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THE EM4 ADDITION AFFECT WATER ABSORPTION TIME AND COMPOST QUALITY IN BIOPORE INFILTRATION HOLE

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ABSTRACT

The EM_4 Addition Affect Water Absorption Time and Compost Quality in Biopore Infiltration Hole. For the composting process, a biopore infiltration hole can be used to handle organic household waste. It can be optimized by adding an Effective Microorganism 4 (EM4) activator. This study aims to determine the effect of EM4 addition on water adsorption time, compost weight, and compost quality, according to SNI 19-7030-2004. The compost test's nutrient content was determined at Lamongan Islamic University's Laboratory of Environmental and Health Science. A cylindrical hole was drilled into the ground using a BIH drill with a diameter of 10 cm and a depth of 50, 75, and 100 cm, with a distance of 100 cm for each hole. The materialThe materials used in this study included domestic organic waste, specifically leaves and kitchen waste, a 50-ml liquid EM4 "Agriculture" activator, diluted with 100 ml of distilled water, and 10 grams of granulated sugar. The experiment was conducted for 15, 30, and 45 days. To measure the water absorption time, a 2x1x1 m barrier is needed to accommodate 2 m3. The difference in BIH diameter can affect the rate of infiltration at the Biopores Infiltration Hole (BIH). The measurement's highest water absorption occurred at the beginning of the 15th day. The addition of EM4 affects the decomposition process and can increase the rate of absorption of water for 45 days. The EM4 additions affect the decomposition process's timing. Additionally, the addition of EM4 has an impact on the nutrients in the compost. The addition of EM4 increased the value of C-organic, nitrogen, phosphorus, and total potassium contained in the BIH compost.

INTRODUCTION

Garbage has become a global problem, affecting the entire world and causing various disasters due to its environmental damage [(1)]. Basically, waste is divided into two types, namely organic and inorgaAccording to Public Law Number 18 of 2008 concerning Waste Management in Indonesia, both types of waste frequently require processing to prevent negative impacts on public health and the environment [2]. Organic waste garners significant attention due to its potential to disrupt the environment, particularly through leachate contamination of land and rivers, which can lead to landslides and floods [3]. This issue can negatively impact health and serve as a breeding ground for various diseases [4]. Additionally, organic waste is unsightly, the processing area is limited, and the open dumping system at the final processing site, known as TPA, is unsuitable for processing organic waste and the open dumping system at the finalfinal processingprocessing sitesite (known as TPA) is not suitable for processing organic waste [5].

Using Biopore Infiltration Holes (BIH) is one solution for handling household organic waste [6, 7]. A biopore infiltration hole is an appropriate solution for managing household organic waste. is an appropriate Ensure that the text is free from grFor instance, the sentence "biopore infiltration holes are very appropriate" should be rephrased as "biopore infiltration holes are very appropriate." Additionally, it should highlight the use of environmentally friendly technology to combat flooding [8–10]. Composting with biopore infiltration holes is very appropriate for handling household organic waste because it is easy to manufacture, does not require a lot of space, and the results can be reused by the community [11–13]. Not only is compost produced, but the surrounding soil is also fertile due to the increase in nutrients in the soil [14].

According to De Corato, 2020 [15], the BIH requires 15–45 days for household waste to decompose. In this short period of time, compost is difficult to produce due to areas that are easily exposed to water flow, which causes organic waste that is still in the process of decomposition to be carried away by the flow of water [16]. The process of decomposition or decomposition of organic compounds can be accelerated by the addition of activators [17]. One of the activators that can be used for composting is effective microorganism 4 (EM4) [18–20]. The EM4 activator is widely used in agriculture because it can help improve land quality [21]. EM4 is also used as a starter to accelerate organic matter decomposition, allowing the composting process to take place more quickly [22].

Weide et al. (2020) produced compost through anaerobic fermentation with the addition of EM4, and they identified the ideal operating conditions to achieve high-quality compost. Researchers looked at how the concentration of EM4 affected the time it took for the compost to break down by watching the C/N values drop over 7 days. They found that compost with concentrations of 0.5% and 0.8% broke down the fastest, in 4 days. After that, the effect of the percentage of added sugar and the size of the ingredients on the decrease in the C/N value was observed to determine the optimal conditions for each parameter. According to this research, the optimal conditions were EM4 concentration of 0.8%, material size of 0.0356 cm, and sugar concentration of 0.8%. The composting time was 4 days, and the compost produced complied with SNI 19-7030-2004 standards.

