

EFFECT OF LOCAL MICROORGANISM (BANANA HUMP WASTE) DOSAGE TO VARIETIES OF MUSTARD CROPS (*BRASSICA SINENSIS*, L.)

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Abstract

Local microorganisms can replace the role of chemical fertilizers and other fertilizers circulating in the market, the manufacture is not complicated and does not require expensive because it uses enough waste for example is a banana hump that has been produced. Mustard commonly favored by the Indonesian community, namely the common mustard greens called mustard fried rice and pakchoy usually also called mustard greens. Production of mustard plants on 2012 until 2016 is relatively small at 0.17% compared to cabbage crops that reach 4.86%, this is due to the high price of fertilizer that is not reached by farmers. The objective of the study was to examine the response of varieties of mustard to the dosage of local microorganisms (banana hump waste). The experiment was conducted in experimental green house of experiment University of Muhammadiyah Malang, using factorial randomized block design. The first factor is varieties of mustard (pakcoy and mustard greens), second factor is the dosage of local microorganisms (7.5 ml / plant, 10 ml / plant and 12.5 ml / plant), the concentration used is 0.10% or 100 ml / l water. The results of the research showed that there was no significant interaction between the treatment of the dosage of local microorganisms with the treatment of varieties of mustard, but each mustard varieties showed a significantly different response to the treatment of the tested dose, as indicated by the growth and yield of the two mustard varieties.

Key words: banana hump, mustard, waste

1. INTRODUCTION

Mustard (*Brassica juncea* L.) includes leafy vegetables belonging to the *Cruciferae* family favored by the community, apart from its economical price, the mustard greens have good benefits for the body. Mustard is a crop that is easy to cultivate, mustard plants generally grow and develop well in mountain areas with sufficient temperature and stable temperature. Mustard commonly favored by the Indonesian community, namely the common mustard greens called mustard fried rice and pakchoy usually also called mustard greens in some specific places in Indonesia.

Increased production of mustard plants on 2012 until 2016 is relatively small at 0.17% compared to cabbage crops that reach 4.86% (Departemen Pertanian, 2016), this is due to the high price of fertilizer that is not reached by farmers. Soaring fertilizer prices make farmers often lose, because of high production costs and inadequate with the sale value of planted crops [3].

Local microorganisms are groups of microorganisms capable of decomposing organic waste into liquid organic fertilizer so that it can be utilized by plants, cheaply priced and does not cause environmental pollution. Local microorganisms can be used as starter in the manufacture of organic fertilizer through the decomposition of organic matter in solid or liquid form [2]. The main ingredients of local microorganisms are usually derived from carbo hydrate, cellulose, glucose and the source of the microorganism itself which is then fermented.

The study was conducted to test the response of some varieties of mustard to the dosage of local microorganisms (MOL) derived from banana hump waste.

2. MATERIALS AND METHODS

The research was conducted at Green House Trial Garden University of Muhammadiyah Malang East Java, height of place $\pm$ 500 m above the sea level, temperature average of 24-27°C, the rainfall $\pm$ 195, 83 mm / year.

The materials used in this study were subsoil, banana hump waste, straw, rice water, molasses, meat mustard and green mustard seedlings (*Brassica rapa* var. *parachinensis* L.)

The research design was carried out using Randomized Block Design (RBD) method factorially with 2 treatment factors: first factor was variety of mustard varieties: meat mustard/ pakcoy (V1) and greens mustard (V2). The second factor is the dose of Local Microorganism (MOL), consisting of: D1 = 7,5ml / plant; D2 = 10ml / plant and D3 = 12,5ml / plant. Each treatment combination was repeated 4 times

MOL making process that is as much as 5 kg banana hump that have been cleaned and cut into pieces / in small chopped then put into the vat, then mixed with 1.5 liters of molasses and 25 liters of laryener (rice water), barrel closed and fermented for 3 weeks then filtered to be taken only part of the solution.

Green mustard seed and meat mustard seed that have been sown at the age of 10 days or have grown leaves 3-4 leaf blossom planted on polybag size 25cm x 25cm that has filled the soil, and applied rice straw 15 g / polybag

Apply Local Microorganisms (MOL) at 10 HST in accordance with the prescribed Local Microorganisms on mustard plant using dosage 7.5 ml/ pant, 10 ml/ pant, 12,5 ml/ pant at concentration 100 ml / l with frequency 7 days.

