

Physiological Response of Three Melon Varieties Applied to Trichokompos Planting Media and Various Concentrations of Liquid Organic Fertilizer

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Abstract. The aim of this research is to determine the effect of providing trichocompost planting media composition, varieties and various concentrations of liquid organic fertilizer on the physiology of melon plants. This experiment used a separate plot design in groups, the Main Plot was the planting medium (m) which consisted of 3 planting media compositions, m1: Soil Composition: Trichokompos = 1:1, m2 : Soil Composition : Trichokompos = 1:2, m3: Soil Composition : Trichokompos = 2:1 and Subplots are 3 types of melon varieties (v), namely: v1 = Glamor F1, v2 = Rio F, v3 = Noni F1, and Children's Plots are the concentration of eco farming (k), namely: k0 = Without eco farming (control), k1 = Eco farming 5 ml/ liter of water, k3 = Eco farming 10 ml/ liter of water. The results of this research indicate that the composition of 2 soil planting media: 1 trichocompost, Rio F1 variety and a liquid organic fertilizer concentration of 1 ml/liter of water is recommended to improve the physiological phase of melon plants.

1 Introduction

Melon (*Cucumis melo*) is an annual plant and is one of the fruits that is popular in Indonesia. Melons have a high vitamin C content so they can function to improve the body's resistance, especially to overcome canker sores[1]. As one of the fruits that is popular with many people, melon cultivation is also used as an effort to increase farmers' income so that it can have an impact on improving the community's economy, this is because melons are much sought after by the domestic and export markets.

This is proven by the production of melons which continues to increase every year from 2014 to 2021, an average of 12% per year, where the total production of melons in 2021 has reached 129,146 tons for all regions of Indonesia [2].

In an effort to produce maximum production, improvements are needed in the cultivation phase. One of the factors that influences melon production is maximum growth. By fulfilling the nutrients needed in the vegetative phase, it will support melons to produce

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high production. The addition of organic material to both planting media is very helpful in improving degraded soil, because the use of organic fertilizer can bind nutrients that are easily lost and help in providing soil nutrients so that fertilization efficiency is higher [3]. Trichokompos is an organic fertilizer obtained from fermentation using the fungus *Trichoderma*, sp. Trichocompost functions as a source of plant nutrients and an energy source for soil microorganisms, preventing soil-borne pathogens, increasing the soil's ability to bind water, and improving air conditioning and drainage.[4].

Apart from adding organic material to the planting medium, variety selection factors also influence the growth process of melon plants. Selection of the best varieties by considering environmental aspects is a driving force for maximum melon growth. Environmental factors that must be considered are climate, weather, altitude and air humidity. Glamor varieties, Rio F1 and Noni F1 are some of the varieties that are widely cultivated by farmers because these three melons have an expensive market price because they have orange flesh.[5].

Apart from that, adding proper nutrition during growth is a crucial thing that must be paid careful attention to because melon plants are susceptible to disease. Using liquid organic fertilizer is one option to increase the nutrition given to plants so that they grow optimally, resulting in high production. Eco farming fertilizer is an organic fertilizer produced with the aim of increasing plant productivity by improving the texture of agricultural soil. Apart from meeting the nutrient needs of plants, this fertilizer helps in repairing damaged textures, including controlling pests[6]. With the description above, the author is interested in conducting research on the physiological response of three melon varieties applied to trichocompost planting media, and various concentrations of liquid organic fertilizer, with the aim of to determine the effect of providing trichocompost planting media composition, varieties and various concentrations of liquid organic fertilizer on the physiology of melon plants.

2 Research methods

1.1 Place and time of research

This research was located at the Green House Teaching Farm, Faculty of Agriculture, Hasanuddin University, Makassar with coordinates 5° 7'40.07" E 119° 28'48.94" E with a height of 9 meters above sea level. This research was carried out from November 2022 to January 2023.

