The effect of Aerobic and Anaerobic composting methods against water content and the amount of Pathogenic Microorganisms from Sludge treatment plant and organic waste

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Abstract. Jambi City has a Sludge Treatment Plant (IPLT) located in Talang Bakung. IPLT Talang Bakung processes sludge from household septic tanks. The processing consists of 1 anaerobic pond, 3 facultative ponds and 3 maturation ponds. The result of processing at IPLT is water that can be discharged into water bodies and sludge. The sludge still can be used, but it must be processed first. One of the sludge processing is a composting process. The composting process consists of two types, namely the composting process aerobically and anaerobically. This study aimed to compare the results of aerobic and anaerobic composting from IPLT sludge mixed with organic matter. Compost characteristics that are reviewed in this study are physical characteristics, those are water content and biological characteristics, namely pathogenic bacteria. The parameters measured in this study were the temperature, pH and number of Fecal Coliform bacteria at the beginning and end of the study.

1. Introduction
Waste generated in human daily life includes: solid waste, liquid waste and gas waste. Liquid waste, especially domestic, consists of gray water and black water. Gray water, for example is rain water, used washing water, while black water is water from the toilet in every house. Black water in Indonesian society is still processed in an on-site system or septic tank. The condition of the septic tank that is not effective, will not fully function to treat household waste so that the septic tank becomes full and must be sucked up. Hence, it is aspirated to the Sludge Treatment Plant (IPLT). Jambi City has one sludge treatment plant located in Talang Bakung, South Jambi Sub-district.

One of the sludge treatment processes is by composting. Compost material can be mixed with other organic ingredients. In general, the composting process is divided into two, namely: aerobic composting and anaerobic composting. The purpose of aerobic composting is to reduce volume and produce compost, while the purpose of anaerobic composting is to produce energy and reduce volume (Tchobanoglous et al, 1993). Mud in Talang Bakung IPLT needs to be composted with aerobic and anaerobic processes and compared the results. The purpose of this study was to find out the aerobic and anaerobic composting processes and find the right composting process for grass in Talang Bakung IPLT, Jambi.

2. Method
2.1 Tools and Materials
One of the ingredients that can be mixed with sludge in a composting is organic waste. In this study, organic waste chosen was traditional market organic waste. Table 1 shows 4 composters with different treatments.
Table 1. Composting

| Composter | Feedstock          | Feedstock Condition | Composting Condition | Frequent of Agitation |
|-----------|--------------------|---------------------|----------------------|-----------------------|
| 1         | Sludge + Organic Waste | Organic waste chopped | Aerobic             | 3 times in a week     |
| 2         | Sludge + Organic Waste | Organic waste not chopped | Aerobic             |                       |
| 3         | Sludge + Organic Waste | Organic waste chopped | Anaerobic           | -                     |
| 4         | Sludge + Organic Waste | Organic waste not chopped | Anaerobic           |                       |

The figure below shows the composter during the study:

![Figure 1. Process Composting](image)

3. Results and discussion

The results and outcomes to be achieved from this research were to produce compost with a mixture of sludge feedstock and market organic waste in accordance with SNI Compost, especially for moisture content and number of microorganisms. Compost moisture content in accordance with SNI was a maximum of 50%, while the maximum amount of Fecal Coliform in compost was 1000 MPN / gr.

The following is a graph showing leachate volume, feedstock temperature and pH of the feedstock.
Leachate observation results are also presented in Graphs 1, 2 and 3. The highest leachate volume produced by reactor 2 was 4.85 L. The highest temperature was 36°C produced by reactor 3. At the beginning of the composting process, the pH was acidic. This proves that the composting process entered the acidogenesis stage. Then, the pH showed neutral with pH 7. The temporary conclusion resulting from this study was: the pH of each composter was different, but still showed acidic properties; The temperature of each composter was different, the highest temperature was in composter 1, 35°C; The average volume of leachate produced for composter 1: 2.16 L; composter 2: 3.21 L; composter 3: 1.94 L; composter 4: 3.37 L. The initial sample test for fecal sludge was 5800 JPT / 100. In this study, Fecal Coliform testing used the APHA 9221 E-2012 Method Specifications.

### Table 2. Result of The Fecal Coliform

| No. | Parameter       | Unit    | 1    | 2    | 3    | 4    |
|-----|-----------------|---------|------|------|------|------|
| 1   | Fecal Coliform  | JPT/100 | 4600 | 3900 | 4900 | 4100 |

### 4. Conclusion

Based on the results and data analysis, the obtained conclusions are as follows: the highest temperature only reaches 36°C. Whereas, pH almost reaches neutral, that is 7. From the number of Fecal Coliform bacteria tested, shows that the aerobic composting process without counting is more effective. However, things that need to be considered for future research are the need for heterogeneous waste, because in this study tend to use organic waste such as cabbage.
References

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