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The Effect of Liquid Organic Fertilizer of Shallot Skins and Compost of Coconut Dregs on the Growth of Mint Plant (*Mentha piperita* L.) Cuttings

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Abstract: Mint (*Mentha piperita* L.) belongs to the Lamiaceae family, whose essential oil is used as a flavouring agent and to treat diseases. The low productivity of mint plants is because the nutrients in the planting medium do not support growth efforts made through fertilization. Two organic materials that can be used as fertilizer are shallot skin and coconut dregs. This study aimed to determine the effect of liquid organic fertilizer on shallot skins and coconut dregs compost and the most optimal treatment for the growth of mint plant cuttings (*Mentha piperita* L.). This type of research was quantitative with an experimental method using a completely randomized design (CRD) factorial consisting of 2 factors, namely red onion skin liquid organic fertilizer and coconut dregs compost, each consisting of 3 levels so that the treatment combination consisted of 9 treatments with as many repetitions as three times. Data analysis in this study used the Kruskal Wallis test with SPSS. The results showed that it had a very significant effect on wet weight and a significant effect on the number of leaves on the growth of mint cuttings (*Mentha piperita* L.). The best treatment for each observation parameter was wet weight BM1AK2 (13 grams), number of primary branches BM1AK2 (2.67), plant height BM2AK1 (26.5 cm) and number of leaves BM2AK1 (27.33 strands).

Keywords: Compost of Coconut Dregs; Liquid Organic Fertilizer of Shallot Skins; Mint Plants.

Introduction

The mint plant (*Mentha piperita* L.) belongs to the Lamiaceae family and is one of the plants with widely used essential oils [1]. This plant is a flavouring for chewing gum, toothpaste and tea. It is also used to treat various diseases, such as stomach aches, headaches, skin irritation and urinary tract diseases [2]. *Mentha piperita* produces peppermint oil, where menthol is its main chemical. Several studies have found that peppermint oil can be an anti-spasmotic, anti-inflammatory and antibacterial [3]. This plant grows and is widespread worldwide in subtropical and tropical areas, including Indonesia [4]. Reproduction in tropical areas like Indonesia usually uses vegetative methods, namely stem cuttings.

Based on the results of observations of problems that occur in the cultivation of mint plants, namely during the growth period. This happens due to several factors, one of which is that the nutrients contained in the planting medium do not support the growth of mint plants and impact their low productivity. Nutrient uptake test at one harvest to produce 41 and 25 kg/ha of oil and menthol required fertilization of 92 kg N + 72 kg P2O5 + 126 kg K2O/ha on mint plants [5]. Efforts to increase nutrient availability in planting media can be made by using fertilizer.

Typically, the utilization of inorganic fertilizers leads to a significant boost in plant productivity. Nevertheless, inorganic fertilizers have adverse effects that can detrimentally affect human health and the surrounding ecosystem. An additional option to consider instead of using inorganic fertilizer is the utilization of organic fertilizer. As stated in reference [6], organic fertilizer refers to fertilizer that is mainly made from the decomposed remnants of living species, such as blood, bones, faeces, feathers, plant residues, or domestic waste, through the action of decomposing microorganisms.

One of the organic materials that can be used as the primary raw material for fertilizer is onion skins and coconut dregs, which are household wastes thrown away. Red onion skin contains body-regulating substances similar to Indole Acetic Acid (IAA). Indole Acetic Acid is the most active auxin in various plants and is essential in promoting optimal growth and killing caterpillar pests [7]. Apart from that, the phytohormones contained in shallots are gibberellins, which stimulate growth in leaves and stems [8]. Coconut dregs can be used to make organic fertilizer compost, which plants need because it contains phosphorus [9]. Phosphorus plays a role in the photosynthesis process and functions in leaf strength to strengthen the leaves so they do not fall and increase the number of leaves [10]. Research [9] stated that coconut dregs compost helps improve soil texture so plant roots can absorb nutrients more efficiently, increasing plant production.

Based on the description above, this research aims to determine the effect and most optimal treatment of applying liquid organic fertilizer from onion peel and coconut dregs compost on mint (Mentha piperita L.) cuttings growth. The benefit of this research is that it is a source of helpful information for the community so that they can utilize shallot skin waste and coconut dregs as organic fertilizer and as a reference for further relevant research.