In 2022, Ruslinda carried out previous research on making compost in biopore infiltration holes. The discussion mentions the research by Weide et al. and Ruslinda, but it lacks critical engagement. How do these studies compare? What are their limitations, and how do they inform the current study? The study compares the type of organic waste with the duration of composting. The results show that biopore infiltration holes filled with leaf waste require a decomposition process for 1-month, dry leaf waste and kitchen waste or food waste for 7 days, and kitchen waste alone undergoes a decomposition process for 3 days.

This study aims to determine the effect of adding EM4 on water adsorption time, compost weight, and compost quality according to the Indonesian National Standard (SNI) 19-7030-2004. It is hoped that adding this activator will accelerate the decomposition process while still producing compost that meets SNI standards.

MATERIALS AND RESEARCH METHODS

Study area

The study was carried out from May to November 2022. The BIH was made and sampled at the Graha Indah Estate, located in Tambakrigadung Village, Tikung, Lamongan. The compost test's nutrient content was determined at Lamongan Islamic University's Laboratory of Environmental and Health Science.

Materials

The following tools were used in the study: a thermometer, an analytical balance (Acculab), a pH meter (Pctestr 35), a desiccator (Sanplatec), a vortex (Bohemia), a mechanical shaker (Edmund Buhler SM 25), a centrifuge (Hitachi Himac CR 21G II), an oven (Memmert), a UV spectrophotometer (Hitachi), and an atomic absorption spectrophotometer (AAS) (Shimadzu).

The study used domestic organic waste from the Graha Indah Estate, Tambakrigadung Village, Tikung, Lamongan. This waste consisted of leaves and kitchen waste, along with liquid EM4 "Pertanian" activator produced by PT. Songgolangit Persada Jakarta, granulated sugar, K2Cr4O7 2 N, H2SO4 98%, filter paper W-41, selenium catalyst, Conway indicator, liquid paraffin, buffer solution pH 4 and 7, devarda alloy, NaOH, H3BO3, HCl 37%, HNO3 65%, HClO4 70%, ammonium molybdate (NH4)6

Procedures

Making the BIH

A cylindrical hole was drilled into the ground using an LRB drill with a diameter of 10 cm and a depth of 50, 75, and 100 cm, with a distance of 100 cm for each hole. The mouth or base of the hole is reinforced with a paralon with a diameter of 10 cm and a length of 50 cm, and the sides are perforated.

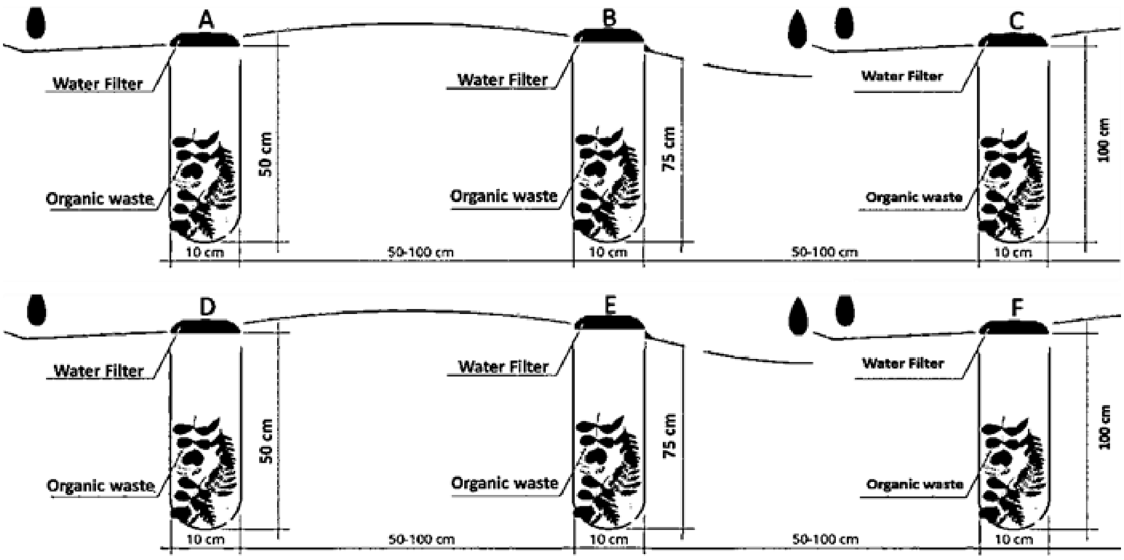

Figure 1 illustrates the Biopore Infiltration Hole Scheme for the experiment.

