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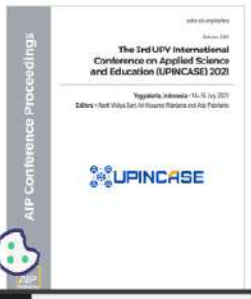

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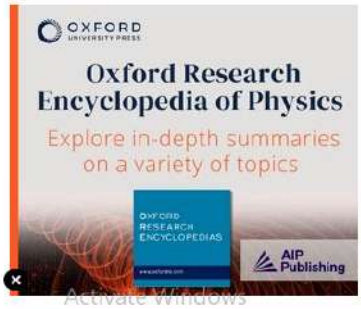

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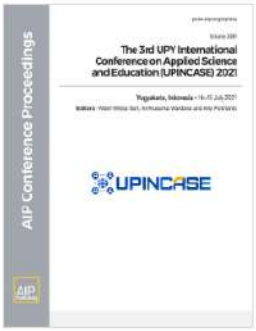

RESEARCH ARTICLE | JUNE 14 2023

Study of microgreens growth on various planting medium

Puguh Bintang Pamungkas ✉; Lana Santika Nadia; Dewi Amrih
+ Author & Article Information

AIP Conf. Proc. 2491, 020018 (2023)
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Microgreens is one of the *urban farming* models that can be harvested at the time of seedlings, in other words only 7-14 days after planting. *Microgreens* are believed to have higher levels of vitamins, minerals and beta-carotene than the same vegetables as adults. The leaves of this new plant still have a lot of vegetable oil and protein content that will be used by vegetables to grow. The aim of this study was to examine the effect of various planting medium on the growth of *microgreens*. This research was conducted in January to May 2021 in agrotechnology laboratory of PGRI University

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Study Of Microgreens Growth On Various Planting Medium

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Abstract. *Microgreens* is one of the *urban farming* models that can be harvested at the time of seedlings, in other words only 7-14 days after planting. *Microgreens* are believed to have higher levels of vitamins, minerals and beta-carotene than the same vegetables as adults. The leaves of this new plant still have a lot of vegetable oil and protein content that will be used by vegetables to grow. The aim of this study was to examine the effect of various planting medium on the growth of *microgreens*. This research was conducted in January to May 2021 in agrotechnology laboratory of PGRI University Yogyakarta and chemistry laboratory of Mercu Buana University Yogyakarta. Research using Complete Random Design 2 factors and 4 replications, the 1st factor is the treatment of *microgreens* seeds (B), B1 = radish seeds; B2 = green mustard seed; and the 2nd factor is various planting medium (M), M1 = soil planting medium; M2 = cocopeat planting medium; and M3 = rockwool planting medium. The results showed that in the variable moisture content showed the interaction between the two factors, on plant height variables showed significant differences in seed factor, whereas the leaf greenness variables didn't show any effect or interaction of these two factors treatment/

Keyword: *microgreens*, planting medium, *urban farming*.

INTRODUCTION

The reduction of agricultural land in Yogyakarta due to the shift in land functions requires people to innovate to keep meeting their food needs and food security. Therefore, the style of farming began to be changed to cultivate in the city, which is called *urban farming*.

Urban farming is a concept in the use of limited land for agricultural activities, according to experts, the definition of *urban farming* or *urbane agriculture* is an activity of cultivating plants or raising livestock in and big cities (metropolitan) or small cities to obtain food or other needs and additional financial resources, including processing of crops, marketing and distribution of products the result of the activity to obtain foodstuffs or other needs and financial additions, including the processing of crops, marketing and distribution of products resulting from such activities [1].

Conventional *urban farming* also has various types that can be run by the community. One of the most popular is the hydroponic method. Planting media through hydroponics can be running in the *Aquaponic system, Drip system, Nutrient film technique, Ebb & Flow system, Water culture system, Wick system*.

