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Article

Giving glycine can increase melon production using a hydroponic spray system

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Abstract: Cucumis melo L. is an annual plant and has high economic value so it is widely cultivated in Indonesia. Possible efforts include providing amino acids and hydroponic methods. Determining the provision of amino acids with the best concentration for the growth and quality of hydroponic plant production is the aim of this research. The research method was a completely randomized design (CRD) consisting of factors with four levels of amino acid concentration, namely G0 (without administration of amino acids), G1 (2 mgL-1), G2 (4 mgL-1) and G3 (6 mgL-1) Meanwhile the data was analyzed using the F test. The results for all parameters, both growth and production of melon plants, were not significantly different. Although the concentration of amino acids given to melon plants did not show any influence on the quality of hydroponic melon production, there was a good increase in diameter of 13.60 cm and fruit weight of 1.46 kg. Based on the administration of amino acids, it can be concluded that although it didn't have a significant effect, the fruit diameter in the 6 mgL-1 treatment was the largest.

Keywords: amino acids**;** *Cucumis melo*; hydroponic

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1. Introduction

Cucumis melo L. not a fruit originating from Indonesia, but in North Africa. Then melon plants spread around the world, starting in the Middle East, Europe, America and Indonesia. The centers of melon cultivation in Indonesia are in the regions Java. Melon is a horticultural product that is part of seasonal crops and is widely cultivated in Indonesia due to its high economic value [1], [2] Melon plants can grow and bear fruit well in subtropical and tropical areas. In addition, melon plants can also adapt to different climatic conditions [3], [4]. However, the production of melon plants is still classified as low because there are pests and diseases, so the loss of melon cultivation is high and affects the productivity of melon plants [5]–[7].

According to the Central Statistics Agency (2021), melon production in Indonesia fluctuated. In 2021, melon production was 103.84 tons. Melon production then increased until 2014, to 125.47 tons in 2012, 125.21 tons in 2013 and 150.36 tons in 2014. From 2015 to

2017, melon production decreased to 137.89 tons, 117.34 tons and 92.43 tons. From 2018 to 2022, it will increase to 118.71 tons, 12.11 tons and 138.18 tons. In 2021, melon production fell by 6.54% to 129,147 tons. Possible efforts to ensure that melon cultivation can achieve good results are the administration of amino acids and cultivation in a type of hydroponics [5], [8], [9]. Amino acids are the basic units of most proteins that are easily absorbed by plants. Giving plants amino acids can help increase growth, morphogenesis and embryogenesis [10]–[12]. Amino acids can be administered using method spray. Spraying amino acids directly into the leaves with a hand sprayer is more effective compared to applying them to the roots of the plant because the nutrients supplied to the leaves can be absorbed directly and aid in the photosynthesis process [13]–[15].

Hydroponic cultivation is plant cultivation in which no land is used as a planting medium and the plant supplies the nutrients it needs through water [5], [16]. Planted melon plants in a hydroponic greenhouse are easier to manage and have higher quality. Compares well to plants planted outside the room [17], [18]. Hydroponic growing in a greenhouse uses a drip/drip irrigation system, in which water and nutrients come in droplets. By using drip irrigation systems, water and nutrients can be distributed evenly to all points [19]. Based on the matter, the study so required uses the concentration of various amino acids to determine the concentration of the best amino acids for high-quality production of melon plants in hydroponics. This study is to perceive the concentration amino acids for quality production of melon plants using systemic hydroponics.

2. Materials and Methods

This happened directly from June 10, 2022, to October 4, 2022, at Smart Green House (SGH) Jember State Polytechnic, Jl. Mastrip, No. 164 East Krajan, Sumbersari, District. Sumbersari, Jember Regency, East Java. The tools used in the study are a 20 x 40 cm a TDS and EC meter, so a Brix refractometer. The materials used in this research were Honey Globe melon seeds, Confidor and Demolish insecticide, Zephyr+ fungicide, glycine, sourdough paper, clear plastic, water, AB mix, and coconut. RAL consists of 1 factor G0: Without administration of the amino acid glycine, G1: Administration of the amino acid Glycine 2 mg/L, G2: Administration of the amino acid Glycine 4 mg/L, and G3: Administration of the Amino Acid Glycine 6 mg/L The method used in the study is the nonfactorial Random Complete (RAL) design, consisting of one factor. This research consisted of 3 treatments with 5 repetitions and 3 samples in each treatment, and 5 repetitions, 1 sample in the non-treatment (control), resulting in a population of 50.