D: Depth 50 cm without EM4; E: Depth 75 cm without EM4; F: Depth 100 cm without EM4)

Sampling preparation

The raw material used for making compost is domestic organic waste from the Graha Indah Estate, Tambakrigadung Village, Tikung, Lamongan. We collect organic waste in the form of leaves from the yard and vegetable scraps from our domestic kitchen. We filled one kilogram of organic waste into the BIH composter.

Table 1. Sampling variations

Sample name	Depth (cm)	Treatment
A	50	Without EM4
B	75	Without EM4
C	100	Without EM4
D	50	With EM4
E	75	With EM4
F	100	With EM4

EM4 preparation

50 ml of liquid EM4 activator was diluted with 100 ml of distilled water. Furthermore, 10 grams of granulated sugar are added to each EM4 liquid. The addition of sugar aims to activate microorganisms in EM4. The dissolved EM4 and sugar were then allowed to stand for 3 hours.

Composting

A total of 1% EM4 activator solution with different concentrations was sprayed evenly on each piece of waste in 3 BIHs. As a control, 3 BIHs did not have any EM4 added to them (Figure 1). Furthermore, the biopore infiltration hole was tightly closed and left for the duration of the experiment (15, 30, and 45 days for the decomposition process to occur). During the decomposition process, the color and temperature of each sample were checked every 3 days to determine the maturity of the compost. Another step was to take a third of the compost in BIH every 15 days (15, 30, and 45 days) from each biopore infiltration hole and measure its water content, pH, organic carbon content, N-total, total P, and total K.

Water absorption and composting analysis

To measure the water absorption time, a 2x1x1 m barrier is needed to accommodate 1.5 m2 of water. The measurement of water absorption time is carried out on the 15th, 30th, and 45th days. Measurements are carried out using a stopwatch by recording the time from when the water is completely filled until the water is completely absorbed in the BIH in the barrier beam.

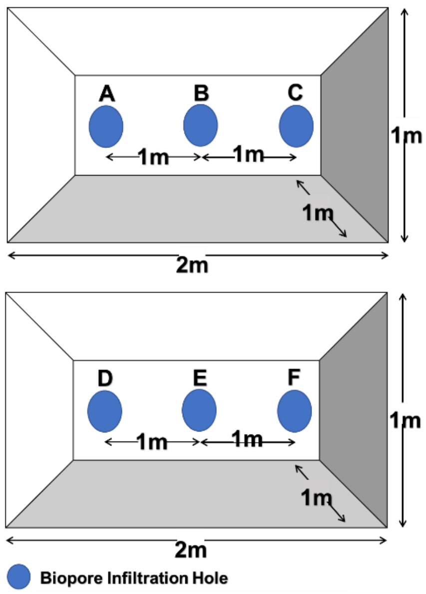

Figure 2. Experiment measuring water absorption time (top view)

Furthermore, to measure and test the compost's quality, the measurement method was carried out in accordance with SNI 19-7030-2004.

pH

1 gram of the compost sample was put into a shaker bottle, then 5 ml of distilled water was added and shaken with a mechanical shaker for 30 minutes. The sample suspension was measured with a pH meter that was calibrated using a buffer solution of pH 7.0 and pH 4.0.

Organic Carbon

A total of 1 gram of the compost sample was put into a shaker bottle, then 5 ml of distilled water was added and shaken with a mechanical shaker for 0. We weighed 1 gram of the mashed sample into a 100 ml volumetric flask, added 5 ml of K2Cr2O7 2 N solution, shaken, and then added 7 ml of H2SO4 pa. 98%, shaken again, and left for 30 minutes. For standards containing 250 ppm C, 5 ml of 5000 ppm C standard solution was pipetted into a 100 ml volumetric flask, then 5 ml of H2SO4 and 7 ml of 2 N K2Cr2O7 solution. Blanks were also used as a standard for 0 ppm C. Each was diluted with distilled water, and after cooling, the volume was adjusted to the mark of 100 ml, shaken until homogeneous, and left overnight. Then measure it with a visible spectrophotometer at a wavelength of 651 nm.

