



## RESEARCH ARTICLE

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# Analysis of The Effect of Mono Potassium Phosphate Fertilizer and Amino Acid Liquid Organic Fertilizer on The Quality of Melon Fruit (*Cucumis melo* L.)

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## Abstract

Melon is a highly valuable horticultural commodity, and improving its fruit quality is essential for enhancing market competitiveness. The application of mono potassium phosphate fertilizer and liquid organic fertilizer (LOF) enriched with amino acids is expected to play a significant role in optimizing melon quality. This study aims to evaluate the effects of different dosages of mono potassium phosphate fertilizer and amino acid-enriched LOF on the quality attributes of melon fruit. The research was conducted from April to July 2024 in a greenhouse located on agricultural land in Jatirejo Village, Nganjuk Regency. A total of 144 plants were used as research samples, arranged into 12 treatment combinations with three replications, with four plants per plot. The first treatment factor was the dosage of mono potassium phosphate fertilizer, with three levels: 5 g/plant, 10 g/plant, and 15 g/plant. The second factor was the dosage of amino acid-enriched LOF, which included four levels: control, 50 ml/plant, 100 ml/plant, and 150 ml/plant. Observed parameters included leaf number, fruit weight, flesh thickness, sweetness level, seed count, water content, and vitamin C content. The interaction between mono potassium phosphate fertilizer and amino acid-enriched LOF had a highly significant effect on fruit weight, flesh thickness, and seed count. Additionally, the interaction had a significant effect on leaf number and fruit sweetness. The combination of 15 g of mono potassium phosphate fertilizer and 100 ml of amino acid LOF per plant resulted in the highest fruit weight and optimal sweetness. This study highlights a novel integrative approach that combines inorganic phosphorus-potassium fertilization with amino acid-rich organic inputs to enhance melon fruit quality more effectively than single-factor applications. Based on these findings, it is recommended that melon growers apply 15 g of mono potassium phosphate, combined with 100 ml of amino acid LOF, per plant to achieve superior fruit quality, particularly in terms of sweetness and overall yield.

**Keywords:** Fruit Physicochemical Traits, Greenhouse Cultivation, Nutrient Interaction, Organic Supplementation, Randomized Block Design

## 1. Introduction

Melons are horticultural products popular among consumers for their sweet taste and high nutritional value, which offer significant health benefits. Beyond their flavor and health advantages, melons play an important role in various industries, serving as raw materials for the production of food, beverages, medicines, and beauty products. These diverse benefits have driven strong market demand, which directly correlates with their economic value. Consequently, melons represent a highly viable crop for development among agricultural entrepreneurs.

Consumer preferences focus on the melon's flesh. Consequently, melon quality can be enhanced by prioritizing attributes that align with consumer preferences. Consumers have expressed a preference for melon varieties characterized by substantial flesh thickness, minimal seed content, elevated sugar levels, and a preference for tenderness or crispness. Melon qualities, such as sweetness, firmness, and flesh thickness, vary with consumer preferences and reflect the melon's nutritional value. Quality is shaped during seed selection, seedling preparation, irrigation, fertilization, pest management, and

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harvesting. However, melon cultivation faces fundamental challenges, particularly inadequate nutrient management. Melon requires balanced phosphorus and potassium to support growth, sugar accumulation, and fruit firmness. Deficiencies in these nutrients often reduce fruit weight and sweetness. Therefore, improving nutrient supply is essential to enhance melon quality and meet market demands.

Fertilization, an on-farm activity, has been demonstrated to exert a significant influence on the quality of melons. This observation is because fertilization is an activity that meets and supplies plants' nutritional needs. Melon farmers commonly use MKP (Mono Kallium Posphate) compound fertilizer to optimize fruit quality, including weight, size, taste, and nutritional content. MKP fertilizer contains 52% phosphorus (P<sub>2</sub>O<sub>5</sub>) and 34% potassium oxide (K<sub>2</sub>O). The role of phosphorus (P) in melon plants is to stimulate root growth, promote the formation of reproductive organs, and accelerate fruit ripening. The elevated levels of phosphorus and potassium are anticipated to enhance the overall quality of melons, including increases in fruit weight, size, and sugar content, thereby rendering the fruit sweeter and augmenting its nutritional content. The use of MKP fertilizer has been shown to enhance the quality of chili fruits, particularly in terms of weight (Made Naratama Nugraha et al., 2023). This assertion is further supported by Bhavya's (2024) findings, which reported that applying MKP fertilizer enhanced the growth and development of watermelon plants. Similarly, Efendi & Ikhwan (2021) demonstrated that MKP fertilizer increased the yield potential of cucumber crops. However, previous studies have primarily focused on the effects of MKP as a single input on cucurbit growth. In contrast, the present study introduces a novel approach by examining the combined interaction between mono potassium phosphate fertilizer and amino acid-based liquid organic fertilizer on the quality attributes of melon fruit, providing new insight into how integrated nutrient management influences fruit sweetness, flesh thickness, and overall quality.

