ISSN No:-2456-2165

# Analysis of the Growth of Mustard Green Plants (Brassica juncea L) with Liquid Organic Fertilizer (LOF) from Rice Waste Water

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**Abstract:- This study aimed to observe the growth of mustard plants (*Brassica juncea* L) with liquid organic fertilizer from rice washing wastewater with various concentrations. This study used an experimental method with a completely randomized design (CRD) consisting of 4 treatments and 5 replications. Parameters observed were seedling acceleration, plant height, number of leaves, and leaf length. Control treatment concentrations (P0) (without adding POC rice washing water), P1 (5 ml rice washing water / 0.5 L water / day), P2 (15 ml rice washing water / 0.5 L water / day), and P3 (25 ml of rice washing water / 0.5 L of water / day). The data obtained will be analyzed using analysis of variance (ANOVA) with a confidence level of 95%. Based on the research data obtained, that the provision of rice washing wastewater affects the growth of plant height and number of leaves. However, it did not affect seedling acceleration and leaf length. The average seeding acceleration occurred 3 days after planting with each treatment and repetition during the study period. In terms of plant height, the control treatment (P0) had the highest growth (16.36 ± 1.48 cm), while the 25 ml/L treatment (P3) had the lowest average (11.50 ± 1.25 cm). The control treatment (P0), namely (6.66 ± 0.57 cm) was the growth in the highest number of leaves, while P3 with 25 ml/L was the lowest average number of leaves obtained. The control treatment (P0) with the longest leaf length growth was (5.93 ± 1.65 cm), and (P3) 25 ml/L, namely (3.80 ± 0.70 cm) was the lowest average leaf growth.**

***Keywords:-*** *Liquid Organic Fertilizer; Rice Washing; Wastewater; Leaves.*

## I. INTRODUCTION

The Covid-19 pandemic that hit the world, including Indonesia, has made us as a society more concerned about health. Especially during a pandemic, we are faced with very poor health conditions, so that all elements of society are required to maintain the condition of their bodies and the intake of food they consume. Consumption of healthy food can be done by consuming fruits and vegetables that come from agricultural products that are quality, healthy and free of chemicals. The development of the green consumer movement directs society towards "organic" agricultural products that can improve the structure and condition of the soil. This can reduce the negative impact of using chemicals that are harmful to health and the environment[1] (Susetya, 2018).

In fertilizing plants, it can be done by using inorganic and organic fertilizers, but the continuous use of inorganic fertilizers can reduce soil fertility, so that the balance of nutrients in the soil will be disrupted and can have a negative effect on the environment (Bahar, 2016). Organic fertilizers come from the process of decomposing organic waste, such as animal waste, plant residues, garbage, sawdust, and others (Wijiyanti, 2019). The use of organic fertilizers for plants can improve the quality and quantity of harvests, and can improve the nutrients found in the soil as a planting medium for plants. One good organic fertilizer to use for plants is organic fertilizer derived from rice washing water waste, which has various benefits for plants, is environmentally friendly and easy to obtain at a relatively cheap price for farmers. According to Wardiah and Linda (2014), rice washing water can be used as a substitute for chemical fertilizers because rice washing water has the potential to increase pakchoy growth. Rice washing water has various benefits including being easily available to farmers, cheap, affordable, and environmentally friendly (Taher, 2022).

Rice washing water has a positive effect on plant dry weight and also contains growth regulators by inhibiting apical domination and young leaves so that ZPT can stimulate the formation of roots, stems and root branches (Lalla, 2018). Rice washing water with various concentrations on pakchoy plants, that 100% rice washing water showed all the best concentrations for all parameters. Rice washing water is industrial waste and household domestic waste which has no economic value, so this rice washing waste must be utilized so that it does not become waste that damages the environment and health. Rice washing water contains vitamins, elements N, P, K, C and B1 with a milky white color, with various dissolved nutrients, namely 80% vitamin B1, 70% vitamin B3, 90% vitamin B6, 50% manganese, 50% phosphorus, 60 % iron (Himayana, 2018). Based on this background, the authors are interested in conducting research with the title ”Growth of Mustard Green Plants (*Brassica*

*juncea* L) With Liquid Organic Fertilizer of Rice Washing Water.