Total Nitrogen

A total of 0.25 grams of the mashed sample was weighed into a Kjeldahl flask. We added 0.5 grams of selenium catalyst and 3 ml of H2SO4 pa, shook the mixture until it was evenly distributed, and then left it for 2-3 hours. It was destroyed at a gradual temperature of 150 oC until finally a maximum temperature of 350 oC was reached and a clear liquid (3–3.5 hours) was obtained. After cooling, dilute it with a little distilled water so as not to crystallize. We quantitatively transferred the solution into a 250-ml distillator boiling flask, adding distilled water until it reached half the flask's volume. We also added a few boiling stones to the mixture. The solution was then distilled by adding 20 mL of 40% NaOH. Prepare a distillate container by adding 10 ml of 1% boric acid to an Erlenmeyer with a volume of 100 ml, and then add 3 drops of Conway indicator. When the volume of liquid in the Erlenmeyer reaches approximately 75 ml, distillation is complete. The distillate was titrated with 0.05 N H2SO4 until the end point (the color of the solution changed from pink to a bluish green), and the blank determination was carried out (A1).

Total Phosphorus

A total of 1 mL of extract A was put into a 25-mL volumetric flask, added with distilled water up to the mark, and then shaken until homogeneous. PipetPipette 1 mL of extract B into a 25-mL volumetric flask, along with 9 mL of color-generating reagent for each standard series P, and shake until homogeneous. s left for 15 minutes, then measured by UV-Vis at a wavelength of 713 nm.

Total Potassium

A total of 0.5 g of the sample was weighed into a Kjeldahl flask, 5 mL of HNO3 pa and 0.5 mL of HClO4 pa were added, shaken and left overnight, and then heated starting at 100 °C. After the yellow steam was exhausted, the temperature was raised to 200 °C. Destruction ends when white steam comes out, and the remaining 0.5 mL of liquid in the flask is then cooled and diluted with H2O, and the volume is adjusted to 50 mL, shaken until homogeneous, and left overnight or filtered with W-41 filter paper to obtain a clear extract (extract A). A total of 1 mL of extract A was put into a 25-mL volumetric flask with distilled water to the limit mark, then shaken until homogeneous (extract B). We measured K using AAS, using the standard series as a comparison.

RESEARCH RESULTS AND DISCUSSION

Effect of EM4 Addition to Water Absorption Time

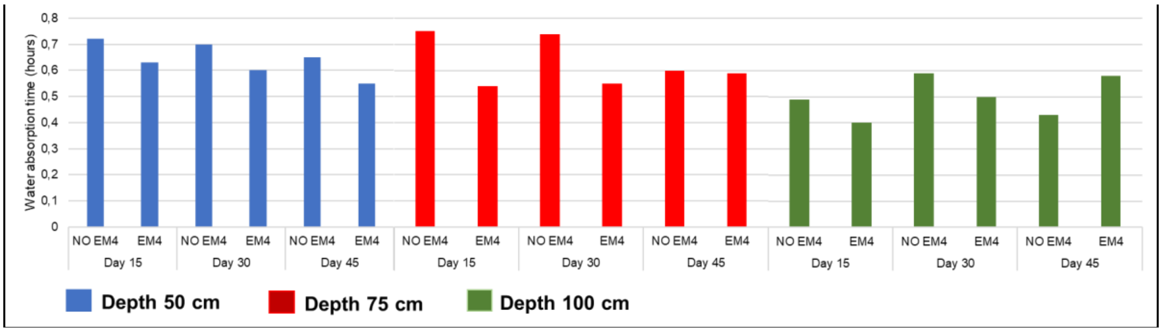

Figure 3. Water absorption time in BIH with and without EM4 for 15, 30, and 45 days

The addition of EM4 has an effect on the temperature and weight of the compost.

According to Table 1, the 15th, 30th, and 45th days of composting domestic waste in each BIH experienced relatively the same temperature, but quite high (above 30 oC). However, the biopore holes with EM4 added experienced a higher temperature increase than the holes without EM4 added.

Table 1. The compost temperature after 15, 30, and 45 days treated with and without EM4

BIH Depth (cm)	Compost temperature (oC)					
	Day 15		Day 30		Day 45	
	NO EM4	EM4	NO EM4	EM4	NO EM4	EM4
50	32	34	33	35	32	34
75	33	33	32	34	33	35
100	34	36	35	35	35	35

During the observation, there was also a decrease in compost mass of about 12.05–33.73% of the mass of waste before composting, which is presented in Table 2.

