



Effect Of Humic Acid Concentration And Liquid Organic Fertilizer On Yield Growth And Brix of Melon (*Cucumis Melo* L.) Alisha F1 Varieties

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Abstract

Background. The application of environmentally friendly fertilizers has become an important strategy for improving melon productivity and fruit quality while reducing dependence on synthetic fertilizers.

Aims. This study evaluated the effects of humic acid and liquid organic fertilizer (LOF) concentrations on the growth, yield, and fruit quality of Alisha F1 melon (*Cucumis melo* L.).

Methods. The experiment was conducted in a greenhouse at SMKN 1 Cikaum, Subang, Indonesia, from March to May 2026 using a factorial Randomized Block Design. The first factor was humic acid concentration (0, 20, 40, and 60 mL L⁻¹), while the second factor was liquid organic fertilizer concentration (0, 5, 10, and 15 mL L⁻¹). Each treatment combination was replicated twice. Data were analyzed using analysis of variance (ANOVA) at the 5% significance level, followed by response surface regression to determine optimum fertilizer concentrations.

Result. The results indicated that the interaction between humic acid and liquid organic fertilizer significantly affected fruit diameter and soluble solids content (°Brix), whereas most vegetative growth parameters showed no significant interaction. The combination of 60 mL L⁻¹ humic acid and 5 mL L⁻¹ liquid organic fertilizer produced the largest fruit diameter (12.10 cm), while 20 mL L⁻¹ humic acid combined with 10 mL L⁻¹ liquid organic fertilizer resulted in the highest fruit sweetness (14.40 °Brix). Response surface analysis predicted that the optimum concentrations for maximizing fruit diameter and quality were 29.04 mL L⁻¹ humic acid and 9.09 mL L⁻¹ liquid organic fertilizer, yielding a predicted maximum fruit diameter of 11.69 cm and soluble solids content of 11.91 °Brix.

Conclusion. These findings demonstrate that the combined application of humic acid and liquid organic fertilizer enhances melon fruit quality through synergistic effects on nutrient availability and uptake, providing an environmentally sustainable fertilization strategy for Alisha F1 melon cultivation.

Keywords: *Cucumis melo* L.; humic acid; liquid organic fertilizer; fruit quality; soluble solids; sustainable fertilization.



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INTRODUCTION

Melon (*Cucumis melo* L.) is a type of horticultural plant that is currently widely consumed by the public because it has juicy, sweet, and refreshing fruit flesh. With the many

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varieties of melons today, people are not tired of consuming melons every day. Melon Alisha F1 was chosen in this study because it is a hybrid variety that has uniform vegetative growth, strong plant vigor, and high yield potential. In addition, Alisha F1 melons have good commercial quality, characterized by thick flesh, crispy texture, and high levels of sweetness, so they are in great demand by consumers. The selection of Alisha F1 melons is also based on their adaptability to various cultivation systems, including cultivation in polybags and limited land. Its genetic traits as a hybrid variety make Alisha F1 melon responsive to the application of cultivation technologies, such as planting media management and fertilization, so it is suitable for use as an object of experimental research. With a relatively stable growth character, this variety is expected to be able to show the effect of treatment clearly and provide research results that are applicable to the development of melon cultivation.

The melon plant (*Cucumis melo* L.) is a horticultural commodity that has high economic value and is widely cultivated in Indonesia. The demand for melon continues to increase as public awareness increases about the importance of consuming fresh fruits rich in vitamins and minerals. In addition to its sweet and fresh taste, melon also has great potential as an export commodity that supports increasing the income of horticultural farmers (Arisandi *et al.*, 2025).

The productivity of melons is still unstable, tends to be not optimal. One of the causes is nutrient imbalance in plants due to excessive use of chemical fertilizers, which in the long run can damage soil fertility and reduce the activity of soil microorganisms (Lisdayani *et al.*, 2022). Therefore, efforts are needed to increase melon productivity with an environmentally friendly approach, such as using organic materials, the part of organic matter is currently humic acid and liquid organic fertilizer.

Humic acid is a complex compound resulting from the decomposition of organic matter that belongs to the humus fraction. This compound plays an important role in improving soil structure, increasing cation exchange capacity (KTK), improving aeration, and supporting root development (Zhu *et al.*, 2025). In addition, humic acid improves nutrient uptake and enzyme activity in plant tissues, thus benefiting in vegetative growth and photosynthetic efficiency. The application of humic acid to melon culture in a nutrient solution was able to significantly increase plant height, leaf count, and leaf SPAD index compared to controls without humic acid (Samran *et al.*, 2023).