MKP fertilizer is a type of inorganic fertilizer that, when used in excess, can lead to a deterioration in soil quality. The decline in soil quality due to excessive use of inorganic fertilizers includes damage to the soil's physical properties, such as hardening of the soil texture, making it more difficult for plant roots to penetrate soil pores. The soil's chemical properties are also damaged, including the degradation of soil nutrients. Finally, the soil's biological properties are damaged, including decreased activity of soil microorganisms. The use of organic fertilizers is imperative to mitigate the deleterious effects of chemical fertilizers while enhancing fruit quality. The long-term use of organic fertilizer is anticipated to serve as a substitute for chemical fertilizers, thereby facilitating the realization of sustainable agriculture (Oktanika et al., 2013). The organic fertilizer used in this study is an amino acid liquid organic fertilizer

(LOF). Posits that amino acids are considered the fundamental constituents of proteins, which are distinguished by their nitrogen (N) composition (Prasetya et al., 2022). During vegetative growth, plants require sufficient nitrogen. The use of amino acid LOF is expected to reduce reliance on inorganic fertilizers. It has been demonstrated that the quality of a plant's yield, particularly in the fruit, is contingent upon adequate nutrition during the vegetative stage.

The amino acid LOF used in this study was primarily derived from tofu liquid waste and chicken eggs. Soybean curd liquid waste contains 5.8% organic carbon, 1.24% nitrogen, 5.54% phosphorus, and 1.34% potassium (Asmoro & Suranto, 2008). This finding is further supported by Sangadji et al. (2020), who reported that soybean curd waste contains 40–60% protein and amino acids, making it a potential source of organic nutrients. Previous research has also highlighted the agronomic benefits of amino-acid-based LOF. The combined application of NPK and amino acid LOF improved maize growth and yield, primarily by enhancing nutrient uptake efficiency (Adzikro et al., 2025). Amino acid LOF derived from livestock blood can be effectively used as an organic fertilizer, demonstrating the versatility of amino acid-rich substrates in agriculture (Adzikro et al., 2025). The protein content of chicken egg white and yolk is 863.3 mg/mL and 930.9 mg/mL, respectively. In addition to proteins and amino acids, chicken eggs contain other nutrients that contribute to the vegetative and generative stages of plants (Ramadhani et al., 2019). These nutrients include sulfur (S), chlorine (Cl), magnesium (Mg), potassium (K), riboflavin, and niacin. The objective of this study is to determine the impact of using MKP (melon-king-plant) fertilizer and amino acid LOF on the quality of melon fruit and to identify the optimal dosage of these fertilizers that will enhance melon fruit quality.

## 2. Material and Methods

The research was conducted from seedlings to harvest in a greenhouse located in Jebug Village, Jatirejo Subdistrict, Nganjuk District, situated at the geographic coordinates  $-7.611560, 111.891308$ , near 9VQR+CGC, Jl. Mayjen Sutoyo V, Jatirejo, at an elevation of approximately +60 to +70 meters above sea level, from April 2024 to July 2024. The materials and equipment used in this study included amino acid LOF, MKP (Mono Kallium Posphate) compound fertilizer (Pak Tani), ultradap, KNO<sub>3</sub>, Golden Alisha F1 melon seeds, planting medium (compost:soil:rice husk in a 1:1:1 ratio), shovel, spoon, trowel, scissors, ruler, hoe, measuring tape, analytical scale, and poly bags.

The research method employed a randomized block design (RBD). The first factor was the dose of MKP fertilizer, which had three levels (5 g/plant, 10 g/plant, 15 g/plant). The second factor was the dose of amino acid LOF, administered at 4 levels (control, 0 ml/plant, 50

ml/plant, 100 ml/plant, 150 ml/plant). The study encompassed 12 distinct treatment combinations. The experiment involved administering MKP at 5 grams per plant, in conjunction with either amino acid LOF Control (M1P0), amino acid LOF at 50 milliliters per plant (M1P1), or amino acid LOF at 100 milliliters per plant (M1P2). The experiment involved the administration of MKP at a concentration of 5 g/plant, in conjunction with amino acid LOF at a volume of 150 ml/plant (M1P3), and MKP at a concentration of 10 g/plant, in conjunction with Amino acid LOF at a volume of 50 ml/plant (M2P1), (M2P2), and MKP at a concentration of 10 g/plant, in conjunction with Amino acid LOF at a volume of 150 ml/plant (M2P3). The experiment involved administering MKP at 15 grams per plant, in conjunction with Amino acid LOF at varying volumes (50 milliliters per plant for M3P1, 100 milliliters per plant for M3P2, and 150 milliliters per plant for M3P3). MKP fertilizer was applied via drip irrigation, with 5 applications commencing 42-70 days after planting (DAP) at an interval of 7 days.