Table 2. Compost weight after 15, 30, and 45 days of treatment with and without EM4

BIH Depth (cm)	Compost weight (grams)					
	Day 15		Day 30		Day 45	
	NO EM4	EM4	NO EM4	EM4	NO EM4	EM4
50	880	653	830	623	810	560
75	881	650	831	625	815	562
100	883	655	835	628	809	564

In addition to temperature measurements, color changes in the waste were also observed during the composting process. On the first day of color observation, all domestic waste in BIH was the same color, which was greenish and smelled of leaves because most of the composition of domestic waste came from leaf waste and vegetable residue. On the third day, the domestic waste in the biopore holes without adding EM4 did not change color, while in the biopore holes with adding EM4, the color changed to yellowish brown.

Effect of EM4 Addition to Compost Quality

pH

The pH measurement was carried out with a pH meter, which was first calibrated with a buffer solution of pH 4 and 7. The pH value for each biopore hole can be seen in Figure 4.

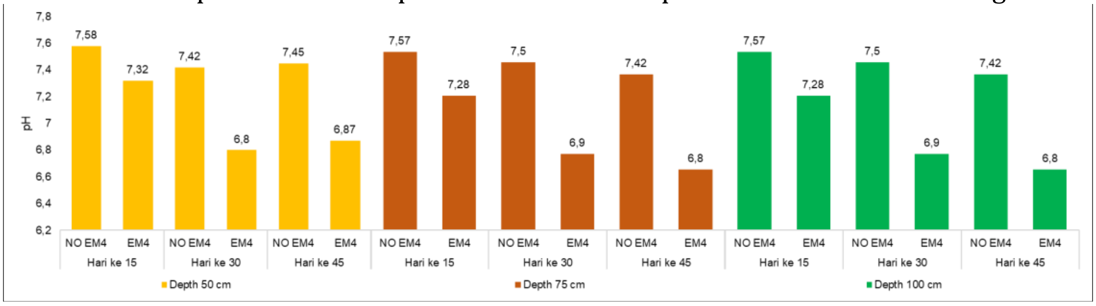

Figure 4. pH of BIH compost after 15, 30, and 45 days treated with and without EM4

Based on the results of the pH measurements, the pH of the compost in BIH, which has an averagely low pH, remains the same after the addition of EM4. The overall average pH without EM4 was 7.47, whereas the pH with EM4 was 6.9. On day 15, the average pH without EM4 was 7.56, while that with EM4 was 7.3. So, on the 15th day, it is suitable for use as compost because it follows SNI standards. Likewise, on days 30 and 45, the average pH included 7.14 (Day 30, No EM4), 6.83 (Day 30, With EM4), 7.43 (Day 45, No EM4), and 6.85 (Day 45, With EM4). However, the depth did not show significantly different results.

C-organic

Organic carbon is one of the nutrients that plants need in large quantities and functions as a builder of organic matter (23). Nitrogen is used as a nutrient or biostimulant. Nitrogen is an important constituent element in protein synthesis (24). The total organic C is influenced by the method of decomposition of organic matter, the quality of the organic matter, and the activity of microorganisms involved in the decomposition of organic matter (25). The percentage of C-organic matter is determined based on the results of testing and measurement. Ensure that the chemical notation and terminology are consistent throughout the text. For example, use either "C-organic" or "organic carbon" on a consistent basis.In the laboratory, we obtained the following results when we used compost:

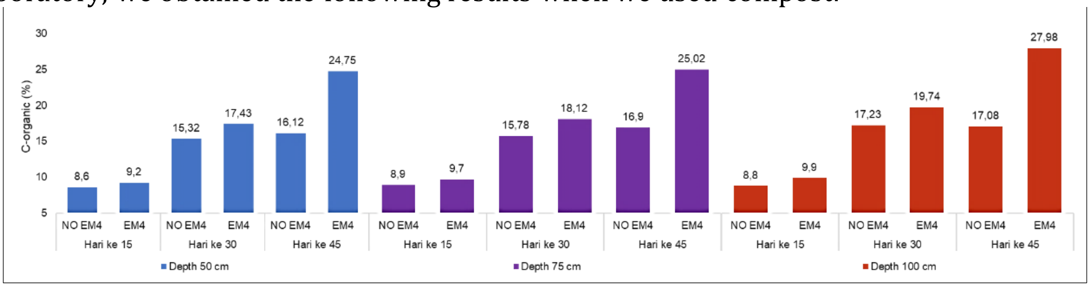

Figure 5. Percent Organic Carbon of BIH Compost After 15, 30, and 45 Days of Treatment with and Without EM4

According to the graph above, adding EM4 increased the average percentage of C-organic at different depths on the same day (9.5% on day 15, 18.6% on day 30, and 25.86% on day 45). HoweHowever, in the treatment at BIH without the addition of EM4, the average percentage of C-organic was 8.7% on day 15, 16.35% on day 30, and 16.64% on day 45. compost C-organic content on day 15 in different depths (both 50.75 and 100 cm) still did not meet the SNI standards, while on days 30 and 40, the C-organic content met the SNI standards.

