

THE EFFECT OF LIQUID SMOKE ON CHLOROPHYLL LEVELS IN GREEN PLANTS (*Brassica juncea* L)

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ABSTRACT

*The green mustard plant (*Brassica juncea* L) is a plant that can adapt well to places with hot or cold air. Liquid smoke is known to contain various bioactive compounds that can affect chlorophyll levels in mustard plants. This research uses quantitative methods to determine the effect of liquid smoke on chlorophyll levels in mustard green plants. This research was carried out on mustard green plants that were given liquid smoke from certain fuels in a laboratory environment. The variable measured was the chlorophyll content in plant leaves, which is considered the main indicator of plant photosynthetic health. This research used a randomized block design with two treatments, namely a control group without administration of liquid smoke and a treatment group with liquid smoke for a certain period of time. Chlorophyll levels were measured using the Uv-Vis Spectrophotometry method. The results of this study showed that control mustard greens had a total chlorophyll content of 10.28 mg/L and mustard greens with liquid smoke had a total chlorophyll content of 7.47 mg/L. Control mustard greens had a higher chlorophyll content than mustard greens treated with liquid smoke.*

Keywords: Chlorophyll levels, green mustard greens, liquid smoke

INTRODUCTION

Green mustard greens (*Brassica juncea* L) is a type of leaf vegetable that is widely consumed by Indonesian people because it has high nutritional content, namely vitamins, minerals and antioxidants (Hernawan et al., 2017). Mustard plants play a role in meeting nutritional needs and contributing to health through their chlorophyll content. Chlorophyll is the main component that plays a role in the photosynthesis process and is very important for plant growth and development. High chlorophyll levels in green mustard leaves will improve plant quality (Kim & Park, 2019)

Liquid smoke is a product of pyrolysis of organic materials such as wood or coconut shells which produces chemical compounds such as phenols, organic acids, which have the potential to be used as organic fertilizer. Phenolic compounds in liquid smoke, for example, are known to have antioxidant properties that can protect chlorophyll from oxidative damage (Smith & Jones, 2020). The organic acids in liquid smoke can increase the absorption of nutrients by plants, which in turn can increase chlorophyll synthesis and plant quality (Kim & Kang, 2021).

Previous research has shown that the application of liquid smoke can provide benefits to plants. For example, research by (Brown & Green, 2018) shows that the use of liquid smoke can increase chlorophyll levels in leaf vegetable plants. At concentrations that are too high, liquid smoke is phytotoxic and disrupts plant metabolism, which can result in a decrease in chlorophyll levels (Kim & Kang, 2021).

This research aims to determine the effect of providing liquid smoke with various concentrations on chlorophyll levels in green mustard plants.

METHOD

This activity was carried out using quantitative methods located in Pucangsimo Village, Bandarkedungmulyo District, Jombang Regency. This activity was carried out from May to June 2024. Mustard plants were taken according to the criteria for green leaves. Planting media uses soil. Every 3

days spray using liquid smoke.

Planting preparation

The mustard seeds used are the green mustard type. Prepare the Cocopit by giving it water until it is damp, then put it in a tray, then sprinkle the green mustard seeds into several trays that have been prepared. Leave it for 15 days. Place it in a damp place and sprinkle it with water using a spray every morning and evening. According to research by Yulia (2018), green mustard plants that are 2-3 weeks old are then transferred to planting media. Transplanting the seedbed is done by lifting the seedlings with a cocop and the roots.

Maintenance

At the maintenance stage, watering is carried out every morning and evening with a volume of water according to the capacity in the polybac. Plant maintenance consists of removing grass/weeds. Divided into 2 groups of factors. The first factor is the control group with liquid smoke treatment and the second factor is the control group without liquid smoke treatment.

Application of Liquid Smoke

Prepare liquid smoke obtained from farmers in Pucangsimo Village. Liquid smoke is applied to mustard plants that are 1 week old after planting, spraying once every 3 days at 17.00 – 18.00 WIB using a sprayer

Place and Time of Research

His research was conducted in Pucangsimo village, Bandarkedungmulyo subdistrict, Jombang regency, where measurements of chlorophyll levels were carried out at the UPN "Veteran" Integrated Testing Laboratory in Surabaya in July 2024.

Leaf selection At the end of the treatment period (3 weeks), healthy and fully developed leaves were taken from each plant. The leaves taken are young and free from damage. Cleaning and preparation The leaves are washed with water to remove dirt and dust, then dried carefully. The leaves are cut into small pieces to make the extraction process easier. Weighing the weight of each sample with a weight of 0.005 grams of leaf pieces was weighed for each sample.

Chlorophyll content was measured using the Uv-Vis spectrophotometric method. Plant leaves were taken after treatment for 3 weeks and extracted using an organic solvent (ethanol 96%). The extract was then measured at wavelengths of 645 nm and 663 nm to determine the chlorophyll A and B content. The total chlorophyll content was calculated using the Arnon formula (1949)

RESULT AND DISCUSSION

Table 1. Results of Chlorophyll A, Chlorophyll B, Total Chlorophyll levels

No	Sample code	Test Parameters	Result	Unit
1	Control mustard green	Chlorophyll A	6,511	mg/L
		Chlorophyll B	3,771	mg/L
		Total Chlorophyll	10,28	mg/L
2	Liquid smoke mustard green	Chlorophyll A	5,456	mg/L
		Chlorophyll B	3,253	mg/L
		Total Chlorophyll	7,47	mg/L

The research results showed that control mustard greens had the highest chlorophyll content compared to mustard greens treated with liquid smoke. The increase in chlorophyll content at low to medium concentrations could be caused by phenolic compounds in liquid smoke which function as antioxidants, protecting chlorophyll from oxidative damage, (Taufiqurrahmi (2015) In addition, the organic acids in liquid smoke can function as additional nutrients that support chlorophyll synthesis.

The decrease in chlorophyll content at high concentrations may be caused by the toxic effects of certain compounds in liquid smoke. Phenolic compounds in high concentrations can be prooxidants, causing oxidative stress and damage to chlorophyll pigments. In addition, organic acids in high concentrations can cause changes in the pH of the growing medium, which can interfere with nutrient absorption by plants. These effects indicate that although liquid smoke can be beneficial at low doses, it must be used carefully to avoid negative effects on plants.

Previous research by Lee et al. (2015) showed that liquid smoke can increase growth and nutrient content in several plant species, but this study highlights the importance of determining the right concentration to avoid toxic effects. Additionally, research by Tan et al. (2018) indicated that phenolic compounds in liquid smoke have potential as antioxidant agents, supporting the finding that liquid smoke at low concentrations can increase chlorophyll content by protecting plants from oxidative stress. From the results of the discussion above, it can be concluded in the table below.

CONCLUSIONS

Liquid smoke has a significant influence on the chlorophyll content of mustard greens. Lower concentrations of liquid smoke can increase chlorophyll content, while higher concentrations tend to decrease it. Further research is needed to understand the mechanisms behind this effect and determine the optimal concentration of liquid smoke for application to mustard greens. Apart from that, field studies also need to be carried out to test the effectiveness of liquid smoke in different environmental conditions.

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