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The Effect of Various Planting Media on The Growth and Yield of Microgreen Mustard (*Brassica juncea* L)

Suwegiono Putra[1,*], Badrul Ainy Dalimunthe[1], Dini Hariyati Adam[1], Kamsia Dorliana Sitanggang[1]

Abstract

Microgreens are young plants from the vegetable group harvested at 10 to 15 days of age. Their short harvest period contributes to their high nutritional value. This study aimed to determine the effect of various planting media on the growth and yield of mustard greens (*Brassica juncea* L.). This research employed the following treatments: soil, cocopeat, rock wool, and rice husk charcoal. The data analysis method utilized was a non-factorial, Completely Randomized Design (CRD). The data obtained were analyzed using ANOVA, and if significant differences were found, further testing was conducted using the Least Significant Difference (LSD) method at the 5% level, employing the Microsoft Excel program. This study shows that the effectiveness of the treatment varies depending on the specific conditions and types of variables observed. Some treatments have a significant effect, while others have no significant impact. Planting media other than soil has been proven to be more optimal in supporting growth. Environmental factors, technical errors, and biological characteristics can affect the study's results, so it is necessary to control external factors and increase the number of repetitions to obtain more accurate and reliable data.

Keywords: Microgreen, Microgreen Growth, Microgreen Production, Mustard Greens, Planting Media

1. Introduction

Constraints in agricultural activities often occur in urban areas. One of the problems that occurs in urban areas is limited land for agriculture. One way to utilize narrow land in urban areas is to use microgreens. Microgreens are plants harvested from the vegetable plant group at 10-15 days. Microgreens have a short harvest period, which causes these vegetables to be highly nutritious. One of the main advantages of growing microgreens is the very short harvest time.

This practice is very suitable for researchers interested in trying new gardening techniques because it is easy to do and does not require ample space. In addition, the equipment needed is quite simple, making it easy for anyone to start gardening. The nutrients in microgreens include vitamins and phytochemicals, such as vitamins C, E, B1, and beta-carotene. Microgreens also contain green leaf substances, which help optimize red blood cell production, prevent anemia, clean body tissues, improve liver performance, improve the body's immune system against pathogen attacks, increase cell strength, protect DNA damage, and positively impact the body. Microgreens are vegetables that are widely sought after and liked by some real food consumers.

The nutritional content and nutrients of microgreens are higher compared to mature plants. Many types of plants can be cultivated as microgreens, such as spinach, mustard greens, kale, and legumes, such as mustard. One of the plants that is often planted using this microgreen method is mustard greens. Mustard greens (*Brassica juncea* L) are a group of plants from the genus Barassica whose leaves and flowers are used as food or vegetables, both fresh and processed.

Microgreen is a young vegetable that has gained more attention and popularity over time as a new vegetable product. Microgreen offers benefits, such as high nutritional content and ease of cultivation, making it an attractive choice for many people, especially those interested in a healthy lifestyle and practical gardening. Microgreens are expected to be an alternative solution for

*Correspondence: suputra2207@gmail.com
1) Universitas Labuhanbatu - Jl. SM. Raja Aek Tapa No.126 A KM 3.5, Bakaran Batu, Kec. Rantau Sel., Kab. Labuhanbatu, Sumatera Utara 21418, Indonesia

urban farming in urban areas, especially in areas with limited land.

Planting media is a place for plant roots to grow and functions as a provider of nutrients needed for plant growth and development. For planting media to be effective, it must meet several critical criteria, such as the ability to bind and store water and nutrients, have good aeration and drainage, and not be a source of disease. In addition, the ideal soil media must be porous enough to store the oxygen needed in the root respiration process, durable, and easy to obtain. Choosing the right media is crucial in planting microgreens to ensure optimal growth. The right planting media will support healthy root development, provide adequate water and nutrient supply, and minimize disease risk.