Total Nitrogen

Nitrogen is one of the elements that is needed in the process of plant growth [26], namely as a constituent of protein, which is a compound with the highest molecular weight consisting of chains of amino acids bound by peptide bonds [27]. Nitrogen is an important constituent of chlorophyll, so plants will appear green [28]. The total nitrogen content of domestic organic waste compost can be seen in Figure 6.

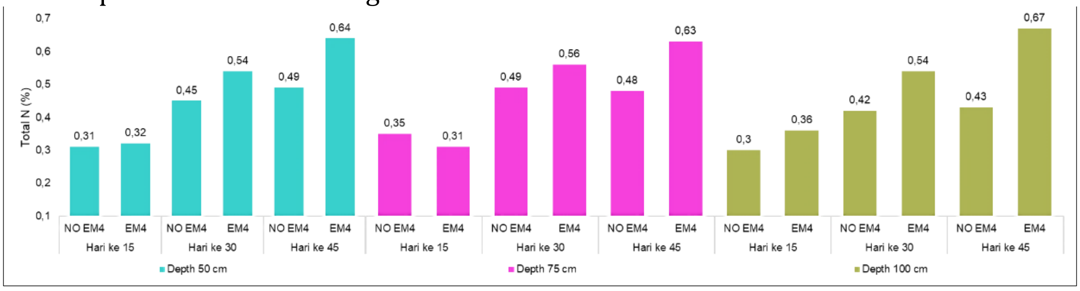

Figure 6. Percent Total Nitrogen of BIH Compost after 15, 30, and 45 days treated with and without EM4

On average, compost with EM4 added has a higher total nitrogen content of 11% than compost without EM4 added. Furthermore, the depth effect does not significantly affect the quality of the compost.

C/N Ratio

The C/N value is the relative content of organic matter (C-organic) to its total nitrogen content. The C/N value indicates the level of maturity in the organic matter decomposition process (29). Table 2 shows the C/N value of the produced compost.

Table 2. C/N ratio of BIH compost after 15, 30, and 45 days treated with and without EM4

BIH Depth (cm)	Day 15		Day 30		Day 45	
	NO EM4	EM4	NO EM4	EM4	NO EM4	EM4
50	29.74	28.75	33.04	32.28	38.90	38.67
75	31.43	31.29	32.50	32.36	39.91	39.71
100	27.93	27.50	39.02	36.56	41.72	40.76

According to Table 2, there was a decrease in the C/N ratio with the addition of EM4 concentration. On days 30 and 40, the compost treated with a hole depth of 100 experienced the highest reduction. There was no significant difference in the C/N ratio between compost with and without EM4.

Total Phosphorous

Phosphorus in plants functions for the formation of flowers, fruits, and seeds, as well as accelerating fruit ripening [30]. Anaerobic phosphate treatment will liquefy organic matter, and inorganic phosphorus compounds will be released from organic compounds [31]. The anaerobic unit's product contains dissolved phosphorus compounds in small concentrations. The hydrolysis of condensed phosphate into orthophosphate is influenced by environmental conditions and microbial concentrations [32]. The analysis of the total P content of compost is presented in Figure 7.

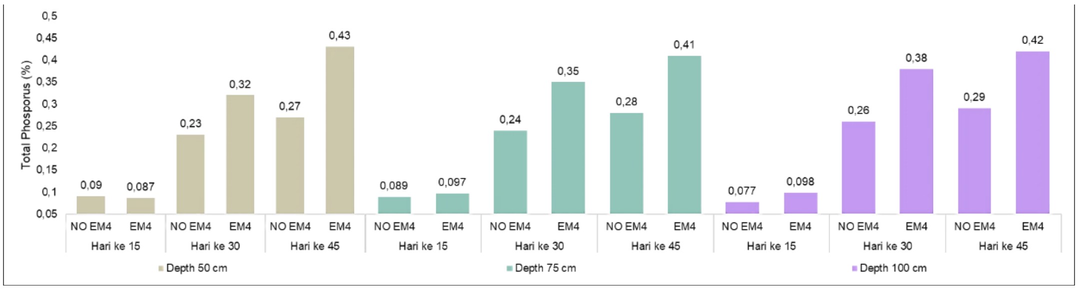

Figure 7. Percent Total Phosphorus of BIH Compost after 15, 30, and 45 days treated with and without EM4

According to Figure 7, adding the EM4 activator to BIH influences total P levels. All compost samples that were added with EM4 experienced an increase in total P content, which ranged from 0.12-0.22% of the total P content of compost that was not added with EM4. A high increase was found in compost with the addition of EM4, namely 0.45% at a depth of 50 cm, 0.41% at a depth of 75 cm, and 0.42% at a depth of 100 cm. The samples on the 15th day still did not meet the SNI standards.

