Vol. 14, No. 6 (2025): 2006 - 2016 http://dx.doi.org/10.23960/jtepl.v14i6.2006-2016

JURNAL TEKNIK PERTANIAN LAMPUNG

ISSN 2302-559X (print) / 2549-0818 (online)
Journal homepage : https://jurnal.fp.unila.ac.id/index.php/JTP

Effect of Dosage and Application Frequency of Potassium Fertilizer on the Growth and Yield of White Eggplant (*Solanum melongena* L. var. Kania)

Kholid Ihsan Abdulloh[1], Ramdan Hidayat[1,✉], Pangesti Nugrahani[1]

[1] Department of Agrotechnology, Universitas Pembangunan Nasional "Veteran" Jawa Timur, Surabaya, INDONESIA.

Article History:

Received : 21 September 2024
Revised : 17 March 2025
Accepted : 16 April 2025

Keywords:

Dosage,
Frequency,
Potassium Fertilizer,
White Eggplant.

Corresponding Author:
✉ ramdan_h@upnjatim.ac.id
(Ramdan Hidayat)

ABSTRACT

Eggplant plants have a high flower drop rate, resulting in a low fruit set. Potassium fertilizer plays an important role in plant physiology and can help reduce flower drop. This study aims to determine the effect of dosage and frequency of potassium fertilization on the growth and yield of white eggplants. The research was conducted in Mojosari District, Mojokerto Regency, East Java, from December 2023 to March 2024. This research was a factorial study with two factors arranged in a Completely Randomized Design. The first factor is potassium fertilizer dosage, which included 3 levels (3, 6, and 9 g/plant), and the second factor is fertilization frequency, which included 3 levels (2, 3, and 4 times). Results showed that the combination of potassium fertilizer dosage of 9 g/plant with potassium fertilization frequency of 4 times was the best treatment combination for fruit weight per plant, with an increase of 114% compared to the combination of potassium fertilizer dosage of 3 g/plant and potassium fertilization frequency of 2 times.

1. INTRODUCTION

White eggplant (*Solanum melongena* L. var. *Kania*) is a shrub that belongs to the *Solanaceae* family that is used by people as a cooking ingredient or eaten raw as a salad. Every 100 g of white eggplant contains 217 mg of calcium, 3 mg of sodium, and 2.5 g of fiber. Other contents in white eggplant are potassium, phosphorus, protein, vitamin C, fat, vitamin B, and vitamin A (Sari, 2015). Eggplant is also useful as a medicine because it contains alkaloids, solanine, and solasodine, as well as trypsin (protease) to fight cancer (Aidah, 2020). White eggplant is generally consumed by Chinese ethnic because the flesh is tender and suitable for processing into food with a long fruit shelf life (Harun, 2019). Eggplant production in Indonesia has increased from 676,339 tons in 2021 to 691,738 tons in 2022, or an increase of 2.27% (BPS, 2023). However, Indonesian eggplant production is only 1.1% of world eggplant production which reaches 58,646,098.21 tons (FAOSTAT, 2023). Along with increasing awareness of the Expected Food Pattern (PPH) and the increasing population in Indonesia, demand for food commodities has increased and one of them is eggplant commodities, so its production needs to be increased.

The obstacles often encountered by farmers in eggplant cultivation are the large number of flowers but the fruit set is still low and the flower loss is still high. Based on the results of Safitri's (2023) research, the average number of eggplant flowers is 19.01 with an average number of fruits formed of 7.87, so the fruit set is 41.3%. The percentage of eggplant flower loss is still high because during the development of eggplant flowers, they do not get enough nutrients or nutrients, especially K nutrients which are mobile and not available when needed by plant. Nutrients K plays a role in the formation of flowers and fruits. The function of potassium is as an enzyme activator, translocating photosynthate, metabolic processes, respiration, photosynthesis processes, and the formation of starch. Based on the results of Tama (2022), the addition of KCl fertilizer at a dosage of 250 kg/ha (10 g/plant) can reduce tomato flower

loss from 6.44 flowers at a KCl dosage of 100 kg/ha (4 g/plant) to 3.11 flowers at a KCl dosage of 250 kg/ha (10 g/plant) or reduce tomato flower loss by 48%.

The dosage of potassium fertilizer given to white eggplant plants should be adjusted for optimal results. Plants that have excess K elements will cause deficiencies in Mg and Ca elements. Plants that lack K elements cause stunted plant growth and decreased yields. The recommended dosage of Mahkota KCl fertilizer (60% KCl) for eggplant plants is 75 kg/ha equivalent to 3 g/plant (Wilmar, 2023). Potassium is a mobile nutrient, meaning that potassium is easily washed away by rainwater and may not be available in the soil when needed by plants. Therefore, the frequency of KCl fertilizer application should be adjusted to the growth phase of white eggplant plants. Fertilizer application is inefficient if the frequency of application is not right. The frequency of KCl fertilizer application to tomato plants as much as 4 times (14, 28, 42, 56 DAP) can increase tomato plant yields including the number of fruits, harvest age, number of harvested fruits, fruit set, and total fruit weight (Tama, 2022). The purpose of this study was to determine the best dosage and fertilization frequency of potassium fertilizer for the growth and yield of white eggplant. The results of this research are expected to be a source of information for the community and farmers to increase the growth and production of white eggplant as well as the development of science in the field of agriculture.