Therefore, choosing the right planting medium is crucial in microgreen cultivation because it directly affects the quality of the plants produced. Microgreens can be planted in several media such as soil, cocopeat, rockwool, and rice husk charcoal. Rockwool and rice husk charcoal are widely used soil substitutes that meet most of the above requirements, making them a popular choice in plant cultivation, including microgreens. Cocopeat media easily absorbs and retains water and contains essential nutrients, such as calcium (Ca), magnesium (Mg), potassium (K), sodium (N), and phosphorus (P).

Based on the background of the problem above, it can be concluded that many planting media can be used in microgreens, such as cocpeat, rice husk charcoal, soil, rockwool. Therefore, research is needed to determine the Effect of Various Planting Media on the Growth and Yield of Mustard Green's microgreens (*Brassica juncea* L).

2. Material and Methods

2.1. Place and Time of Research

This research was conducted in Lohsari 1 village, Jln Sadewo, Kampung Rakyat District, South Labuhanbatu Regency, North Sumatra Province, with coordinates 2°5′16″N 100°4′38″E, with an altitude of about 20 MDPL. This research was conducted for 2 weeks, on February 15, 2025 to February 29, 2025.

2.2. Research Object

The object of this research is the height and width of mustard greens microgreen leaves , in each plant media including soil, rockwool, rice husk charcoal, and cocopeat.

2.3. Tools and Materials

The tools used in this study were a sprayer, microgreen plant container, camera, ruler, scissors, bucket, label paper, stationery and 10 watt LED lamp. In contrast, the materials used were soil, cocopeat, rockwool, rice husk charcoal, water.

2.4. Research methods

This research was conducted using a Completely Randomized Design (CRD) consisting of 4 treatments and 3 repetitions so that 12 experimental units were obtained, and the 4 treatments consisted of: Soil, cocopeat, rockwool, and rice husk charcoal.

Each experimental unit consists of 30 seeds of mustard greens, so a total of 360 mustard seeds are needed. The parameters observed are plant height and microgreen leaf width.

2.5. Research Implementation

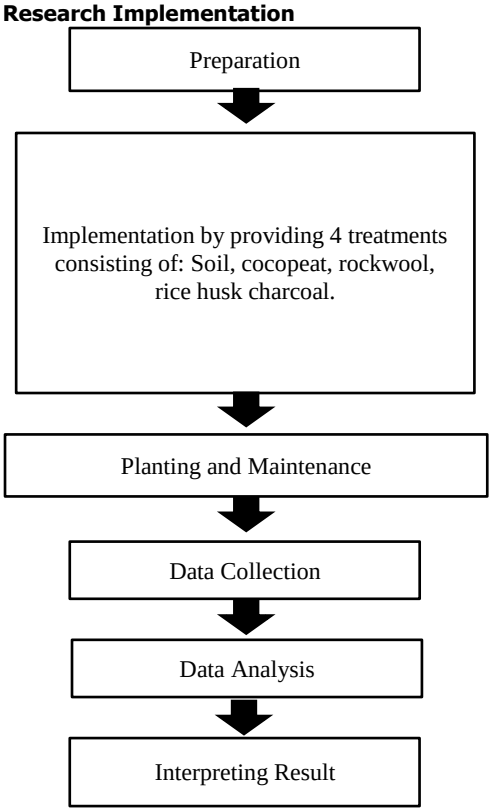

Figure 1. Research Flow Diagram

2.6. Observation

Observations in this study were carried out by measuring the height of the microgreen, the leaves' width, and the microgreen plants' wet weight.

2.6.1. Microgreen Height

Measurements were taken at 6 and 12 days after planting (DAP). Measurements were taken from the stem's base to the leaf's tip.

2.6.2. Measuring Leaf Width

The leaf width was measured on all microgreen planting media 12 days after planting.

2.6.3. Wet Weight of Mustard Plants

Using scales, weighing the wet weight of mustard greens is carried out during harvest, namely at 10-13 days after planting.

2.7. Data analysis

The data analysis method used was a non-factorial Completely Randomized Design (CRD). The data obtained were analyzed using ANOVA. If the treatment had a significant effect, it was continued with the smallest significant difference (LSD) test at the 5% level. Using the Microsoft Excel 2010 program.