## II. METHODOLOGY

This research was conducted at the Laboratory and Greenhouse of Bung Hatta University, Padang, from February to April 2021. The method used in this study was an experimental method with a completely randomized design consisting of 4 treatments and 5 replications. Data analysis used is analysis of variance (ANOVA). If the confidence level is 95% in the analysis test F count < F table then there is no effect (Ho is accepted Hi is rejected). Conversely, if F count > F table with a confidence level of 95%, it means that there is an influence (Hi is accepted, Ho is rejected) And continued with the Duncan's Multiple Range Test (DMRT) to see the differences between treatments. The tools needed in this study were polybags, buckets, aqua glasses, soil, rulers, labels and stationery and laboratory equipment such as beakers, measuring cups, funnels, thermometers, pH paper and others.

The materials used in this study were green mustard seeds, rice washing water waste, brown sugar and EM4. To make POC from rice washing wastewater, it can be done by preparing as much as 1.5 liters of rice washing wastewater, which is added with ½ kg of sugar and 20 ml of EM4. According to Satriawi (2019), the concentration of taking POC for rice washing water is by treating P0 without giving POC for rice washing water, P1 is 5 ml of rice washing water/0.5 L of water/day. P2 15 ml POC rice washing water/0.5 L water/day, P3 25 ml POC rice washing water/0.5 L water/day. The observed variables in this study were looking at each treatment starting from seedling acceleration, plant height, number of leaves (strands), leaf length.

## III. RESULT AND DISCUSSION

In this study, it was observed that for each different concentration, the growth of plant height and number of leaves (strands) were affected by the use of POC from rice washing waste, but had no effect on leaf length and seedling acceleration. Table 1 shows that there were no significant changes at the time of seeding because the average seedling acceleration was considered the same, both untreated and treated. The cotyledons appeared above the soil surface 3 days after sowing, and the seeds grew and had leaves after 1 week of planting. According to Adelia (2013), that the element Nitrogen (N) affects the initial growth of stems, leaves and roots.

Table 1. Average Results of Nursery Acceleration

| **Treatments** | **Observation-(day)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| P0 (**c**ontrol) | - | - | √ | √ | √ | √ | √ |
| P1 (5 ml) | - | - | √ | √ | √ | √ | √ |
| P2 (15 ml) | - | - | √ | √ | √ | √ | √ |
| P3 (25 ml) | - | - | √ | √ | √ | √ | √ |

Description: The sign (√) indicates the growth of leaves on green mustard seeds

The results showed that the average plant height had a significant effect (P<0.05) on the yield of treated or untreated plant height, while the application of POC to rice washing wastewater had no significant effect on plant height (P>0.05). The average plant height for the treatment (P3) was 25 ml/L or 11.50 x 1.25 cm, while the average for the control treatment (P0) was 16.36 x 1.48 cm.

Table 2. The average height of mustard greens in each treatment

| **Treatments** | **Plant height (cm)** | |
|---|---|---|
| | Beginning | End |
| P0 (control) | 3,70 ± 0,30 | 16,36 ± 1,48$^{b}$ |
| P1 (5 ml/L) | 3,36 ± 0,66 | 14,30 ± 1,90$^{ab}$ |
| P2 (15 ml/L) | 3,96 ± 0,57 | 14,76 ± 2,41$^{ab}$ |
| P3 (25 ml/L) | 3,46 ± 0,25 | 11,50 ± 1,25$^{a}$ |

Note: The same superscrip letter behind the mean number in the same column indicates a significant difference (P>0.05) while a different superscrip letter behind the mean number in the same column indicates a significant difference (P<0.05).

As can be seen in Table 2, both treated and untreated POC of rice washing water had a significant effect (P<0.05) on the average yield of the observed plant height. The most prominent development was in the control treatment (P0) to be specific (16.36 ± 1.48 cm) and the normal decrease was greatest in the treatment (P3) 25 ml/L in particular (11.50 ± 1.25 cm). Based on Siagian's research (2018), that the administration of POC for rice washing waste did not significantly affect the growth of plant height at 1 week of age, this was due to the nature of organic fertilizer which was slow to become available in the soil so that the utilization of rice washing water waste could not be utilized by lettuce plants.

Duncan's test showed that plant height in treatment P0 (control) was significantly different from plant height in

treatment P3 (25 ml/L), and vice versa in treatment P3 (25 ml/L) was significantly different from plant height in treatment P0 (control). Plants were greatly affected by the treatment without POC to control rice washing water waste because the soil nutrients can be absorbed properly by plants without any obstacles. Although P1 (5 ml/L) and P2 (15 ml/L) were not significantly different from the other treatments, this was because the plants were unable to absorb nutrients due to the effect of pH on the fertilizer and media which made the planting soil conditions more acidic. An acidic soil environment greatly affects the availability of nutrients in the soil. Acidic soil can inhibit the activity of microorganisms that provide macro and micro nutrients, especially N and P nutrients in the soil, thereby inhibiting plant growth.