Observations conducted at harvesting done at age 50 days after planting. Harvesting is done by removing the mustard from the planting medium and clean the roots of mustard plants from the remnants of planting media attached. Observation was done every 7 days started at 10 dap (Day After Planting) with observation parameters as follows: plant height; number of leaves; leaf area; the amount of chlorophyll; wet weight and dry weight. Quantitative data were analyzed using various analysis, followed by Real Difference Type test of 5% level.

3. RESULT AND DISCUSSION

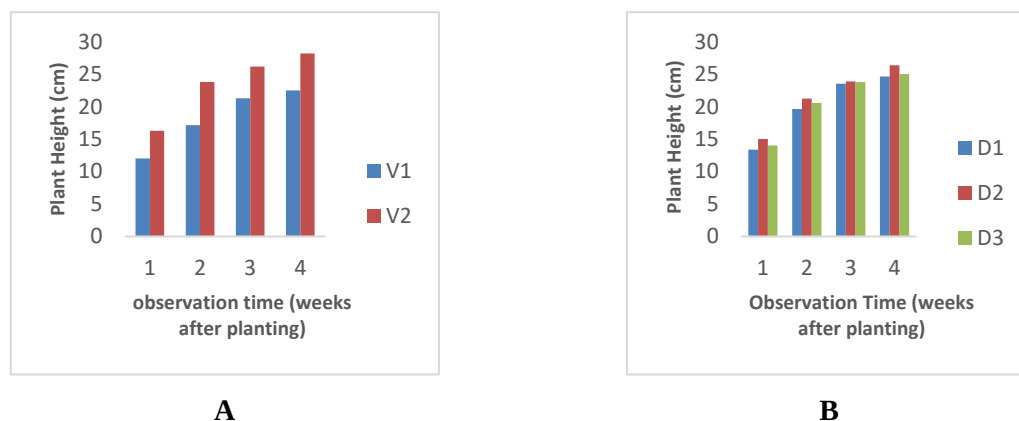
3.1. Result

The results showed that there was no real interaction between the treatment of varieties and treatment of local microorganism doses of banana hump to the growth and result of mustard. This is shown in the observation variables which included: plant height, leaf number, leaf area, leaf chlorophyll content, wet weight of plant and dry weight of plant. The observation result of each variable is presented in Figure 1, Figure 2, Figure 3, and Figure 4.

Treatment of varieties showed different responses to the dosage of local microorganisms of banana hump waste where the green mustard variety were more responsive than the pakcoy mustard variety for plant height growth and for leaf area this is shown in Figures 1 A and Fig 3 A, otherwise the pakkoy mustard varieties more responsive to the doses of local microorganisms of waste banana stumps for leaf number formation, chlorophyll content, and wet weight of plants shown in Figure 2 A and Figure 4 A.

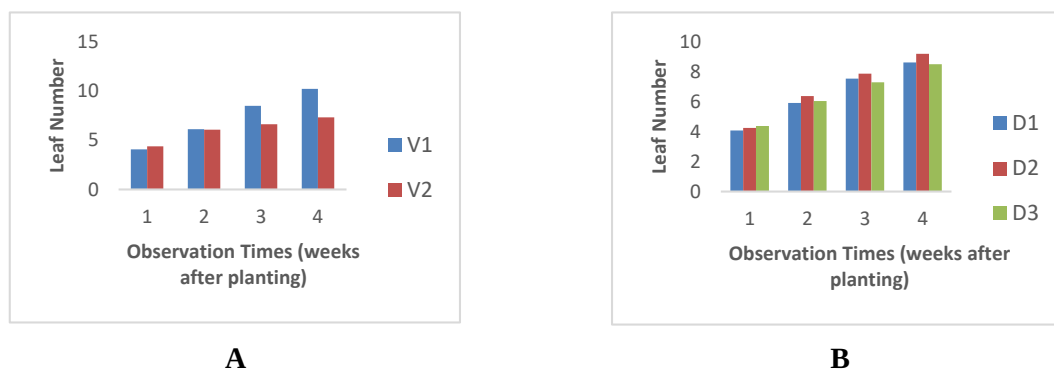
Treatment of dosage of local microorganisms of banana hump waste showed significant difference to growth and yield of mustard varieties of meat mustard (pakcoy) and green mustard, where the treatment of local microorganism doses of good banana hump waste was D2 (10 ml / plant). This is shown in the variable of leaf number, leaf area, and wet weight of the plant (Figures 2 B, 3 B, and 4 B). While on the variable height of plant, chlorophyll content and dry weight of plant, treatment of dosage of local microorganism of banana cobs waste did not show the real difference shown in Figure 1 B and Figure 4 B.