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Research Methods

This research was carried out in the gardens belonging to Paya Bujok Tunong village residents, Bahagia Hamlet, Langsa Baro District, Langsa City, Aceh, from May to July 2023. This research approach was quantitative, using experimental methods. The design used in this research was a Factorial Completely Randomized Design (CRD), which consisted of two factors, namely liquid organic fertilizer from onion skins and coconut dregs compost, each consisting of 3 levels with a treatment combination of 9 treatments, each treatment combination consisting of 3 replications so there are 27 experimental units. The onion skin liquid organic fertilizer factor (BM) consists of 3 treatment levels, namely BM0 (without shallot skin POC or control), BM1 (80 ml/l shallot skin POC + 20 ml Aquades) and BM2 (90 ml/l POC red onion skin + 10 ml Aquades). Meanwhile, the coconut dregs compost factor consists of 3 levels, namely AK0 (without coconut dregs compost or control), AK1 (300 g of coconut dregs compost), and AK2 (400 g of coconut dregs compost). The combination of treatment with liquid organic fertilizer from onion skins and coconut dregs compost is as follows:

1. BM0AK0 = Control
2. BM0AK1 = Without POC shallot skin and 300 g coconut dregs compost
3. BM0AK2 = Without POC shallot skin and 400 g coconut dregs compost
4. BM1AK0 = 80 ml POC shallot skins + 20 ml Aquades and no coconut dregs compost
5. BM1AK1 = 80 ml POC shallot skin + 20 ml Aquades and 300 g coconut dregs compost
6. BM1AK2 = 80 ml POC shallot skins + 20 ml Aquades and 400 g coconut dregs compost
7. BM2AK0 = 90 ml POC shallot skin + 10 ml Aquades and no coconut dregs compost
8. BM2AK1 = 90 ml POC shallot skin + 10 ml Aquades and 300 g coconut dregs compost
9. BM2AK2 = 90 ml POC shallot skin + 10 ml Aquades and 400 g coconut dregs compost.

The tools used in this research were cutting scissors, a ruler, a measuring cup, a digital scale and a 30 x 30 cm polybag. The materials used in this research were mint cuttings, shallot skins, coconut dregs, burnt soil, water, brown sugar and EM4. The growth parameters measured were wet weight, number of primary branches, plant height and number of leaves. The data analysis used was the Kruskal Wallis test with SPSS. The value is significant in research if the analyzed variable has a significant value of $P < 0.05$ [11].

Results and Discussion

Wet Weight

Based on the research results, the average wet weight of mint plants (*Mentha piperita* L.) in Figure 1 can be concluded that the highest wet weight was in the BM1AK2 treatment, namely 13 grams, while the lowest wet weight was in the BM0AK0 treatment, namely 4 grams.

Based on the results of data analysis using the Kruskal walis test in Table 1, it was found that the application of liquid organic fertilizer from onion skins and coconut dregs compost showed a very significant effect on the wet weight of mint plants (*Mentha piperita* L.) because the value of Asymp. Sig. Equal to 0.001 < 0.01. The BM0AK0 (control) treatment showed the lowest wet weight because plant weight is basically influenced by plant height, number of branches, and number of leaves. According to [12], the more leaves there are, the better the photosynthesis process will be. High photosynthesis will produce more incredible energy for growth and development. [13] Explains that nitrogen nutrients encourage the growth rate of organs related to photosynthesis so that plant growth increases and plant production results in the form of plant fresh weight being greater. The high wet weight yield in the BM1AK2 treatment was due to the application of liquid organic fertilizer from onion skins and coconut dregs compost, which can increase the nutrients in the soil used by plants in photosynthesis and carbohydrates. Providing the right combination of liquid organic fertilizer from onion skins and coconut dregs compost can increase the wet weight of mint plants due to sufficient nutrients. The nutrients needed by plants during growth are essential, namely the macro elements, namely Nitrogen (N), Phosphorus (P) and Potassium (K). According to [14], liquid fermentation from vegetable waste, namely shallot skin, has 0.05% N, 0.02% P2O5, 0.16% K2O and a C/N ratio of 47.8. Meanwhile, [15] explained that organic fertilizer with 300 grams of coconut dregs contained 1.050% N, 1.850% P, 1.19% K and a C/N ratio of 25.513.