Table 3. The average number of leaves of mustard greens in each treatment

| **Treatments** | **Number of Leaves (strands)** | |
|---|---|---|
| | **Awal** | **Akhir** |
| P0 (kontrol) | 3,00 ± 0,00 | 6,66 ± 0,57$^{b}$ |
| P1 (5 ml/L) | 3,33 ± 0,57 | 6,00 ± 1,00$^{ab}$ |
| P2 (15 ml/L) | 3,00 ± 0,00 | 6,66 ± 0,57$^{b}$ |
| P3 (25 ml/L) | 3,33 ± 0,57 | 5,00 ± 1,00$^{a}$ |

Note: The same superscrip letter behind the mean number in the same column indicates a significant difference (P>0.05) while a different superscrip letter behind the mean number in the same column indicates a significant difference (P<0.05).

Based on table 3, there was no significant effect (P>0.05) on the observed average number of leaves (sheets), but a significant effect (P<0.05) on the growth of the number of leaves by administering POC of rice washing wastewater without treatment. The control treatment (P0) had the highest growth in the number of leaves, which was an average of 6.66 ± 0.57 cm, not significantly different from the treatment (P2) of 15 ml/L. While treatment (P3) had the lowest average number of leaves, namely an average of 5.00 - 1.00 cm. The number of leaves can be affected by increasing the height of the stem, the higher the stem, the more the number of leaves. Based on the results of the research, the P1 treatment with a dose of 10% on the stem was superior to other treatments (Hanifa, 2022). In addition, plants need quite a lot of nitrogen (N) elements, the availability of nitrogen (N) in plants functions to increase the growth of stem height and number of leaves. Photosynthesis in plants is influenced by the availability of nitrogen (N) in the soil so as to keep the photosynthesis process running smoothly. It is used as energy to maintain plant life such as roots, stems, leaves, accumulated in seeds and fruit.

Based on the information obtained, Duncan's test showed that there was a significant difference in the number of leaves (strands) between the P0 treatment (control) and the P3 treatment (25 ml/L). The P2 (15 ml/L) and P3 (25 ml/L) treatments were significantly different. Treatment P0 (control) and P2 (15 ml/L) were significantly different from treatment P3 (25 ml/L). Plants were greatly affected by the treatment (control) in which POC rice washing water was not given to plants because the soil nutrient content was easily absorbed by plants. In contrast, the P1 treatment (5 ml/L) was not significantly different from the other treatments because the plants were unable to absorb nutrients due to the influence of pH on fertilizers and growing media which caused the soil to become acidic. In an environment with acidic soil, this greatly affects the availability of nutrients in the soil. Acidic soil can inhibit the activity of microorganisms that provide macro and micro nutrients, especially N and P nutrients, so that plants are unable to absorb these nutrients.

Table 4. Leaf length of mustard plants

| **Treatments** | **Leaf Length(cm)** | |
|---|---|---|
| | **Beginning** | **End** |
| P0 (kontrol) | 0,66 ± 0,05 | 5,93 ± 1,65$^{a}$ |
| P1 (5 ml) | 0,53 ± 0,11 | 4,43 ± 0,66$^{a}$ |
| P2 (15 ml) | 0,93 ± 0,05 | 5,83 ± 1,44$^{a}$ |
| P3 (25 ml) | 0,73 ± 0,15 | 3,80 ± 0,70$^{a}$ |

Note: The same superscrip letter behind the mean number in the same column indicates a significant difference (P>0.05) while a different superscrip letter behind the mean number in the same column indicates a significant difference (P<0.05)