Total Potassium

Potassium in plants plays a role in influencing the absorption of other elements, root development, and resistance to disease and drought. Potassium serves to strengthen the plant's body. Potassium is absorbed in the K+ form (especially in young plants). Potassium has the property of being easily soluble and washed away; besides that, it is easily fixed (absorbed) in the soil (33). The average potassium content of liquid organic fertilizer can be seen in Figure 8.

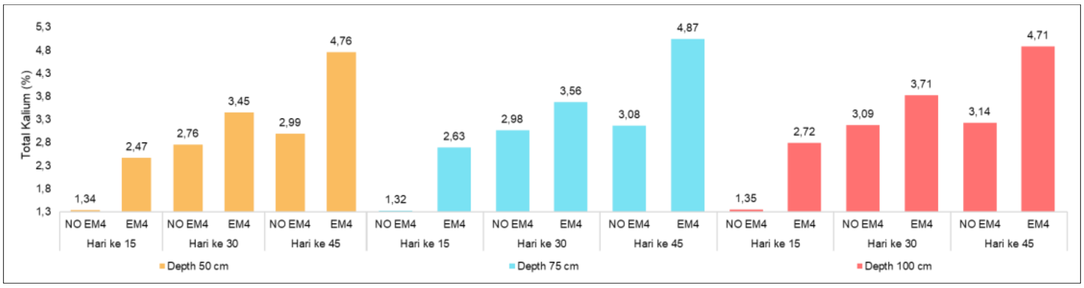

Figure 8. Percent Total Potassium of BIH Compost After 15, 30, and 45 Days of Treatment with and Without EM4

Figure 8 illustrates that the longer the compost's maturity time after adding EM4 formulation to the biopore holes, the higher the compost's total potassium content in the biopores. The average content of total potassium in compost, both at a depth of 50 cm, 75 cm, and 100 cm, was not significantly different. The following is the average total potassium content without the addition of EM4 based on day-to-day observations: on the 15th day, the average is 1.33%; on the on the 30th day, the average is 2.94%; and on the 45th day, the average is 3.07%. While the average total potassium content with the addition of EM4 was based on observations on the 15th day, the average was 2.61%; the 30th day average was 3.57%; and the and the 45th day average was 4.78%.

According to Hasunuma et al, (2013) (34), this high temperature indicates the activity of thermophilic microorganisms in breaking down proteins and non-cellulose carbohydrates, such as starch and hemicellulose.
According to Zhou et al. (2020) (35), mature compost will feel soft when crushed because, during the composting process, the organic matter undergoes decomposition and changes in the fresh material, including the formation of microbial cell substances and their

transformation into a dark amorphous form. This substance is called earth-like matter. This is reinforced by Antil et al. (2014) [36], who state that several factors that occur during the composting process affect compost maturity. After the composting process is complete, the raw material turns brown and black. The color change that occurs can be caused by the activity of microorganisms that work during the decomposition process. The color produced in this study met the standard (SNI 19-7030-2004), namely brown-black compost.

The pH level test results for the compost samples showed that the higher the EM4 concentration, the lower the pH level. This is due to the activity of lactic acid bacteria, which produce organic acids such as lactic acid, acetic acid, or pyruvic acid. These organic acids come from the breakdown of organic materials such as carbohydrates, proteins, and fats [37]. Lactic acid bacteria are one of the largest components of microorganisms in EM4. The higher the EM4 concentration, the more lactic acid bacteria there are, causing the organic matter decomposition process to take place faster [38]. These results are in accordance with previous research conducted by Sadeli et al. (2022), which stated that the pH value decreased with the addition of an EM4 activator.

The percentage of C-organic in BIH with EM4 addiction treatment was higher than that without EM4 addition. Other factors besides LRB, such as temperature conditions and soil moisture, can affect the metabolism and work of microorganisms that decompose organic matter [39]. According to the results of this study, the value of C-organic content in domestic organic waste compost can decrease with the addition of EM4 concentration as a bio-activator. This is due to the microorganism activity in EM4. The oxidation of compounds containing total C-organic represents the mechanism by which heterotrophic organisms obtain energy for synthesis. Under anaerobic conditions, organic carbon is converted into carbon dioxide and methane [40].

