# Production of Local Microorganism by Utilizing Organic Matter in PT Ultra Peternakan Bandung Selatan

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**Abstract.** Unmanaged waste in livestock can cause pollution, but it can benefit the environment if managed properly. PT Ultra Peternakan Bandung Selatan reported that effluent produced every day from this farm is about 150.000 liter. The application of local microorganisms (MOL) could be practical because used as a starter for decomposition. However, the most efficient way to produce MOL to manage waste effectively in this company needs to be carried out. This study aimed at improving effluent management by using MOL most efficiently from some organic matters. The analysis performed three treatments for making 10 liters MOL: M1 (Main MOL + molasses + water), M2 (Main MOL + mastitis milk), M3 (Main MOL + milk MOL + water). Each treatment was given a dose of 10% and 15% of 10 liters for main MOL, molasses, and milk MOL. The fermentation experiment was carried out by mixing all the ingredients, that is, main MOL, molasses, and water for M1. For the second ingredient, M2 is mixing mastitis milk and main MOL. Then M3 combines the main MOL, milk MOL, and water. After seven days fermented, observations in local microorganism characteristics were pH, density, and brightness value. The result suggested that treatment M2 (Main MOL + mastitis milk) 10% was the most efficient local microorganism reproduce based on the pH is 4,36, density has a value of 531 gram, and brightness value is 897 lux. The study underlined the importance of mastitis milk to produce MOL and seems effective and efficient to improve the effluent before being evacuated to the land.

## 1 Introduction

Waste is an organic or inorganic material that is no longer used, so it can cause severe problems for the environment if not handled properly [1]. If this waste is managed correctly, it can provide added value. Waste generated by cattle consists of solid waste in livestock manure and leftover feed, liquid waste in barn washing wastewater, livestock sanitation wastewater, cow urine, and air waste in the form of an unpleasant odor [2].

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PT Ultra Peternakan Bandung Selatan reported that it produced 150.000 liters of irrigation every day, including liquid waste, urine, water for washing tools, water for cleaning barns, and other activities. PT Ultra Peternakan Bandung Selatan wants to improve the quality of its liquid waste or effluent by mixing local microorganisms to get higher nutrients before irrigating it to the land. In addition, the production of local microorganisms helps utilize cow's milk affected by mastitis so that it is not immediately thrown away, and integrated farming can be applied. Local microorganisms are materials available in the environment and can decompose organic matter containing degrading microorganisms [3]. The addition of MOL solution has been shown to increase the number of microorganisms so that the decomposition process of organic matter is faster [4].
Therefore, if the concentration of MOL for irrigation on land is required 5% in a day according to the determination of the concentration in the previous experiment, the local microorganism used as a mixture is 7.500 liters per day, so efficient local microorganism production is needed.

## 2 Materials and Methods

This experiment was conducted at PT Ultra Peternakan Bandung Selatan, Jl. Raya Pangalengan No 340, Margaluyu, Pangalengan, Bandung from February 8 to February 13, 2021. The materials used in this experiment were water, mastitis milk, main MOL, milk MOL, and molasses. The tools used to produce the MOL were a jerry can, hoses, pH meters, lux meters, scales, and measuring cups. The formula for the production of Local Microorganisms (MOL) is:

1. M1 = Main MOL + molasses + water.
2. M2 = Main MOL + mastitis milk.
3. M3 = Main MOL + milk MOL + water.

Each formula consisted of 10% and 15% doses, so six treatments. These doses were used for the main MOL, molasses, and milk MOL from 10 liters of water and mastitis milk. So that obtained 1 liter and 1,5 liter respectively in the main material MOL, molasses, and milk MOL. The fermentation experiment was conducted with an anaerobic concept and mixed all the main MOL, molasses, and water for M1. For the second ingredient, M2 is mixing mastitis milk and main MOL. Then M3 combines the main MOL, milk MOL, and water. Fermentation aims to break down complex compounds into simpler compounds.

The selection of these materials to multiply the main MOL is based on organic materials that exist in the surrounding environment and have large quantities. Organic matter can be used as a culture medium (inoculant) for certain local microorganisms (MOL), which can degrade organic waste [5]. In making MOL, fermentation was carried out for seven days and the method used is the anaerobic concept. Anaerobic is a microbiological process without air. In multiplication with this concept, the bacteria that develop may be anaerobic. Observations on MOL production to compare formulas are pH, density, and brightness values.

Making local microorganisms is relatively easy to do by the wider community and farmers. In addition, the role of MOL as an essential component of fertilizer, microorganisms are not only beneficial for plants; they are also helpful as decomposers of organic matter, agricultural waste, household, and industrial waste [6]. The use of local microorganism doses as the decomposition of liquid waste is done with 5% of the liquid waste. According to [7], adding 10% MOL in livestock urine can produce the highest nutrient for plants.

