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The Effect of Liquid Smoke in Planting Media on the Growth of Mustard Greens

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ABSTRACT
This research aims to evaluate the use of liquid smoke and different planting media, namely soil planting media and cocopeat planting media on the growth of mustard greens. Liquid smoke is used because it is known to contain organic compounds that can act as natural fertilizers and pesticides. This research uses a quantitative method of 2 factors, namely differences in planting media and liquid smoke treatment carried out every 3 days. The parameters measured include leaf length, leaf width and total leaves. Statistically, analysis of variance (ANOVA) shows that the differences between treatments have a significance of ≤ 0.050 (α). The results showed that the use of liquid smoke had no significant effect on leaf length, but had a significant effect on leaf width and total leaves.

***Keywords**: Liquid smoke, Cocopeat, Growth, Mustard greens, Soil..*

INTRODUCTION
Vegetable plants are a superior commodity of the horticultural group as a provider of improved nutrition for the Indonesian people (Haryanto et al., 2006). Mustard greens can be consumed by all levels of society and contain many nutrients that are really needed by the body, namely dietary fiber, manganese, folate and vitamins K, A, C, E (Directorate of Nutrition, Ministry of Health of the Republic of Indonesia, 1999). The vitamins contained in mustard greens are beneficial for human growth metabolism (Missdiani et al., 2020).

Planting media plays an important role in plant growth and seedling growth, seedbeds require nutrition and a large space. Plants can grow optimally in media that contain nutrients (Sari et al., 2016). There are several types of planting media including soil and cocopeat. The soil medium is strong enough to bind water. Soil fertility guarantees or supports optimum growth (Yamani, 2010). According to Handayanto et al. (2002), high nutrient content influences soil fertility levels depending on soil processing, season and type of plant. Cocopeat is a planting medium that has organic properties and is made from ground coconut fiber. Cocopeat is able to absorb water and is environmentally friendly (Sani, 2015). Cocopeat has the advantage of storing a number of nutrients, namely (Ca), (Mg), (K), (N), and (P)(Kravatskaia, 2009)

Use of liquid smoke as a growth stimulant (ZPT). Liquid smoke is the evaporation of compounds through decomposition with heat and condensation in the cooling system (Riska, 2021). Apart from that, liquid smoke is considered as an alternative to synthetic ZPT which tends to be expensive (Kravatskaia, 2009). Research is needed to determine the effect of liquid smoke application with soil and cocopeat planting media on the parameters of length, width and number of mustard leaves in all observation age (5 – 25 days after).

METHOD
The research will be carried out from May 2024 to June 2024 in Pucangsimo Village, Bandarkedungmulyo District, Jombang Regency. This research applies experimental quantitative methods with 2 factors, namely planting media and liquid smoke treatment. The materials used are as follows: mustard seeds, liquid smoke, soil, cocopeat and, water. The tools used are as follows: cutting tools, buckets, agricultural tools, polybags and spray equipment.

EXPERIMENTAL DESIGN

This research implemented a two group design. The first factor is the control group with liquid smoke treatment, while the second factor is the control group without liquid smoke treatment. Observations were carried out every 5 days, so in total there were 5 observations analyzed in this research. The liquid smoke treatment is applied once every three days, so there are 8 sprayings, namely on the 3rd day of the day, the 6th day of the day, the 9th day of the month, the 12th of the day, the 15th of the day, the 18th of the day, the 21st of the day, and the 24th of the day .

Plant Preparation

Before sowing the seeds, first prepare the tray, cocopeat, water and mustard seeds. Then wet the cocopeat with water, then put it in the tray. then sprinkle mustard seeds into the tray holes, and cover again with a thin layer of cocopeat. The seeding process is carried out by regularly watering the plants in the morning and evening. The seeding continues until it germinates until the first 3-4 leaves appear or it is 2-3 weeks old to get strong roots and stems.

Planting Media

After sowing the mustard seeds, they are 2-3 weeks old, the mustard greens are transferred to soil and cocopeat media. The first step is to fill part of the polybag with soil and the other part with moistened cocopeat. Then plant the mustard greens in polybags, then water them with water.

Maintenance and Application of Liquid Smoke

The application of liquid smoke in this research refers to research by Yulia (2018) that on the 3rd day after transplanting with a dose of 10 ml/liter and the liquid smoke spraying treatment was carried out in the afternoon between 16.30 and 17.00. It was sprayed on the stems. , leaves and the underside of the leaves. To ensure optimal absorption of liquid smoke. As well as affixing by making stands around the mustard greens and removing grass / weeds.

Table 1. Sprinkling water in the morning and evening and spraying liquid smoke at 3, 6, 9, 12, 15, 18, 21 and 25 DAP.