1.2 Tools and materials

The tools used in this research were polybags, hoes, spades, scales, ropes, nails, bamboo, paper, measuring tape, buckets, 600 ml used bottles, plant droppers, rulers, writing tools, documentation tools. The materials used in the research were melon seeds of the Glamor F1 variety, Rio F1 variety, Noni F1 variety, *Trichoderma* sp, eco farming fertilizer, soil, bedding chicken manure, laying hen manure, husk charcoal, water, molasses, NPK 16:16 fertilizer. :16, KNO₃ fertilizer.

1.3 Research planning

This research used a Split-split Plot Design in the main plot group, namely planting media (m) which consists of 3 planting media compositions, namely m1= Soil: Trichokompos =

(1:1), m₂= Soil: Trichokompos = (1:2) , m₃= Soil: Trichokompos = (2:1). Subplots consist of 3 types of melon varieties (v), namely: v₁ = Glamor F1, v₂ = Rio F1, v₃ = Noni F1. The plots consist of eco farming concentration (k), namely: k₀ = No eco farming (control), k₁ = Eco farming 5 ml/ liter of water, k₃ = Eco farming 10 ml/ liter of water. So there were 27 treatment combinations which were repeated 3 times. Each repetition consists of 3 units, so there are were 243 units.

1.4 Implementation procedures

1.4.1 Preparation of trichocompost

Preparation of trichocompost consisting of starter mushroom *Trichoderma* sp., chicken manure. The way to make trichocompost was that you need several tools and materials such as *Trichoderma* sp mushroom seeds or starter. 10 kg, 40 kg of cut chicken manure, 20 kg of laying hen manure, 40 kg of husk charcoal, molasses, 1 liter of fruit molasses, sufficient water, gembor (water sprinkler sprayer), hoe, and wide plastic or tarpaulin.

The first step is to stir all the compost ingredients, broiler chicken bedding and laying hen droppings that have been prepared and spread them flat on the ground/floor with a thickness of 20 cm. Meanwhile, mix 1 liter of fruit molasses in 5 liters of water then add the molasses, then stir until all the ingredients are mixed. Next, the solution is poured over the compost mixture using gembor. Stir using a hoe until evenly mixed, then cover tightly with plastic or tarpaulin. On the third and sixth days the compost was stirred. After 12 days, open the plastic cover and insert the *Trichoderma* sp seeds. as much as 10 kg and stir again. Close the plastic again and leave it for approximately 30 days. After 30 days the *Trichoderma* sp. has grown as indicated by the appearance of fine white threads in the compost media. Trichocompost fertilizer is ready to use.

1.4.2 Preparation for eco farming

The way to used Eco Farming was to start with one tube used as Eco Farming stock solution which was then mixed with one liter of water (making 1000 ml of stock) and left for 24 hours. Then diluted according to the concentration of the Eco Farming treatment.

1.4.3 Field experiment

Field experiments consist of: sowing seeds, making Trichokompos, preparing a Green House, preparing polybag planting media, transferring melon seeds 14 days after planting, maintenance which consists of (watering, planting, watering and propagating, fertilizing, applying eco farming, weeding and selecting fruit, pruning top shoots), pest and disease control, and harvesting.

1.5 Observation parameters and data analysis

Physiological observation parameters consist of Chlorophyll A ($\mu\text{mol.m}^{-2}$), Chlorophyll B ($\mu\text{mol.m}^{-2}$), and total Chlorophyll ($\mu\text{mol.m}^{-2}$) and flowering age (DAP). The research data were analyzed using Sidik Ragam (Anova). If there are real or very significant differences in the treatments, further tests are carried out to differentiate the means between treatments using the Least Significant Difference (LSD) test at the 5% level.

2 Results and discussion

2.1 Results

2.1.1 Chlorophyll A Index

Table 1. Average chlorophyll a which is influenced by the interaction between the composition of the planting media, type of variety, and the concentration of eco farming liquid organic fertilizer.