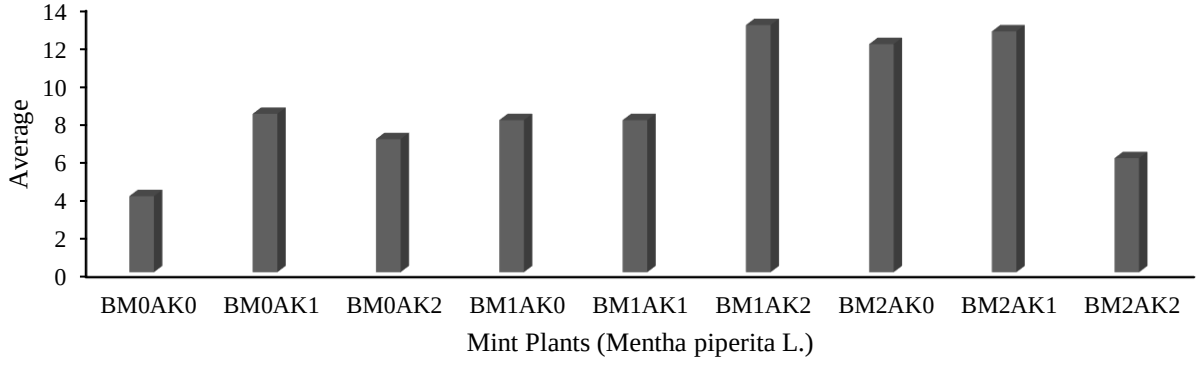

Figure 1. Average Wet Weight of Mint Plants (*Mentha piperita* L.) Age 7 Weeks After Planting

Table 1. Results of the Kruskal Wallis Wet Weight Test.

Treatment	N	Mean Rank	Asymp. Sig.
BM0AK0	3	2.00	
BM0AK1	3	15.00	
BM0AK2	3	8.00	
BM1AK0	3	13.50	
BM1AK1	3	13.50	
BM1AK2	3	25.00	0.001
BM2AK0	3	20.50	
BM2AK1	3	23.50	
BM2AK2	3	5.00	
Total	27		

Number of Primary Branches

Based on the research results, in Figure 2, the average percentage of the number of primary branches of mint plants (*Mentha piperita* L.) 7 weeks after planting shows that the highest growth was in the BM1AK2 treatment, namely 2.67, while the lowest number of primary branches was in the BM0AK0 treatment, namely there are no primary branches (0).

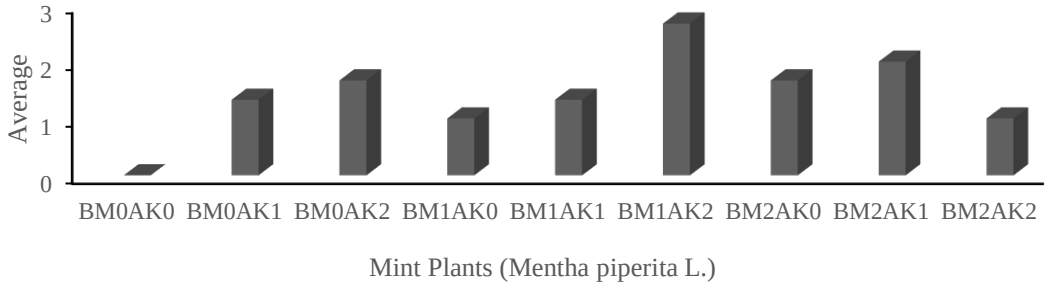

Figure 2. Average Number of Primary Branches of Mint Plants (*Mentha piperita* L.) Age 7 Weeks After Planting.

Based on the results of the Kruskal walis test in Table 2, it shows that the number of primary branches of mint plants (*Mentha piperita* L.) shows no significant effect on the application of liquid organic fertilizer from onion peel and coconut dregs compost because the Asymp value. Sig. equal to 0.108 > 0.05. Providing liquid organic fertilizer from onion peel and coconut dregs compost can increase the number of primary branches of mint plants (*Mentha piperita* L.) compared to the control treatment, namely BM0AK0, which does not produce primary branch growth. According to [16], branch growth is part of vegetative growth, where Nitrogen is the nutrient that plays the most role. Nitrogen nutrients play a significant role in plant growth, forming new branches and leaves. Apart from the Nitrogen nutrient, the Potassium nutrient also plays a significant role in increasing the number of plant branches. The increase in the number of branches occurs due to cell division in the apical meristem and cell extension, forming new branches.