Figure 1. High of Mustard Plants Due to treatment of Local Microorganism Doses of Banana Hump Waste.



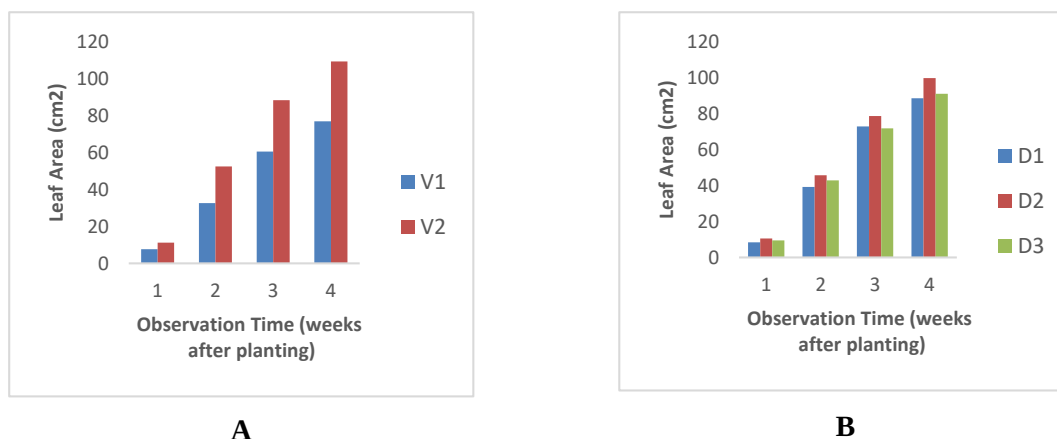
- A. Plant Height of Each Mustard Varieties Every Age of Observation (V1: meat mustard / pakcoy; V2: green mustard)
- B. Plant Height Due to Treatment of Local Microorganisms Dosage of Banana Hump Waste (D1: 7.5 ml / plant, D2: 10 ml / plant, D3: 12.5 ml / plant)

Figure 2. Leaf Number of Mustard Plants Due to Treatment of Local Microorganism Doses of Banana Hump Waste.



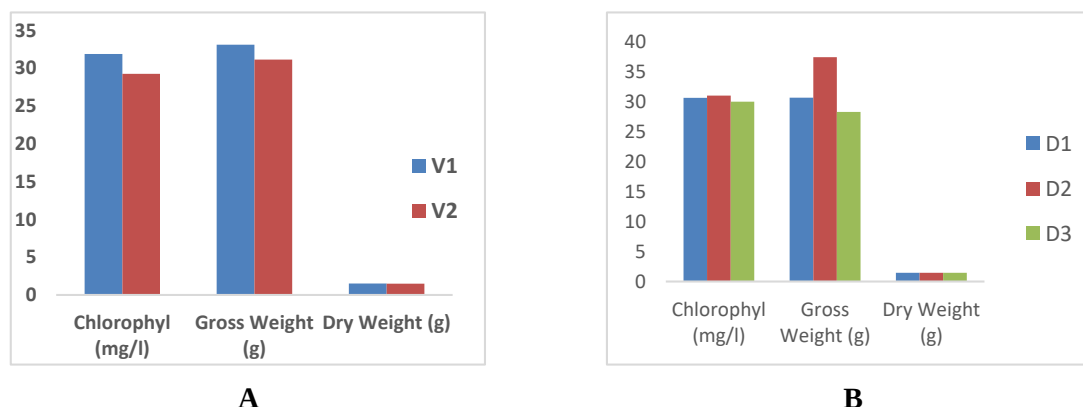
- A. Leaf Number of Each Mustard Varieties Every Age of Observation (V1: mustard / pakcoy; V2: green mustard)
- B. Leaf Number of Mustard Plant Due to Treatment of Local Microorganisms Dosage of Banana Hump Waste (D1: 7.5 ml / plant, D2: 10 ml / plant, D3: 12.5 ml / plant)

Figure 3. Leaf Area of Mustard Plants Due to Treatment of Local Microorganism Doses of Banana Hump Waste.