Planting media (m)	Varietas (v)	Concentration Of Liquid Organic Fertilizer (k)		
		k0 0 ml/L	k1 5 ml/L	k2 10 ml/L
m1 (Soil:Trichocompost) (1:1)	v1 (Glamour F1)	x263.6 ^a _p	x246.2 ^a _p	x246.3 ^a _q
	v2 (Rio F1)	x262.9 ^a _p	x263.9 ^a _p	x274.5 ^a _p
	v3 (Noni F1)	x257.3 ^a _p	x256.5 ^a _p	x254.2 ^a _q
m2 (Soil:Trichocompost) (1:2)	v1 (Glamour F1)	x230.3 ^b _q	x241.3 ^a _q	x235.5 ^a _q
	v2 (Rio F1)	x269.0 ^a _p	x269.7 ^a _p	x264.5 ^a _p
	v3 (Noni F1)	x269.0 ^a _p	x271.6 ^a _p	x275.3 ^a _p
m3 (Soil:Trichocompost) (2:1)	v1 (Glamour F1)	x267.0 ^a _p	y232.9 ^a _q	y245.6 ^a _q
	v2 (Rio F1)	x277.7 ^a _p	y246.0 ^a _q	x283.3^a_p
	v3 (Noni F1)	x272.2 ^a _p	xy271.5 ^a _p	y252.9 ^a _q
LSD (m)= 33.27	LSD (v)= 19.43	LSD (k)= 18.97		

Note: Numbers followed by the same letter are not significantly different in the LSD 0.05 test.

Table 1 shows that the interaction treatment between m3 and v2 on k2 produced the highest average chlorophyll a, namely 283.3 $\mu\text{mol.m}^{-2}$. but not significantly different from treatments m1 and m2. Table 1 also shows that the interaction between v2 and m3 on k2 produces the highest average chlorophyll a, namely 283.3 $\mu\text{mol.m}^{-2}$ and is significantly different from treatments v1 and v3. Table 1 also shows that the interaction between k2 and m3 in v2 produces the highest average chlorophyll a, namely 283.3 $\mu\text{mol.m}^{-2}$, but it is not significantly different from treatment k0, and significantly different from treatment k1.

2.1.2 Chlorophyll B Index

Table 2. Average chlorophyll b which is influenced by the interaction between the composition of the planting media, type of variety, and the concentration of eco farming liquid organic fertilizer.

Planting media (m)	Varietas (v)	Concentration Of Liquid Organic Fertilizer (k)		
		k0 0 ml/L	k1 5 ml/L	k2 10 ml/L
m1 (Soil:Trichocompost) (1:1)	v1 (Glamour F1)	x108.3 ^{ab} _p	y98.0 ^a _q	xy99.7 ^a _q
	v2 (Rio F1)	x107.5 ^a _p	x108.0 ^a _p	x113.5 ^a _p
	v3 (Noni F1)	x104.6 ^a _p	x104.5 ^a _{pq}	x103.8 ^a _q

m2 (Soil:Trichocompost) (1:1)	v1 (Glamour F1)	x93.1 ^b _q	x97.7 ^a _q	x96.3 ^a _q
	v2 (Rio F1)	x110.6 ^a _p	x110.5 ^a _p	x108.3 ^a _p
	v3 (Noni F1)	x111.4 ^a _p	x111.3 ^a _p	x113.9 ^a _p
m3 (Soil:Trichocompost) (1:1)	v1 (Glamour F1)	x110.3 ^a _p	y94.4 ^a _q	y99.6 ^a _q
	v2 (Rio F1)	x114.6 ^a _p	y99.6 ^a _q	x119.0^a_p
	v3 (Noni F1)	x108.9 ^a _p	x111.9 ^a _p	x102.8 ^a _q
LSD (m)= 15.60		LSD (v)= 8.67		LSD (k)= 9.48

Note: Numbers followed by the same letter are not significantly different in the LSD 0.05 test.