2. MATERIALS AND METHODS

2.1. Research Location

This research was conducted in Mojosulur Village, Mojosari District, Mojokerto Regency. The research location has an altitude of about 45 m above sea level with average annual rainfall of about 237 mm and the air temperature of 24°C–32°C. This experiment was arranged in a Completely Randomized Design consisting of two factors with 4 replications. The first factor (dosage of KCL fertilizer) consisted of 3 levels, namely 3, 6, and 9 g/plant. The second factor (fertilization frequency) consisted of 3 levels, namely 2, 3, and 4 times. Each experimental unit was observed using 3 sample plants, and 108 eggplant plants were provided for measurement of growth and yield. The experiment was carried out through several stages as follows.

(1). Preparation of Planting Media

The research land was cleared of weeds that would disturb the plants and leveled the surface, as well as installing stakes. Planting media was prepared a day before planting by mixing soil, husk charcoal, and vermicompost with a ratio of (1:1:1) (v/v). The evenly mixed planting media was put into a polybag measuring of 40 × 40 cm until 4/5 full.

(2). Seed Preparation and Planting

The eggplant seeds used in this study were Kania F1 variety. The planting medium for the nursery, a mixture of soil and vermicompost 1:1 (v/v), was put into a 10×12 cm polybag. Before planting, the medium was watered and left for 1 day to keep it moist. The eggplant seeds were soaked in warm water for 10–15 min, and then sown in polybags with a planting hole depth of about 3 cm. The polybags were then placed in a shady place. Watering was done twice a day in the morning and evening, but depending on humidity. Seedlings that are ready are seedlings that have 3–4 leaves and grow normally and are around 27 DAS old. Seedlings that have met the requirements are transferred into polybag planting media and each polybag is filled with 1 plant seedling. Transferring is done in the morning or evening. Polybags are then placed in the experimental field and arranged according to the predetermined plan. After planting, the seedlings are watered with enough water until moist.

(3). Plant Maintenance

a) Irrigation. Irrigation is done to keep the planting medium moist and sufficient water availability for the plants. Irrigation is done by routinely watering the plants in the morning and evening, if it rains then watering is not done.

b) Replanting. Replanting was carried out as early as possible up to 7 days after planting (DAP) if there are damaged, diseased or abnormal plants, then they are removed and replaced with plants of uniform size and healthy.

c) ***Staking.*** Stakes measuring 4 x 100 cm was inserted into the planting medium 5−7 cm from the plant and inserted 20−30 cm deep perpendicularly. Installation was carried out at 7 DAP. The installation of stakes aims to support the plant so that it continues to grow upright and does not easily fall over when bearing heavy fruit.

d) ***Fertilization.*** Urea fertilizer was given at 200 kg/ha (7.5 g/plant) and SP-36 at 100 kg/ha (3.75 g/plant). Both fertilizer were given 2 times (14 DAP and 28 DAP) at a dosage 3.75 g/plant and 1.875 g/plant, respectively. The Urea and SP-36 fertilization was done by making holes on the side of the polybag. The KCl dosage was given according to the treatment, namely 3, 6, and 9 g/plant with a frequency of 2 times (14 and 28 DAP), 3 times (14, 28 and 42 DAP), and 4 times (14, 28, 42, and 56 DAP). KCl fertilization was done by digging with detail amount as presented in Table 1.

Table 1. KCl fertilization dosages and frequency

KCl Dosage (g/plant)	Frequency (time)	Fertilizer Dosage (g/plant) According to Frequency (DAP)			
		14 DAP	28 DAP	42 DAP	56 DAP
3	2	1.50	1.50		
	3	1.00	1.00	1.00	
	4	0.75	0.75	0.75	0.75
6	2	3.00	3.00		
	3	2.00	2.00	2.00	
	4	1.50	1.50	1.50	1.50
9	2	4.50	4.50		
	3	3.00	3.00	3.00	
	4	2.25	2.25	2.25	2.25

e) ***Scraping/Pruning.*** Water shoot pruning was done at the age of 15−25 DAP. Pruning is done in the morning with a weekly interval. Pruning is done so that plant production can be maximized because the leaves of the plant get optimal sunlight.

f) ***Weeding.*** Weeding is done by manually removing weeds so that the growth of eggplant plants is not disturbed by the presence of weeds.

g) ***Pest Control.*** Pest control is done by removing pests by hand or by spraying insecticides. While disease control is done by spraying fungicides according to the disease that attacks.

2.2. Harvesting

White eggplant was first harvested at 49−52 DAP with fruit characteristics of white shiny and a length of around 23−26 cm. Harvesting was done by cutting the fruit stalk 2 cm from the base of the stem using scissors. The best time to harvest eggplant is in the morning or evening when the weather is sunny. Harvesting was done for 5 periods with one week per period. With twice harvesting each period, a total of 10 times harvesting was realized.

2.3. Measurements

2.3.1. Plant height (cm)**.** Plant height was measured from the base of the stem to the top (growing point). Observations began at the age of 7 DAP with an observation interval of 1 week until the age of 49 DAP.

2.3.2. Number of Flowers. The number of flowers was counted daily and starts when the first flower appears until 2 weeks before the harvest time (70 DAP).

2.3.3. Number of Fallen Flowers. The number of fallen flowers was counted every day and starts from when the first formed flower falls until 2 weeks before the harvest time (70 DAP).

2.3.4. Number of Fruits Formed. The number of fruits formed was calculated from the fruits that have formed from each eggplant plant.