- A. Leaf Area of Each Mustard Varieties Every Age of Observation (V1: mustard / pakcoy; V2: green mustard)
- B. Leaf Area of Mustard Plant Due to Treatment of Local Microorganisms Dosage of Banana Hump Waste (D1: 7.5 ml / plant, D2: 10 ml / plant, D3: 12.5 ml / plant)

Figure 4. Chlorophyll Level, Weight Wet and Dry Weight of Mustard Plants Due to Treatment of Local Microorganism Doses of Banana Hump Waste.



- A. Chlorophyll Level, Weight Wet and Dry Weight of Mustard Plants (V1: mustard / pakcoy; V2: green mustard)
- B. Chlorophyll Level, Weight Wet and Dry Weight of Mustard Plants Due to Treatment of Local Microorganisms Dosage of Banana Hump Waste (D1: 7.5 ml / plant, D2: 10 ml / plant, D3: 12.5 ml / plant)

3.2. Discussion

Plant growth is a process of increasing the number and size of leaves and stems. The increase in leaf size is often used as a measure of plant growth. In addition to the formation of leaf green varieties of mustard, the response also to the dose of local microorganism of banana hump waste for plant height increase (Figures 1 A and B). Leaves are one of the main structures of plants that have a major function in implementing the process of photosynthesis. Chlorophyll is an important element in the process of photosynthesis, the content of chlorophyll determines the results of photosynthesis (Harizena, 2012), chlorophyll a and chlorophyll b are the main pigment of photosynthetic, which absorbs light violet, blue, red and reflect green light (Widjajanto, 2017).

The leaf area on the green mustard plant is affected by the nutrients needed by the plant. As shown in Fig. 3 (A and B), it appears that green mustard varieties are more responsive to the local microorganism dose of banana hump waste for the formation of leaf area than the meat mustard / pakcoy. Nutrition that plays an important role on the growth of leaf width is nitrogen and other nutrients such as phosphorus, calcium, carbohydrates and others (Badan Standart Nasional. 2014). The much needed nutrient elements for leaf formation and crop production are N elements absorbed through the roots in the form of nitrate or ammonium ions. The most influential nutrient element on leaf growth and development is the N element, the main role of nitrogen for plants is to stimulate overall growth, especially stems, leaves and buds (Handayani, *et al.*, 2015). N levels of many elements generally produce more leaves and larger (Agriculture Syllabus, 2009). N, P, and K nutrient elements are the most nutrient absorbed by plants, so that if there is a lack of these elements will cause the decrease of growth activity and production of plants.

In the early growth of the plant requires a large amount of nutrients, with the availability of nutrients in sufficient quantities and balanced then the process of photosynthesis, and the process of elongation of cells will take place quickly resulting in several plant organs grow quickly, especially in the vegetative phase (Arinong, 2008). Organic fertilizers increase the availability of nutrients N, P, and K, and improve soil structure (Agriculture Syllabus. 2009). The high low dry matter of the plant depends on the number or absorption of nutrients by the roots that take place during the growth process (Aries Alfajri. 2015), if photosynthesis proceeds well then the plant will grow well and the roots will grow well too and followed by increased dry weight of the plant. Plant production is usually more accurate when expressed in dry weight rather than wet weight, because wet weight is strongly influenced by moisture (Arinong. 1998).