Based on table 6, there was no significant increase in leaf length (P>0.05) with treated and untreated POC of rice washing wastewater. The control treatment (P0) had the highest leaf length growth (5.93 ± 1.65 cm), while the 25 ml/L treatment (P3) had the lowest average (3.80 ± 0.70 cm). According to Oviyanti (2016) that the width and length of the leaves will affect the metabolism of mustard plants, especially during the photosynthesis process. Giving more and more fertilizer will stimulate plant cell metabolism that occurs in meristimatic tissue at the point of leaf growth. Quite a lot of nutrients such as N, P, and K components. Especially N, which works a lot together to stimulate plant growth, these

components can be utilized by plants as food because the mineralization process continuously causes various nutrients to be released freely gradually. Gradually so that the process is used by plants as food. The concentration in the treatment of giving rice washing waste water to mustard plants was too little, so the effect of adding POC to rice washing waste was not significant. According to Oviyanti (2016), the application of gumal leaf liquid organic fertilizer with increasing concentrations will have a good impact on plant conditions without disrupting growth and metabolic processes. Based on the statement of Suwardani, et.al., (2014), giving low doses cannot supply the macro nutrients needed by plants so that it will slow down plant growth. In Dewi's research (2022), the growth in the POC concentration of rice washing waste is a 100% concentration because it contains the nutrients carbohydrates, vitamin B1, phosphorus, nitrogen, magnesium, and sulfur. While the lowest growth was with P0 concentration (0% content of rice washing waste) due to the low nutrient content contained.

From the data it can be concluded that the results of Duncan's test showed that leaf length in treatments P0 (control), P1 (5 ml/L), P2 (15 ml/L), and P3 (25 ml/L) was not significantly different. different from all actions. This is because plants find it difficult to absorb nutrients because the pH in fertilizers and growing media makes the soil acidic. In an acidic soil environment, this greatly affects the availability of nutrients in the soil. Acidic soil can inhibit the activities of microorganisms which make macro and micro nutrients available, especially N and P nutrients in the soil so that nutrients cannot be absorbed by plants which results in stunted plant growth and small plant growth. The adequacy of plant nutrients can affect plant growth, namely it will grow tall and have wide leaves. While nutrient deficiencies can make plants stunted and small (Lakitan, 2011).

Table 5. Results of Analysis of POC Nutrient Content of Rice Washing Water Waste

| No. | Parameters | Unit | * Analysis Results | ** Quality Standards for Agriculture |
|---|---|---|---|---|
| 1. | Nitrogen | % | 0.050 | 2-6 |
| 2. | Fosfor | % | 0.072 | 2-6 |
| 3. | Kalium | % | 0,021 | 2-6 |

Source: *Basic Chemistry Laboratory Proclaimers III Campus, Bung Hatta University, 2021 ** Minister of Agriculture of the Republic of Indonesia Number 261 of 2019

According to Astuti (2022), nutrients absorbed by plants are used, among other things, to compose plant parts. Research and Technology Laboratory, Faculty of Agriculture, University of North Sumatra (2013) found that the nutrient content of topsoil planting media was 1.40 percent nitrogen, 5.12 percent P2O5, and 0.05 percent K2O. Each type of plant, as well as the same type of plant with different levels of production, requires a different amount of nutrients to make the plant parts. According to Astuti (2022), plant growth is hampered by acidic soil which contains ammonium fertilizer, which has a negative impact on plants. According to BPPP (2011), the C/N ratio is a factor which is one of the most important processes in composting. The statement that the C/N of solid organic fertilizer (C/N 4.62 percent) and liquid organic fertilizer (C/N 3.06 percent) is too low, namely below 10%, further supports this explanation. While the C/N of an organic fertilizer or compost that is good for use as a nutrient enhancer is in the range of 15-20%. The ideal C/N ratio for composting should be between 15 and 20 percent. The activity of biological microorganisms will decrease if the C/N ratio is high. Ammonia will be lost through evaporation as excess nitrogen (N) which is not utilized by microorganisms if the C/N ratio is too low.

## IV. CONCLUSION

In this study, it can be concluded that liquid organic fertilizer (POC) from rice washing wastewater affects the growth of plant height, number of leaves (strands), but has no effect on seedling and leaf length. At the time of seeding the average parameter acceleration occurred 3 days after planting for each treatment and replicates. Judging from the height of the plant, P0 was the highest growth (16.36 ± 1.48 cm), and the lowest average was found in treatment (P3) 25 ml/L, namely (11.50 ± 1.25 cm). Judging from the number of leaves in the control treatment (P0), there were a large number of leaves (6.66 ± 0.57 cm). and treatment (P3) 25 ml/L with the lowest average number of leaves (5.00 ± 1.00 cm). while the highest leaf length was found in the control treatment (P0), namely (5.93 ± 1.65 cm) and the lowest average was in the treatment (P3) 25 ml/L, namely (3.80 ± 0.70 cm).

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