2.3.5. Number of Fruits Fallen. The number of fallen fruits was calculated from the fallen fruits per eggplant plant. Observations were made by recording the fallen fruits per plant.

2.3.6. Number of Harvested Fruits. The number of harvested fruits was calculated from the fruits that have been harvested per plant and is carried out at each harvest period.

2.3.7. Fruit Length (cm). The length of the fruit was calculated using a ruler from the harvested fruit per fruit and is carried out at each harvest period.

2.3.8. Fruit Diameter (cm). The fruit diameter was calculated using a caliper from the harvested fruit per fruit and is carried out at each harvest period.

2.3.9. Fruit Weight (g). Fruit weight was calculated by weighing the fruit that has been harvested per plant and is carried out at each harvest period.

2.3.10. Fruit Weight per Plant (g). Fruit weightwa calculated by weighing the fruit that has been harvested per plant and is carried out at each harvest period and then added up to obtain the fruit weight for each plant sample.

2.3.11. Fruit set (%). Fruit set is the percentage of flowers that become fruits and was calculated by dividing the number of fruits formed and the number of flowers. The calculation is done per plant sample.

$$Fruit\ set\ = \frac{number\ of\ fruits\ formed}{number\ of\ flowers} \times 100\% \quad (1)$$

2.2. Data analysis

Data analysis of the results of observations of the effect of KCl fertilization dosages and frequencies is by using analysis of variance (ANOVA). If the final result of the ANOVA has a significant effect, then further analysis was performed using the HSD (Honestly Significant Difference) test at a level of 5% to compare mean values. The HSD formula is as follows (Susilawati, 2015):

$$HSD_{0,05} = q_{0,05}(p; dba)\sqrt{\frac{MSE}{r}} \quad (3)$$

where $q_{0.05}(p; dba)$ is the q value at the 5% level at the number of treatments p and random degrees of freedom dba (found in the HSD 5% table), p is the number of treatments, MSE is mean square error, r is number of replications, and N is number of treatment levels.

3. RESULTS AND DISCUSSION

3.1. Plant Height

Figure 1 shows eggplants posture at 42 DAP. The ANOVA analysis showed no significant effect of both single and interaction of dosage and frequency of KCl fertilizer application on the height of white eggplant plants with F-count values 0.05–3.19 for single factor ($< F_{0.05} = 3.35$) and 0.04–1.52 for interaction ($< F_{0.05} = 2.73$). Table 2 reveals that eggplants achieved in average 71.25 cm at 49 DAP, or a growth rate around 10 cm/week. Although the KCl fertilizer dosage did not differ significantly, there was a tendency for the white eggplant plant height to increase as the KCl fertilizer dosage increased up to 9 g/plant. According to Maryono *et al.* (2022), the higher the dosage, the better the plant growth. However, our research results did not show a significant effect of KCl fertilizer application. Rahmiati *et al.* (2023) stated ineffective KCl fertilizer may be due to insufficient quantity for eggplant plants. Our treatment, however, was equal and higher than the recommended KCl fertilizer dosage for eggplant plants, which is 75 kg/ha or 3 g/plant according to (Wilmar, 2023). Therefore, the insignificant effect of KCl fertilization on plant height may be due to the soil being sufficiently nutrient-rich to support plant growth. The application of both urea and SP-36 fertilizers at 14 and 28 DAP could be a reason why the effect of KCl on plant height was insignificant. External factors such as high rainfall intensity during experiment can be another reason for the insignificant effect of KCl because K element is easily washed away by rainwater so that plants can not absorb optimally. Kotu *et al.*, (2015) stated that K elements in tropical areas are easily lost because they are washed away by rainwater starting from the topsoil to the bottom layer.

Figure 1. White eggplant plants from 9 treatment combinations at 42 DAP (K = KCl dosage, F = application frequency).

Table 2. Effect of dosage and application frequency of KCl fertilizer on the height of white eggplant plants age 7–49 DAP

Treatment	Plant height (cm) at different DAP						
	7	14	21	28	35	42	49
KCl Fertilizer Dosage (g/plant)							
3	10.27±0.13	16.31±0.20	28.52±0.13	37.76±0.14	50.90±0.18	60.58±0.66	70.89±1.03
6	10.39±0.14	16.16±0.14	28.54±0.42	37.11±1.16	50.91±0.49	61.80±0.84	71.39±0.47
9	10.38±0.29	16.25±0.14	29.18±0.71	38.25±0.17	51.63±0.30	62.46±0.81	71.46±0.39
Average	10.35±0.19tn	16.24±0.16tn	28.75±0.42tn	37.71±0.16tn	51.15±0.32tn	61.61±0.77tn	71.25±0.63tn
KCl Fertilization Frequency (times)							
2	10.24±0.03	16.21±0.16	29.11±0.80	37.35±1.39	51.09±0.78	62.34±1.01	70.91±1.03
3	10.48±0.27	16.38±0.07	28.60±0.42	37.97±0.22	51.29±0.35	61.66±1.04	71.68±0.29
4	10.33±0.11	16.14±0.13	28.53±0.06	37.81±0.25	51.05±0.32	60.85±0.86	71.14±0.21
Average	10.35±0.06tn	16.24±0.12tn	28.53±0.43tn	37.81±0.62tn	51.15±0.48tn	61.62±0.97tn	71.24±0.51tn

Description: tn = not significant

3.2. Number of Flowers

The results of ANOVA showed no significant interaction of the dosage and frequency of KCl fertilization on the number of flowers (*F*-count = 0.03). Meanwhile, the single factor KCl dosage had a very significant effect (*F*-count = 8.94), but application frequency of KCl had no significant effect (*F*-count = 0.49). Table 3 shows that treatment with KCl dosage of 9 g/plant gives the best number of flowers per plant with a difference of 16.77% as compared to that of 3 g/plant. The increase in the number of flowers is due to the potassium (K) element helping to maximize the absorption of sunlight and increase the rate of photosynthesis. Adrian & Husna (2017) stated that K is important element to increase flowering because it is needed in the process of photosynthesis and photosynthate translocation.

