Artikel 6

THE INFLUENCE OF ECOENZYME ON METHANE (CH4) LEVELS IN LANDFILL WASTE

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THE INFLUENCE OF ECOENZYME ON METHANE (CH_4) LEVELS IN LANDFILL WASTE

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Abstract

The effect of Ecoenzyme and waste thickness on methane gas levels contained in waste. Utilization of Ecoenzyme in reducing pollutant power in the environment. Obstacles in waste processing and the consequences of excess landfill can damage the earth's layer, becoming a global warming event. The objective of this study was to determine how much influence the concentration of ecoenzyme in reducing methane gas pollutants in waste. The sequence of research conducted was: 1) Looking for and determining the location at the Supit Urang Landfill in Malang City; 2) Make ecoenzyme in the mature period (+ 3months); 3) Make plotting according to the treatment; 4) Measuring methane gas content before and after treatment; 5) Record results. After conducting research activities at the Supit Urang landfill in Malang City, there was a decrease in methane gas in the treatment of ecoenzyme concentrations of 6%, 8%, and 10% at a thickness of 10cm and 30 cm, this shows that there is an influence of concentration and thickness on the reduction of methane gas.

Keywords: *Methane Gas; Ecoenzymes; Concentration; Thickness*

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INTRODUCTION

The more people there are, the more organic and inorganic waste will collect and accumulate in landfills. Landfill waste undergoes a process of decomposition by bacteria, evaporation, and other chemical reactions. According to (Kurniasari, et al., 2014; Qadriyah et al., 2019), processing with an open dumpling system is a landfill problem in Indonesia since it is processed layer by layer which can lead to an anaerobic process that produces methane gas. The presence of methane gas (CH_4) generation in landfills is influenced by the waste material, the length of time the waste is piled up, the waste and the thickness of the waste pile.

Piles of garbage that are left without proper processing can produce pollution in the form of emissions of carbon dioxide (CO_2) and methane gas (CH_4) (Prasetio et al., 2021), it can cause depletion of the ozone layer and affect the increase in temperature on earth or normally known as global warming (Kustiah et al., 2014). In addition, the production of methane gas adds to the risk of reduced oxygen levels, air pollution by gas which can last quite a long time ±20-30 years after the landfill is closed, with an estimate of having 45%-60% methane gas in the air.

The existence and movement of methane gas is very dangerous in landfills that are not equipped with gas management facilities, since methane gas levels can explode at a threshold position of 5% LEL (Lower Explosive Limit) and 15% UEL (Upper Explosive Limit) of the air volume. Apart from that, health problems can have a bad effect on breathing and in the long term can cause death.

One of the effective steps that can be taken to reduce the pollutant power of methane gas in waste is remediation using eco-enzymes which is one of the results of organic waste processing in the form of liquid so that it is more effective to use (Junaidi et al., 2021; Novianti & Muliarta, 2021) and has multiple benefits (Budiyanto et al., 2022) minimizing excess pollutants, besides that the benefits of ecoenzyme are used as plant fertilizers, as plant pest repellents (Utpalasari & Dahliana, 2020).

This study was conducted to determine the effect of the thickness and concentration of ecoeznym on the reduction of methane gas levels in the Supit urang landfill waste pile.

RESEARCH METHODS

This study used an experimental method, this study used ecoenzyme concentration parameters of 6%, 8% & 10% (Wikaningrum & El Dabo, 2022) and

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the thickness of the waste was 10cm, 30cm & 60cm. carried out at TPA Supit Urang Malang City.

The tools and materials needed are: waste that is 1-2 weeks old, plastic bottles, ecoenzyme, stationery and books to take notes. The instrument used to measure methane gas levels is the ATZ1050C gas analyzer with LEL (Lower Explosive Limit) units. While the work steps are as follows: block waste samples measuring 10cm, 30cm & 60cm, measure the methane gas content before treatment, then spray ecoenzyme with concentrations of 6%, 8% & 10%; the final step is to observe and record the results. Based on the results of data analysis, it is known that the thickness of the waste has an effect on methane gas emissions.

RESULTS AND DISCUSSION

This research was conducted at the Supit Urang TPA Malang City from September 2022 to March 2023. Based on research on the ability of ecoenzymes to reduce methane gas at the Supit Urang TPA. The parameters of the tests carried out are based on the thickness of the waste and the concentration of ecoenzymes. The research data can be seen in Table 1.