Table 2. Kruskal Wallis Test Results for Number of Primary Branches

Treatment	N	Mean Rank	Asymp. Sig.
BM0AK0	3	3.00	
BM0AK1	3	13.33	
BM0AK2	3	16.67	
BM1AK0	3	11.00	
BM1AK1	3	13.33	
BM1AK2	3	22.33	
BM2AK0	3	16.67	
BM2AK1	3	18.67	0.108
BM2AK2	3	11.00	
Total	27		

Plant Height

Based on the graph of plant height growth (*Mentha piperita* L.) in Figure 3, there was no immediate change in growth three weeks after planting, but it started to become visible after treatment was given. Namely at four weeks after planting observations. Based on the graph of plant height growth at seven weeks after planting. This was the last observation, and it produced the highest growth. Namely, in the BM2AK1 treatment with a plant height

of 26.5 cm. the lowest growth was BM0AK0 with a plant height of 19.33 cm.

Based on the results of the Kruskal Walis test analysis of the height of mint plants (*Mentha piperita* L.) in Table 3, it shows that there is no natural effect on the application of liquid organic fertilizer from onion peel and coconut dregs compost. Because of the Asymp value. Sig. amounting to 0.072 > 0.05. The height growth of mint plants (*Mentha piperita* L.) has increased. Several things influence the increase in plant height. One is the hormone auxin, which stimulates the elongation of stem cells. Shallot skin itself contains growth regulators, which have a role similar to Indole Acetic Acid (IAA) [7]. Indole acetic acid (IAA) is one of the auxin hormones that play the most active role in increasing cell division and elongation. Resulting in optimal growth [17].

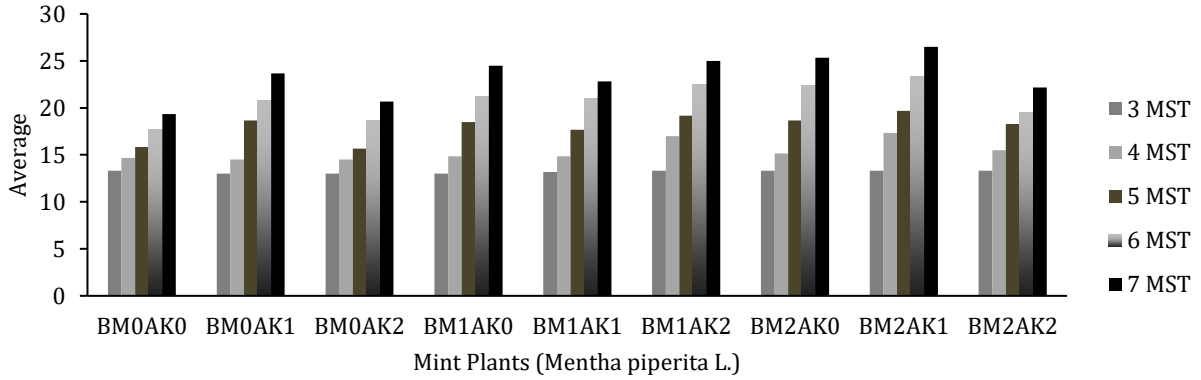

Figure 3. Average Height of Mint Plants (*Mentha piperita* L.)

Table 3. Kruskal Wallis Test Results for Plant Height

Treatment	N	Mean Rank	Asymp. Sig.
BM0AK0	3	2.67	
BM0AK1	3	15.33	
BM0AK2	3	6.33	
BM1AK0	3	16.83	
BM1AK1	3	14.33	
BM1AK2	3	17.17	0.072
BM2AK0	3	19.33	
BM2AK1	3	21.83	
BM2AK2	3	12.17	
Total	27		

Number of Leaves

The number of leaves of mint plants (Mentha piperita L.) was observed from 3 weeks to 7 weeks after planting. Namely by counting the leaves found on each mint plant (*Mentha piperita* L.). Based on the average number of leaves of mint plants (*Mentha piperita* L.) in Figure 4. the highest was in the BM2AK1 treatment. Namely 27.33 at seven weeks after planting. While the lowest was BM0AK0. Namely 7.33 at seven weeks after planting.

