected tuber wet weight per sample and tuber dry weight per sample but had no significant effect on plant height, number of leaves, number of saplings, tuber wet weight per plot and tuber dry weight per plot.
2. Potassium fertilizer treatment did not significantly affect all observational data.
3. The interaction between liquid organic fertilizer and potassium fertilizer doses had a significant effect on plant height 5 WAP, tuber wet weight per sample, tuber dry weight per sample, tuber wet weight per plot, and tuber dry weight per plot.

Suggestion

Based on the research results, the recommended liquid organic fertilizer dose is 630 ml solution/plot combined with 15 gr/plot potassium fertilizer for red onion cultivation.

References

[1]. Amir, Nurbaiti. Paridawati, Ika. Mulya, S. Amin. 2021. ResponPertumbuhan Dan ProduksiTanamanBawang Merah (Allium *ascalonicum* L.). FakultasPertanianUniversitas Muhammadiyah Palembang DenganPemberianPupukOrganikCair Dan PupukKalium. Jurnalilmu-ilmuAgroteknologi, Vol.16 No 1 : 6-11.

[2]. Apriliani, I. N., S. Heddy dan N. E. Suminarti. 2016. PengaruhKalium Pada Pertumbuhan Dan Hasil DuaVarietasTanamanUbiJalar (*Ipomea batatas* L.). JurnalProduksiTanaman. 4(4):264-270.

[3]. Badan Pusat Statistik. 2019. DistribusiPerdaganganKomoditasBawang Merah. Indonesia. Badan Pusat Statistika.

[4]. Badan Pusat Statistik. 2020. BPS Provinsi Sumatera Utara. Biro Statistik Sumatera Utara, Medan.

[5]. Dewanto, F. G., J. J. M. R. Londok, R. A. V. Tuturoong, dan W. B. Kaunang. 2013. PengaruhPemupukanAnorganik Dan Organic TerhadapProduksiTanamanJagungSebagaiSumberPakan. JurnalZootek. 32(5):1-8

[6]. Efendi, Elfin., D. W. Purba dan N. U. I H. Nasution. 2017. ResponPemberianPupuk NPK Mutiara Dan Bokashi JeramiPadiTerhadapPertumbuhan Dan ProduksiTanamanBawang Merah (*Allium ascalonicum* L). JurnalPenelitianPertanian BERNAS Volume 13 No 3

[7]. Fajjriyah, N. 2017. KiatSuksesBudidayaBawang Merah. Bio Genesis. Yogyakarta.176 hal.

[8]. Fajri, M. 2014. PengaruhDosisPupukKandang dan KaliumTerhadapPertumbuhan dan Hasil TanamanBawang Merah (*Allium cepa*L. Kelompok*Agregatum*). JurnalFakultasAgroteknologi. UniversitasTeuku Umar Meulaboh: Aceh Barat.

[9]. Fannisa, F., dan D. Kastono. 2020. PengaruhPupukOrganikCairTerhadap Hasil Bawang Merah (*Allium cepa* L.) di LahanPasir. JurnalVegetalika. FakultasPertanian. Universitas Gadjah Mada.

[10]. Hidayat, O. dan Suharyana, A., 2019. PengaruhDosisPupukOrganikCairDaunLamtoroTerhadapPertumbuhan dan Hasil TanamanPakcoy (*Brassica rapa* L.) Varietas Nauli-F1. *Paspalum: JurnalIlmiahPertanian,* 7(2), pp 57-63

[11]. Irma. M., A., Pasigai dan H. Mas'ud. 2018. Pertumbuhan dan Hasil Bawang Merah (*Allium ascalonicum* L.) TerhadapPemberianBerbagaiDosisPupuk NPK. E-J. Agrotekbis 6. ISSN : 2338-3011.

[12]. Istina, I, N, 2016, PeningkatanProduksiBawang Merah Melalui Teknik Pemupukan NPK. BalaiPengkajianTeknologiPertanian Riau. JurnalAgroekoteknologi. Vol 3 (1).

[13]. Kurnianingsih, A., Susilawati dan M. Sefrila. 2017. KarakterPertumbuhanTanamanBawang Merah pada BerbagaiKomposisi Media Tanam. ISSN: 2614-2872.

[14]. Kurniawati, F. 2018. PengujianKualitasKompos Di Kebun Raya CibodasTerhadapPertumbuhanSawiHijau (*Brassica rapa*). J. Hort.Indonesia. 9(1): 47-53.

[15]. Kuswardhani, D. S. 2016. SehatTanpaObatDenganBawang Merah-BawangPutih. Penerbit Rapha Publishing. Yogjakarta.

[16]. Laia, Y. 2017. ResponPertumbuhan dan ProduksiTanamanBawang Merah (*Allium ascalonicum* L.) TerhadapPemberianPupukKotoranAyam Dan PupukOrganikCair (POC) Bonggol Pisang. FakultasPertanian. Universitas Medan Area. Medan.