Planting media is processed by preparing planting media in the form of cocopeat. Before sterilizing the media, the place for sterilization is cleaned first by sweeping it clean, then sterilizing the media is carried out using zhepyr fungicide and convidor insecticide, then let it sit and dry in the sun for 1 week. After this process, the planting medium is put into a 20 x 40 cm polybag until it is 95% filled. Next, it is placed in the production area with a spacing between plants of 40 cm and a distance between rows of 150 cm. The data obtained from examining each observation parameter is then analyzed using the F test. Parameters in research include the height, leaves number, female flowers number per branch, number of flowers and fruiting plants per sample, the weight of plant fruits per sample, the diameter of plant fruits per sample and the degree of sweetness (Brix) of plants per sample, thickness of plant pulp per sample and thickness of plant fruit peel per sample.

3. Results and Discussion

Build upon from table of summary results of single factor variance of glycine concentration, it has no significant different effects on the parameters height plant, leaves number, female flowers number per branch, number flowers bearing fruit per

sample plant. Fruit weight per sample plant, fruit diameter per sample plant, sweetness level (Brix) per sample plant, pulp thickness per sample plant and fruit peel thickness per sample plant.

Table 1. Summary of f-test analysis results

Observation Parameters	Analysis of Various Calculated F Tests			
	F Count	Notation	F Table	
			5%	1%
Plant height 2 WAP	2.82	ns	3.24	5.29
Plant height 3 WAP	1.15	ns	3.24	5.29
Plant height 4 WAP	1.46	ns	3.24	5.29
Plant height 5 WAP	0.58	ns	3.24	5.29
Plant height 6 WAP	0.48	ns	3.24	5.29
Number of leaves 2 WAP	1.94	ns	3.24	5.29
Number of leaves 3 WAP	1.36	ns	3.24	5.29
Number of leaves 4 WAP	0.78	ns	3.24	5.29
Number of leaves 5 WAP	0.27	ns	3.24	5.29
Number of leaves 6 WAP	0.36	ns	3.24	5.29
Female flowers number 4 WAP	0.77	ns	3.24	5.29
Female flowers number 5 WAP	0.58	ns	3.24	5.29
Female flowers become fruit number 5 WAP	0.27	ns	3.24	5.29
Fruit weight per sample plant	0.47	ns	3.24	5.29
Fruit diameter per sample plant	0.70	ns	3.24	5.29
Sweetness level *(Brix)* per sample plant	0.49	ns	3.24	5.29
Fruit flesh thickness per sample plant	0.53	ns	3.24	5.29
Fruit skin thickness per sample plant	0.29	ns	3.24	5.29

Note: the calculated F value is without any signs, the calculated F shows that it is not significantly different (ns) at the 5% and 1% levels

3.1. Plant height (cm)

Plant height measurements were conducted on plants that were two weeks after planting (WAP). These measurements were performed on a weekly basis until the plants reached six WAP. The height was measuring the base of the stem to the growing point using a meter. Analysis of variance (ANOVA) results reveal that the application of Amino Acid (AA) treatment does not have a significantly impact on height. The average plant height values obtained from the F test can be found in Figure 1.