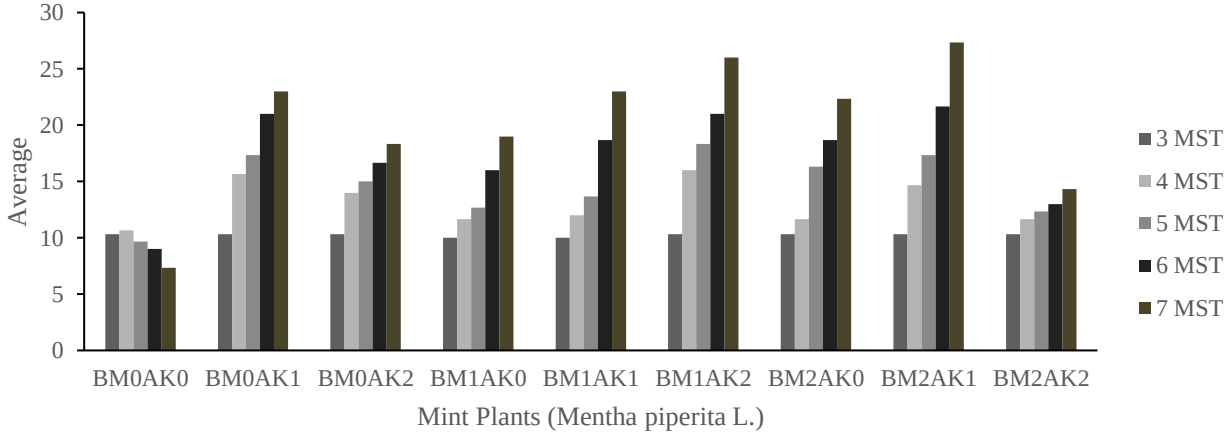

Figure 4. Average Number of Leaves of Mint Plants (*Mentha piperita* L.)

Based on the results of the Kruskal Walis test in Table 4 show that the application of liquid organic fertilizer from onion skins and coconut dregs compost had a significant effect on the number of leaves of mint plants (Mentha piperita L.). because of the Asymp value. Sig. equal to 0.020 < 0.05. Mint plants (*Mentha piperita* L.) in the BM0AK0 treatment (control) experienced leaf loss from 5 weeks to 7 weeks after planting. The decrease in the number of leaves on mint plants (Mentha piperita L.) in the BM0AK0 treatment was due to a lack of nutrients in the soil. The BM0AK0 treatment was a control treatment without liquid organic fertilizer from onion peel and coconut dregs compost. The availability of the nutrients provided causes an increase in the number of leaves, according to [10]. The nutrient element phosphorus plays a role in the photosynthesis process and functions in leaf strength to strengthen the leaves so they do not fall and can increase the number of leaves. Apart from that. [18] explains that Nitrogen is an essential element that plants need to form leaves. Leaves are the primary organ in photosynthesis because leaves contain pigments that absorb sunlight. The number of leaves indicates the amount of photosynthate the plant will produce about the value of plant productivity.

Table 4. Kruskal Wallis Test Results for Number of Leaves

Treatment	N	Mean Rank	Asymp. Sig.
BM0AK0	3	2.00	
BM0AK1	3	18.17	
BM0AK2	3	11.50	
BM1AK0	3	11.50	
BM1AK1	3	17.50	
BM1AK2	3	21.00	0.020
BM2AK0	3	16.33	
BM2AK1	3	22.33	
BM2AK2	3	5.67	
Total	27		

Conclusion

Based on the results of the research that has been carried out. It can be concluded that there is a very real influence on wet weight and the number of leaves on the growth of mint (*Mentha piperita* L.) cuttings. The best treatment for each observation parameter was wet weight in the BM1AK2 treatment. Number of primary branches in the BM1AK2 treatment. Plant height in the BM2AK1 treatment and number of leaves in the BM2AK1 treatment.

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