Liquid organic fertilizer is the result of fermentation of organic matter that contains macro (N, P, K) and micro (Fe, Zn, Mn, B) nutrients in a form that is easily absorbed by plants.

Liquid organic fertilizer plays a role in improving soil nutrient balance and increasing microbial activity that benefits plant growth (Sumartono *et al.*, 2017).

Although each ingredient has a positive impact, research on the interaction between humic acid and liquid organic fertilizer on melon growth and yield is still limited, especially in polybag cultivation systems that allow for precise control of planting media and treatment doses. The alleged synergistic effect of this combination is that humic acid improves the structure and capacity of the soil to retain nutrients, while liquid organic fertilizer supplies nutrients that are easily absorbed by roots and leaves. The use of humic acid and liquid organic fertilizer in the Alisha F1 melon study was carried out because the plant requires adequate availability of nutrients to support growth and production. Humic acid plays a role in improving the physical, chemical, and biological conditions of the planting medium and increasing the effectiveness of nutrient absorption, while liquid organic fertilizer functions as a provider of organic nutrients and bioactive compounds that are easily and quickly absorbed by plants. The simultaneous application of these two inputs is expected to have a synergistic effect in supporting vegetative growth, fruit formation, and improving the quality of Alisha F1 melon yields, as well as in line with the implementation of sustainable and environmentally friendly cultivation.

Based on this description, this study is important to determine the influence and interaction of humic acid and liquid organic fertilizers on the growth and yield power of melon plants, so that the best doses and combinations that are effective, efficient, and environmentally friendly can be obtained.

RESEARCH METHODS

This experiment was carried out from March to May 2026 at the *Green House* of SMKN 1 Cikaum, East Cikaum District, Subang Regency. The altitude of the research site is 150 meters above sea level with alluvial soil type.

The main ingredients used in this experiment are Melon golden Alisha F1 Variety, Liquid Humic Acid, Bioto Grow Organic Liquid Fertilizer. The supporting materials are; polybag size 40 x 40, compost/manure, NPK Mutiara fertilizer 16 – 16 - 16, Mutiara Grower 15 – 09 - 20, Karate Plus Boroni fertilizer, Gandasil D, danke insecticide, Curacorn 40 WSC insecticide, Furadan 3G, Dithane M-45 80 WP fungicide, Cabrio Top 60 WG fungicide, KNO₃ Red, white KNO₃. Meanwhile, the equipment used is a hoe, sprayer sling, raffia thread, knife, measuring

cup, cup, refractometer, meter/ruler, cuttings, stationery, and digital scales, calipers, hygrometer.

Treatment applications include; applying humic acid concentrations with treatment (0, 20, 40 and 60 mL L⁻¹ water), and for liquid organic fertilizer given treatment (0, 5, 10 and 15 mL L⁻¹ water), an interval of 7 days, starting from before planting, 0 DAP, and continued when the plants are 6, 12, 18, and 24 DAP.

This study used two independent variables, namely humic acid concentration and liquid organic fertilizer concentration, as well as 2 bound variables in the form of growth and yield characteristic response. The treatment of humic acid concentration consists of four levels, namely 0 (without treatment), 20, 40 and 60 mL L⁻¹ water. Meanwhile, the concentration of liquid organic fertilizer consists of four levels, namely 0 (without treatment), 5, 10 and 15 mL L⁻¹ water, with 2 replicates each. The data were analyzed using ANOVA level 5% and to find the Optimum point a surface regression response was used.

DISCUSSION

Plant Height

The results of the analysis of plant height observation data can be seen in Table 1. Based on the observation results in Table 1, it is shown that there is no interaction between humic acid concentration and liquid organic fertilizer concentration on plant height. The results of the self-test on the treatment of humic acid concentration and liquid organic fertilizer concentration showed that all treatments did not have a noticeable difference in plant height at the age of 2 DAP, 7 DAP, 13 DAP, 19 DAP and 25 DAP. However, numerically in the h0 treatment of humic acid (0 mL L⁻¹ water/control) tends to produce the highest plant height at the age of 25 DAP, which is 120.59 cm. The concentration of liquid organic fertilizer p3 (15 mL L⁻¹ water) resulted in the highest plant height at the age of 25 DAP compared to other treatments, which was 122.63 cm. This confirms that in the melon cultivation system in polybags, the plant's high growth response is more influenced by the basic conditions of the planting medium and the growing environment than the variation in the concentration of organic inputs given. The insignificance of the effect of humic acid on plant height indicates that the main role of humic acid in this study is as a plant medium (amelioran), not as a direct determining factor for vegetative growth. Humic acid works by increasing the cation exchange capacity (KTK), stability of the media structure, and the efficiency of nutrient absorption in the root zone. These