The production of amino acid LOF commences with the meticulous preparation of the requisite ingredients and tools. These include 130 grams of chopped chicken eggs, 350 grams of rice, 3 liters of water, 5 liters of tofu liquid waste, 200 milliliters of EM4, 200 milliliters of molasses, a thermometer, a pH meter, and a TDS meter. The production of Amino acid LOF is initiated by incubating EM4 and molasses in 1 liter of water for 2 hours. The chopped chicken eggs are then subjected to a rigorous beating process, continuing until the mixture attains a homogeneous consistency. Subsequently, the ingredients are thoroughly amalgamated to ensure the absence of air Pockets (Aisyah et al., 2024). The optimal temperature for mesophilic bacterial growth ranges from 25°C to 35°C. According to Nugroho (2013), the pH of mature LOF is 6–5.7. Mature LOF is characterized by a decline in concentration, as evidenced by reduced TDS meter readings. The application of this solution is achieved through a meticulous pouring technique, with five applications initiated at 7–35 days post-planting, at 7-day intervals.

The parameters analyzed included melon flesh thickness, the number of seeds per melon, the fruit's sweetness level, the fruit's water content, and the melon's vitamin C content. The thickness of the fruit flesh was measured using a ruler from the skin to the innermost flesh. The number of seeds was meticulously enumerated by manual counting. The fruit's sweetness was measured using a refractometer. The water content of the fruit was measured using the oven method with the formula according to Aventi (2015) as follows:

Fruit water content (%) :

$$\frac{\text{wet weight of sample} - \text{dry weight of sample}}{\text{wet weight of sample}} \times 100\%$$

The measurement of fruit moisture content is initiated by the weighing of 250 g of melon flesh. Subsequently, the melon flesh undergoes oven baking at 100°C for 80 hours, with a 2-hour interval maintained until the end of the process. This results in a stable dry weight.

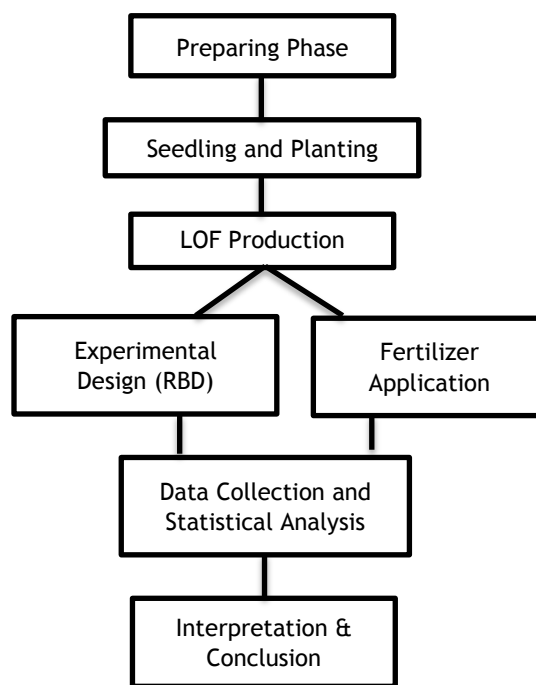


Figure 1. Research flow diagram

The ascorbic acid content was measured by iodine titration. A quantity of 100 grams of fruit flesh was subjected to a mechanical extraction process, followed by a filtration procedure and subsequent weighing. Subsequently, the fruit flesh filtrate was transferred into a 100-ml measuring flask. Aquades is added until the desired volume is reached, as indicated by the mark on the measuring flask. Subsequently, the solution is diluted. A 10 ml sample is transferred to a 125-ml Erlenmeyer flask, followed by the addition of 2 ml of 1% starch solution and homogenization with the sample. The titration was conducted with 0.01 N iodine until a blue color was observed. 0.88 milligrams of ascorbic acid is equivalent to 1 milliliter of 0.01 N iodine (Setiadi Daryono et al., 2016). According to the research conducted by Ngginak et al. (2019), the calculation of vitamin C content is determined by the following formula:

$$\text{Vitamin C levels (mg/100 g)} = \frac{VI2 (ml) \times 0,88 \times Fp}{W \text{ sample}} \times 100 \text{ g}$$

VI2 = Iodine volume (ml)

Fp = dilution factor ( $\frac{\text{volume of Volumetric flask (100ml)}}{\text{sample volume pipetted (10 ml)}} = 10 \text{ ml}$ )

Ws = Weight sample (g)

Statistical analysis was conducted using analysis of

variance (ANOVA) to evaluate the effects of treatments on all observed variables. The calculated F-values were compared with F-table values at the 5% and 1% significance levels. When the calculated F-value exceeded the F-table value at the 5% level, the treatment was considered to have a significant effect; if it exceeded the 1% level, the effect was considered highly significant. Significant results were further analyzed using the 5% Honestly Significant Difference (HSD/BNJ) test to identify treatment differences.