### 2.1 pH

The MOL sample was measured using a digital pH meter in the pH test. pH or degree of acidity is used to express the level of acidity or alkalinity possessed by a substance, solution, or object [8]. pH also plays a significant role in controlling the microbial decomposition rates of organic matter [9]. The pH observation using a pH meter is shown in Figure 1.

**Fig. 1.** The pH observation of MOL by taking samples on a pH meter

### 2.2 Density

Density is defined as mass per unit volume [10]. There are various ways to measure the density of liquids, one of which is using a digital balance and measuring cup (see Figure 2). The purpose of observing density is to see the activity of microorganisms that turn MOL into lumps to increase their density. Density observations were carried out by taking a 500 ml MOL sample in a measuring cup and then weighing it using a digital scale.

**Fig. 2.** The density observation of MOL by taking sample 500 ml on a digital balance

### 2.3 Brightness value

Observation of the brightness value is carried out to determine the electrolyte content in MOL (see Figure 3)). A liquid with high acidity, large or smaller pH value can conduct large currents of electricity [11]. Measurements were carried out using a lux meter to measure light intensity in a dipped using a soil fertility tester on a 500 ml MOL sample. Measurements are taken at a distance of 20 cm and parallel to the light from the bulb.

**Fig. 3.** The brightness value observation by dipped using soil fertility tester to conduct electricity

## 3 Results and Discussion

### 3.1 pH

This high to low pH process flow indicates the decomposition of organic matter. Following [12] research, the pH value tends to be acidic or down, revealing the decomposition process is still running. The pH of the main MOL obtained a value of 7,55; this shows that the pH has increased and is alkaline. According to [13], an increase in pH indicates an autolysis process. This process can increase the pH value because it produces compounds that are autolysis in main MOL is probably due to time storage and air contamination. The lowest pH value is obtained in the MOL M3 formula: main MOL + milk MOL + water; both doses are 3,47 (Fig. 4).

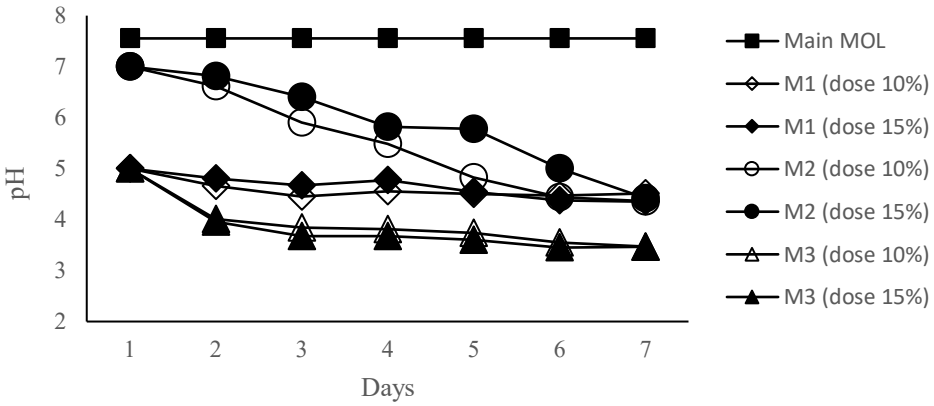


**Fig. 4.** The graphic of pH showing pH values of days 1 to 7

This might be the mixture of ingredients in the MOL of milk has a pH of 3,74, allowing the decomposition process in M3 to be faster. According to [14], the degree of acidity is closely related to the production of organic acids by microbes, especially lactic acid, which can lower the pH to 5,0 or more minor. Observing the pH value for all formulas M1, M2, and M3 on the 7th day had values below 5,0. This means that the organic acids produced by microbes are increasing. In other words, the whole method in the production of the MOL tends to be successful because of the microbial growth in the process. According to [15],

Acidity changes could be evaluated as an indirect characteristic of the growth of lactic acid bacteria.

### 3.2 Density

Figure 5 shows that the density of MOL after days 5 to 7 increased. However, on days 2 and 4, the density of the MOL decreased compared to day 1. This was due to an increase in temperature. According to [16], when the temperature increases, density will decrease. The rise in temperature in this MOL was because of the activities of microorganisms that decompose organic materials, and fermentation produces organic acids, CO2, and heat.