results are in line with the report Rosli *et al.* (2022) dan Irshad *et al.* (2022) which states that the plant growth response to humic acid is highly dependent on the initial conditions of the medium and the dosage of application. Liquid organic fertilizer serves as a source of macro and micro nutrients as well as organic compounds that are easily absorbed by plants. However, in the condition of the media that has met the nutritional needs of the plant, the additional liquid organic fertilizer has not been able to significantly increase the rate of stem elongation. This supports the findings Ayu *et al.* (2017) dan Wijaya *et al.*

Number of Leaves

The results of the analysis of the data on the number of strands can be seen in Table 2. Based on the observation results in Table 2, it is shown that there is no interaction between humic acid concentration and liquid organic fertilizer concentration on the number of leaves. The results of the self-test on the treatment of humic acid concentration and liquid organic fertilizer concentration showed that all treatments did not have a noticeable difference in the number of leaves at the age of 2 DAP, 7 DAP, 13 DAP, 19 DAP and 25 DAP. However, numerically in h3 treatment humic acid (60 mL L⁻¹ water) tends to produce the highest plant height at the age of 25 DAP, which is 16.94 sheets. The concentration of liquid organic fertilizer p3 (15 mL L⁻¹ water) yielded the highest number of leaves at the age of 25 DAP compared to other treatments, which was 17.19 leaves. This shows that the response of leaf formation in this study was not significantly influenced by the variation in concentration of the two inputs, but rather determined by the basic conditions of the planting medium and environmental factors of growth (Irshad *et al.*, 2022; Wijaya *et al.*, 2023).

Liquid organic fertilizer has the potential to support leaf formation through the supply of macro and micronutrients, amino acids, and growth hormones, but these effects are not strong enough to produce statistically significant differences. This condition is suspected to be caused by the availability of sufficient basic nutrients in the planting medium, so that additional nutrients from liquid organic fertilizer are not the main limiting factor in leaf formation (Ayu *et al.*, 2017; Prakoso *et al.*, 2022)

Table 1. Effect of Humic Acid and Liquid Organic Fertilizer Concentrations on Plant Height

CONCENTRATION	PLANT HEIGHT (cm)				
	2 DAP	7 DAP	13 DAP	19 DAP	25 DAP

Humic Acid

h ₀ (0 mL L ⁻¹ air)	4,89	a	8,07	a	15,71	a	51,19	a	120,59	a
h ₁ (20 mL L ⁻¹ air)	4,68	a	8,04	a	15,37	a	48,88	a	115,19	a
h ₂ (40 mL L ⁻¹ air)	4,73	a	7,83	a	14,88	a	45,38	a	112,38	a
h ₃ (60 mL L ⁻¹ air)	5,11	a	7,88	a	15,19	a	45,63	a	114,94	a

Liquid Organic Fertilizer

p ₀ (0 mL L ⁻¹ air)	4,68	a	7,82	a	15,28	a	47,44	a	114,72	a
p ₁ (5 mL L ⁻¹ air)	4,63	a	7,73	a	14,48	a	45,38	a	112,16	a
p ₂ (10 mL L ⁻¹ air)	4,85	a	8,06	a	14,87	a	47,63	a	113,59	a
p ₃ (15 mL L ⁻¹ air)	5,24	a	8,21	a	16,53	a	50,63	a	122,63	a

Remarks: The average number of treatments followed by the same letter in the direction of the column is not is a real difference according to Duncan's Multiple Distance Test at a real level of five percent.