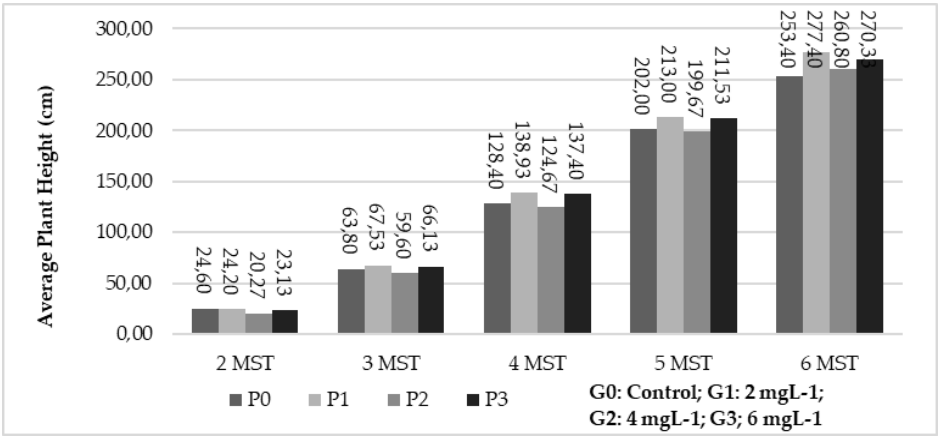

Figure 1. Graph of Average Melon Plant Height

3.2. Amount leaves (strands)

The leaves number was carefully observed when the plants age of 2 WAP. This observation was then repeated once every week until the plants reached the age of 7 WAP. The process of observing the leaves number was done manually, ensuring accurate and meticulous data collection. Upon analyzing the results using Anova, it was determined that the treatment with AA (Amino Acid) had no significant effect, as indicated by the non-significant difference (ns). The average number of leaves, as obtained from the F test, can be visually depicted in Figure 2, providing a clear representation of the findings.

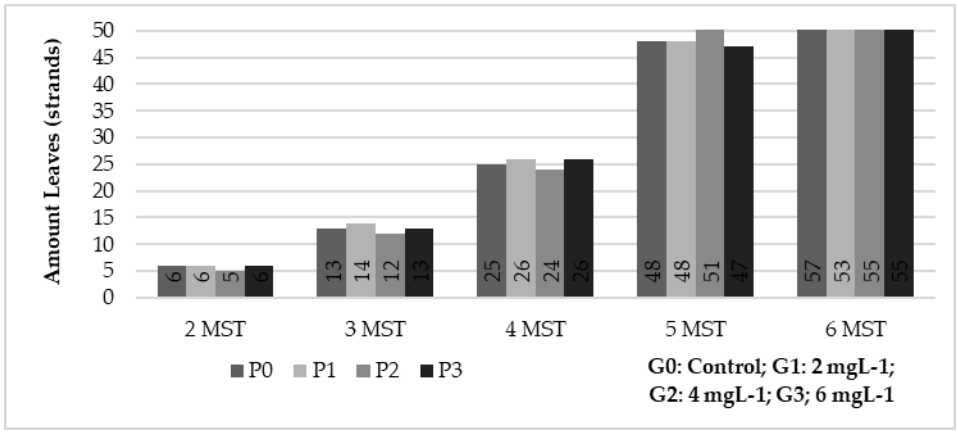

Figure 2. Average Number Graph Leaf

3.3. Amount flower female every branch (fruit)

The count of female flowers was observed at 4 weeks after planting (WAP) and continued a weekly basis until the plants reached 5 WAP. The observation specifically focused on counting all female flowers from branches 9 to 20. After conducting an Anova analysis, it was determined that the AA (Amino Acid) treatment did not have a significant impact (ns). The female flowers number average in the F test results can be visualized in Figure 3.

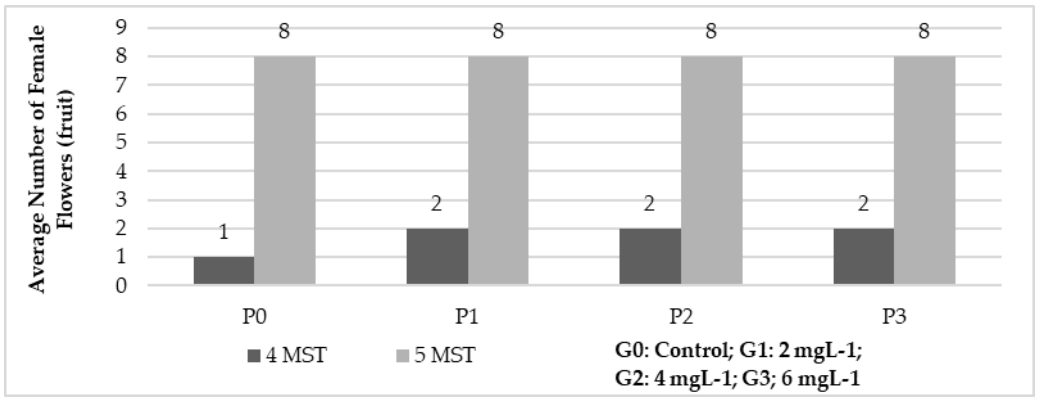

Figure 3. Average Number Graph Flower Female

3.4. Amount flower female fruits per plant sample (Fruit)

Perception of the number of female blossoms was carried out when the plants were 5 WAP and watched once a week. Perception of the number of female blooms is carried out when the fertilization prepare has been carried out and after that checked by the shrinking of the female blooms. Based on the Anova comes about, it is known that AA (Amino Corrosive) treatment features a non-significant different effect (ns). The comes about of the normal number of wrapped up female blooms within the F-test seen in Figure 4.