3. Results and Discussion

3.1. Plant height (cm)

Based on observations of plant height in the field and analysis of ANOVA test data, it is presented in Table 1. Based on the results, the rice husk charcoal planting medium showed the highest average growth of 4.7. It was not significantly different from cocopeat (4.5) or rockwool (4.6), all of which were included in the same group with the letter notation "b." Meanwhile, the soil planting medium had the lowest average of 2.9. It was significantly different from the other three media, marked with the letter notation "a." This shows that planting media other than soil, especially rice husk charcoal, provides better growth results. This study is in line with the study (Nasution & Tammin T, 2022), which shows that the use of cocopeat as a planting medium, especially when combined with manure, has a significant effect on the growth of plant height and the number of cayenne pepper leaves. This study differs from the study (Khadafi et al., 2020), which showed that soil + manure media provided the best growth in pepper plant cuttings, significantly increasing shoot height, shoot diameter, and number of leaves.

Table 1. Results of the Bnt test at 5% level

Treatment	Average
Land	2.9±0.49a
Cocopeat	4.5±0.49b
Rockwool	4.6±0.49b
Rice husk charcoal	4.7±0.49b

3.2. Leaf Width

Based on observations of Leaf Width 12 MST in the field and analysis of ANOVA test data, it is presented in Table 2. Based on the results above, there is no significant difference between the planting media used because all media (soil, cocopeat, rockwool, and rice husk charcoal) have almost the same average growth. Soil and cocopeat each have an average of 0.8, rockwool is slightly lower with an average of 0.7, and rice husk charcoal has the lowest average of 0.6. All these planting media are in the same group, marked with the letter notation "a," which indicates that they are not statistically different in plant growth. This study aligns with (Khadafi et al., 2020), which revealed that soil media mixed with bokashi provided the best increase in shoot height, shoot diameter, and number of leaves. Research that is different from (Siregar, 2020) that planting media such as tankos, rice husk charcoal, cocopeat, and a combination of the three were tested, with the parameters observed including leaf length, number of leaves, number of tubers, tuber diameter, wet weight, and dry weight of tubers.

Table 2. Results of the Bnt test at 5% level

Treatment	Average
Land	0.8±0.06a
Cocopeat	0.8±0.06a
Rockwool	0.7±0.06a
Rice husk charcoal	0.6±0.06a

3.3. Wet Weight of Mustard Plants

Based on observations of Leaf Width 12 MST in the field and analysis of ANOVA test data, it is presented in Table 3. Based on the results, the four planting media of soil, cocopeat, Rockwool, and rice husk charcoal did not show statistically significant differences, marked with the same letter notation, "a." However, there is a variation in the average value where rice husk charcoal shows the highest value of 5.33, followed by rockwool at 5.00, cocopeat at 4.33, and soil with the lowest value of 3.33. These results indicate that rice husk charcoal and rockwool provide better growth results numerically, although the difference is not statistically significant compared to other planting media. This study is in line with (Bungaalus et al., 2023), which revealed that soil media mixed with chicken manure gave the best results with an average plant height of 26.16 cm, several leaves 14.16 strands, and a plant weight 45 g. This is in line with your findings, where planting media such as rice husk charcoal and rockwool showed better growth results numerically. Different research with (Silalahi FR, 2020) The media tested included a combination of soil with compost and burnt rice husks. The results showed that media with specific compositions can significantly affect coffee seedlings' number of leaves, leaf area, plant height, and stem diameter.

Table 3. Results of the Bnt test at 5% level

Treatment	Average
Land	3.33±0.51a
Cocopeat	4.33±0.51a
Rockwool	5.00±0.51a
Rice husk charcoal	5.33±0.51a

Figure 2. Research documentations

4. Conclusion

The analysis results indicated that the effect of treatment varied depending on the observed variables. Some variables did not demonstrate significant differences, while others exhibited notable effects. This confirms that environmental conditions and the plant's biological characteristics significantly influence the planting medium's effectiveness. Media other than soil, such as rice husk charcoal and rock wool, yield better results. However,

external and technical factors can impact the accuracy of the data. Therefore, it is recommended that the number of replications be increased and external variables controlled to achieve more consistent and reliable research outcomes.

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