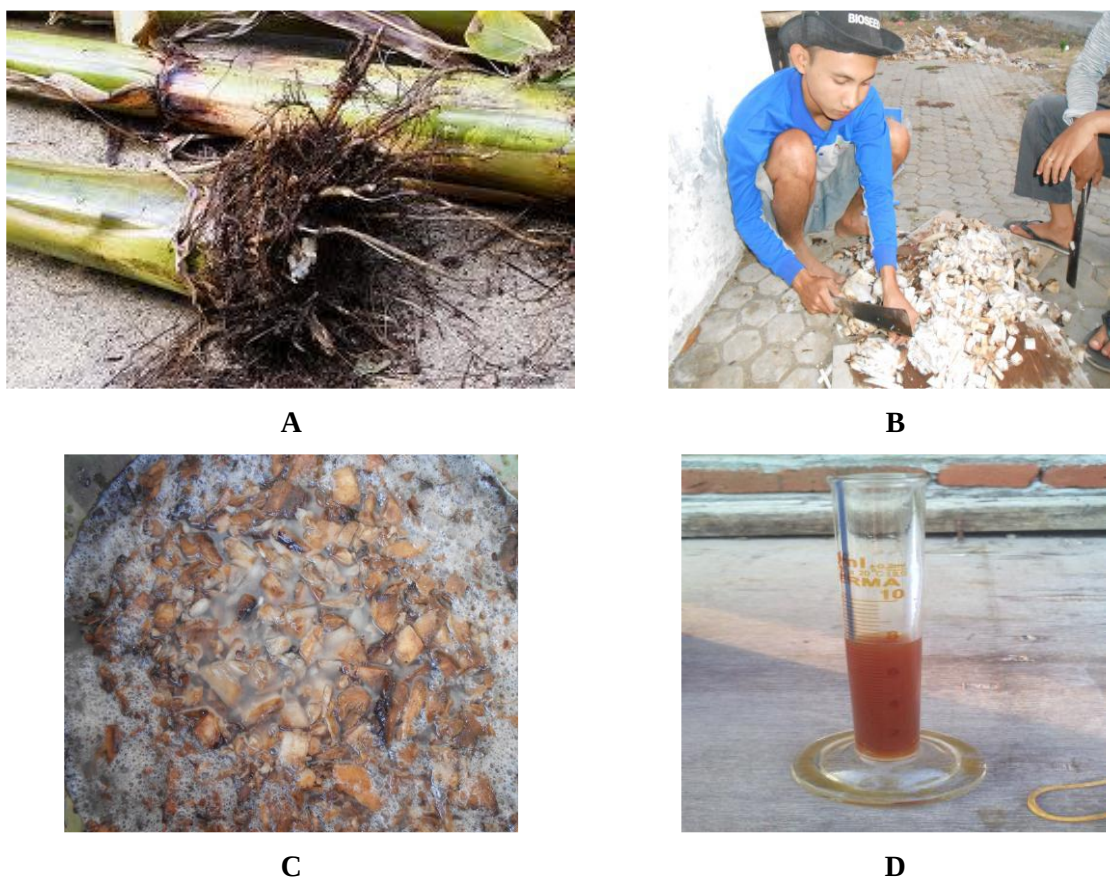
Each of the tested varieties showed different responses to doses of local microorganisms of banana hump waste. Organic matter / waste materials whose function supports the availability of soil nutrients also enable microorganisms to grow and grow (Seni, dkk., 2014). For example fruits and vegetables that contain *Lactobacillus plantarum* *Lactobacillus pentosus*, *Lactobacillus brevis*, play an important role in producing liquid organic fertilizer containing nutrients elements Nitrogen, Phosphor and Potassium, Lactic acid bacteria are turning waste into something that is not harmful in the process of decomposition naturally (Agrotekno., 2015). As stated by Setianingsih (2009) that MOL banana hump has a role in the growth of vegetative plants and makes plants tolerant to disease. High levels of phenolic acids help the binding of Al, Fe and Ca ions to help the availability of P elements in the soil.

The microorganism population that contributes to basic processes can support the stability and productivity of agroecosystems (Astuti, *et al.* 2014). Several investigations of microorganisms and organic matter in soils aim to improve the diversity, dynamics and importance of soil microbial communities, benefit and participate in agricultural productivity and sustainability. Contribution of Plant Growth Promoting Rhizobacteria and Cyanobacteria in the development of safe and sustainable agriculture.

4. CONCLUSION

There is no interaction between the treatment of varieties of mustard and the dosage of local microorganisms of banana hump waste to the growth and production of mustard. Each of the mustard varieties tested showed different responses to growth and yield. The optimum dosage of local microorganisms of banana waste is 20 ml / plant.

Figure 5. The Process of Making Local Microorganisms Waste Banana Hump



- A. Banana Humps Before Cleaning
- B. Banana Humps After Cleaning and Cutting Small
- C. Banana Humps After Small Cut (B), then Mixed with Rice Water / *Leri* and Molasses subsequently Fermented for 3 Weeks
- D. After Fermentation Process (C) then Filtered, and Obtained Solution Containing Local Microorganisms

Figure 6. Plant Morphology of Mustard: Green Mustard (A and B); Meat Mustard/ Pakcoy (C and D)





C



D

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