Table 3. Effect of dosage and application frequency of KCl fertilizer on the number of flowers of white eggplant plants

Treatment		KCl Fertilization Frequency (times)			Average
		2	3	4	
KCl Fertilizer Dosage (g/plant)	3	9.29±1.19	9.71±1.27	9.62±0.97	9.54 A
	6	10.19±0.52	10.67±0.42	10.48±0.49	10.45 AB
	9	11.04±0.33	11.2±1.67	11.14±0.53	11.14 B
Average		10.17 a	10.54 a	10.42 a	

Note: Same letters show no significant difference in the 5% HSD test; lowercases for fertilization frequency and uppercases for KCl dosage

3.3. Number of Fallen Flower

The ANOVA results showed that there was no significant effect of the single factors of KCl dose and application frequency (*F*-count = 0.12 and 0.96) as well as the interaction (*F*-count = 0.01). The average number of fallen flowers was 3.9 (Table 4). Compared to the total flowers, the number of fallen flowers was quite high, reaching 35–41%. This can be due to the high intensity of rainfall causing the application of KCl fertilizer to be ineffective because the potassium element is easily washed away by rainwater. In addition, the high intensity of rainfall and strong winds can cause the flowers of white eggplant plants to fall off. According to Triani & Arifin (2019), high rainfall can disrupt the flowering process, causing pollen to rot due to high humidity so that pollination fails and the flowers finally fall off.

Table 4. Effect of dosage and application frequency of KCl fertilizer on the number of fallen flowers of white eggplant plants

Treatment		Fertilization Frequency KCl (times)			Average
		2	3	4	
KCl Fertilizer Dosage (g/plant)	3	4.27±1.04	4.09±0.75	3.62±1.21	3.99 A
	6	4.11±0.74	4.13±0.48	3.54±0.83	3.93 A
	9	3.95±1.31	3.94±1.83	3.45±1.17	3.78 A
Average		4.11 a	4.05 a	3.54 a	3.90

Note: Same letters show no significant difference in the 5% HSD test; lowercases for fertilization frequency and uppercases for KCl dosage

Table 5. Effect of dosage and application frequency of KCl fertilizer on the number of fruits formed by white eggplant plants

Treatment		Fertilization Frequency (times)			Average
		2	3	4	
KCl Fertilizer Dosage (g/plant)	3	5.02±0.37	5.62±0.59	6.00±0.68	5.54 A
	6	6.08±0.39	6.54±0.22	6.94±0.47	6.52 B
	9	7.09±1.30	7.31±0.38	7.69±0.38	7.36 C
Average		6.06 a	6.49 ab	6.88 b	

Note: Same letters show no significant difference in the 5% HSD test; lowercases for fertilization frequency and uppercases for KCl dosage

3.4. Number of Fruits Formed

The results of ANOVA found that the interaction of the dosage and frequency of KCl fertilizer application did not significant on the number of fruits (*F*-count = 0.11). Meanwhile, both single factors are significant with *F*-count = 22.89 for KCl dosage and *F*-count = 4.57 for fertilization frequency. Table 5 shows that the treatment of KCL fertilizer dosage of 9 g/plant was the best treatment and was significantly different from other KCl fertilizer dosage treatments. The increase in the number of fruits formed was 32.85% by the effect of the treatment of KCL fertilizer dosage of 9 g/plant compared to the treatment of KCL dosage of 3 g/plant. The treatment of KCL fertilizer application frequency of 4 times obtained the best number of fruits formed per plant and was significantly different from other KCl fertilization frequencies. The increase in the number of fruits formed was 13.53% by the effect of the treatment of fertilization frequency of 4 times compared to the treatment of KCl fertilization frequency of 2 times. According to Hafsi *et al.* (2014), Potassium plays a role in plant growth and development because it affects the rate of photosynthesis in the formation of chlorophyll and carbohydrates. Potassium can increase the number of fruits formed.

The K element can increase the photosynthesis process which will increase the number of flowers and reduce the number of fallen flowers so that flowers that have been fertilized will form fruit. According to Salim (2024), unfavorable weather conditions such as frequent rain can cause the fertilizer that has been given to be washed away by rainwater. On the other hand, the dosage of KCL fertilizer 9 g/plant can optimize the number of fruits formed by white eggplant plants. Ambarwati *et al.* (2020) reported that the K element can increase the number of tomato plant fruits.