EM4 consists of a collection of microorganisms that have been selected to function as a soil enhancer and a source of nutrition for plants. Compounds such as carbohydrates and fats can be decomposed into C-organic by microorganisms from EM4, which can later be used by lactic acid bacteria as an energy source. When given to the soil, they will become an additional organic substance that will be used by soil microflora and have a positive effect on plants [41].

On average, compost with EM4 added has a higher total nitrogen content of 11% than compost without EM4 added. The total nitrogen content may be different because of things outside the biopore infiltration holes, like the temperature and soil moisture around the BIH. These things can change how microorganisms break down organic matter. The N-total content of this compost is caused by the activity of microorganisms, where microorganisms, apart from breaking down nitrogen, also use it for their metabolic activities in addition to breaking down nitrogen [42]. These results are in accordance with previous research conducted by Ney et al. (2020) [42], who stated that the addition of EM4 concentration reduced the total N content of compost.

According to Dubey et al, (2021) [43], nitrogen absorbed by plant roots is in the form of nitrate (NO3-) and ammonium (NH4+), but this nitrate will soon be reduced to ammonium through enzymes containing molybdenum. If the available nitrogen elements are greater than others, more protein will be produced. The higher the nitrogen content, the faster plant protein synthesis is carried out. According to Dubey et al. (2021), the process of protein decomposition occurs as follows:

Ammonia (NH3) is a protein, peptide, and amino acid.

Furthermore, ammonia (NH3) will undergo nitrification to become nitrate (NO3). Nitrosomonas and other nitrifying bacteria change ammonium (NH4+) into nitrites (NO2) in the main stage of nitrification. After that, Nitrobacter is responsible for oxidizing nitrite to nitrate (NO3-). The process of converting nitrites to nitrates is very important because nitrite are toxic to plant life. The following reaction describes the nitrification process:

$NH3 + 1½O2$ *Nitrosomonas* $NO^{2-} + H_2O + H^+$

$$NO^{2-} + ½O_2 \xrightarrow[Nitrobacte]{} NO_3-$$

When all these processes are complete, the organic form of nitrogen, ammonia, is converted to the inorganic form of nitrogen for plants to use. Based on the total N content produced, all compost samples fulfilled the total N content according to SNI 19-7030-2004, namely >0.40%.

The C/N ratio of compost added with EM4 was smaller than that without EM4. The C/N ratio is affected by a decrease in the amount of carbon used by microorganisms as an energy source to decompose organic matter (44). In addition, in the anaerobic composting process, a reaction occurs where the carbon in organic compounds turns into CO2 and CH4 in the form of gas, which also causes a decrease in the amount of carbon in the material (45). The results obtained are in accordance with previous research conducted by Cheng et al. (2016), who stated that the addition of EM4 reduced the C/N ratio of compost.

Based on the C/N ratio of the compost produced, there is no compost that meets the requirements of SNI 19-7030-2004 because the C/N ratio in all sample treatments is in the value range of 28.75–41.72. According to Cheng et al. (2016) (45), the C/N value of a good fertilizer is similar to the soil C/N value, which is 12. This value is the best condition for determining nutrient utilization efficiency.

According to Suryawan et al. (2019) (46), there was an increase in total phosphorous content with the addition of EM4 activator. This is due to the higher concentration of EM4, which causes more organic acids to form during the decomposition process and increases the solubility of nutrients such as P, Ca, and K, making more P available to plants (46).

Microorganisms play an important role in the phosphorus formation. Organic P-compounds are converted and mineralized into organic compounds. Given that element P is an organic matter, it plays a crucial role in soil fertility. The intake of nutrients from organic matter helps to increase soil nutrient levels, thereby achieving optimal fertility intensity (47).

The analysis of the quality of the resulting compost yields a total P content ranging from 0.2057 to 0.3776%. Based on these values, all the compost produced meets the total P content value of SNI compost 19-7030-2004, which is greater than 0.10%.

CONCLUSIONS AND RECOMMENDATIONS

The addition of EM4 affects the decomposition process. The more EM4 added, the faster the organic waste decomposes. Furthermore, the addition of EM4 has an impact on the nutrients present in the compost. The addition of EM4 increased the value of C-organic, nitrogen, phosphorus, and total potassium contained in the BIH compost.

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