

APPLICATION OF BSF LARVAE METHOD IN SOLID WASTE MANAGEMENT IN THE PURI CIPAGERAN MARKET, CIMAHI, INDONESIA

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Abstract

Puri Cipageran Indah (PCI) I market waste in Cimahi City is currently not managed by implementing local reduction and processing. Now, waste is collected and transported to the nearest TPS, without sorting and processing. There is a desire from local RW managers to do better waste management. There is land for processing which is very limited in size (3×2 m) so that the processing technology that can be applied is also limited. One technology that can be applied is processing organic waste using Black Soldier Flies (BSF) larvae. This activity aims to obtain a waste management design so that it can be built according to the characteristics of community needs. Activities are carried out by holding meetings and mutual agreements regarding the layout of sanitation facilities, including waste management. This activity has resulted in a waste management design for Puri Cipageran Indah Market with a building dimension of 2m×3m utilizing the available area optimally. The number of bio pond racks for waste processing uses 3-4 levels of maggot.. In general, the activity went well. Residents of PCI I Housing represented by the PCI Forum stated that they were greatly helped by the arrangement of the market area to be better and with educational nuances for the general public.

Keywords: *BSF larvae, maggot, solid waste management, traditional market*

Introduction

Puri Cipageran Indah I Complex is one of the housing complexes in Cipageran Village, North Cimahi District, Cimahi City. Waste management in PCI I is still using the collect-transport-disposal pattern. There is no waste sorting activity at the source, with waste collection 2-3 days per week by garbage officers and transported to the nearest TPS. There are no

waste processing activities carried out by residents or outside parties in the PCI I area. Meanwhile, from the market in PCI 1, there are more than 100 traders who generate waste ranging from 60-80 kg/day, of which almost 80-90% is organic waste. The market operates every morning from 06.00-10.00. At night in front of the market location is used for night culinary traders. Currently, waste from market activities is also not treated, only collected and transported to the Pasar Atas TPS in Cimahi City, which is about 2 km from the location. Garbage from traders is still organized in a mixed state, between organic and inorganic waste.

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The discussion results with the manager of the Cipageran Indah I RW Complex have agreed on several problems and their priorities. Also discussed are several activities that will be carried out to design and operate a waste management unit in the PCI I complex. This study aims to obtain the best waste management design for the site.

Methodology

In this study, several stages were carried out. Several activities involve residents and traders in sorting waste. Waste processing that will be proposed is waste processing using BSF larvae due to the limited land available in the PCI I environment. In addition, there is economic potential by selling BSF larvae as animal feed, which can be used to support waste services in the PCI I environment. BSF larvae has many economic value, e.g. as fish nutritional food (Fauzi and Sari, 2018), (Iskandar & Fitriadi, 2017). It can also be processed as manure powder for chicken (Nangoy et al., 2017), (Dillak et al., 2018). BSF larvae are also reported to be used as biodiesel after being processed.

This community service activity is carried out with the training method, providing assistantship for environmental management facilities, one of which focuses on building waste processing facilities. Training and assistantship were among the effective activities in community services program (Sofiati & Linawati, 2020), (Fauziah & Maryani, 2020), (Bibin et al., 2021).

Partners contribute to adapting research results to the application steps, including:

1. Conditioning the location including residents, market traders, market customers and the surrounding community so that they can receive

information about environmental improvements properly,

2. Determine the location for the placement of the waste processing shelter,
3. Help find experts to design all required sanitation facilities and environmental management plans,
4. Prepare workers for facility construction activities

Students who are involved in community service activities carry out several activities, including:

1. Presenting research results regarding waste processing using the bioconversion method with Black Soldier Flies to build the design according to the best conditions.
2. Prepare documentation of the implementation of community service
3. Completing activities with technical and administrative assistance

Result and Discussion

An investigation and comprehensive considerations were conducted by local partner to decide the exact location of the waste processing. The location is near the river bank beside the sanitation facility of the PCI market. The decision of waste handling and processing is very important to not arise problems for the vicinity (Milasari, 2021). The construction of public toilet as sanitation facility will be included in building repairing activity around the location of the waste processing workshop. Figure 1 shows a simple design of a workshop room for processing waste at Puri Cipageran Indah Market using Black Soldier Flies. To process organic waste regularly, the entire life cycle of BSF is controlled so that it can form a well-designed biosystem. To create an environment that is almost the same as the BSF's original habitat while at the same time

guaranteeing the sustainability of waste processing, a specially designed processing facility is needed to differentiate between several processing units. Some other additional media may increase the BSF growing quality (Supriyatna & Putra, 2017), (Silmina et al., 2010).