From the above description can be concluded to attract the public's interest in *urban farming*, a plant that does not need high attention, does not take up land, does not take a long time and has the same benefits as normal plantation yields. *Microgreens* answers all those problems, *microgreens* is one of the *urban farming* models that can be harvested at the time of seedlings, in other words only 7-14 days after planting. The treatment is not so difficult because it only requires 1 flush every day. Microgreens are believed to have higher levels of vitamins, minerals and beta-carotene than the same vegetables as adults. The leaves of this new plant still contain a lot of vegetable oil and protein which will be used by vegetables to grow. The aim of this study was to examine the effect of various planting medium on the growth of *microgreens*.

MATERIALS AND METHODS

This research was conducted in January to May 2021 in agrotechnology laboratory of PGRI University Yogyakarta and chemistry laboratory of Mercu Buana University Yogyakarta.

The tools used in this study were plastic boxes as a *microgreens* nursery, gloves, small shovels, sprinklers, oven, desiccator, clamp, SPAD, glassware, stationery, and camera. While, the materials used in this study included *microgreens* seeds (raddish and green mustard) and cocopeat, rockwool, and soil planting medium.

The research using Complete Random Design 2 factors and 4 replications, the 1st factor is the treatment of *microgreens* seeds (B), B1 = radish seeds; B2 = green mustard seed; and the 2nd factor is various planting medium (M), M1 = soil planting medium; M2 = cocopeat planting medium; and M3 = rockwool planting medium.

To see the effect of treatment on the variables observed, data processing using an Analysis of Variance (ANOVA) 5%, when obtained real effect then conducted further testing with Duncan's New Multiple Range Test (DMRT) 5%.

RESULTS AND DISCUSSION

The physiological quality of *microgreens* can be seen during and after the growth process after being planted on various planting medium, the physiological quality can be seen from various variables, including plant height, leaf greenness and moisture content of *microgreens*.

1. Moisture content

The results of the analysis of the moisture content of *microgreens* after being planted on various planting medium showed that there were significant differences between two treatments.

Table 1. The mean moisture content *microgreens* after planting in various medium

Treatment	Purata
--- Moisture content (%) ---	
M1B1	10.06 b
M1B2	10.15 b
M2B1	9.76 b
M2B2	10.08 b
M3B1	10.10 b
M3B2	14.63 a

Explanation: Purata values followed by the same letters show no difference according to DMRT 5%.

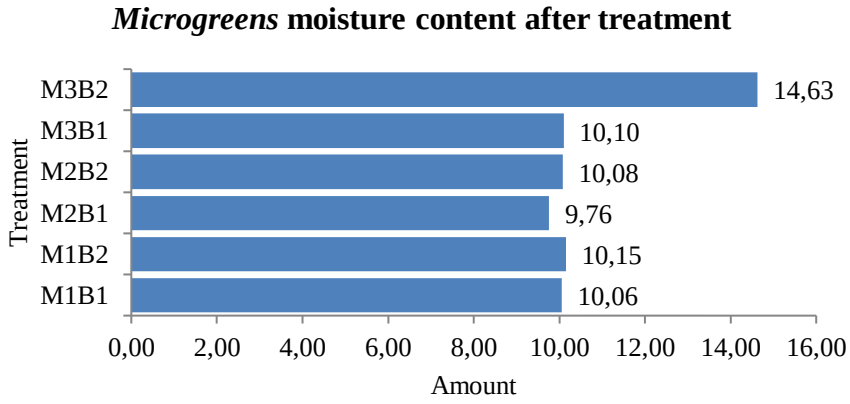

Figure 1. *Microgreens* moisture content after planting in various planting medium

Based on the results of the research, the highest water content value of *microgreens* was in the M3B2 treatment, namely green mustard seeds planted on rockwool planting medium, with a water content of 14.63%, followed by cocopeat and soil planting medium.

Rockwool planting medium produces the highest water content in microgreens, this is because rockwool has so many pores, so it can store more water [2],

2. Leaf Greenness

Analysis of the leaf greenness variable of microgreens after being planted on various planting medium showed that there was no significant difference between treatments, while the treatments did not show any interaction.

Table 3. The mean leaf greenness *microgreens* after planting in various medium

Treatment		Purata
	--- Leaf Greenness (%) ---	
Planting medium	M1	2.43 a
	M2	2.50 a
	M3	2.38 a
Microgreen seeds	B1	1.87 a
	B2	1.85 a

Explanation: Purata values followed by the same letters show no difference according to DMRT 5%.