Table 6. Effect of dosage and application frequency of KCl fertilizer on the number of fallen fruits of white eggplant plants

Treatment		KCl Fertilization Frequency (times)			Average
		2	3	4	
KCl Fertilizer Dosage (g/plant)	3	1.48±0.44	1.80±0.90	1.94±0.59	1.74 A
	6	1.77±0.93	1.36±0.41	1.61±0.65	1.58 A
	9	1.65±1.53	1.56±1.07	1.03±1.09	1.42 A
Average		1.63 a	1.57 a	1.53 a	1.58

Note: Same letters show no significant difference in the 5% HSD test; lowercases for fertilization frequency and uppercases for KCl dosage

3.5. Number of Fruit Fallen

The results of the ANOVA analysis found that the single factor of dose (*F*-count = 0.04) and frequency of KCl fertilization (*F*-count = 0.37) as well as the interaction of both (*F*-count = 0.49) did not significantly affect the eggplant fruit that fell. Table 6 shows that fallen white eggplant fruit reached an average of 1.58 or an average of 21-28% of the fruit formed. Although not significant, the treatment of KCl fertilizer dose of 9 g/plant showed the lowest

number of fruit that fell compared to other dose treatments. The treatment of KCl fertilization frequency of 4 times showed the lowest number of fruit that fell compared to other KCl fertilization frequencies. The number of fruit that fell was thought to be more due to the high intensity of rainfall during the study causing the fruit to be susceptible to disease. According to Rahaju & Muhandoyo (2014) rainfall causes high humidity so that the fruit is more susceptible to disease. Fruit that is attacked by disease will then fall.

3.6. Number of Fruits Harvested

Table 7 presents the effect of treatments on the harvested white eggplants. ANOVA analysis results showed that both factors separately had a significant effect on eggplant fruit weight at harvest, with *F*-count = 61.10 for KCl dose and 11.24 for fertilization frequency. The interaction was not significant (*F*-count = 1.22). The 9 g/plant KCl fertilizer treatment resulted in the highest number of harvested fruits and was significantly different from other KCl fertilizer doses. The 9 g/plant KCl fertilizer treatment increased the number of harvested fruits by 56.17% compared to the 3 g/plant KCl treatment. The 4 times KCl fertilizer application treatment resulted in the highest number of harvested fruits and was significantly different from the 2 times KCl fertilizer application treatment (a difference of 20.77%), but not significantly different from the 3 times KCl fertilizer application treatment.

Table 7. Effect of dosage and application frequency of KCl fertilizer on the number of fruit harvested of white eggplant plants

Treatment		KCl Fertilization Frequency (times)			Average
		2	3	4	
KCl Fertilizer Dosage (g/plant)	3	3.54±0.22	3.81±s 0.47	4.06±0.38	3.81 A
	6	4.31±0.72	5.19±0.43	5.33±0.42	4.94 B
	9	5.44±0.24	5.75±0.71	6.66±0.43	5.95 C
Average		4.43 a	4.92 ab	5.35 b	

Note: Same letters show no significant difference in the 5% HSD test; lowercases for fertilization frequency and uppercases for KCl dosage

Potassium plays a role in increasing fruit number. Potassium is easily lost due to its mobile nature, so more frequent fertilization is more effective because potassium is not wasted (Rahmawan *et al*., 2016). During the development process, plants require potassium to fill their fruit after nutrient supply to all parts of their bodies is met. The nutrient K helps maintain the number of fruit and fruit filling until harvest time. This is supported by research by Lingga & Marsono (2011), which states that the nutrient K influences fruit production.

3.7. Fruit Length

Table 7 shows the length of white eggplant fruit from the treatment of dosage and frequency of KCl fertilizer application. The results of the ANOVA analysis found no significant interaction on fruit length (*F*-count = 0.04). Meanwhile, the single factor of KCl fertilizer dosage had a very significant effect (*F*-count = 7.61) and the frequency of KCl fertilization had a significant effect on fruit length (*F*-count = 3.82). From Table 7, it can be seen that the KCl fertilizer dosage of 9 g/plant produced the best white eggplant fruit length and was significantly different from the KCl fertilizer dosage of 3 g/plant with a difference of 15.10%. The treatment of KCl fertilizer application frequency of 4 times produced the best white eggplant fruit length and was significantly different from the treatment of KCl fertilizer application frequency of 2 times with a difference of 10.65%.

Table 8. Effect of dosage and application frequency of KCl fertilizer on the fruit length of white eggplant

Treatment		KCl Fertilization Frequency (times)			Average
		2	3	4	
KCl Fertilizer Dosage (g/plant)	3	18.52±1.21	19.54±1.44	20.73±s 0.81	19.60 A
	6	19.82±1.17	20.77±1.99	21.54±1.31	20.71 AB
	9	21.35±1.71	22.54±3.66	23.78±2.06	22.56 B
Average		19.90 a	20.95 ab	22.02 b	

Note: Same letters show no significant difference in the 5% HSD test; lowercases for fertilization frequency and uppercases for KCl dosage

A fertilizer dose of 9 g/plant can increase the fruit length of white eggplant plants due to increased plant photosynthesis. This is in line with the statement by Mariyono *et al*., (2022) that KCl fertilizer helps the availability of K elements so that the needs of eggplant plant fruit development are met and produce maximum fruit length. Meanwhile, more frequent fertilization will maintain the availability of potassium in the soil, so plants can absorb it when needed. Potassium is a highly mobile element that is easily leached (Alfy & Handoyo, 2022). By applying KCl fertilizer more frequently, it can maintain the availability of K elements in the soil, which can then be used to fill the fruit, thus affecting the length of white eggplant fruit.