1. BSF mass breeding unit

This unit maintains tiny larvae (called 5-DOL). They are always available in consistent quantities and can treat organic waste that comes every day at the processing facility. However, in this rearing unit, the number of hatching larvae is limited to a certain number to ensure the stability of the breeding population.

2. Garbage receiving and pre-treatment unit

Ensuring that the waste received at the facility is suitable for feeding the larvae is very important. For this reason, the first step is to control waste to ensure that it does not contain hazardous materials and non-organic materials. The next step is to reduce the particle size of the waste, reduce the moisture content if the humidity level is too high, and/or mix different types of organic waste to produce a balanced diet of nutrients and moisture for the larvae (70-80%). Water content is also an important factor in waste preparation for BSF's larvae (Jatmiko, 2021).

3. Waste treatment unit with BSF

In this unit, 5-DOL (Day of Larva) from the breeding unit are fed organic waste in containers called "larveros". The larvae that eat organic waste then grow into large larvae to process it by reducing waste.

4. Product harvest unit

Before turning into a pre-pupa, the larva is taken from the larvero. The waste residue left in larvero is also a high-value product.

5. Post-processing unit

If necessary, both larvae and residues can be further processed to suit local market demands. This is called "product purification". Usually, the first step is to kill the larvae. However, there are other steps for larval purification, such as freezing or drying, or by separating the larval oil from the larval protein. As for the purification of the residue is usually done by composting or putting into a digester.

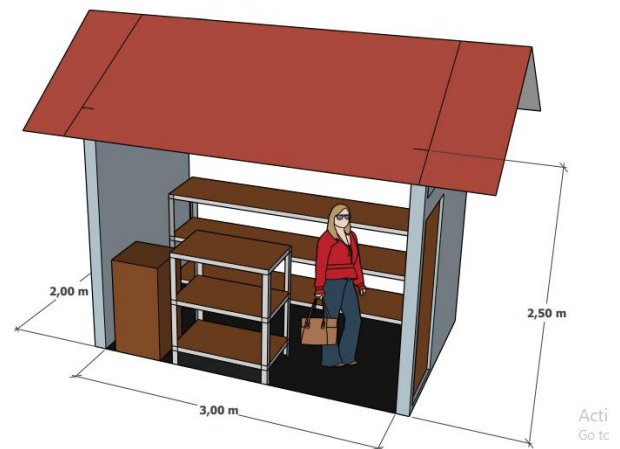


Figure 1. Schematic of Placement of Waste Treatment Plants With BSF

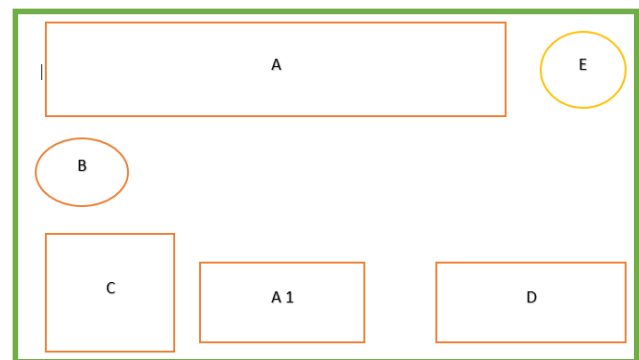


Figure 2. Layout of Waste Treatment Installation with SBF

Description of Figure 2:

A =Bioconversion installation. It consists of stacking shelves for bio pond storage for enlargement and pond hatching, according to the number of bio ponds needed.

B = organic waste counter

C = BSF house/ fly cage

D = garbage collector. Organic waste fermentation place so that it becomes wilted and easy to chop and easy to digest by maggot

E = Space for supporting equipment needs

Note: For the size of the shelf listed in the layout, it adapts to the needs of hatching bio ponds, enlargement bio ponds



Figure 3. BSF Cage

Figure 3 shows the BSF cage. This unit is used for adult flies that will lay eggs and continue the processing in a sustainable process. Condition of light is one of the essential components for the BSF cage. Improper setting of light introduction to BSF will cause the breeding process not optimal (Wardhana, 2016). Usually, an adult of BSF will need high intensity of light but lower than the light of the sun (Zhang et al., 2010) (Gobbi et al., 2013).

Conclusion

This activity has resulted in a waste management design for Puri Cipageran Indah Market with a building dimension of 2m×3m utilizing the available area optimally. The number of bio pond racks for waste processing uses 3-4 levels of maggot. The BSF fly cage can be placed in the space to not interfere with the market view. In general, the design of the waste management site is carried out by actively involving the community partners. The construction of facilities and environmental improvements are coordinated directly by partners by following the agreement results and the results of research on the process of processing waste using maggot. In general, the activity went well, residents of PCI I Housing represented by the PCI Forum stated that they were greatly helped by the arrangement of the market area to be better and with educational nuances for the general public.

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