Journal of Sustainable Applied Modification Evidence Community
Vol. 01 , No. 1 , June 2024, 11-16
***e*-ISSN: 3048-040X**

Socialization of the Use of Cross-sectional Area Variations Container for the Amount of Weight Reduction in Organic Waste by Using BSF Maggots (*Black Soldier Fly)*

Mila Sari[1]*, Kalasta Ayunda[2], Siti Handam Dewi[3], & Rantika Maida Sahara[4]
[1]*STIKES Dharma Landbouw Padang, Indonesia, [2]STIKES Dharma Landbouw Padang, Indonesia, [3]STIKES Dharma Landbouw Padang, Indonesia, [4]Politeknik Kesehatan Kementerian Kesehatan Padang, Indonesia
*Co e-mail: milasari@stikeslandbouw.ac.id[1]

Article Information
Received: May 08, 2024
Revised: May 15, 2024
Online: June 11, 2024

Keywords
Black Soldier Fly (Hermetia Illucens), Waste Reduction, Container Surface Area

ABSTRACT
Organic waste processing is a major challenge in environmental management that requires an effective solution. One promising method is using Black Soldier Fly (BSF) larvae to convert organic waste into high-value biomass. Therefore it is necessary to do itsocialization of the use of variations in the cross-sectional area of containers in cultivating BSF larvae for processing organic waste. The method done ieSocialization to the community includes BSF larvae, life cycle, cultivation procedures and benefits. Results: SSocialization shows an increase in public understanding about cultivating BSF larvae and the influence of variations in the cross-sectional area of containers on waste processing efficiency. Discussion:What happens in the socialization is optimizing the growth conditions for BSF larvae and the obstacles that may occur in cultivating BSF larvae. So thatregulate the water content of BSF Larva feed and maintain the condition of the container. The conclusion of this outreach is increased understanding among the community about the importance of processing organic waste and the role of BSF larvae in reducing waste. So this results in efforts to manage organic waste and create new jobs for the community.

***Keywords**: Black Soldier Fly (Hermetia Illucens), Waste Reduction, Container Surface Area*

INTRODUCTION

Waste processing involves the utilization and use of facilities and infrastructure, including placing waste in available containers, the process of collecting waste, moving and transporting waste, as well as processing waste until the final disposal process.(Sahil et al., 2016)So far, planning for waste processing has not been carried out properly, resulting in the waste processing system being less than optimal and making the absence of a waste processing site the underlying problem.(Hercog and Kuleta, 1979)

http://doi.org/10.69855/samec.v1i1.18
https://gpijournal.com/index.php/samec

The large amount of organic waste produced by society and the impact on the environment requires proper processing so that organic waste can be handled properly. Some organic waste processing has been carried out by converting it into compost and biogas. Apart from being processed into compost and biogas, recycling organic waste can be done using the bioconversion method. Bioconversion is a process that involves microorganisms such as fungi, yeast, bacteria and larvae to convert organic waste into high-value products.(Salman et al., 2019)

The bioconversion method can be a solution to the problem of organic waste management. The sustainable bioconversion process utilizes insect larvae to transform organic waste. The larvae used can convert nutrients from waste and store them as biomass. In this case, the larvae used are Diptera insects with the species: Hermetia illucens.(Salman et al., 2019)

Black Soldier Fly(BSF) or Hermetia illucens is a common tropical fly species that can be widely found on grass and leaves. This type of fly does not cause disease because its life span is only for mating and reproducing. BSF has been researched to be able to degrade organic waste by utilizing its larvae which will extract energy and nutrients from vegetable waste, food waste, animal carcasses and feces as food (Sipayung, 2015). The objective is to evaluate how container geometry influences the amount of weight reduction in organic waste when processed by BSF maggots and to enhance community awareness and capability in managing organic waste through this environmentally friendly approach (Nasution et al., 2022).

BSF larvae reproduce even in unnatural environments, such as media/garbage that contains high levels of salt, alcohol, acid and ammonia. BSF larvae do not die, but BSF larvae become dormant/inactive if the environmental air is very cold or there is a lack of food and will be active if the weather becomes warm again or food is available.

BSF larvae convert organic waste into simpler biomass, and are able to reduce waste mass by 52% -56%. Apart from that, BSF larvae can also live in a fairly high pH tolerance, do not carry disease genes, have a fairly high protein content (40-50%), and are easy to cultivate.(Suciati and Faruq, 2017)،(Rizki et al., 2017)So BSF larvae can be used as a solution to reduce organic waste.