Table 2. Effect of Humic Acid and Liquid Organic Fertilizer Concentrations on Leaf Count

CONCENTRATION	NUMBER OF LEAVES				
	2 DAP	7 DAP	13 DAP	19 DAP	25 DAP
Humic Acid					
h ₀ (0 mL L ⁻¹ air)	0,44 a	2,06 a	3,94 a	9,13 a	16,88 a
h ₁ (20 mL L ⁻¹ air)	0,63 a	2,00 a	4,00 a	8,88 a	16,75 a
h ₂ (40 mL L ⁻¹ air)	0,56 a	1,94 a	4,06 a	8,88 a	16,56 a
h ₃ (60 mL L ⁻¹ air)	0,69 a	2,00 a	4,06 a	9,00 a	16,94 a
Liquid Organic Fertilizer					
p ₀ (0 mL L ⁻¹ air)	0,50 a	2,06 a	3,88 a	8,63 a	16,56 a
p ₁ (5 mL L ⁻¹ air)	0,69 a	2,00 a	4,00 a	8,75 a	16,63 a
p ₂ (10 mL L ⁻¹ air)	0,50 a	1,94 a	4,13 a	9,06 ab	16,75 a
p ₃ (15 mL L ⁻¹ air)	0,63 a	2,00 a	4,06 a	9,44 b	17,19 a

Remarks: The average number of treatments followed by the same letter in the direction of the column is not is a real difference according to Duncan's Multiple Distance Test at a real level of five percent.

Table 3. Effect of Humic Acid and Liquid Organic Fertilizer Concentrations on Wet Plant Weight

CONCENTRATION	WET WEIGHT					
	Bt+Dn		Root		Bt+Dn= Root	
Humic Acid						
h0 (0 mL L ⁻¹ air)	179,25	a	2,75	a	182,00	a
h1 (20 mL L ⁻¹ air)	168,00	a	2,75	a	170,75	a
h2 (40 mL L ⁻¹ air)	177,00	a	3,31	ab	180,31	a
h3 (60 mL L ⁻¹ air)	189,13	a	3,50	b	192,63	a
Liquid Organic Fertilizer						
p0 (0 mL L ⁻¹ air)	163,75	a	2,69	a	166,44	a
p1 (5 mL L ⁻¹ air)	186,00	a	2,88	ab	188,88	a
p2 (10 mL L ⁻¹ air)	174,50	a	3,38	b	177,88	a
p3 (15 mL L ⁻¹ air)	189,13	a	3,38	b	192,50	a

Remarks: The average number of treatments followed by the same letter in the direction of the column is not is a real difference according to Duncan's Multiple Distance Test at a real level of five percent.

Wet Weight, Dry Weight and Dry Weight of Plants

The results of the analysis of wet weight observation data can be seen in Table 3. Based on the observation results in Table 3, it shows that there is no interaction between humic acid concentration and liquid organic fertilizer concentration on plant wet weight. The results of the self-test showed that the treatment of humic acid concentration had a noticeable effect on the wet weight, namely on the roots. The h3 treatment (60 mL L⁻¹ water) produced the highest root value, which was 3.50, which was significantly different from the h0 and h1 treatments, but not significantly different from the p2 treatment. Meanwhile, in the concentration of liquid organic fertilizer, all treatments had no real effect, but numerically the p3 treatment (15 mL L⁻¹ water) produced the highest total wet weight compared to other treatments, which was 192.50.

This condition suggests that the overall accumulation of fresh biomass of the plant has not been significantly affected by variations in humic acid and liquid organic fertilizer concentrations, but rather is determined by the initial conditions of the planting medium and

relatively homogeneous growing environmental factors during the study (Gardner *et al.*, 1985; Taiz *et al.*, 2015). This indicates that humic acid plays a greater role in stimulating root system growth and activity than increasing crown biomass.

Meanwhile, the wet weight of liquid organic fertilizer roots has not been able to significantly increase the accumulation of fresh biomass of plants. These findings are in line with Ayu *et al.* (2017) and Prakoso *et al.* (2022) who reported that the effectiveness of liquid organic fertilizer on the wet weight of horticultural crops was greatly influenced by the initial fertility level of the planting medium and the intensity of nutrient stress experienced by the plant.

The results of the analysis of dry weight observation data can be seen in Table 4. Based on the observation results in Table 4, it is shown that there is no interaction between humic acid concentration and liquid organic fertilizer concentration on dry weight of plants.