Data processing was performed using Microsoft Excel 2021 for initial tabulation and SPSS Statistics 26 and Minitab 19 for statistical computation and ANOVA procedures. Graphical visualization of growth and fruit quality parameters was generated using GraphPad Prism 9.5. All analyses were conducted on a personal computer running Windows 10 Pro (64-bit) to ensure consistency and accuracy in statistical evaluation.

**Table 1.** Laboratory Test Results on the Composition of Amino Acid LOF

Nutrient Type	Contents (%)	Quality Standards* (%)
C – Organic	0.8	Minimum 10
N – Total	0.2	2 – 6
P – Total	0.2	2 – 6
K – Total	0.1	2 – 6

\* Quality standards for liquid organic fertilizers (Ministry of Agriculture, 2019)

Laboratory test results for the composition of Amino acid LOF demonstrate that the content of organic C, total N, total P, and total K remains below the established quality standards. Organic carbon in organic fertilizers that do not meet quality standards can be classified as a soil conditioner. Soil conditioners are defined as natural or synthetic materials, minerals, or organic substances. However, the present study demonstrated that the application of Amino acid LOF doses interacted significantly with MKP fertilizer doses, resulting in a substantial enhancement in melon fruit quality. It is hypothesized that LOF contains not only macro nutrients but also micro nutrients. The absorption of micronutrients by plants is facilitated under these conditions (Kaya, 2013). The use of LOF with high micronutrient content has been demonstrated to support overall plant growth. Furthermore, the frequency of LOF application significantly influences plant growth and yield. When the LOF application is administered at the optimal frequency, it has been demonstrated to promote robust vegetative growth in plants, thereby enhancing harvest yields. To enhance plant growth, LOF should be used at low doses with consistent frequency (Haytova, 2013).

The decomposition of organic materials by microorganisms results in the production of nutrients essential for plant metabolism. Using organic fertilizers has been proven to enhance soil fertility in various ways. These

### 3. Results and Discussion

The incorporation of inorganic fertilizer, specifically monopotassium phosphate (MKP), and amino acid LOF represents a strategy to enhance melon fruit quality while maintaining soil fertility, thereby achieving sustainability. According to research by Awliya et al. (2022), the application of MKP fertilizer was proven to stimulate root growth, promote fruit and flower formation, prevent fruit and flower drop, improve fruit quality (including yield, weight, sweetness, and shelf life), and enhance plant resistance to pests and diseases. Compared to other types of compound fertilizers, MKP is considered more efficient and effective (Putra et al., 2022). This result is because MKP is a crystalline powder that dissolves in water and can be applied either around plant roots or sprayed onto leaves, allowing plants to absorb nutrients more rapidly.

fertilizers have been shown to positively impact soil physical, biological, and chemical properties, in addition to promoting plant growth. The use of organic fertilizers is characterized by a gradual release of nutrients, thereby enhancing the efficiency of inorganic fertilizers (Nugraha et al., 2022). During the metabolism of organic nitrogen, amino acids facilitate the uptake of ammonia and nitrite (Greenwell & Ruter, 2018). In addition to their role in nitrogen storage, amino acids effectively supply nitrogen through protein synthesis pathways (Okumoto et al., 2016). Nitrogen plays a pivotal role in plant growth, promoting leaf growth, enhancing plant protein content, and fostering the growth of soil microorganisms.

The results of the analysis of variance (ANOVA) on the effect of MKP fertilizer dose and Amino acid LOF dose on various melon quality parameters are presented in Table 2. The observations indicate that the MKP fertilizer dose has a highly significant effect on leaf number, fruit weight, fruit flesh thickness, seed number, and fruit sweetness level. LOF of Amino acid fertilizer demonstrated a highly significant effect on the parameters of number of leaves, fruit weight, fruit flesh thickness, and number of seeds, as well as a significant effect on the parameters of fruit sweetness level. The interaction between MKP fertilizer dose and Amino acid LOF demonstrated a highly significant impact on fruit weight, fruit flesh thickness, and seed count, as well as a significant effect on leaf number and fruit sweetness level.

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well as a significant effect on the parameters of fruit sweetness level. The interaction between MKP fertilizer dose and Amino acid LOF demonstrated a highly significant impact on fruit weight, fruit flesh thickness, and seed count, as well as a significant effect on leaf number and fruit sweetness level.