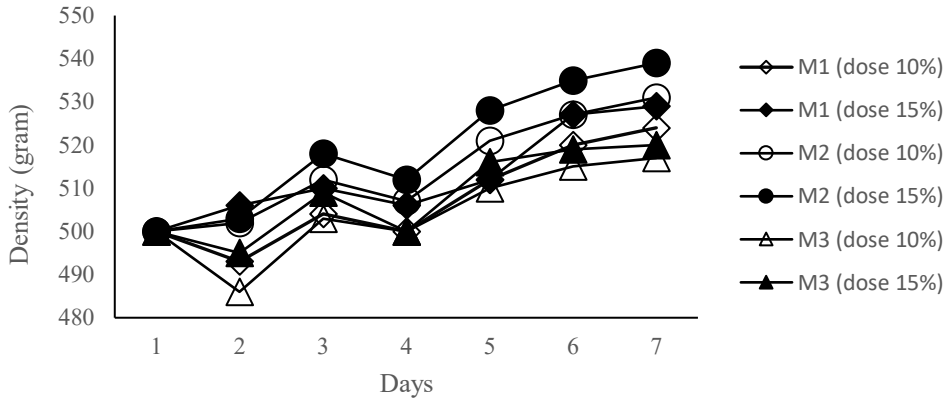


**Fig. 5.** The graphic of density days 1 to 7

One of the factors that cause this is the presence of microbes that decompose organic matter. It decreases pH and changes the character of organic matter such as milk that turns into lumps, causing the density to increase. According to [17], these clots are caused by lactic acid bacteria. The highest increase in specific gravity in this MOL was M2 with a dose of 15%. This is because the ingredients of the M2 formula are milk that turns into lumps. The lowest density is formula M3 with an amount of 10% due to the decomposition process of decomposition of organic matter, namely milk MOL, so the density decreases.
The density analysis results show that the overall formula for MOL tends to be successful because the MOL density increases every day, indicating microbial development and changes in the characteristics of organic matter in the process.

### 3.3 Brightness value

The brightness value is measured using a lux meter. [18] explains that illuminance is many light currents that come in one unit plane, measured by Lux or Lumen/$m^3$. At the same time, the process is called illumination (illumination), namely the arrival of light to an object. Observation of brightness value is influenced by distance and angle during measurement. So distances and angles must be equalized for every measure. The brightness value was taken using a lux meter and a soil tester by taking 500 ml of the MOL sample, then the soil tester was immersed in the MOL sample, and the distance to see the Lux meter brightness value was carried out at 20 cm from the light source.

Based on figure 6, the most considerable lux value on the 10th day was found in M1 at a dose of 15%. This is related to the material from M1; there are molasses. Observations brightness values were also performed on molasses, and the results obtained a value of more than 900. It proves that molasses have an acid content, and [19] mentioned that acidity could generate electrical energy because it is an electrolyte. This observation has a pH value of the brightness and inversely comparison, seen in figures 1 and 3 for the 10th day pH decreased while the brightness value is increased. The expected result of observing the brightness value is to find out the electrolyte produced by the solution associated with acid production.

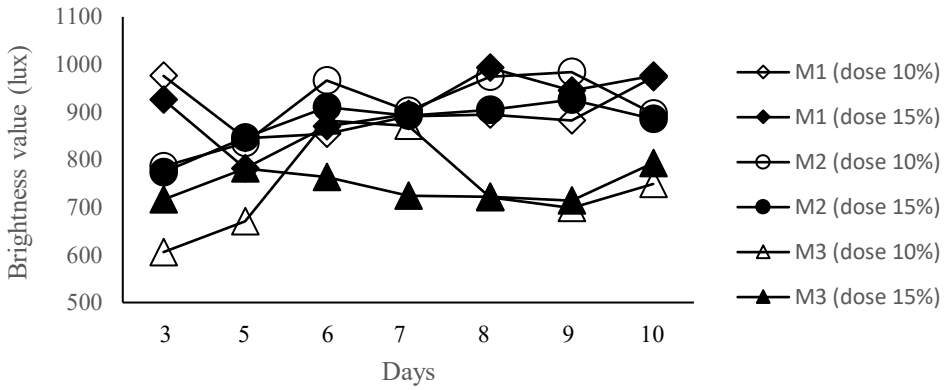


**Fig. 6.** The graphic of brightness value days 3 to 10.

## 4 Conclusion

The study underlined the importance of using the efficient method to produce MOL. The analysis found that the efficient way of producing MOL was the M2 (main MOL + mastitis milk with a dose of 10%). With this method, the pH value has entered below 5; the density increases and the brightness level shows a reasonably good value. In addition, the raw material can be made from mastitis milk so that the MOL propagation target of 7.500 liters/day will be easy and cheap to produce.

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