Table 1. Test results based on waste thickness and ecoenzyme concentration

	CH_4 levels (LEL)			
	Test			
Treatment	U1	U2	U3	Average
T1K1	0	0	0	0
T1K2	0	0	0	0
T1K3	0	0	0	0
T2K1	0	1	0	0.33
T2K2	0	0	0	0
T2K3	0	0	0	0
T3K1	0	1	0	0.33
T3K2	1	1	1	1
T3K3	1	1	1	1

The results of this study indicate that ecoenzymes have the ability to reduce methane gas in waste, it is shown in the 10cm and 30cm thickness data there is a decrease in methane gas. Another factor is that the thickness and maturity of the waste affect the levels of methane gas produced (Indiarto, 2017), shown in the variation results with a thickness of 60cm, the methane gas produced 1 LEL is given ecoenzyme treatment with a concentration of 6%, 8%, 10% produced methane gas levels did not decrease

The data from this study were analyzed using the Shapiro Wilk Test for normality with a probability value (Sig) of more than 0.05.

Table 2. Thickness and ecoenzyme concentration normality test for decreasing methane gas

	Kolmogorov-Smirnov a			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Standardized Residual for VALUE	.426	27	.000	.599	27	.000

Based on the output of the normality test table on Shapiro-Wilk, the result is (Sig) 0.00 <0.05, so it can be concluded that the data were not normally distributed. So an alternative non-parametric test was carried out on the Friedman test.

Table 3. Nonparametric analysis test results for the effect of the thickness and concentration of ecoenzymes on the reduction of methane gas.

N	27
Chi-Square	41,835
Df	2
asymp. Sig.	.000

Based on the output of the Asymp test statistic. Sig. 0.00 < 0.05, it can be concluded that there is an average effect on the concentration of eco-enzyme, the thickness of the waste on the methane gas (CH_4) content is the result of the anaerobic decomposition of organic waste in the landfill (Artiningrum, 2018).

In this study it is known that the longer the waste decomposes, the more methane gas emissions produced. Methane gas is a gas produced from the anaerobic fermentation (decomposition) process of organic matter by methane bacteria (methanogens) (Indarto, 2007).

The content of microorganisms that produce enzymes can work in reducing or reducing the methane gas content in waste (Kurnia et al., 2015). Microorganisms produce enzymes that break down toxic pollutants and convert them into uncomplicated chemical structures to become pollutants with low toxicity (Widyasari & Wiratama, 2021).

The content of acetic acid in eceoenzymes which are produced naturally from bacterial metabolism in fruit/vegetable residue remains so that it has disinfectant properties (Astuti & Maharani, 2020). On research (Mavani, 2020), said that the fermentation of organic fruit peels was able to produce several types of phenolic compounds such as flavonoids, saponins, tannins and lignins. It is proven by the results of research, in reducing methane gas with different concentrations, ecoenzym can reduce methane gas in piles of garbage.

Ecoenzym liquid has the characteristics of a dark brown color and a strong fresh aroma (Larasati et al., 2020). In the ecoenzyme fermentation process, brown sugar functions as food or a source of nutrition for microorganisms/bacteria so that the fermentation goes well (Syakdani et al., 2021).

In the results of the three studies, concentration variations were seen to be effective in reducing methane gas. The results showed that ecoenzym was effective in reducing methane gas in the 10cm and 30cm thickness treatments with the three concentration variations. It indicated that the concentration of ecoenzymes also affects the thickness of the pile of waste. In addition, several factors that affected the thickness were the incubation time or soaking time. This is in line with (Karila et al., 2022), in the study of polluted water sources, the treatment was given a comparison between ecoenzym and water of 1:100, after it was left for 3 hours, it produceda a fresher aroma than before and experienced a change in color. In this study only used time or incubation time of 10-15 minutes, as in the 60cm thickness treatment with all three concentrations with an incubation period of 10 minutes, it showed that the methane gas content was still detected by the gas detector.

CONCLUSION

There is an effect. The concentration of ecoenzym has a significant effect, shown on the methane gas content, which initially changed from 1 LEL to 0 LEL. The higher the concentration of ecoenzym, the more it affects the reduction of methane gas. The thickness of the waste to the emission of methane gas in this study was shown at variations in the thickness of the waste 10cm, 30cm and 60cm. at a thickness of 60cm after treatment the methane gas content was still detected.

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