Research conducted byTifani Rosa Mahardika with the title Waste Reduction Technology by Utilizing Black Soldier Fly Larvae (BSF) obtained the percentage reduction results on a laboratory scale, it is known that the mixture of organic waste including fruit waste and food waste reached 82.87%, the reduction in the mixture of fruit waste and chicken manure reached 62.13%. This indicates that the higher the water content in the waste, the higher the level of waste reduction by maggots.(Mahardika, 2016)

One of the studies conducted by Rukmini Piyantina, et al regarding the processing of organic waste for cultivating BSF larvae showed that the amount of 1.5-2 kilograms of BSF larvae could reduce waste by 3-4 kilograms of waste per day. This explains that the number of BSF larvae in the amount of waste that can be reduced is 1:2 per day.(Rukmini et al., 2020)

BSF larvae can consume large amounts of food waste faster and more efficiently than any other known species. This is influenced by the mouthparts and digestive enzymes of the larvae which are more active (Sipayung, 2015). BSF larvae also have a characteristic in their food pattern, namely that BSF larvae move to search for food horizontally. Dortmans B, et al. in their book on organic waste processing using BSF states that the amount of waste that can be consumed by BSF larvae is limited by the thickness of the waste layer. BSF larvae can eat the entire food medium at the bottom of the cross-section with a thickness of around 5 cm. If this thickness exceeds, the work

of BSF larvae will not be optimal in breaking down the waste in the cross-section of the container (Hoornweg et al., 2013). According to Lalander et al. (2015), the efficiency of BSF larvae in decomposing organic material is also influenced by factors such as moisture content, aeration, and larval density, which directly affect their development rate and waste reduction performance.

One of the studies conducted by Bayu Condro Purnomo in 2022 showed the results that this waste processing container uses the cross-sectional area of the organic waste container that will be processed by BSF larvae, with variations in cross-sectional area of 20x20 cm2, 20x30 cm2, and 30x40 cm2. These results were obtained sThe wider the cross-sectional area of the container, the greater the BSF larvae will reduce waste. Apart from that, it is also influenced by the level of larval death, environmental conditions, and the type of food given to BSF larvae. Further implementation needs to be carried out on a household and communal scale in order to reduce the amount of organic waste produced by households.Based on these conditions, the author is interested in conducting outreach to the public regarding the application of variations in container cross-section to the amount of weight reduction in organic waste using BSF fly larvae.

METHODS

The method used was a lecture by the resource person and also a direct simulation of cultivating BSF larvae. The resource person provided motivation to the community about the importance of processing organic waste. The expected target of this activity is that the public will be able to understand how to cultivate BSF larvae using containers in various cross-sectional areas, so that they will be able to increase creativity and public opinion. The following are the stages of socialization carried out.

1. Socialization and presentation of material
2. Application practice using BSF larvae containers

RESULTS

1. Socialization and Presentation of Material

Socialization and presentation of material regarding BSF larva cultivation containers with varying cross-sectional areas. The material explained starts with the introduction, life cycle, cultivation procedures, benefits obtained from cultivating larvae and waste processing containers with varying cross-sections. Apart from that, the types of organic waste that can be decomposed by BSF larvae are presented so that people can also sort household waste from their respective homes.

The first session in this socialization activity was providing material to the community regarding BSF fly cultivation. The aim of providing this material is to provide an initial overview to the public about the forms and methods of cultivating BSF flies. A good initial picture in the community can increase people's interest in cultivating BSF larvae. Apart from that, the public was also explained about the benefits of cultivating BSF flies. The benefits obtained from cultivating BSF flies are that they can reduce the presence of household organic waste, maggot feces (kasgot) can be used as compost for plants, and maggot larvae are used as an alternative feed for fish and poultry because of the high protein content of maggots (Paputungan et al , 2022).

Apart from explaining the life cycle of BSF larvae, the presenter also gave an explanation about the BSF fly container. The container is placedComposting containers can be wooden boxes or plastic boxes. Composting boxes should be made flexible and easy to move(Hakim et al., 2017).The

structure of the container is very important for the larval food process in producing substrate and allows the larvae to actively move and the larvae to maintain the respiratory process in producing food.(Lalander et al., 2020) The composting box must be able to protect the BSF larvae colony from exposure to rainfall, heat, and predatory animals. The composting container should make it easy for female insects to enter and comfortable for laying eggs. Ideally, the composting container should include pieces of material where female flies lay their eggs.(Hakim et al., 2017)

2. Practice

The practical stage of making containers for processing waste by cultivating BSF larvae is carried out by the service team. Community members are invited to pay close attention to all stages carried out. The steps in carrying out a demonstration are:

1. Explains the design of the BSF Larva container
2. Preparation of tools used in making containers
3. Preparation of materials used in making containers
4. Demonstrate with the community the manufacture of containers according to design drawings and sizesvariations in cross-sectional area 20x20 cm2, 30x20 cm2, 30x40 cm2which has been prepared.
5. Black Soldier Fly (BSF) larvae and organic waste originating from waste processing sites located around residents' homes. The available waste is fruit, vegetable waste or food waste from the community.
6. All waste obtained is chopped or crushed according to the required weight and then put into a section with a volume of 6000 m3 and variations in cross-sectional area of 20x20 cm2, 30x20 cm2, 30x40 cm2.
7. The larvae used in the BSF larvae research were 20 – 25 days old. These larvae are in the active phase, namely larvae that are 20-25 days old1/2 kg BSF Larvae.
8. Organic waste is weighed in a quantity of 1 kg

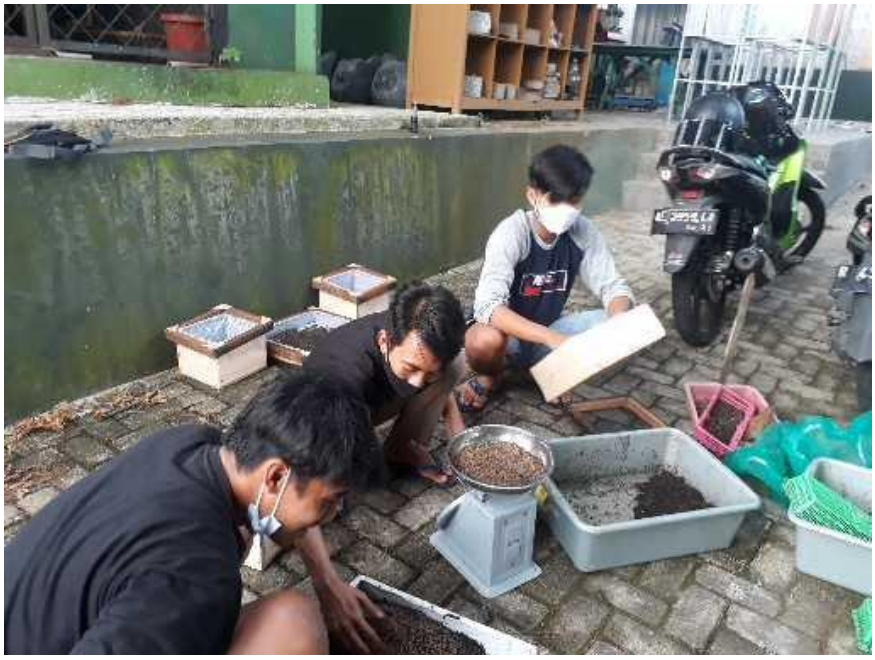

Figure 1. The Process of Weighing and Putting Larvae and Waste Into Containers

3. End

At the final stage, the product produced in the practical process of making the container is handed over. It is hoped that the practice and submission of the results of this practice can increase community enthusiasm in implementing organic waste processing using BSF larvae. The final explanation presented is the cultivation of BSF larvae and the function of surface area in the BSF larvae processing container. The speaker provides solutions to every obstacle that is often encountered in cultivating BSF larvae. The obstacles faced are dead BSF larvae, BSF larvae that escape from the container, and wet BSF larvae droppings

DISCUSSION

Containers with a larger surface area can allow the larvae to move easily to process food more quickly.(Lalander et al., 2020)Waste processing using BSF larvae of course takes place in a container that can provide optimal conditions for larval growth. Not only environmental factors, the material and shape of the compost bin structure are also considerations for the optimal conditions for larvae in reducing waste(Arief Sabdo Yuwono, 2018). If the depth of the waste in the container is more than 5 cm, the larvae will have difficulty processing everything and the waste in the bottom layer will not be touched.(Budiyanto et al., 2019).

In carrying out cultivation there are severalObstacles include dead BSF larvae, which can be caused by a lack of BSF larvae eating and wet environmental conditions. Meanwhile, the cause of the problems with BSF larvae running away and wet cassava is due to wet containers and BSF larvae being fed with too much water content. The solution to this problem is to regulate the water content of BSF larvae feed and maintain the condition of the container.

CONCLUSIONS

Based on the implementation of socialization on the cross-sectional area of BSF fly cultivation containers, the following conclusions were obtained: (1) The public understands the characteristics and life cycle of BSF larvae, (2) Socialization participants understand the obstacles and solutions to problems faced in cultivating BSF larvae, (3) Socialization participants understand that the wider the cross-section, the faster the reduction in waste so that it will produce fertilizer quickly and in large quantities.

ACKNOWLEDGMENT

Through socialization of BSF fly cultivation, it is hoped that it can increase the percentage of organic waste processing and can create new jobs.

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