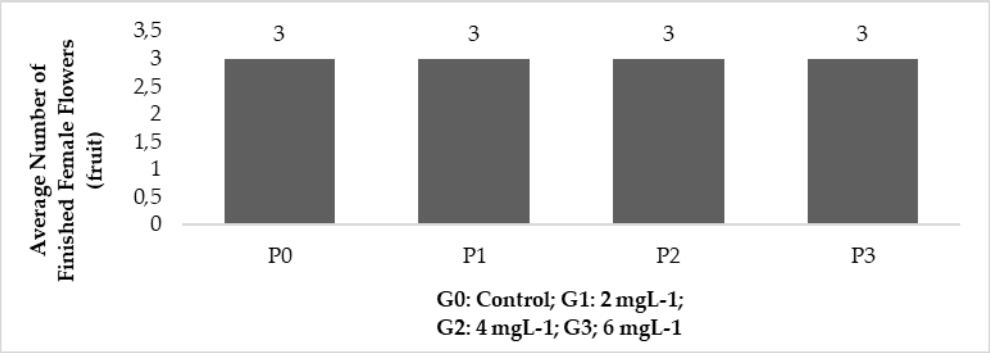

Figure 4. Average Number Graph Flower Female

3.5. Weight fruits per plant sample (kg)

Build upon from table of summary results of single factor variance of glycine concentration, it has no significant different effects on the parameters height plant, leaves number, female flowers number per branch, number flowers bearing fruit per sample plant. Fruit weight per sample plant, fruit diameter per sample plant, sweetness level (Brix) per sample plant, pulp thickness per sample plant and fruit peel thickness per sample plant.

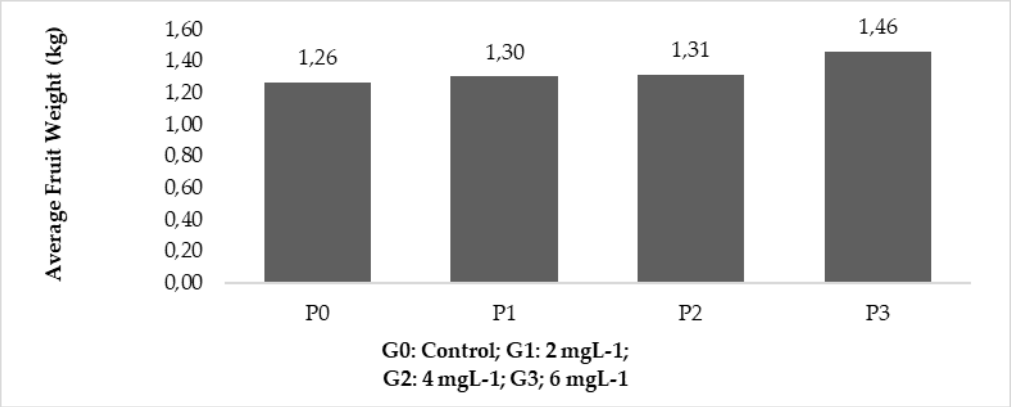

Figure 5. Average Number Graph Flower Female

3.6. Fruit diameter per plant sample (cm)

When the melons have been harvested, the fruit diameter is measured. The fruit was sliced open and measured using a cloth meter to make observations. According to the Anova data, the AA (Amino Acid) therapy has a non-significant difference impact (ns). Figure 6 depicts the F test findings for average fruit diameter per sample plant.

