The Effectiveness Test of Using Various Planting Media by Giving Coconut Water as Nutrient to the Growth of Microgreen Sunflower Plants (*Helianthus annuus L.*)

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Abstract: The research was conducted at the Tissue Culture Laboratory, Faculty of Agriculture, University of Asahan, from December 2022 to January 2023. This study aims to determine the effectiveness of planting media and coconut water on the growth of microgreen sunflower plants. The design used is a factorial Randomised Complete Design (CRD), with 2 treatment factors, the first factor is: Planting Media (M), consisting of soil (M0), cocopeat (M1), rockwool (M2), husk charcoal (M3). The second factor is: Coconut Water (K), consisting of (K0) 0%, (K1) 25%, (K2) 50%, (K3) 75%, (K4) 100%. Observed variables: seed germination potential, number of seed germination and chlorophyll rf (retention/retardation factor) value. The results showed that the planting media had a very significant effect on all observed parameters. Giving coconut water has a very significant effect on chlorophyll rf. There is an interaction between planting media and coconut water on chlorophyll rf.

Keywords: Coconut Water; Effectiveness Test; Planting Media; Sunflower Plants

Introduction

Along with the increasing need for land, causing the use of agricultural land to switch to non-agricultural uses, this has become a serious problem for Indonesia. If the problem continues, agricultural commodities will drop dramatically as the land changes (Febriani et al., 2017). One of the gardening activities that does not require a large area of land and is very suitable for urban areas is microgreen (Samarsih et al., 2022; B. Singh, 2023). Microgreen is a new vegetable product that is gaining popularity over time (Eliseeva et al., 2021). Microgreen is an edible plant seedling that is harvested when the first real leaves appear, which is 7-14 days after planting. Microgreen is suitable for indoor production and is part of the global movement towards the development of a Controlled Environment Agriculture (CEA) model (Maulidiyah et al., 2022).

There are several plants that can be used as microgreen, one of which is sunflower (Poudel et al., 2023). Sunflower (*Helianthus annuus L.*) is a native introduced plant originating from the United States. Since most people use sunflower as an ornamental plant, processed foods derived from commercially available sunflower plants are still rare (Bila et al., 2023; Hassama et al., 2022).

There are several factors that affect plant growth in cultivation, one of which is the planting medium. Planting media determines the good and bad growth of plants, which in turn will affect production (Buana et al., 2019). In addition to planting media, nutrition is also an important factor for plant growth. Plant nutrition refers to how plants obtain, disperse and use nutrients in various processes and reactions that occur in plants for plant growth and development (Febrilla, 2021; Munawar, 2018).
Current undernutrition statistics are high and exacerbated by contemporary agricultural practices that damage the environment on which the production of nutritious food depends. As the world’s population grows at an unprecedented rate, food systems must be revised to provide adequate nutrition while minimizing environmental impact (Weber, 2017). To improve mineral malnutrition, nutrient enhancement and land malfunction, one of the things that can be done is to microgreen (Ampim et al., 2022; Gupta et al., 2023; N. Singh et al., 2020).

Method

The research was conducted at the Tissue Culture Laboratory, Faculty of Agriculture, University of Asahan, from December 2022 to January 2023. Based on Figure 1, it can be explained that the first is a literature study, namely previous studies that are similar to the direction of this research. From this reading, a novelty emerges that ultimately underlies the formulation of the problem.

The design used is a factorial Completely Randomized Design (CRD), with 2 treatment factors, the first factor is: Planting Media (M), consisting of soil (M0), cocopeat (M1), rockwool (M2), husk charcoal (M3). The second factor is: Coconut Water (K), consisting of (K0) 0%, (K1) 25%, (K2) 50%, (K3) 75%, (K4) 100%. Observed variables: seed growth potential, number of seed germination and chlorophyll rf (retention/retardation factor) value.

Result and Discussion

The use of cocopeat planting media (M1) obtained the highest growth potential of 85.60% while the lowest growth potential was found in the husk charcoal planting media (M3) at 50.60%. The results of the independent t-test of the mean response to the treatment of planting media types and the provision of coconut water nutrients to the number of seed germination.

Table 1. T-test results of the mean difference in response to the treatment of planting media types and coconut water nutrition on seed germination potential.