The results of the self-test showed that the treatment of humic acid concentration had a noticeable effect on dry weight, namely on the roots. The h3 treatment (60 mL L⁻¹ water) produced the highest root value, which was 0.50 which was significantly different from the h₀ and h₁ treatments, but not significantly different from the h₂ treatment. Meanwhile, in the concentration of liquid organic fertilizer, all treatments had no real effect, but numerically the p1 treatment (5 mL L⁻¹ water) produced the highest total dry weight compared to other treatments, which was 20.08.

Table 4. Effect of Humic Acid and Liquid Organic Fertilizer Concentrations on Dry Weight of Plants

CONCENTRATION	WEIGHT DRYING		
	BT+Root	Root	Bt+Dn= Root
Humic Acid			
h0 (0 mL L ⁻¹ air)	19,13 a	0,40 a	19,53 a
h1 (20 mL L ⁻¹ air)	17,69 a	0,39 a	18,08 a
h2 (40 mL L ⁻¹ air)	18,11 a	0,41 ab	18,52 a
h3 (60 mL L ⁻¹ air)	19,69 a	0,50 b	20,19 a
Liquid Organic Fertilizer			
p0 (0 mL L ⁻¹ air)	17,68 a	0,38 a	18,06 a
p1 (5 mL L ⁻¹ air)	19,65 a	0,43 a	20,08 a

p2 (10 mL L ⁻¹ air)	18,24 a	0,45 a	18,69 a
p3 (15 mL L ⁻¹ air)	19,04 a	0,44 a	19,49 a

Remarks: The average number of treatments followed by the same letter in the direction of the column is not a real difference according to Duncan's Multiple Distance Test at a real level of five percent.

These results show that in humic acid, the overall accumulation of dry biomass of plants is relatively stable and has not been significantly affected by variations in treatment concentrations, but rather by photosynthesis capacity and the balance of vegetative growth of plants during the observation period (Gardner *et al.*, 1985; Taiz *et al.*, 2015). In the liquid organic fertilizer treatment, it was not able to significantly increase plant dry matter accumulation. In planting media conditions with relatively adequate nutrient availability, additional nutrients from liquid organic fertilizer tend to play a greater role in maintaining plant metabolic balance than increasing the rate of net photosynthesis and assimilate accumulation converted into dry biomass (Ayu *et al.*, 2017; Prakoso *et al.*, 2022)

The results of the analysis of dry weight NPA observation data can be seen in Table 5.

Table 5. Dry Weight.

Treatment	Dry Weight
Humic Acid	
h0 (0 mL L ⁻¹ air)	48,63 b
h1 (20 mL L ⁻¹ air)	46,22 ab
h2 (40 mL L ⁻¹ air)	44,54 a
h3 (60 mL L ⁻¹ air)	39,63 a
Liquid Organic Fertilizer	
p0 (0 mL L ⁻¹ air)	47,10 a
p1 (5 mL L ⁻¹ air)	47,10 a
p2 (10 mL L ⁻¹ air)	41,86 a
p3 (15 mL L ⁻¹ air)	42,97 a

Remark: The average number of treatments followed by the same letter in the direction of the column did not differ significantly according to Duncan's Multiple Distance Test at a real level of five percent.

Based on the observations in Table 5, it is shown that there is no interaction between humic acid concentration and liquid organic fertilizer concentration on dry weight NPA of treatment plants.

The results of the self-test showed that the humic acid concentration treatment had a significant effect on dry weight NPA, the h0 treatment (0 mL L⁻¹ water) produced the highest NPA value, which was 48.63 which was significantly different from the h2 and h3 treatment, but not significantly different from the h1 treatment. Meanwhile, in the concentration of liquid organic fertilizer, all treatments had no real effect. This indicates that the formation of plant biomass is more influenced by humic acid concentrations than liquid organic fertilizer, and shows a negative response to higher humic acid concentrations to the accumulation of plant dry matter.

Fruit Diameter

The results of the analysis of wet weight observation data can be seen in Table 6. Based on Table 6, the results of the analysis show that there is an interaction between the concentration of humic acid and the concentration of liquid organic fertilizer on the diameter of the fruit. The results of the analysis in Table 6, the observation of fruit diameter at the age of 70 DAP can be seen that all treatments have a real effect, the highest average number is in the h₃ treatment (60 mL L⁻¹ water) with the p₁ treatment (5 mL L⁻¹ water) resulting in a larger fruit diameter (12.1 cm) compared to other treatments. This confirms that fruit enlargement is influenced by a combination of improving the condition of the planting medium by humic acid and the availability of nutrients supplied through LIQUID ORGANIC FERTILIZER, rather than by each treatment separately. Humic acid at relatively high doses is able to increase the efficiency of nutrient utilization from LIQUID ORGANIC FERTILIZER so as to support optimal fruit growth.

