

## **CREATION OF LOCAL MICROORGANISMS (MOLES) WITH THE USE OF HOUSEHOLD VEGETABLE WASTE AS A STARTER/DECOMPOSER FOR COMPOST FERTILIZER MAKING**

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### **ABSTRACT**

Local Microorganisms (MOL) are microorganisms made from natural materials as a medium for the development of microorganisms that are useful for accelerating the destruction/decomposition of organic matter (the process of decomposition into compost/organic fertilizer). In addition, it can also function as additional nutrients for plants, Local Microorganisms contain macro and micro nutrients and also contain microbes that have the potential to be a catalyst for organic matter, growth stimulants and as plant disease pest control agents. Based on the content contained in the MOL, MOL can be used as a decomposer, biofertilizer, and as an organic pesticide. This type of research is an experiment, by making a formulation of MOL solution based on the content/concentration of coconut water in the MOL solution, the bacterial content in the sample based on laboratory testing of Samples 1.2 and 3 with values (3.57 x 10<sup>6</sup> CFU/ml, 3.86 x 10<sup>6</sup> CFU/ml and 3.94 x 10<sup>6</sup> CFU/ml). The purpose of making the formulation of MOL solution in this study is to see the effectiveness of local microorganisms (MOL) in accelerating/shortening the time of the decomposition process of organic waste in making compost, the fastest decomposition value/time in samples 1-4 with the amount of starter/decomposer solution used 1 liter requires a decomposition time of 5 weeks.

**Keywords:** Local Microorganisms, Starter/Decomposer, Compost Fertilizer

### **INTRODUCTION**

The high generation of waste in Indonesia is one of the problems that the Indonesian government is focusing on in finding a solution to this problem. The Ministry of Environment and Forestry said that in the 2019-2022 period, as much as 29.3 million tons in 2019 with an average daily production of 80,210 tons, In 2022, the amount of waste production jumped to 33.9 million tons a year with an average daily waste generation of 92,960 tons. The largest composition of waste is sourced from households, which reaches 35.42 percent. In the 2023 LIKE Festival activity, the government together with the Ministry of Environment and Forestry (MoEF) invited the community to manage the waste produced before being disposed of in landfills, so that zero waste and net zero emissions were achieved. Efforts to support the government in reducing waste generated from household activities by utilizing vegetable waste as a starter/decomposer of Local Microorganisms (MOL) Vegetable waste has the potential to become a starter/decomposer because it has a high acid content and beneficial microbes, in order to accelerate the decomposition of organic waste into compost so that waste arising from household activities can be reused.

Local microorganisms (MOLs) have a role as activators or additional nutrients for plants. Local

microorganisms (MOLs) are also one of the decomposers that can be used for decomposition and are one of the rapidly growing decomposers in today's organic farming systems. MOL is indispensable in organic farming systems to create quality and healthy agricultural products and create sustainable agriculture (Kesumaningwati, 2015). MOL also acts as a bioactivator of liquid organic fertilizers (Jamilah and Juniarti, 2014).

The manufacture of Local Microorganisms (MOL) by utilizing vegetable ingredients has also been carried out by CS before. Utama., A. Mulyanto in 2009 with the title Potential of Vegetable Market Waste to become a Fermentation Starter with a fermentation period of 6 days containing a total of 2.1 x 10<sup>10</sup> CFU/ml of bacteria. 1 Preparation of Local Microorganisms (MOL) by N.M. S. Sukmawati<sup>1</sup>, N. W. Suniti and I N. Sujana with the research title Application of Fermentation Technology in the manufacture of leaf and fruit-based Biostarters in the village of Baturiti Tabanan showed that fruit-based biostarters have acidic bacteria content Higher lactate than leaf-based ones (8 x 10<sup>6</sup> CFU/ml VS 6.95 x 10<sup>6</sup> CFU/ml) Effect of EM4 Formulation, Coconut Water, Brown Sugar in the Preparation of Liquid Biourine Organic Fertilizer on the Early Growth of Red Ginger, where the results of the study showed that the lowest pH value

was found in P5 using a mixture of 180 ml coconut water and 160 ml brown sugar. Subsequent observations at the final pH of the POC showed a decrease in pH and tended to be acidic. The pH value tends to decrease because microorganisms produced from the addition of coconut water, pH is one of the factors that affect microbial activity in organic matter decomposition media.