Day	Morning	Afternoon	Liquid Smoke
1	✓	✓	x
2	✓	✓	x
3	✓	✓	✓
4	✓	✓	x
5	✓	✓	x
6	✓	✓	✓
7	✓	✓	x
8	✓	✓	x
9	✓	✓	✓
10	✓	✓	x
11	✓	✓	x
12	✓	✓	✓
13	✓	✓	x
14	✓	✓	x
15	✓	✓	✓
16	✓	✓	x
17	✓	✓	x
18	✓	✓	✓
19	✓	✓	x
20	✓	✓	x
21	✓	✓	✓
22	✓	✓	x
23	✓	✓	x
24	✓	✓	✓
25	✓	✓	x

✓ : Given treatment

× : Not given treatment

Observation

Observations were made every 5 days during the research period. Each mustard plant in the treatment group (given liquid smoke) and the control group (not given liquid smoke), which was planted in soil or cocopeat growing media, was carefully observed. Observations include recording the length, width and number of leaves.

Data Analysis

Data analysis was carried out using variance. If the variance results show a significant difference (F count > F table 5%) or very significant (F count > F table 1%) or the significance value is ≤ 0.050, then to compare the averages of the two treatments a further test is carried out using the least significant difference test. (BNT). This data analysis process was carried out with the help of SPSS 26 software.

RESULT AND DISCUSSION

Result

Plant growth involves increasing the number, length, and width of leaves, which is part of the plant growth process. These parameters are observed to measure the treatment effect in the study. The results show that the planting medium has an influence on leaf length, leaf width and number of leaves, from the first observation (5 DAP) to the fifth observation (25 DAP).

- **Mustard greens growth parameters are presented in table form.**

Soil Planting Media Without Liquid Smoke.

Table 1. Mustard greens growth parameters in soil planting media without liquid smoke.

DAY	LEAF LENGTH (CM)	LEAF WIDTH (CM)	TOTAL LEAVES
5	8 cm	2,2 cm	3
10	9 cm	4,1 cm	4
15	20 cm	7 cm	6
20	26 cm	10,4 cm	7
25	32 cm	14 cm	7

Soil Planting Media With Liquid Smoke.

Table 2. Mustard greens growth parameters in soil planting media with liquid smoke.

DAY	LEAF LENGTH (CM)	LEAF WIDTH (CM)	TOTAL LEAVES
5	8 cm	2,3 cm	3
10	11 cm	5 cm	4
15	23 cm	10,3 cm	6
20	29,3 cm	13,6 cm	7
25	36 cm	17 cm	8

Cocopeat Planting Media Without Liquid Smoke.

Table 3. Mustard greens growth parameters in cocopeat planting media without liquid smoke.

DAY	LEAF LENGTH (CM)	LEAF WIDTH (CM)	TOTAL LEAVES
5	8 cm	2 cm	2
10	8 cm	2.2 cm	2
15	9 cm	2.5 cm	3
20	10,4 cm	2,7 cm	3
25	12 cm	3 cm	3

Cocopeat Planting Media With Liquid Smoke.

Table 4. Mustard greens growth parameters in cocopeat planting media with liquid smoke.

DAY	LEAF LENGTH (CM)	LEAF WIDTH (CM)	TOTAL LEAVES
5	7,6 cm	2 cm	3
10	9 cm	2.4 cm	3
15	9,2 cm	2,6 cm	4
20	10 cm	2,8 cm	4
25	11,1 cm	3,1 cm	4

- **Mustard greens growth parameters are presented in table form**

The increase in mustard leaf length parameters is presented in Figure 1:

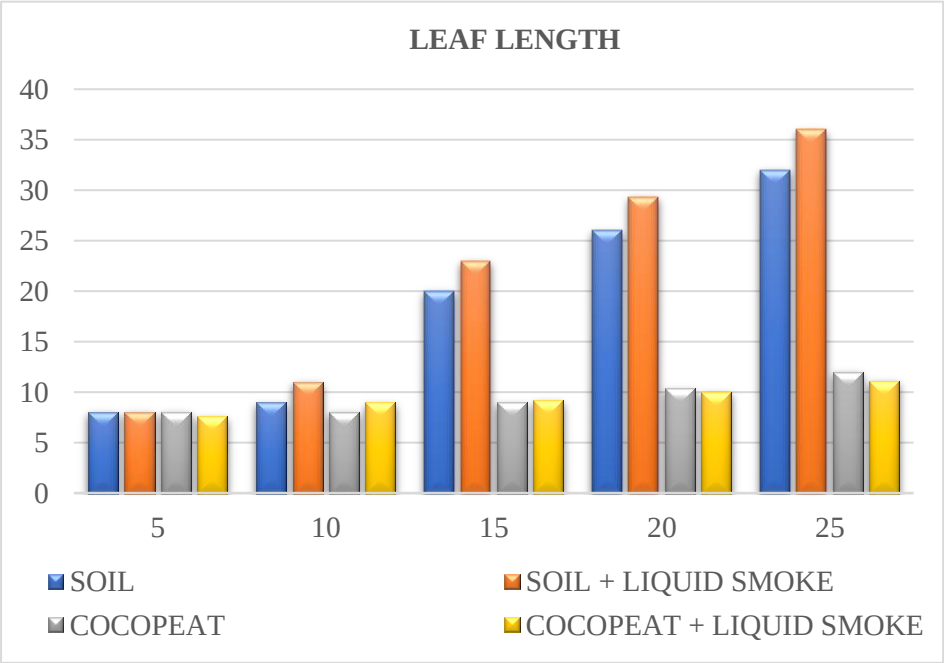

Figure 1. Average increase in mustard leaf length parameters

The increase in mustard leaf length parameters is presented in Figure 2:

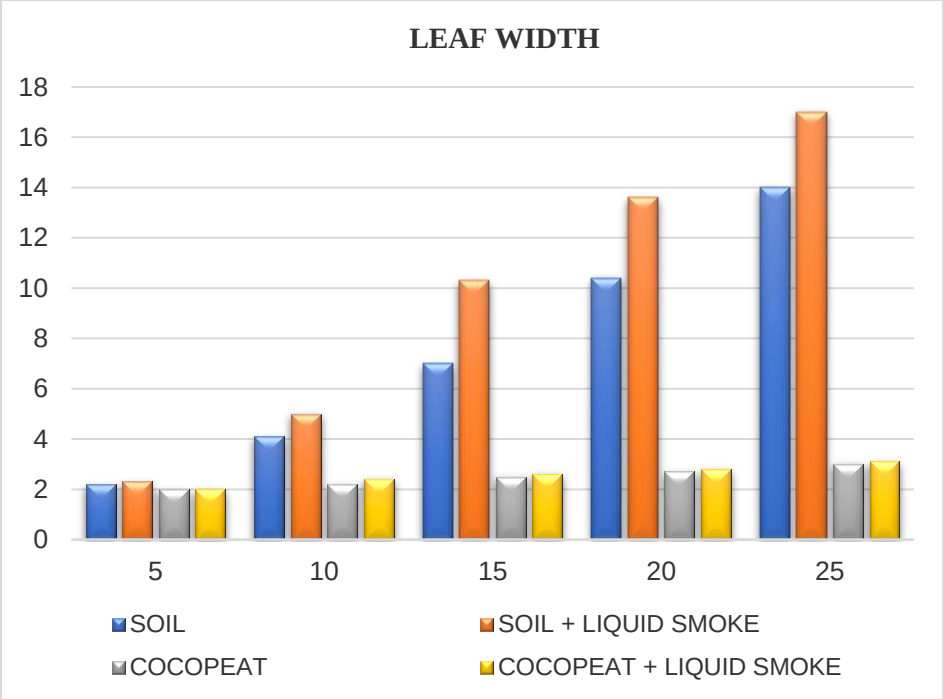

Figure 2. Average increase in mustard leaf width parameters

The increase in mustard total leaves parameters is presented in Figure 3 :