3.8. Fruit Diameter

The combination of dosage and fertilization frequency of KCl fertilizer did not show any significant effect based on ANOVA test (*F*-count = 0.80). Meanwhile, the single factor of KCl fertilizer dosage had a significant effect and the single factor of KCl dosage and application frequency had a very significant effect with *F*-count = 4.31 and 6.30. Table 9 shows that treatment of KCl dosage 9 g/plant produced the best fruit diameter of white eggplant and was significantly different from that of 3 g/plant dosage. There was increase of 10.16% in the fruit diameter of white eggplant with KCL dosage of 9 g/plant compared to that of 3 g/plant. The treatment of KCL application frequency of 4 times produced the best fruit diameter and was significantly different from the application frequency of 2 times with an increase of 12.84%.

The K element in KCL fertilizer plays a role in increasing the photosynthesis process, which then determine the size (diameter) of the white eggplant fruits. This is in accordance with the statement of Faizi *et al*. (2021) where the diameter of the white eggplant fruit is related to the K nutrient which increases the translocation the photosynthates to fill the fruit. The provision of KCl fertilizer will increase the availability of K elements in the soil. Periodic provision of KCl fertilizer is better to maintain the availability of K elements in the soil. Efficient use of K fertilizer requires attention to the correct timing of fertilizer application (Alfy & Handoyo, 2022).

Table 9. Effect of dosage and application frequency of KCl fertilizer on the fruit diameter of white eggplant

Treatment		KCl Fertilization Frequency (times)			Average
		2	3	4	
KCl Fertilizer	3	3.98±0.50	4.10±s 0.27	4.31±0.33	4.13 a
Dosage (g/plant)	6	4.08±0.07	4.20±0.31	4.44±0.51	4.24 ab
	9	4.08±0.34	4.60±0.36	4.97±0.38	4.55 b
Average		4.05 a	4.30 am	4.57 b	

Note: Same letters show no significant difference in the 5% HSD test; lowercases for fertilization frequency and uppercases for KCl dosage

Table 10. Effect of dosage and application frequency of KCl fertilizer on the fruit weight per fruit of white eggplant

Treatment		KCl Fertilization Frequency (times)			Average
		2	3	4	
KCl Fertilizer	3	170.63±4.89	171.84±3.02	173.58±3.37	172.01 A
Dosage (g/plant)	6	172.49±4.47	175.98±3.09	178.14±1.06	175.54 A
	9	181.34±4.00	185.03±1.86	194.42±3.77	186.93 B
Average		174.82 a	177.62 a	182.04 b	

Note: Same letters show no significant difference in the 5% HSD test; lowercases for fertilization frequency and uppercases for KCl dosage

3.9. Single Fruit Weight

Table 10 shows the average single fruit weight of white eggplant as a result of the dosage and frequency of KCl fertilizer application. ANOVA results concluded that there was no significant interaction between dosage and frequency of fertilization (*F*-count = 2.58). Meanwhile, the single factors of dosage and frequency of KCl fertilizer treatment had a very significant effect on fruit weight (*F*-count = 59.00 and 12.88). The KCl fertilizer dosage of 9 g/plant produced the best average fruit weight per white eggplant plant and was significantly different from other KCl fertilizer dosages. There was an increase 8.67% in single fruit weight under KCL dosage of 9 g/plant as compared to that of 3 g/plant dosage. While, the KCL application frequency of 4 times produced the best fruit weight by 4.13% as

compared to the fertilization frequency of 2 times. Fertilizers containing K elements help plants in filling fruit so that the weight of the fruit will increase along with the increasing provision of fertilizers containing K elements. This is in line with Syahputra & Elfis (2023), where a proper application of K fertilizer will increase fruit weight.

3.10. Fruit Weight per Plant

The results of ANOVA reveals that interaction of dosage and frequency of KCl fertilizer addition resulted in a very significant effect on the fruit weight per plant (*F*-count = 75,500). Table 11 shows that the combination of KCl fertilizer dosage of 9 g/plant and application frequency of 4 times produced the highest fruit weight per plant and was significantly different from other treatments. This treatment combination increase fruit weight per plant by 114% compared to the lowest (3 g/plant and application frequency of 2 times).

Table 11. Effect of dosage and application frequency of KCl fertilizer on the fruit weight per white eggplant per plant

Treatment		KCl Fertilization Frequency (times)		
		2	3	4
KCl Fertilizer Dosage (g/plant)	3	604.30±39.40 a	655.85±90.56 ab	706.04±76.91 b
	6	746.37±141.09 b	912.11±62.34 c	949.50±75.69 c
	9	985.60±33.60 cd	1064.85±142.00 d	1293.24±68.28 e

Note: Same letters show no significant difference in the 5% HSD test

The KCL fertilizer dosage of 9 g/plant given 4 times at age of 14, 28, 42 and 56 DAP insured the availability of K nutrient in the planting medium during the plant growth. This is in accordance with Rahmiati *et al*. (2023), stating that the provision of K fertilizer to the soil can increase the amount of K-available in the soil. The frequency of KCL application 4 times helps to keep K availability. This is supported by Novizan (2005), that K fertilizer should be given several times during the growing season. According to Kotu *et al*. (2015), potassium is easily washed away by rainwater. The combination of KCl fertilizer dosage treatment of 9 g/plant and KCl application frequency 4 times is the best combination of treatments in helping the availability of K elements in the soil for the growth and development of white eggplant plants. This was also highlighted by Rina *et al*. (2019), that proper and balanced fertilization will provide sufficient nutrients needed by plants and can optimize plant growth and development, so that plant yields increase. The availability of sufficient potassium will increase plant photosynthesis. The nutrient K in the photosynthesis process acts as a catalyst for protein formation, transports carbohydrates, and regulates stomata movement so that if plants lack the nutrient K, the photosynthesis process will be inhibited (Rosmarkam & Yuwono, 2002). Increasing the photosynthesis process causes an increase in the assimilate yield which will be distributed to enlarge the fruit. This is supported by the statement of Wijiyanti *et al*. (2019) and Kesumawati *et al*. (2022), that a high rate of photosynthesis will accelerate the production of assimilates which can increase plant production.