Table 2 shows that the interaction treatment between m3 and v2 on k2 produced the highest average chlorophyll b, namely 119.0 $\mu\text{mol.m}^{-2}$ but was not significantly different from the m1 and m2 treatments. Table 2 also shows that the interaction between v2 and m3 on k2 produces the highest average chlorophyll b, namely 119.0 $\mu\text{mol.m}^{-2}$ and is significantly different from treatments v1 and v3. Table 2 also shows that the interaction between k2 and m3 on v2 produces the highest average chlorophyll b, namely 119.0 $\mu\text{mol.m}^{-2}$ but is not significantly different from treatment k0, and significantly different from treatment k1.

2.1.3 Total Chlorophyll Index

Table 3. Average total chlorophyll which is influenced by the interaction between the composition of the planting media, type of variety, and the concentration of Eco Farmin liquid organic fertilizer.

Planting media (m)	Varietas (v)	Concentration Of Liquid Organic Fertilizer (k)		
		k0 0 ml/L	k1 5 ml/L	k2 10 ml/L
m1 (Soil:Trichocompost) (1:1)	v1 (Glamour F1)	x378.4 ^a _p	x353.0 ^a _p	x353.5 ^a _q
	v2 (Rio F1)	x377.1 ^a _p	x378.7 ^a _p	x393.9 ^a _p
	v3 (Noni F1)	x369.0 ^a _p	x368.0 ^a _p	x365.0 ^a _q
m2 (Soil:Trichocompost) (1:1)	v1 (Glamour F1)	x330.9 ^b _q	x346.4 ^a _q	x335.4 ^a _q
	v2 (Rio F1)	x386.0 ^a _p	x386.9 ^a _p	x379.5 ^a _p
	v3 (Noni F1)	x384.6 ^a _p	x387.5 ^a _p	x395.5 ^a _p
m3 (Soil:Trichocompost) (1:1)	v1 (Glamour F1)	x383.5 ^a _p	y334.7 ^a _q	y352.6 ^a _q
	v2 (Rio F1)	x398.5 ^a _p	y353.0 ^a _q	x407.1^a_p
	v3 (Noni F1)	x390.6 ^a _p	xy389.7 ^a _p	y362.8 ^a _q
LSD (m)= 47.03		LSD (v)= 28.71		LSD(k) = 27.72

Note: Numbers followed by the same letter are not significantly different in the LSD 0.05 test.

Table 3 shows that the interaction treatment between m3 and v2 on k2 produced the highest average total chlorophyll, namely 407.1 $\mu\text{mol.m}^{-2}$, but it was not significantly different from the m1 and m2 treatments. Table 3 also shows that the interaction between v2 and m3 on k2 produces the highest average total chlorophyll, namely 407.1 $\mu\text{mol.m}^{-2}$ and is significantly different from treatments v1 and v3. Table 3 also shows that the interaction between k2 and m3 on v2 produces the highest average total chlorophyll, namely 407.1 $\mu\text{mol.m}^{-2}$, but it is not significantly different from the k0 treatment, and significantly different from the k1 treatment.

2.3.1. Flowering age

Table 4. Average flowering age of melon plants which is influenced by variety

Varietas (v)	Average	LSD (v)
v1 (Glamour F1)	17.01c	0.81
v2 (Rio F1)	17.93b	
v3 (Noni F1)	19.47a	

Note: Numbers followed by the same letter are not significantly different in the LSD 0.05 test.

Table 4 shows that treatment v1 produced the lowest average flowering age, namely 17.01 DAP and was significantly different from treatments v2 and v3. Table 4 also shows that the interaction between planting media, variety and concentration of liquid organic fertilizer does not have a significant effect on the flowering age of melon plants. However, the variety factor alone influences the flowering time of melon plants.