Humic acid plays a role in improving the structure of the medium and increasing the cation exchange capacity, thereby supporting the development of the root system and nutrient absorption efficiency. Meanwhile, liquid organic fertilizer provides macro and micro nutrients as well as bioactive compounds that support assimilate translocation to fruit. The synergy of the two treatments contributes to increasing the diameter of the fruit through an increase in the

accumulation of photosynthetic results in the generative phase (Canellas & Olivares, 2014; Taiz *et al.*, 2015).

The regression results between the concentration of humic acid X_1 and the concentration of liquid organic fertilizer (X_2) and the weight of melons (Y) are as follows.

$$Y = 10.1090 + 0.0444.X_1 + 0.2072.X_2 - 0.0005.X_1^2 - 0.0086X_2^2 - 0.00179X_1X_2; R^2 = 0.4687$$

Based on surface response analysis, the optimum concentration of humic acid was obtained at 29.04 mL L⁻¹ water and liquid organic fertilizer at 9.09 mL L⁻¹ water with a predicted maximum fruit weight of 11.69.

Fruit Weight

The results of the analysis of fruit weight observation data can be seen in Table 7. Based on Table 7, it shows that there is no interaction between humic acid concentration and liquid organic fertilizer concentration on fruit weight.

The results of the analysis showed that independently the treatment of humic acid concentration had a significant effect on the weight of the fruit. The h₁ treatment (20 mL L⁻¹ water) produced the highest fruit weight value, which was 1050.00 grams, which was significantly different from the h₀ treatment, but not significantly different from the h₁ and h₂ treatments. Likewise, the concentration of liquid organic fertilizer has a real effect on the weight of the fruit. The highest weight of p₁ treatment (5 mL L⁻¹ water) was 1025.00 grams, which was significantly different from the p₀ treatment, but not significantly different from the p₂ and p₃ treatments. This shows that in this dosage range, humic acid is able to improve the physical and chemical characteristics of the planting medium, increase the cation exchange capacity, and the efficiency of nutrient absorption, thereby supporting optimal fruit filling. Higher doses of humic acid (60 mL L⁻¹) did not increase fruit weight further, indicating that the effect of humic acid was optimal at moderate doses. These findings are in line with the report by Canellas and Olivares (2014).

In liquid organic fertilizer treatment, it was shown that the supply of macro and micronutrients, amino acids, and bioactive compounds in liquid organic fertilizer at moderate doses was able to support the accumulation of assimilates to fruits. An increase in liquid organic fertilizer concentrations to 10–15 mL L⁻¹ did not significantly increase fruit weight, indicating that the plant's nutrient needs were met at lower doses. These results are in line with Ayu *et al.*

(2017) and Wijaya *et al.* (2023) who reported that the effectiveness of liquid organic fertilizer on horticultural crop yields was generally optimal at moderate doses.

Table 6. Effect of Humic Acid and Liquid Organic Fertilizer Concentrations on Fruit Diameter

Faktor	h0		h1		h2		h3	
p0	10,55	a	10,75	a	10,55	a	11,00	b
	A		A		A		A	
p1	10,70	ab	11,45	b	11,45	b	12,1	c
	A		B		B		B	
p2	11,10	ab	11,75	b	11,65	b	10,8	ab
	AB		B		B		A	
p3	11,30	b	11,35	ab	11,90	b	10,15	a
	B		B		B		A	

Remarks: The average number of treatments marked with the same letter in each column (letters and each line (capital letter) does not differ significantly at the real level of 5% based on Duncan Double Distance Test.

Table 7. Effect of Humic Acid and Liquid Organic Fertilizer Concentrations on Fruit Weight

Concentration	Fruit Weight (g)	
Humic Acid		
h ₀ (0 mL L ⁻¹ air)	856,25	a
h ₁ (20 mL L ⁻¹ air)	1050,00	b
h ₂ (40 mL L ⁻¹ air)	1031,25	b
h ₃ (60 mL L ⁻¹ air)	962,50	b
Liquid Organic Fertilizer		
p ₀ (0 mL L ⁻¹ air)	881,25	a
p ₁ (5 mL L ⁻¹ air)	1025,00	b
p ₂ (10 mL L ⁻¹ air)	1012,50	b
p ₃ (15 mL L ⁻¹ air)	981,25	b

Remarks: The average number of treatments followed by the same letter in the direction of the column is not a real difference according to Duncan's Multiple Distance Test at a real level of five percent.