**Table 2.** Results of the analysis of variance of the effect of MKP fertilizer dose and Amino Acid LOF dose on the fruit yield response of melon plants

Observation parameters	MKP Fertilizer Dosage (g/plant)	LOF Dosagee Amino Acids (l/plant)	Interaction
Number of leaves (49 DAP)	**	**	*
Fruit weight	**	**	**
Fruit flesh thickness	**	**	**
Number of seeds	**	**	**
Fruit sweetness level	**	*	*
Fruit vitamin C content	tn.	tn.	tn.
Fruit moisture content	tn.	tn.	tn

Description: tn = not significantly influential; \*=significantly influential; \*\*=very significantly influential

**3.1. Number of Leaves**

As illustrated in Table 3, the M3P2 treatment combination (MKP fertilizer 15 g/plant + Amino acid LOF 100 ml/plant) exhibits significant disparities from alternative treatment combinations with respect to leaf production and yield attributes. Notably, this combination yields the highest mean values for leaf count, fruit weight, and fruit sweetness. The mean number of leaves in the M3P2 treatment combination was  $39.67 \pm 0.58$  leaves, a value substantially higher than those reported in previous studies. For example, an average of 34–36 leaves under similar MKP and amino acid fertilization, indicating that the current combination produces a more pronounced vegetative response (Rohcahyani, 2024). Leaves function as source organs that produce photosynthates; Thus, an increase in leaf number proportionally increases the accumulation of assimilates that are subsequently allocated to sink organs such as fruits and seeds. Correspondingly, this study recorded a positive correlation between leaf formation, fruit weight, flesh thickness, and sweetness, supporting the role of vegetative vigor in determining melon fruit quality.

The present findings demonstrate that the M3P2 dose is the most effective in promoting leaf proliferation, thereby supporting the plants’ transition into the generative

phase, particularly during fruit filling, which ultimately results in superior melon quality. During the growth period up to early reproductive development, amino acid-based organic fertilizer contributes significantly to vegetative enhancement, consistent with the results of Rohcahyani et al. (2025), who reported improved leaf expansion and nutrient uptake efficiency under amino acid supplementation. This result can be attributed to the more diverse nutrient profile in organic fertilizers compared to inorganic ones. Organic fertilizers meet vegetative nutrient requirements because they contain functional microbes, macroelements, and micronutrients. According to Kaya et al. (2013), optimal plant growth is strongly dependent on the availability of micro nutrients. Their higher bioavailability compared to macro nutrients ensures more effective absorption by the root system. Consequently, the superior leaf formation observed in M3P2 reinforces previous findings while quantitatively demonstrating that micro nutrient–rich organic fertilizer combined with MKP yields better vegetative performance than earlier formulations, and its use is therefore recommended during the vegetative phase.

**3.2. Fruit Weight and Fruit Flesh Thickness**

As illustrated in Table 3, the M3P2 treatment combination (MKP fertilizer 15 g/plant + Amino acid LOF 100 ml/plant) yielded the highest mean fruit weight of  $1.83 \pm 0.03$  kg. Conversely, the highest mean fruit flesh thickness was observed in the M2P2 treatment combination (MKP fertilizer 10 g/plant + Amino acid LOF 100 ml/plant), measuring  $4.90 \pm 0.10$  cm. These values exceed the quantitative ranges reported by Rohcahyani et al. (2025), who obtained fruit weights between 1.55–1.70 kg and flesh thickness of 4.20–4.60 cm under MKP and amino acid fertilization, indicating that the current dosage combinations enhance fruit development more effectively. Treatment M3P2 exhibited significant disparities from other treatment combinations with respect to fruit weight, except for the M2P2 treatment combination (MKP fertilizer 10 g/plant + Amino acid LOF 100 ml/plant) and M3P1 (MKP fertilizer 15 g/plant + Amino acid LOF 50 ml/plant). The M2P2 treatment exhibited substantial disparities in fruit flesh thickness relative to the other treatments, except for the M3P0 treatment (MKP fertilizer 15 g/plant + Amino acid LOF control), M3P1 (MKP fertilizer 15 g/plant + Amino acid LOF 50 ml/plant), and M3P2 (MKP fertilizer 15 g/plant + Amino acid LOF 100 ml/plant).

MKP fertilizer, containing 52% phosphorus and 34% potassium at a dose of 15 grams per plant, has been demonstrated to be an effective dose for increasing melon fruit yield. This finding aligns with the observations of Rohcahyani et al. (2025), who noted that MKP doses above 12 grams improved fruit weight but did not exceed the yield achieved in the present study. This dose has been shown to affect fruit weight and flesh thickness significantly. According to Prayuda et al. (2024), applying

the appropriate concentration or dose of MKP fertilizer enables plants to meet their phosphorus and potassium requirements. Plants that meet their phosphorus and potassium requirements exhibit increased protein levels,

which positively correlate with plant production, particularly fruit weight. The researchers ascertained that fruit weight is directly proportional to fruit flesh thickness.