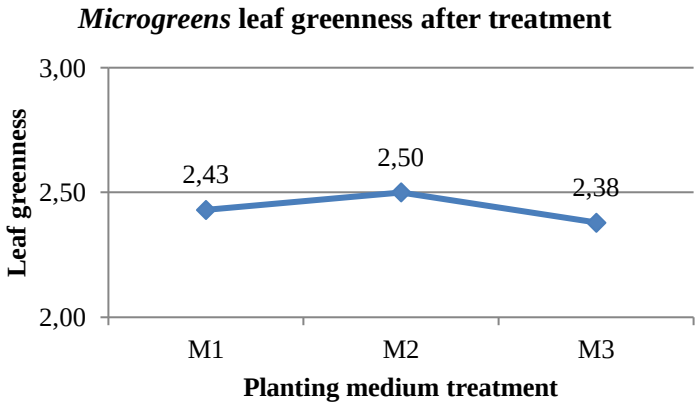

Figure 2. *Microgreens* leaf greenness seen from various planting media

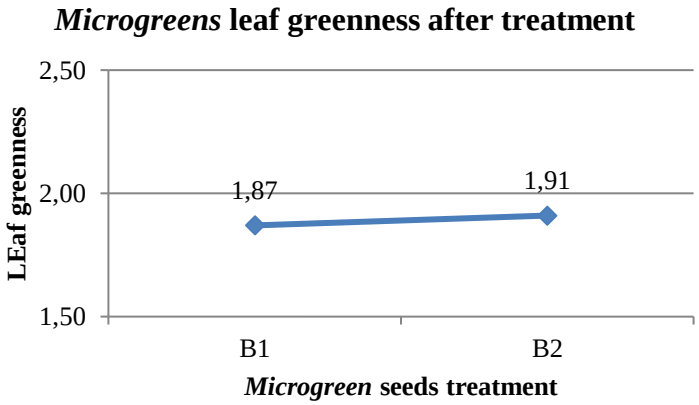

Figure 3. *Microgreens* leaf greenness seen from various seed

Based on the results of the research, the highest leaf greenness value in various planting media was indicated by the M2 treatment, cocopeat planting medium at 2.50%, followed by rockwool planting medium and finally soil planting medium.

While, the highest leaf greenness value in various *microgreens* seeds was shown by treatment B2, green mustard seeds at 1.91%, followed by radish seeds.

Factors that affect the formation of chlorophyll include genes, light, and elements N, Mg, Fe as the shaper and catalyst in chlorophyll synthesis.

All greenery contains chlorophyll a and chlorophyll b. Chlorophyll a makes up 75% of total chlorophyll, chlorophyll content in plants is about 1% dry weight [3].

Temperature and light intensity are external factors that affect the formation or synthesis of chlorophyll in leaves. Based on [4] observations, it is said that chlorophyll synthesis occurs in the hottest temperature range in the dry season. Temperatures between 30-48 °C are a good condition for chlorophyll formation in most plants, but the best is between 26-30 °C.

[5] states that in a low light environment, plants must be able to absorb enough light to stay alive, therefore these plants must be able to maximize the amount of light absorbed. At high light intensity, more light is passed through the leaves and is reflected, while at low light intensity, more light is absorbed and used.

The results of varying chlorophyll content are due to the affect of light intensity, the higher the light intensity, the more chlorophyll content produced than areas with low light intensity [6]. This is in accordance with the results of research by [7], which states that the chlorophyll content of a plant is not only affected by the presence of water conditions in an area but also the physical factor, light intensity [8].

This is reinforced by the research of [9], which states that the higher the light intensity, the more chlorophyll content in plants as evidenced by the results of the study, namely the measurement of the total chlorophyll content at an intensity of 0-500 lux is 25.44 mg / L, at an intensity of 500-1000 lux of 47.70 mg/L, and at an intensity of 1000-1500 lux of 52.45 mg/L. Light intensity plays an important role in receiving energy for plants through photosynthesis by direct absorption of photons by pigment molecules such as chlorophyll.