Table 12. Effect of dosage and application frequency of KCl fertilizer on the fruit set (%) of white eggplant plants

Treatment		KCl Fertilization Frequency (times)			Average
		2	3	4	
KCl Fertilizer Dosage (g/plant)	3	54.49±6.04	58.05±3.06	62.86±9.35	58.46A
	6	59.84±5.57	61.41±3.29	66.39±6.72	62.55A
	9	64.27±12.01	66.44±13.22	69.25±9.84	66.65A
Average		59.53a	61.96a	66.17a	62.55

Note: Same letters show no significant difference in the 5% HSD test; lowercases for fertilization frequency and uppercases for KCl dosage

3.11. Fruit set

The dosage and frequency of KCl fertilization as well as their interaction were not significant on the frit set of white eggplant (F-count = 0.05 for interaction, 2.84 for dosage, and 1.91 for application frequency). Table 12 shows that in average the fruit set achieved 62.55%. Even though statistically insignificant, there is a trend of small increase in fruit set of white eggplant plants due to dosage and application frequency of KCL fertilizer with the highest (69.25±9.84) was resulted from a combination treatment of 9 g/plant and 4 times application.

High fruit set percentage is closely related to high number of flowers, low number of fallen flowers, and high number of formed fruits. The higher dosage of KCL fertilizer and the more frequent frequency of KCL fertilizer application, the higher the fruit set of the plant. This is due to the real role of K element on the number of flowers and fruits of the plant. K element helps the flowers and fruits of the plant to grow and develop successfully and helps the formation of carbohydrates and proteins (Mustamu, 2015).

4. CONCLUSION

The combination of KCl fertilizer dosage treatment of 9 g/plant and fertilization frequency of 4 times is the best treatment with an increase in fruit weight per plant of 114% compared to the lowest dosage and frequency (KCl fertilizer dosage of 3 g/plant with application frequency of 2 times). The treatment of KCl fertilizer dosage of 9 g/plant is the best treatment of KCl fertilizer dosage on the number of flowers, number of fruits formed, number of harvested fruits, fruit length, fruit diameter, and fruit weight per white eggplant plant. The treatment of KCl fertilizer frequency of 4 times gave the best results on the parameters of the number of fruits formed, number of harvested fruits, fruit length, fruit diameter, and fruit weight per eggplant plant white. The treatment of KCl fertilizer dosage of 9 g/plant with fertilization frequency of 4 times is recommended for fertilization of eggplant plants based on the highest growth and yield.

ACKNOWLEDGMENT

The author expresses their gratitude for the physical support of those who have helped during this research, especially to the land owners Mr. Didit and Mr. Dido, and Mr. Arga and Faiz for data collection.

REFERENCES

Adrian, E., & Husna, Y. (2017). Pengaruh pemberian urea, TSP, KCl dan pupuk organik cair (POC) kulit pisang terhadap pertumbuhan dan produksi tanaman cabai merah keriting (*Capsicum annum* L.). *Jurnal Online Mahasiswa Fakultas Pertanian Universitas Riau*, ***4***(1), 1–13.

Aidah, S.N. (2020). *Ensiklopedi Terong: Deskripsi, Filosofi, Manfaat, Budidaya & Peluang Bisnisnya*. KBM Indonesia Publisher, Yogyakarta.

Alfy, M.N.T., & Handoyo, T. (2022). Pengaruh dosis dan waktu aplikasi pupuk KCl terhadap pertumbuhan dan hasil tanaman buncis (*Phaseolus vulgaris* L.). *Agriprima: Journal of Applied Agricultural Sciences*, ***6***(1), 85–97. https://doi.org/10.25047/agriprima.v6i1.431

Ambarwati, D.T., Syuriani, E.E., & Pandu Pradana, O.C. (2020). Uji respon dosis pupuk kalium terhadap tiga galur tanaman tomat (*Lycopersicum esculentum* Mill.) di Lahan Politeknik Negeri Lampung. *Jurnal Planta Simbiosa*, ***2***(1), 11-21. https://doi.org/10.25181/jplantasimbiosa.v2i1.1608

BPS (Badan Pusat Statistik). (2023). *Vegetable Crop Production 2022*. www.bps.go.id. Accessed on November 19, 2023.

Faizi, M., Pratiwi, S.H., & Purnamasari, R.T. (2020). Respon pertumbuhan dan hasil tanaman terung (*Solanum melongena* L.) akibat aplikasi pupuk organik sabut kelapa limbah pupuk organik cair (POC). *Jurnal Agroteknologi Merdeka Pasuruan*, ***4***(2), 15–19.

FAOSTAT. (2023). *Eggplants (aubergines)*. www.fao.org Retrieved 19 November 2023.