## RESEARCH METHOD

### Material and Equipment

Body lotion can be made using the following ingredients: limbah sayuran (kangkung, kubis, sawi), air kelapa, gula merah, dan air putih. The equipment used in this study includes ember, pengaduk, baskom 5 liter, dan telenan.

### Local Microorganism Manufacturing (MOL)

- Formula 1 (MOL A) 1. Kale, cabbage and mustard greens (1 kg) 2. Coconut water 1 liter 3. Brown sugar 200 grams 4. Water 2 Liters 5. Fermentation time 1 month.
- Formula 2 (MOL B) 1. Kale, cabbage and mustard greens (1 kg) 2. Coconut Water 2 Liters 20 3. Brown sugar 200 grams 4. Water 1 Liter 5. Fermentation time 1 month.
- Formula 3 (MOL C) 1. Kale, cabbage and mustard greens (1 kg) 2. Coconut Water 3 Liters 3. Brown sugar 200 grams 4. Fermentation time 1 month d.
- Formula 4 1. 200 ml EM4 Solution 2. Brown Sugar 200 grams 3. Water 3 Liters 4. Not through the fermentation process

### Composting from leaf waste leaves with the formula 4 Starter/Decomposer (MOL/EM4)

No	Sampah Rumah Tangga (Daun Kering & Sayuran)	MOL A (Formula 1)	MOL B (formula 2)	MOL C (formula 3)	Starter EM4
1	5 Kg	1 lt	1 lt	1 lt	1 lt
2	5 kg	0,5 lt	0,5 lt	0,5 lt	0,5 lt
3	5 kg	0,25 lt	0,25 lt	0,25 lt	0,25 lt

### How to make a MOL solution

Vegetable waste is cut into small pieces, then put it in a bucket that has been washed clean, put coconut water in a bucket according to the formula, add 200 grams of brown sugar and dilute, add water according to the formula mix all the dough until homogeneous or evenly mixed, the next step is to put the MOL solution that has been mixed well into the container, after all the ingredients enter the container and close the MOL solution then store for 1 month, and the resulting mole is ready to be used as a starter or decomposer for composting.

### How to Make Compost

Leaf waste is mashed by chopping, weighing all ingredients as much as 5 kg, then leaf waste is mixed/stirred all ingredients in a bucket with the addition of MOL liquid according to the formula until ready for fermentation, then make a hole or excavation and put all the compost material that has

been stirred into the hole and cover it with a tarp, Every 3 days the tarpaulin is opened and turned over several times until it is no longer hot so that decomposing microorganisms do not die, observe until the sample is perfectly cooked

## RESULT AND DISCUSSION

In the composting process, bacteria have an important role, namely to accelerate/shorten the decomposition of compost.

### Graph of Bacterial Populations in MOL

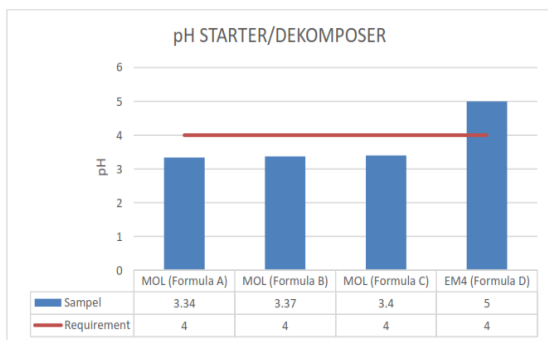
In this study, the author uses coconut water as one of the food sources for bacteria. Micro-creation of local organisms by varying the amount of coconut water used is done to see the growth/population of bacteria in the MOL solution.