**Table 3.** Average number of leaves (49 DAP), fruit weight, fruit flesh thickness, and number of seeds per fruit by combination treatment of MKP fertilizer dosage and Amino Acid LOF dosage

Treatment	Average				
	Number of leaves	Fruit weight (kg)	Fruit flesh thickness (cm)	Fruit sweetness level (°Brix)	Number of seeds
M1P0	31.67 ± 0.58 a	0.67 ± 0.04 a	2.70 ± 0.26 a	12.00 ± 0.00 a	492.67 ± 2.08 i
M1P1	32.33 ± 0.58 a	0.70 ± 0.02 ab	2.63 ± 0.06 a	13.33 ± 0.58 ab	344.33 ± 3.06 c
M1P2	34.00 ± 1.00 abc	1.24 ± 0.06 ef	3.33 ± 0.58 ab	14.00 ± 1.00 abc	425.33 ± 4.04 i
M1P3	32.33 ± 2.08 a	1.06 ± 0.07 cd	3.33 ± 0.29 ab	15.33 ± 0.58 bcd	405.33 ± 4.16 fg
M2P0	32.67 ± 0.58 a	1.15 ± 0.04 de	3.80 ± 0.35 bcd	16.00 ± 0.00 bcd	422.00 ± 1.00 hi
M2P1	33.00 ± 1.00 a	1.18 ± 0.03 def	3.83 ± 0.29 bcd	16.67 ± 0.58 cde	414.00 ± 1.00 gh
M2P2	36.67 ± 0.58 bcd	1.77 ± 0.01 g	4.93 ± 0.12 e	17.00 ± 1.00 cde	309.67 ± 2.08 a
M2P3	34.33 ± 2.08 abc	0.86 ± 0.04 b	3.53 ± 0.46 b	17.67 ± 1.15 de	322.67 ± 2.08 b
M3P0	35.00 ± 1.00 abc	1.32 ± 0.13 f	4.47 ± 0.06 cde	18.33 ± 0.58 de	440.33 ± 1.53 h
M3P1	37.00 ± 0.00 cd	1.72 ± 0.06 g	4.67 ± 0.29 de	19.33 ± 0.58 e	377.33 ± 1.53 e
M3P2	39.67 ± 0.58 d	1.83 ± 0.03 g	4.90 ± 0.10 e	19.67 ± 2.08 e	473.33 ± 1.53 k
M3P3	33.33 ± 1.15 ab	1.16 ± 0.01 def	3.67 ± 0.29 bc	17.33 ± 2.31 de	367.67 ± 8.08 de
BNJ 5%	3.42	0.16	0.88	3.19	10.77

Description: Numbers followed by the same letter indicate no significant difference based on the 5% BNJ test. M = Mono Kallium Phosphate (MKP) fertilizer dosage (M1 = 5 g/plant; M2 = 10 g/plant; M3 = 15 g/plant); P = Amino acid LOF dosage (P0 = control; P1 = 50 ml/plant; P2 = 100 ml/plant; P3 = 150 ml/plant)

**3.3. Fruit Sweetness Level**

As illustrated in Table 3, the M3P2 treatment combination (MKP fertilizer 15 g/plant + Amino acid LOF 100 ml/plant) exhibited the highest mean value for the fruit sweetness parameter at 19.67 ± 2.08° Brix. This value is higher than the sweetness range reported in previous studies, such as (2024), who found that potassium-enriched fertilization increased grape sweetness only to 16.2–17.5° Brix, indicating that the MKP–LOF combination in the present study produced a greater increase in sugar accumulation. The pH level was found to be significantly different from the other treatments, except for the M2P1 treatment combination (MKP fertilizer at a rate of 10 g per plant and Amino acid LOF at a rate of 50 ml per plant), the M2P2 combination (MKP fertilizer at a rate of 10 g per plant and Amino acid LOF at a rate of 100 ml per plant), the M2P3 application of 10 grams MKP and 150 ml LOF, the M3P0 treatment (15 grams MKP with 50 ml LOF), the M3P1 treatment (15 grams MKP with 150 ml LOF), and the M3P3 treatment (15 grams MKP with 150 ml LOF).

The results of this study demonstrate a positive correlation between the number of leaves and fruit sweetness. This finding suggests that fruits produced with more leaves may be sweeter. According to Wirajaya et al. (2022), potassium (K) levels that meet plant requirements enhance photosynthesis. This phenomenon can be attributed to the increased turgor pressure in leaf guard cells, facilitated by the presence of potassium ions (K+) within plant cells. This condition is known to cause stomata to open, thereby facilitating unobstructed photosynthesis.