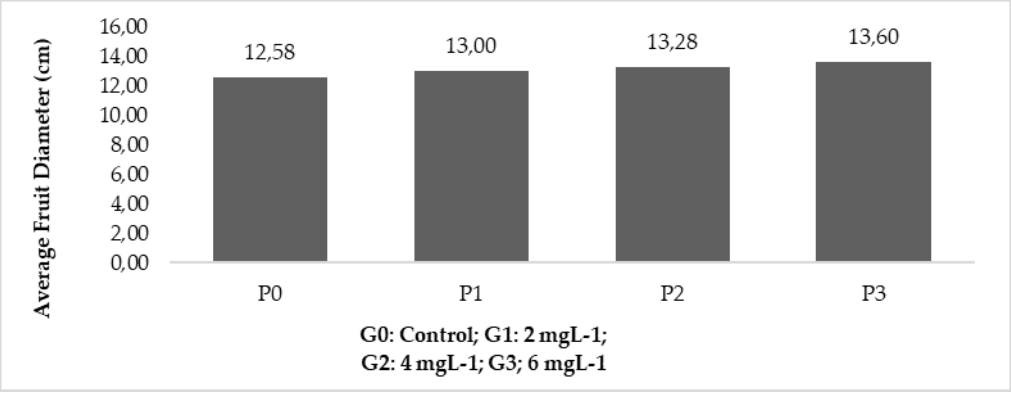

Figure 6. Graph of Average Fruit Diameter

3.7. Sweetness level (brix) per plant sample (%)

The degree of sweetness (Brix) of the fruits is observed after the melons have been harvested. Observation of the sweetness level was carried out with a Brix refractometer by taking a small amount of melon pulp and then introducing it into the tool for each sample plant. Based on the Anova results, AA (amino acids) treatment is known to have a non-significant differential effect (ns). The results of the average sweetness content per sample plant in the F-test seen in Figure 7.

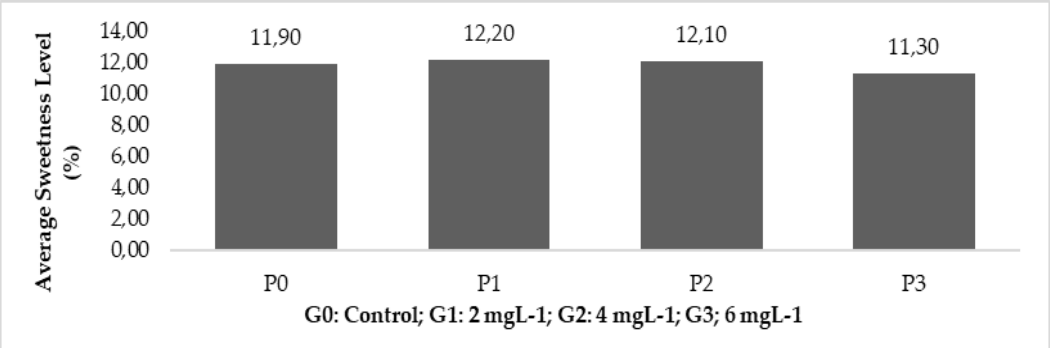

Figure 7. Average Level of Sweetness (%)

3.8. Thickness meat fruits per plant sample (cm)

Checking the thickness of the pulp takes place after the melons have been harvested. The thickness of the pulp was determined by splitting the melon and then measuring it with a cloth knife. Based on the Anova results, AA (amino acids) treatment is known to have a non-significant differential effect (ns). The results of the average pulp thickness per sample plant in the F test can be seen in Figure 8.