Table 8. Effect of Humic Acid and LIQUID ORGANIC FERTILIZER Concentrations on Brix (Sugar Content)

Faktor	h ₀		h ₁		h ₂		h ₃	
p ₀	10,65	a	12,20	b	14,15	b	12,30	b
	A		B		C		B	
p ₁	11,15	b	11,65	a	14,30	c	12,25	b
	A		B		D		C	
p ₂	10,55	a	14,40	d	13,60	a	11,85	a
	A		D		C		B	
p ₃	12,00	c	13,85	c	13,70	a	13,65	c
	A		C		B		B	

Remarks: The average number of treatments marked with the same letter in each column (lowercase) and each row (capital letters) did not differ significantly at a real level of 5% based on the Duncan Multiple Distance Test.

Concentrations on Brix (Sugar Content)

The results of the analysis of Brix observation data can be seen in Table 6.

Based on Table 8, it shows that there is an interaction between humic acid concentration and liquid organic fertilizer concentration on fruit brix.

The results of the analysis of the observation of 70 DAP fruit brix can be seen that all treatments have a real influence between the concentration of humic acid and liquid organic fertilizer) on the sweetness level (°Brix) of melons.

In general, the combination of humic acid h₁ (20 mL L⁻¹ water) with liquid organic fertilizer p₂ (10 mL L⁻¹ water) results in a higher °Brix value than other treatments. The highest °Brix value (14.40). These results show that at these doses, the conditions of the planting medium and nutrient availability are at optimal levels to support the synthesis and accumulation of sugars in the fruit, as reported in various horticultural crop studies (Wijaya *et al.*, 2023; Prakoso *et al.*, 2022). This also indicates that the quality of fruit, especially the accumulation of sugar, is influenced by the synergy between the improvement of the condition of the planting medium by humic acid and the availability of nutrients supplied through liquid organic fertilizer. These findings are in line with the concept of plant physiology which states that the efficiency of

nutrient absorption and photosynthetic distribution is the main factor determining the quality of horticultural crop yields (Taiz *et al.*, 2015; Canellas & Olivares, 2014).

Then the results of the regression between the concentration of humic acid X_1 and the concentration of liquid organic fertilizer (X_2) with the brix of melon fruit (Y) are as follows: $Y = 10.1090 + 0.0444.X_1 + 0.2072.X_2 - 0.0005.X_1^2 - 0.0005.X_2^2 - 0.0017X_1X_2$; $R^2 = 0.47$

The positive linear coefficient showed an increase in brix levels to some extent, while the quadratic coefficient and negative interaction showed the optimum point at humic acid of 29.04 mL L⁻¹ water and liquid organic fertilizer of 9.09 mL L⁻¹ water with a predicted maximum brix of 11.905%.

The improvement in the quality of this fruit is related to the role of humic acid in increasing the efficiency of nutrient absorption and photosynthesis (Stevenson, 1994; Canellas & Olivares, 2014), as well as the role of liquid organic fertilizers in providing K, P, microorganisms, and phytohormones to support the accumulation of fruit sugars (Vessey, 2003; Khalid *et al.*, 2004).

CONCLUSION

There was an interaction between the concentration of humic acid and liquid organic fertilizer on the yield of Alisha F1 melon, namely in the diameter of the fruit and °Brix (sweetness level). There is an optimal concentration of fruit diameter and fruit brix rate. In the fruit diameter, the optimum concentration of humic acid is 29.04 mL L⁻¹ of water and the optimum concentration of liquid organic fertilizer is 9.09 mL L⁻¹, so that the maximum diameter of melon fruit is 11.69 cm. Then at the brix level, the optimum concentration of humic acid is 29.04 mL L⁻¹ water and the concentration of optimum liquid organic fertilizer is 9.09 mL L⁻¹ of water so that the maximum melon brix is 11.905 %.

Advice

Treatments with optimal results in fruit diameter and brix content can be applied and socialized to farmers as recommendations in planting, and further research is needed to uncover more comprehensive information about these treatments in different media with different environmental conditions.

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