Photosynthesis, when operating within optimal conditions, results in the synthesis of substantial quantities of photosynthates, including glucose. Comparatively, Wang et al. (2024) reported that high potassium availability increased sucrose–hexose conversion efficiency in grape fruits, supporting the finding that enhanced K uptake stimulates sugar accumulation. The greater the glucose received by the fruit organ, the more sugar is present in the fruit, thereby increasing its sweetness.

**3.4. Number of seeds**

As illustrated in Table 3, the M2P2 treatment combination (MKP fertilizer 10 g/plant + Amino acid LOF 100 ml/plant) exhibited the lowest mean value for the fruit seed count parameter, at 309.67 ± 2.08 seeds/fruit. This value is significantly lower than the seed counts typically reported in similar studies. For example, Bhavya et al. (2024) observed that the application of MKP and balanced foliar fertilizers in green gram resulted in higher reproductive output, with pod seed counts increasing by 14–18% relative to control treatments—indicating that the MKP–LOF combination in the present study produced an inverse effect through a reduction in seed formation. This result was significantly different from the other treatments. Consumer preferences tend to gravitate toward fruits with fewer seeds, as they offer greater convenience and ease of consumption. The M2P2 treatment combination resulted in the greatest decline in melon seed number among the tested treatments.

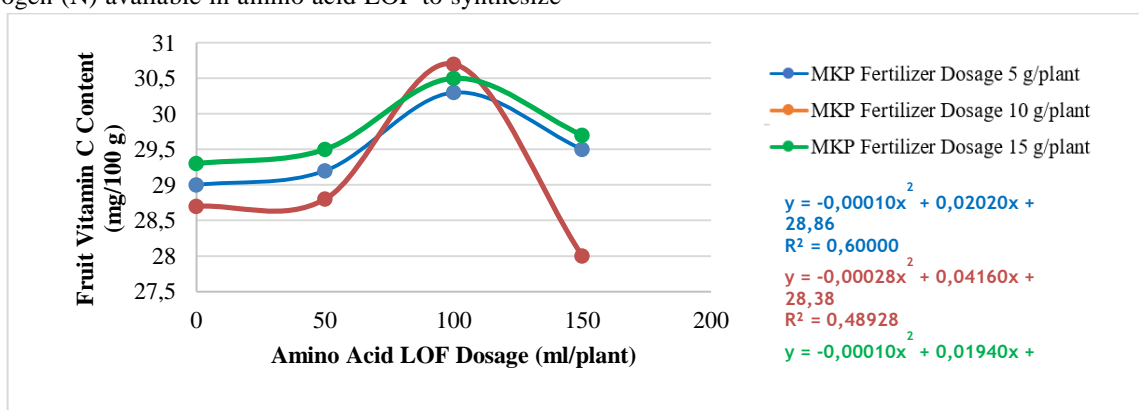
Increased gibberellin hormone activity has been

associated with a decrease in seed number in fruits. Gibberellin hormones have been demonstrated to inhibit seed formation in fruit. Gibberellin hormones inhibit pollen tube growth prior to fertilization, thereby preventing the union of male and female gamete cells and inhibiting seed formation (Purba et al., 2019). Comparatively, Bhavya et al. (2024) also noted that excessive nutrient-induced hormonal stimulation in green gram could delay reproductive synchronization, although it did not reduce seed number as sharply as observed in the present study.

The present study employed amino acid-based organic fertilizer (LOF) derived from soybean curd and chicken egg liquid waste, which is abundant in protein and amino acids. Endophytic bacteria residing in plant tissues have been shown to convert proteins and amino acids into the phytohormone gibberellin. According to (2023), rhizobacteria (*Bacillus* sp. and *Pseudomonas* sp.) exploit the nitrogen (N) available in amino acid LOF to synthesize

phytohormones such as auxin and gibberellin, which support the increase in endogenous gibberellin activity observed in this study.

MKP fertilizer, which contains phosphorus, has been shown to promote seed formation. A dose of 10 g/plant of MKP fertilizer is considered ideal for stimulating the absorption of nitrogen, a nutrient essential for plants to synthesize gibberellin hormones. Gibberellin synthesis occurs in the vegetative organs of leaves and roots; therefore, the biosynthesis process increases as plant growth progresses. Plants lacking gibberellin hormones tend to have harder textures, greater seed weight, and more seeds (Purba et al., 2019). According to Suhartono et al. (2020), exogenous gibberellin application is a widely used technique for producing seedless grapes, reinforcing the hormonal mechanism underlying the reduced seed number observed in the M2P2 treatment.



**Figure 2.** Graph showing the average of vitamin C content of melons in relation to MKP fertilizer dosage and amino acid LOF dosage.