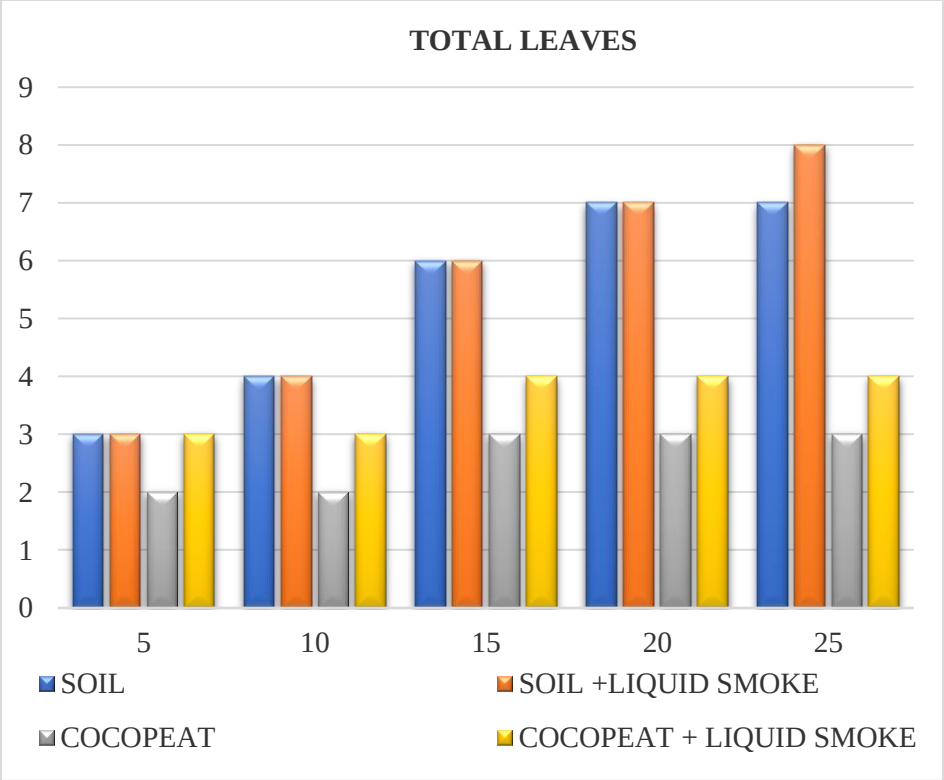

Figure 3. Average increase in mustard total leaves parameters

- **Credibility**

Further testing uses the least significant analysis of variance (ANOVA) with the following results :

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Leaf length	Between Groups	598.354	3	199.451	3.115	.056
	Within Groups	1024.328	16	64.021		
	Total	1622.682	19			
Leaf width	Between Groups	194.668	3	64.889	4.370	.020
	Within Groups	237.560	16	14.847		
	Total	432.228	19			
Total leaves	Between Groups	31.400	3	10.467	5.106	.011
	Within Groups	32.800	16	2.050		
	Total	64.200	19			

Note: Sig ≤ 0.050 = significant, Sig ≥ 0.050 = not significant

Discussion

Leaf Length

Leaf length parameters were monitored from the base to the tip of the leaf. The results of the analysis of variance showed a value of 0.056 or ≥ 0.050, which means there is no significant effect on the leaf length growth parameters. This is thought to be due to differences in media treatment given between planting in cocopeat and liquid smoke treatment (I: I), planting in cocopeat and without liquid smoke treatment (I: 0), planting in soil media and liquid smoke treatment (I: I) and on soil media and without liquid smoke treatment (I : 0). It is possible that this causes a significant influence on the length of mustard leaves on soil media.

Leaf Width

Leaf width was monitored from the right side to the left side of the leaf. The results of analysis of variance showed that the addition of liquid smoke had a significance value of 0.020 or ≤ 0.050, which means there is significant effect on leaf width growth parameters. This is thought to be due to differences

in media treatment given between planting in cocopeat and the treatment liquid smoke (I: I), planting in cocopeat and without liquid smoke treatment (I : 0), planting in soil media and liquid smoke treatment (I : I) and in soil media and without liquid smoke treatment (I : 0). Possible things This causes a significant influence on the length of mustard leaves in soil media.

Total Leaves

The number of leaves is measured by the total leaves. The results of the analysis of variance show that the significance value of the addition of liquid smoke is 0.011 or ≤ 0.050, which means it has a significant effect on the total leaves growth parameters. This is thought to be due to the differences in media treatment given between planting in cocopeat and liquid smoke treatment (I: I), planting in cocopeat and without liquid smoke treatment (I: 0), planting in soil media and liquid smoke treatment (I: I) and in soil media and without liquid smoke treatment (I: 0). It is possible that this causes a significant influence on the total leaves in soil media.

The results of this research support the findings of Missdiani, et al (2020) which revealed that M4 planting media (soil, manure, and cocopeat) gave the best results in terms of number of leaves, wet fruit weight, production per plant, and production per hectare. The concentration of agrobost H1 biological fertilizer (5 ml/l water) also showed the best effect on plant wet plant weight, plant production, and production per hectare. The combination of soil, manure, cocopeat, and Agrobost biofertilizer concentration of 5 ml/l water (M4H1) gave the best results in terms of seed weight per plot and seed production per hectare.

CONCLUSIONS

The combination of liquid smoke treatment with soil planting media showed that there was an interaction in increasing the growth of mustard greens in leaf length, leaf width and number of leaves. The combination of liquid smoke treatment with cocopeat planting did not show a significant increase in growth in mustard plants. Liquid smoke had no significant effect on length growth parameters. leaves with a significance value of 0.056 or ≥ 0.050, but liquid smoke has a significant effect on the growth parameters of leaf width and number of leaves with a significance value of leaf width of 0.020 and a significance value of number of leaves of 0.011 or the parameters of width and number of leaves have a significance value of ≤0.050 (α).

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