**Figure 1.** Graph of Bacterial Populations in MOL

From the graph above, it can be seen that the amount of coconut water used in the manufacture of MOL solution can affect the content/population of bacteria living in the MOL solution. MOL Formula A is a MOL with a coconut water content of 1 liter of bacterial population of  $3.57 \times 10^6$  CFU/ml, MOL Formula B is a MOL with a coconut water content of 2 liters of bacterial population of  $3.86 \times 10^6$  CFU/ml while MOL Formula C is a MOL with a coconut water content of 3 liters of bacterial population of  $3.94 \times 10^6$  CFU/ml, from the three MOL formulas above the most bacterial content/population in Formula C with a coconut water content of 3 liters, This is because the nutrient content of Formula C coconut water needed for bacterial growth is more than the samples in formulas A and B. The bacterial content/population contained in the three MOL solutions is still below the standard based on the Decree of the Minister of Agriculture of the Republic of Indonesia No. 261/KPTS/SR/310/M/4/2019, this is also influenced by several factors, both the type of raw materials and the time / Fermentation process.

### pH Observation Graph from Starter/Decomposer

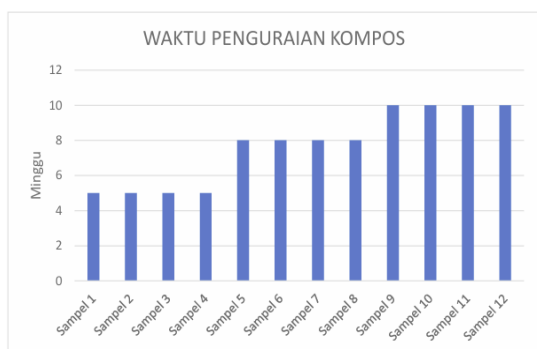


**Figure 2.** pH Starter/Dekomposer

The graph above shows the PH of the four Starters / Decomposers that have met the standards according to the Decree of the Minister of Agriculture of the Republic of Indonesia No. 261/KPTS/SR/310/M/4/2019, namely Starter / Decomposer EM4 (Formula D) with pH 5 while the third MOL Starter / Decomposer is still below the standard, pH is 3.34, 3.37 and 3.40 respectively. The pH value tends to be low, this is due to the formation of organic acids which are the result of microorganisms produced from the addition of coconut water.

### Compost Decomposition Time Chart

The process of decomposing leaf waste into compost normally takes  $\pm$  4-6 months depending on the type of leaf waste, in this study it is hoped that the decomposition time will be shorter with the addition of starter activators/decomposers.



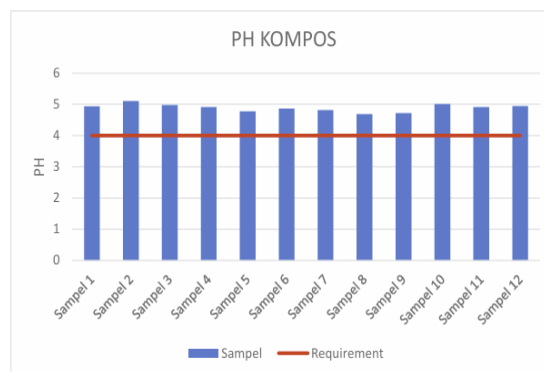
**Figure 3.** Compost Decomposition Time Graph

The starter / decomposer made in this study plays a very important role in accelerating the decomposition of organic waste produced in household activities. From the graph above, it can be seen that sample 1-4 is a sample with a total use of 1 Liter Starter / Decomposer, the decomposition process can be shortened in only 5 weeks, patches 1-3 using the MOL actuator while sample 4 uses the EM4 activator. Microorganisms made from

vegetable waste can have the same decomposing ability as starters/decomposers sold in the market.

### Compost pH Chart

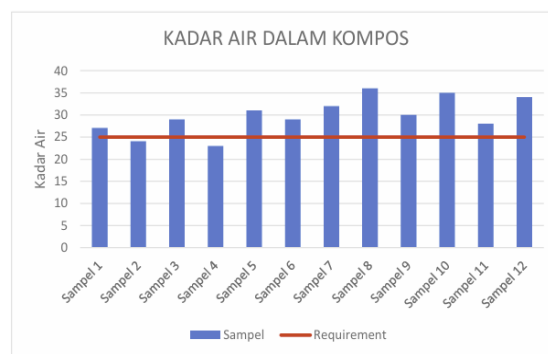
Unsuitable pH conditions will affect the absorption of nutrients by plants. If the pH condition in the plant growing medium is acidic, the absorption of nutrients by plants will be inhibited, which causes late plant growth or dwarfism.