Hafsi, C., Debez, A. & Abdelly, C. (2014). Potassium deficiency in plants: Effects and signaling cascades. *Acta Physiol Plant,* ***36***, 1055–1070. https://doi.org/10.1007/s11738-014-1491-2

Harun, M. (2019). Pengaruh Pupuk NPK 16:16:16 terhadap Pertumbuhan dan Produksi Tiga Varietas Tanaman Terung (*Solanum melongena* L.). [*Undergraduate Theses*]. Universitas Islam Riau.

Kesumawati, N., Jafrizal, & Saputra, A. (2022). Respon tanaman tomat terhadap pemberian pupuk kandang dan pupuk kalium. *Jurnal Agribis*, ***15***(2), 2019–2030. https://doi.org/10.36085/agribis.v15i2.3566

Kotu, S., Rondonuwu, J.J., Pakasi, S., & Titah, T. (2015). Status unsur hara dan pH tanah di Desa Sea, Kecamatan Pineleng, Kabupaten Minahasa. *Cocos,* ***6***(12), 10 pp.

Lingga, P., & Marsono, M. (2011). *Petunjuk Penggunaan Pupuk*. Penebar Swadaya, Jakarta.

Maryono, M., Hadiyanti, N., & Supandji, S. (2022). Pengaruh dosis pupuk KCl terhadap pertumbuhan dan produksi tanaman terung (*Solanum melongena* L.). *Agrivet: Jurnal Ilmu-Ilmu Pertanian dan Peternakan (Journal of Agricultural Sciences and Veteriner)*, ***10***(1), 147–152. https://doi.org/10.31949/agrivet.v10i1.2389

Mustamu, N.E., Nasution, S.N., & Asmara, R.M. (2015). Respon pemberian pupuk urea dan pupuk KCl terhadap pertumbuhan dan produksi tanaman cabai rawit (*Capsicum frutescens* L.) dalam polibag. *Agroplasma*, ***2***(2), 1-7.

Novizan, N. (2005). *Petunjuk Pemupukan yang Efektif*. Agromedia Pustaka, Jakarta.

Rahaju, J., & Muhandoyo, M. (2014). Dampak perubahan iklim terhadap usaha apel di Kecamatan Poncokusumo Kabupaten Malang. *Agromix*, ***5***(1), 1-9.

Rahmawan, I.S., Arifin, A.Z., & Sulistyawati, S. (2019). Pengaruh pemupukan kalium (K) terhadap pertumbuhan dan hasil kubis (*Brassica oleraceae* var. *capitata*, L.). *Jurnal Agroteknologi Merdeka Pasuruan*, ***3***(1), 18-24.

Rahmiati, R., Savitri, S., Hayati, R., & Berutu, E.F. (2023). Pengaruh aplikasi pupuk guano dan pupuk kcl terhadap pertumbuhan dan hasil tanaman terung ungu (*Solanum melongena* L.). *Jurnal Serambi Akademica*, ***11***(5), 501–510.

Rina, T., Marliah, A., & Anhar, A. (2019). Pertumbuhan dan hasil tanaman terung (*Solanum melongena* L.) pada berbagai dosis bahan organik dan kombinasi pupuk N, P dan K. *Jurnal Ilmiah Mahasiswa Pertanian Unsyiah*, ***4***(1), 100-107.

Rosmarkam, A., & Yuwono, N.W. (2002). *Ilmu Kesuburan Tanah*. Kanisius, Yogyakarta.

Safitri, M.D. (2023) Pengaruh komposisi media tanam dan konsentrasi pupuk gandasil b terhadap pertumbuhan dan hasil tanaman terung ungu (*Solanum melongena* L.). [*Undergraduate Thesis*]. UPN Veteran Jawa Timur.

Salim, E. (2024). *Meraup Untung Bertanam Cabe Hibrida Unggul Di Lahan dan Polybag*. Andi Publisher, Yogyakarta.

Sari, F.K. (2015). Perlindungan hukum terhadap pemulia dan varietas tanaman terong putih (Kania F1). [*Undergraduate Thesis*]. University of Jember.

Susilawati, M. (2015). *Perancangan Percobaan*. Udayana University, Denpasar.

Syahputra, D.R., & Elfis. (2023). Pengaruh bokashi batang pisang dan pupuk KCl terhadap pertumbuhan serta produksi tanaman terung ungu (*Solanum melongena* L.). *Jurnal Agroteknologi Agribisnis dan Akuakultur*, ***3***(2), 131–145.

Tama, E.W. (2023). Pengaruh dosis dan frekuensi aplikasi pupuk kalium terhadap pertumbuhan dan hasil tanaman tomat (*Lycopersicum esculentum*). [*Undergraduate Thesis*]. UPN Veteran Jawa Timur.

Triani, F., & Ariffin, A. (2019). Dampak variasi iklim terhadap produktivitas mangga (*Mangifera indica*) di Kabupaten Indramayu, Jawa Barat. *Plantropica: Journal of Agricultural Science*, ***4***(1), 49–56.

Wijiyanti, N., & Soedradjad, R. (2019). Pengaruh pemberian pupuk kalium dan hormon giberelin terhadap kuantitas dan kualitas buah belimbing Tasikmadu di Kabupaten Tuban. *Berkala Ilmiah Pertanian*, ***2***(4), 169–172.

Wilmar. (2023). *KCl Canada*. https://pupukmahkota.co.id. Accessed November 19, 2023.