**3.5. Fruit Vitamin C Content**

As demonstrated in Figure 1, the analysis of vitamin C content in the fruit indicates that the combination of MKP fertilizer dose and Amino acid LOF dose exhibited no statistically significant impact. However, a tendency toward increased vitamin C content was observed in the M2P2 treatment combination, which involved applying MKP fertilizer at 10 g per plant and Amino acid LOF at 100 ml per plant. This combination resulted in a vitamin C content of 30.67 mg per 100 g. It is noteworthy that glucose, a monosaccharide derivative, plays a crucial role in the synthesis of vitamin C, also known as ascorbic acid. The MKP fertilizer, which contains 52% phosphorus, has been demonstrated to facilitate carbohydrate synthesis and glycolysis, thereby enhancing vitamin C synthesis in fruit tissues. (Putra et al., 2022) stated that there are 30 milligrams of vitamin C per 100 grams of melon fruit, indicating that the addition of MKP fertilizer and amino acid LOF in this study can increase the vitamin C content of melon fruit, although the increase is not significant.

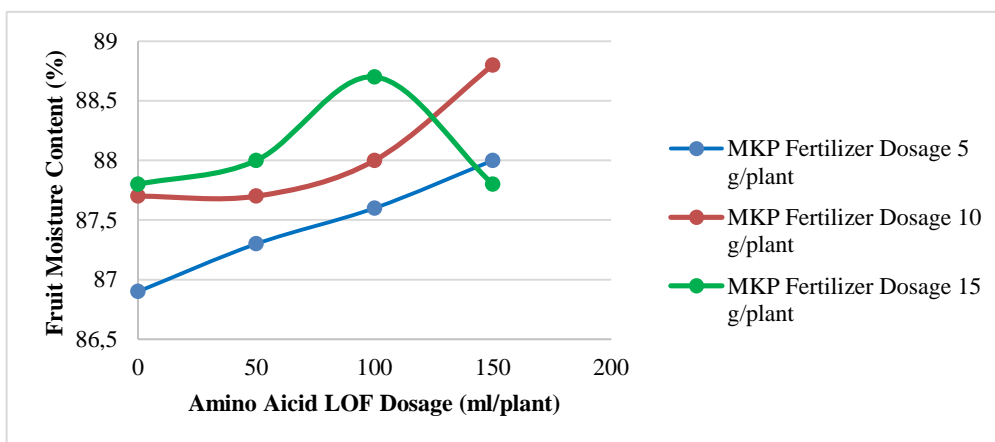
content. However, there was a tendency toward increased fruit moisture content in the M2P3 treatment

combination (MKP fertilizer 10 g/plant and LOF Amino Acid 150 ml/plant), which was 88.77%. As posited by Hadiwijaya et al. (2020), numerous factors exert influence on the texture, appearance, taste, freshness, and shelf life of fruit during storage. The water content of high-quality melons is approximately 93%. This finding suggests that the water content of melons in this study is below the established standard (Setiawati & Bafdal, 2020). This outcome may be attributable to the process of fruit transpiration, which occurs during the measurement of the fruit's water content at four days post-harvest. The water content of a fruit directly correlates with its freshness, with higher water content resulting in faster spoilage. Additionally, higher water content increases the fruit's susceptibility to cracking and reduces its texture's firmness upon consumption. After harvest, the fruit ceases to receive the necessary supply of photosynthates, minerals, and water. Instead, the fruit undergoes respiration and transpiration using the water reserves stored in the fruit tissue or stem. As a result, the fruit's water content diminishes, thereby initiating the process of decay.

### 3.6. Fruit Moisture Content



The results of Figure 2 demonstrate that the combination of MKP fertilizer dose and LOF Amino Acid dose did not have a significant effect on fruit moisture. The comparison table illustrates the general differences in moisture content among the treatment groups. One group tended to maintain slightly higher moisture levels, while the other exhibited comparatively lower moisture content.

Overall, moisture levels in all treatments remained below the expected standard for fresh melons. This condition may result from natural post-harvest processes, particularly transpiration, which gradually reduces the fruit’s internal water reserves. As moisture decreases, fruit freshness and firmness decline, eventually initiating the early stages of deterioration.



**Figure 2.** Graph showing the average water content of melons in relation to MKP fertilizer dosage and amino acid LOF dosage.

**Table 4.** Comparison of Fruit Moisture Content Across Treatment Combinations

Treatment Group	Moisture Content (%)	Comparison Image
Group A	Shows a tendency toward higher moisture content compared to other treatments.	
Group B	Displays lower moisture content relative to Group A.	

### 4. Conclusion

The interaction between MKP fertilizer and amino acid LOF significantly improved key melon quality traits, particularly fruit weight, flesh thickness, sweetness, and reduced seed number. The most effective treatment was

MKP at 15 g/plant combined with amino acid LOF at 100 ml/plant, producing the highest fruit weight (1.83 kg) and sweetness (19.67 °Brix). These findings recommend this combination as the optimal fertilization strategy for farmers seeking to enhance melon quality and market value.

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