2.2 Discussion

The results of the analysis of variance in tables 1, 2 and 3 show that the m3v2k2 treatment was dosed with 2:1 planting media (soil: trichocompost). The Rio F1 variety and giving eco farming 10 ml/liter of water produced the highest chlorophyll a levels, namely 283.3 $\mu\text{mol.m}^{-2}$, the highest chlorophyll b levels of 119.0 $\mu\text{mol.m}^{-2}$ and total chlorophyll of 407.1 $\mu\text{mol.m}^{-2}$. This is thought to be because during the growth phase plants need a lot of water. Organic growing media can provide nutrients, water and organisms that can help plants provide the nutrients they need. This is in accordance with opinion[7] that fertile soil is soil that can provide and support optimal growth and development of plants with sufficient water content, organic matter, soil organisms and nutrients available.

Chlorophyll is the main factor that influences photosynthesis. Photosynthesis is the process of changing inorganic compounds (CO_2 and H_2O) into organic compounds (carbohydrates) and O_2 with the help of sunlight. Chlorophyll is the main pigment found in chloroplasts [8]. Sunlight at the time of the research was sufficient for melon plants to produce high levels of chlorophyll, even though the rainy season was occurring during the research so the sunlight obtained was less than optimal. Photosynthesis is a very important process in the growth phase because with a maximum photosynthesis rate, melon production will also be maximum.

Sunlight has a very important role in the formation of chlorophyll. Apart from that, environmental factors can also have an influence. This is in accordance with opinion[9] which states that Sunlight and adequate environmental conditions not only support the photosynthesis process, but also the formation of chlorophyll.

Apart from the help of sunlight, the chlorophyll content is also influenced by the availability of nutrients in both planting media and eco farming. The formation of leaves by plants is greatly influenced by the availability of nitrogen and phosphorus nutrients in the medium and which are available to the plant. These two elements play a role in the formation of new cells and are the main components of organic compounds in plants such as amino acids, nucleic acids, chlorophyll, ADP and ATP. In treatments without compost, plants experience nutrient deficiencies, because the growing medium does not provide enough nutrients. The metabolism of plant organic compounds will be disrupted if the plant experiences a deficiency of these nutrients[10].

The highest chlorophyll levels were found in the Rio F1 variety, this shows that chlorophyll levels are influenced by the genetic factors of each plant. This is in accordance with opinion[9] that chlorophyll content is strongly influenced by genetic factors. Apart

from that, according to [9], light functions to increase the activity of enzymes that play a role in carotenoid biosynthesis. Reduced light absorbed by leaves causes inhibition of carotenoid biosynthesis in leaves. This is thought to be because carotenoids are pigments that help chlorophyll in absorbing light, so there are not as many as chlorophyll. Carotenoid pigments absorb light at different wavelengths to those absorbed by chlorophyll. So, carotenoids and chlorophyll are light-receiving pigments that complement each other. This is in accordance with opinion [9] that carotenoids are accessory pigments that help chlorophyll in the process of photosynthesis. The relative content of carotenoids and chlorophyll varies across plant species.

In general, the chlorophyll a, chlorophyll b and total chlorophyll content of melon leaves in this study was green and varied, meaning the melon plants were not stressed by water, in accordance with the statement according to [8] If a plant is deficient it will affect all aspects of plant growth, including physiological, biochemical, anatomical and morphological processes. Chlorophyll a content correlates with total chlorophyll content (407.1), so that an increase in chlorophyll a content will be followed by an increase in total chlorophyll content

The results of the analysis of variance in table 4 show that the flowering age of melon plants is influenced by the type of variety only. This shows that each variety has a different influence on melon flowering time. This is in accordance with opinion [11], that different plant varieties show different growth and yields even though they are grown in the same environmental conditions. This certainly affects the phenotypic appearance of each variety when it interacts with the environment in which it grows [11] states that in adapting, plants will experience physiological and morphological changes in a direction that suits their new environment.

3 Conclusion

Based on the results above, it can be concluded that the planting medium is trichokompos with a ratio of 2: 1 (soil: trichokompos), Rio F1 variety and Eco Farming liquid organic fertilizer concentration of 10 ml/L recommended to improve the physiological phase of melon plants.

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