3. Plant height

The results of the analysis of microgreens after being planted on various planting medium, showed that there was a significant difference in seed treatment, while the treatment of growing media did not show any significant difference, then between the treatments did not show any interaction.

Table 4. The mean plant height *microgreens* after planting in various medium

Treatment		Purata
	--- ***Plant height (cm)*** ---	
Planting medium	M1	8.09 a
	M2	9.31 a
	M3	11.00 a
Microgreen seeds	B1	7.21 b
	B2	11.73 a

Explanation: Purata values followed by the same letters show no difference according to DMRT 5%.

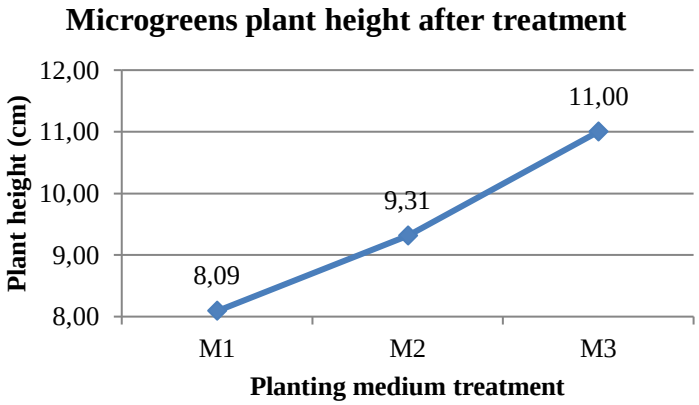

Figure 4. *Microgreens* plant height seen from various planting media

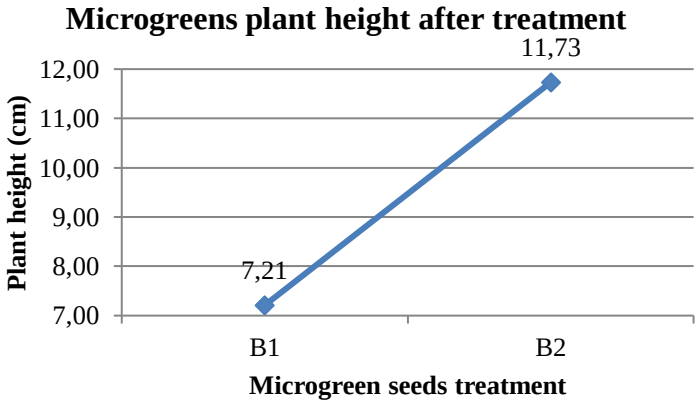

Figure 5. *Microgreens* leaf greenness seen from various various seed

Based on the results of the research, the high value of the best plants in various planting media is shown by the treatment of M3, rockwool planting medium of 11.00 cm, followed by cocopeat planting medium and finally soil planting medium.

While, the highest plant height value in various *microgreens* seeds was shown by treatment B2, green mustard seeds at 11.73 cm, followed by radish seeds.

Planting medium is one of the external factors that greatly affect the growth and yield of plants. This is because the media is not only a place for plants to grow, but also as a supporter in carrying out various metabolic processes. [10] stated that plant roots will develop well if supported by sufficient water, nutrients, and air from

the planting media. Planting medium is a major component in plant growth. For plants, planting media has many roles, a place to rest so that plants can stand upright, which contains nutrients, water, and air needed by plants.

The planting medium used in this study were rockwool, cocopeat and soil. Where rockwool planting medium is a collection of fine, soft particle substrates and has good drainage so that the roots are more free to absorb water into the planting media. Rockwool planting medium contains important nutrients such as phosphorus (P) and potassium (K), besides that rockwool planting medium also has more water storage compared to other growing media so that the media becomes moist and the water needs for photosynthesis in plants can be met. This is what makes *microgreens*, both radish and green mustard, show the best plant height compared to cocopeat planting medium and soil planting medium.

CONCLUSION

In general, rockwool planting medium gives better results compared to other planting medium. The treatment of planting medium and seeds showed an interaction on the moisture content variable of *microgreens*, rockwool planting medium gave the highest yield on the variable plant height, while the cocopeat planting medium gave the highest yield on the greenness of the leaves.

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