[17]. Manik, S. Ernawati. 2020. PengaruhPemberianPupuk Abu SekamPadi Dan Kalium (KCL) TerhadapPertumbuhan Dan ProduksiTanamanBawang Merah (*Allium ascolanicum* L.). AGRILAND JurnalIlmuPertanian 8(2)

[18]. Pardoso, 2014.POC .PT. Natural Nusantar. Indonesia.

[19]. Pasaribu, S. 2017. Botani dan MorfologiTanamanBawang Merah. UniversitasMercuBuana. Yogyakarta.

[20]. Pradana, M. R. 2018. Pengaruh Tingkat Kekeringan Tanah TerhadapPertumbuhan dan Hasil Bawang Merah VarietasTiron (*Allium ascalonicum* L). FakultasPertanian. Universitas Muhammadiyah Yogyakarta. Yogyakarta.

[21]. Prastya, D., Wahyudi, I. and Baharudin, B. 2016. PengaruhJenis Dan KommposisiPupukKandangAyam Dan Pupuk NPK TerhadapSerapan Nitrogen Dan Hasil Bawang Merah (*Allium ascalonicum* L.) Varieta Lembah Palu di EntisolSidera. Agrotekbis: E-JurnalIlmuPertanian, 4(4), Pp.384-393

[22]. Prayitno, A. 2015. ResponPemberianKapurDolomit dan PupukOrganik Granule ModerenTerhadapPertumbuhan dan Hasil Bawang Merah (*Allium ascalonicum*L.) pada Tanah Berpasir. JurnalFakultasPertanianAgroteknologi. UniversitasJember. Palangkaraya.

[23]. Prizal, R. M., dan Nurbaiti. 2017. PengaruhPemberianPupukOrganikCairTerhadapPertumbuhan Dan ProduksiTanamanPakcoy (*Brassica rapa* L.). JomFaperta. 4 (2) : 1-9.

[24]. Rahayu, S, E. dan Rosdiana. 2016. ResponPertumbuhan Dan ProduksiBawang Merah DenganPenambahanPupukOrganikCair. JurusanAgroteknologi. Universitas Muhammadiyah Jakarta. Ciputat Jakarta Selatan 15419. Indonesia.

[25]. Ramadhani, N. F. Hayati, Mardhiah dan H. Rita. 2019. ResponPertumbuhan dan Hasil Bawang Merah AkibatDosisPupukKalium Dan Konsentrasi POC LimbahTahu. FakultasPertanianAgroteknologi, UniversitasSyiah Kuala. JurnalIlmiahMahasiswaPertanian Volume 4, Nomor 1.

[26]. Ramdani, D. Nugraha dan A. A. Wijaya. 2015. ResponPertumbuhan dan Hasil TanamanPadi (*Oryza sativa* L.) KultivarInpari 30 Pada SistemTanamBerbeda dan PemberianMacamDosisPupukAnorganik. JurnalIlmuPertanian dan Peternakan, Vol. 3 (2) : 125 – 131.

[27]. Rina, Dwi. 2015. ManfaatUnsur N, P, dan K BagiTanaman. BalaiPengkajianTeknologiPertanian. Kalimantan Timur. Diakses pada tanggal 7 Januari 2022.

[28]. Rosyidah, A. 2016. ResponPemberianPupukKaliumTerhadapKetahananPenyakitLayuBakteri dan KarakterAgronomi pada Tomat (*Solanum lycopersicum* L.). Seminar Nasional Hasil Penelitian. Universitas Islam Malang, Malang.

[29]. Sinaga, S. F., Simanungkalit, T dan Y. Hasanah. 2016. ResponsPertumbuhanBawang Merah TerhadapPemberianSampah Kota dan Pupuk K. JurnalAgroteknologiUniversitas Sumatera Utara.Vol. 4, No. 3. Hal: 2181-2187.

[30]. Supriyatna, S. Salman dan D. R. Nugraha. 2016. KombinasiPenggunaanOrganikCair, Kompos Dan AnorganikTerhadapPertumbuhan Dan Hasil TanamanBawang Merah (*Allium ascalonicum* L.) Kultivar Maja Cipanas. Agrivet Journal.

[31]. Uke, Kalwiyah H.Y., Henry B., dan Ichwan S.M. 2015. PengaruhUkuran Umbi dan DosisKaliumterhadapPertumbuhan dan Hasil ProduksiBawang Merah.

[32]. Wijarini, Nefrina. 2017. PengaruhEtilMetanaSulfonat (EMS) TerhadapResponPertumbuhanTanamanBawang Merah (*Allium cepa* L.). Skripsi. ITS, Surabaya.

[33]. Yasin, S. M. 2016. ResponPertumbuhanPadi (*Oryza sativa* L.) pada BerbagaiKonsentrasiPupukOrganikCairDaun Gamal. JurnalGalungTropika, 5(1), 20-27.