<table>
<thead>
<tr>
<th>M/K</th>
<th>K0</th>
<th>K1</th>
<th>K2</th>
<th>K3</th>
<th>K4</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>M0</td>
<td>79.00</td>
<td>83.00</td>
<td>83.00</td>
<td>83.00</td>
<td>83.00</td>
<td>82.20abc</td>
</tr>
<tr>
<td>M1</td>
<td>83.00</td>
<td>79.00</td>
<td>83.00</td>
<td>100.00</td>
<td>83.00</td>
<td>85.60 a</td>
</tr>
<tr>
<td>M2</td>
<td>91.00</td>
<td>70.50</td>
<td>79.00</td>
<td>87.00</td>
<td>95.50</td>
<td>84.60 ab</td>
</tr>
<tr>
<td>M3</td>
<td>54.00</td>
<td>50.00</td>
<td>45.50</td>
<td>45.50</td>
<td>58.00</td>
<td>50.60 d</td>
</tr>
</tbody>
</table>

Average 76.75a 70.63a 72.63a 78.88a 79.88a

Note: numbers followed by the same letter in the column and row show no significant difference at the 5% level of the BNJ test.

Table 2. Types of planting media on the amount of germination

<table>
<thead>
<tr>
<th>M/K</th>
<th>K0</th>
<th>K1</th>
<th>K2</th>
<th>K3</th>
<th>K4</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>M0</td>
<td>9.50</td>
<td>10.00</td>
<td>10.00</td>
<td>10.00</td>
<td>10.00</td>
<td>9.90 abc</td>
</tr>
<tr>
<td>M1</td>
<td>10.00</td>
<td>9.50</td>
<td>10.00</td>
<td>12.00</td>
<td>10.00</td>
<td>10.30 a</td>
</tr>
<tr>
<td>M2</td>
<td>11.00</td>
<td>8.50</td>
<td>9.50</td>
<td>10.50</td>
<td>11.00</td>
<td>10.20 ab</td>
</tr>
<tr>
<td>M3</td>
<td>6.50</td>
<td>6.00</td>
<td>5.50</td>
<td>5.50</td>
<td>7.00</td>
<td>6.10 d</td>
</tr>
</tbody>
</table>

Average 9.25 a 8.50 a 8.75 a 9.50 a 9.63 a

Note: numbers followed by the same letter in the column and row show no significant difference at the 5% level of the BNT test.

Figure 2. Graph of the effect of using the type of planting media on the growth potential of seeds at the age of 14 day after plant.
Figure 3. Graph of the effect of using the type of planting media amount of germination at the age of 14 day after plant.

The use of cocopeat planting media (M1) obtained the highest number of sprouts at 10.30 while the lowest number of sprouts was found in the husk charcoal planting media (M3) with the number of sprouts at 6.10.

Table 3. The results of the independent t-test of the mean response to the treatment of planting media types and the provision of coconut water nutrients to the rf value of chlorophyll.

<table>
<thead>
<tr>
<th>M/K</th>
<th>K0</th>
<th>K1</th>
<th>K2</th>
<th>K3</th>
<th>K4</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>M0</td>
<td>0.56</td>
<td>0.51</td>
<td>0.46</td>
<td>0.46</td>
<td>0.57</td>
<td>0.51 a</td>
</tr>
<tr>
<td>M1</td>
<td>0.39</td>
<td>0.52</td>
<td>0.51</td>
<td>0.48</td>
<td>0.42</td>
<td>0.46 c</td>
</tr>
<tr>
<td>M2</td>
<td>0.38</td>
<td>0.39</td>
<td>0.47</td>
<td>0.05</td>
<td>0.59</td>
<td>0.37 d</td>
</tr>
<tr>
<td>M3</td>
<td>0.47</td>
<td>0.45</td>
<td>0.61</td>
<td>0.41</td>
<td>0.50</td>
<td>0.49 b</td>
</tr>
<tr>
<td>Average</td>
<td>0.45</td>
<td>0.47</td>
<td>0.51</td>
<td>0.35</td>
<td>0.52</td>
<td>39.18%</td>
</tr>
</tbody>
</table>

Note: numbers followed by the same letter in the column and row show no significant difference at the 5% level of the DMRT test.