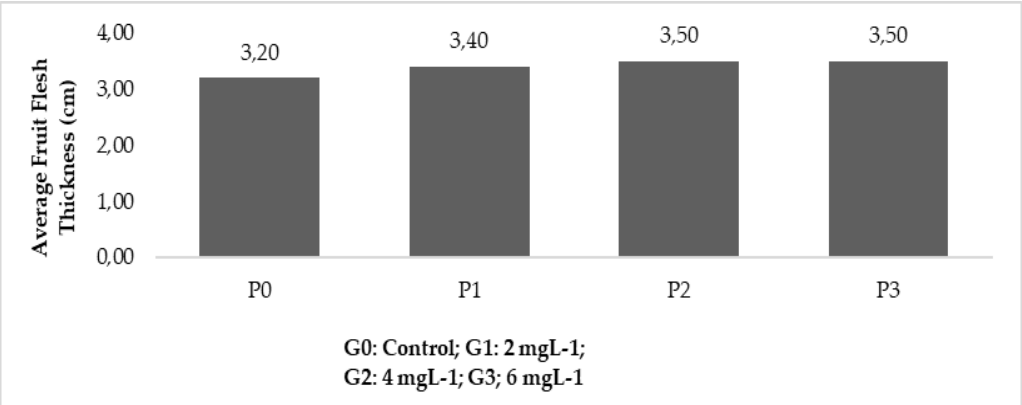

Figure 8. Average Thickness Graph Meat Fruit

3.9. Thickness skin fruits per plant sample (cm)

Observation of the thickness of the fruit peel is carried out after the melons have been harvested. The thickness of the fruit peel was determined by splitting the melon and then separating the pulp from the fruit peel. Then measure with a fabric knife. Based on the Anova results, AA (amino acids) treatment is known to have a non-significant differential effect (ns). The results of the average fruit peel thickness per sample plant in the F-test seen in Figure 9.

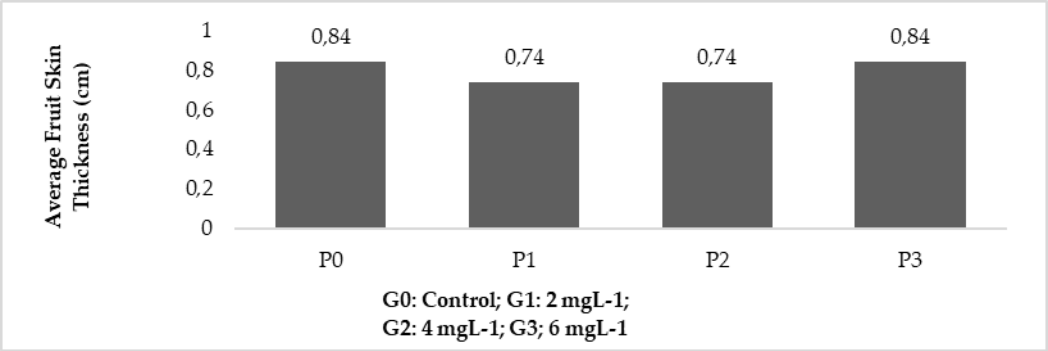

Figure 9. Average Thickness Graph Skin Fruit

Providing melon plants with amino acids led to non-significantly different results (ns) in all parameters, both in growth (height, leaves number, female flowers number per branch, number of flowers that bore fruit per sample plant) and in Production (plant). Fruit weight per sample, diameter of the plant fruit per sample, degree of sweetness (Brix) of the plants per sample, thickness of the plant pulp per sample and thickness of the plant fruit peel per sample). This is because the application of amino acids on melon plants is less effective, and the specified concentration is not appropriate. In addition, the drip irrigation hose does not run smoothly or is clogged. This research uses amino acids, which are one of the elements contained in Boosbloom (PT Prima Agrotech, Indonesia). Amino acids provide a source of organic nitrogen, which is more easily absorbed by plants than available inorganic nitrogen. The element nitrogen (N) plays a role in plant growth. Nitrogen nutrients serve to increase plant chlorophyll and increase leaf growth [20]–[24].

In [5], Glycine was added to the medium so that glycine can be easily metabolized by plants. Meanwhile, glycine is applied to melon plants using a spray system. When applied to leaves, leaching and evaporation can cause the applied nutrients to evaporate, meaning the plant can effectively use the nutrients it contains. The weak point when using a spray system is determining the correct dose, because the higher the dose of fertilizer used, the more there is not only an overdose of the plants, but also an increased circulation of pests [25]. Glycine application based on research [5] provides good growth results, namely an increase in height, leaves number and a number of roots. However, applying glycine to melon plants did not produce good results. This is because Bilalang's research applied glycine to small amounts of orchid tissue culture media. During the cultivation process, the drip irrigation hose was blocked. This means that the nutrients supplied to the melon plants do not come out of the irrigation hose. This results in the nutrients needed by melon plants not being distributed, causing the planting medium to dry out and the plants to wilt. This affects the growth and production of melon plants [26]–[28]

4. Conclusions

In accordance with the findings of this research, it can be determined that:

1. Results on all parameters, including growth and production, showed no statistically significant difference (ns) when glycine was administered. Under every treatment, the growth and quality plants were nearly identical. The most suitable average plant weight trend was treatment P3 (1.46 gr) with the highest level of sweetness in treatment P1 (12.12%).
2. When melon plants are given different concentrations of amino acids, the quality of hydroponically produced melon plants is not optimally boosted

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