**Figure 4.** Graphic pH Compost

The compost produced in this study has met the pH standard according to the Decree of the Minister of Agriculture of the Republic of Indonesia No. 261 / KPTS / SR / 310 / M / 4 / 2019 so that the compost produced from this research is safe to be applied to plants.

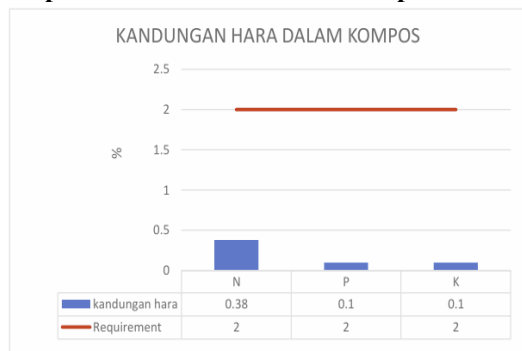
### Graph of Moisture Content in Compost



**Figure 5.** Graph of Moisture Content in Compost

It can be seen in the graph above that the water content in the sample still tends to be high when compared to the standard set out in the Decree of the Minister of Agriculture of the Republic of Indonesia No. 261/KPTS/SR/310/M/4/2019, where the moisture content standard itself is 10-25%. From the research conducted on 12 samples, there were 2 samples with moisture content that met the quality standards, namely samples 2 and 4. The high moisture content in the sample is likely due to the condition of the soil where the compost is being composted which is in a wet condition at that time.

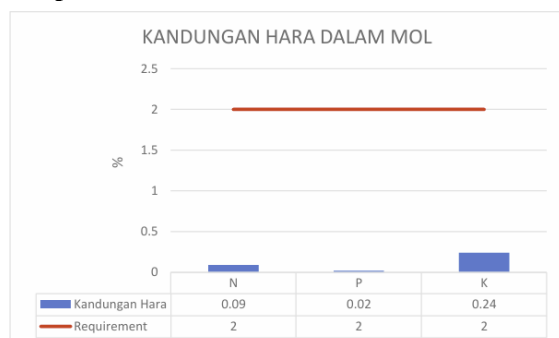
### Graph of Nutrient Content in Compost



**Figure 6.** Graph of Nutrient Content in Compost

The nutrient content in the compost sample in this study is still very far below the standard set out in the Decree of the Minister of Agriculture of the Republic of Indonesia No. 261/KPTS/SR/310/M/4/2019. With a minimum standard of 2 %, the highest nutrient value in the sample is only 0.38. This is possible because the waste material used in this composting is only one type of waste, namely dry leaves, no other vegetables that contain nutrients.

### Graph of Nutrient Content in MOL



**Figure 7.** Graph of Nutrient Content in MOL

Based on the tests that have been carried out on the MOL (Formula C) sample, the nutrient value in the sample is still very far below the standard/quality standard that has been set in the Decree of the Minister of Agriculture of the Republic of Indonesia No. 261/KPTS/SR/310/M/4/2019. where the highest value obtained in element K is 0.24% while the standard is at least 2%. This is likely due to the type of vegetable ingredients used in the manufacture of MOL.

### CONCLUSIONS

The amount of coconut water used in the manufacture of MOL solution can affect the content/population of bacteria living in MOL solution. MOL Formula A is a MOL with a coconut water content of 1 liter of bacteria population of  $3.57 \times 10^6$  CFU/ml, MOL Formula B is a MOL with a coconut water content of 2 liters of bacteria

population of  $3.86 \times 10^6$  CFU/ml while MOL Formula C is a MOL with a coconut water content of 3 liters of bacterial population of  $3.94 \times 10^6$  CFU/ml, from the three MOL formulas made with the most bacterial content/population in Formula C with a coconut water content of 3 liters. And the decomposer (MOL) made in this study plays a very important role in accelerating the decomposition of organic waste produced in household activities as presented in table 4.4 where in a sample with a total use of 1 liter of MOL the decomposition can be shortened in just 5 weeks

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