The use of soil planting media (M0) obtained the highest rf value of 0.51 cm while the lowest rf value was found in rockwool planting media (M2) which was 0.37 cm.

Figure 4. Graph of the effect of the use of planting media types on the rf value of chlorophyll at the age of 14 day after plant.

Figure 5. Graph of the effect of coconut water nutrition on the rf value of chlorophyll at the age of 14 day after plant.

The provision of coconut water with the highest rf value is at 100% concentration (K4) with a value of 0.52 cm, while the lowest rf value is at 75% concentration (K3) with a value of 0.35 cm.

Figure 6. Interaction graph of the use of planting media types and coconut water nutrition on the rf value of chlorophyll at the age of 14 day after plant.

The results showed that the use of the type of planting media had a very significant effect on seed growth potential, the number of seed germination and rf chlorophyll. The best response was found in cocopeat planting media followed by rockwool, soil and husk charcoal on seed survival potential and number of seed germination (Pal et al., 2019). In chlorophyll rf, the best response was found in soil planting media followed by husk charcoal, cocopeat and rockwool. Soil planting media has the best response at rf chlorophyll because this planting media is a top surface soil that contains high nutrients, weathering products and metabolic products of various organisms. Fertile topsoil also contains potassium, phosphorus, and iron (Maluin et al., 2021; Rizki & Novi, 2017).

The application of coconut water had no significant effect on seed germination potential and the number of seed germinations but had a very significant effect on chlorophyll rf (Borgohain et al., 2020). Giving coconut water with a concentration of 100% has the best response compared to giving it with a concentration of 75%, 50%, and 25% on chlorophyll rf. The unreal effect of coconut...
water on growth potential and number of germinations, according to Manullang et al. (2019), is because after the absorption of water by the seeds, the seeds experience a slow absorption phase, where metabolic activity takes place in this phase (El-Maarouf-Bouteau, 2022; Sarkar et al., 2019). In this phase the seeds move stored food reserves such as protein, starch and metabolic enzymes become active. Then the seeds enter the first cell elongation and mitosis while producing the protrusion of the root, then the epicotyl, hypocotyl and cotyledon appear (Mangena & Mokwala, 2019).

The interaction between the use of planting media and the application of coconut water had no significant effect on seed germination potential and the number of germinated seeds but had a very significant effect on chlorophyll rf. The absence of interaction between planting media and coconut water on seed growth potential and number of seed germination, indicates that each treatment and the elements in it have a function that does not support each other (Mukarlina et al., 2010).

The interaction between planting media and coconut water on chlorophyll rf indicates that the two treatments support each other. Planting media and its ability to bind water affect the absorption of nutrients (Du et al., 2022; Eswaranpillai et al., 2023). The provision of coconut water is able to be absorbed well by the planting media used so that nutrients and ingredients contained in coconut water can be absorbed well by plants. These two treatments influence and support each other so that there is an interaction between the two on chlorophyll rf, where the elements contained become a factor in chlorophyll formation. According to (Setiwati & Furqonita, 2007), elements of magnesium, iron and nitrogen are forming elements and catalysts in chlorophyll synthesis.

**Conclusion**

The treatment of planting media has a very significant effect on all observed parameters. The treatment of coconut water concentration did not significantly affect all observed parameters except chlorophyll rf. There is no interaction between the type of planting media and the application of coconut water concentration on all observed parameters except chlorophyll rf. Planting media with the best response on the parameters of seed growth potential and the number of seed germination is found in cocopeat (M1), namely (85.60% seed growth potential) and (10.30 number of seed germination). Whereas in the rf of chlorophyll, the best response is found in soil planting media (M0) which is 0.51 cm. Seeing the results of using the type of planting media that gives a very real effect, the authors suggest using more types of other planting media so that a more varied comparison is obtained.

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**Author Contributions**

In this research, our collaboration places equal roles and positions based on the assignment agreement that we always discuss, even from the idea until the research report is made, and also until this publication.

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**Conflicts of Interest**

There is no conflict of interest in this research, with any party. The research team is completely independent in determining the research theme, preparation of proposals to the implementation, reporting and publication of the research results. Every step taken, is definitely through discussion by the team.

**References**


