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# The role of black soldier fly (BSF) *hermetia illuncens* as organic waste treatment

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**Abstract.** Black Soldier Fly (BSF) become concern that it can solve environment problem. It can turn organic waste to biomass supporting the composition of its micro flora. The research aim to investigate agricultural waste in Lembang site west java.. Amount of bsf with 100 mg in weight was used in research in 200 g, 250 g and 300 g with two and three combination of waste product. The two combinations were bran + milk, bran + vegetable, fish + bran, afterward it was continuo with three combination that they were media of milk + vegetable+ bran and milk + vegetable + bran. All material were slice into small sizes, blend and measure. After pre pupae stage they were harvested. The result show at bsf treatment with two combination with fish waste + bran at 250 : 250 resulted the best bioconversion i.e 20 g compare to milk + bran (16 g) and waste vegetable (15 g) while with three combination of milk + vegetable waste + bran on 150+150+200 was the highest (26 g) compare to milk vegetable+ bran (24 g). This showed capability bsf to degrade material from organic material especially from protein.

## 1. Introduction

Research about Black Soldier Fly (BSF) become a concern since BSF known as an environment problem solver such as organic waste, garbage household and restaurant. Another reason is BSF live and growth in waste product [8].

BSF has a capability to turn organic waste to biomass, only small number waste prpduct and ammonia left [9]. One of reason is BSF has unique microbiota composition that way it can digest all organic materials such as carcass, rotten vegetable, animal and human feces, garbage and coconut cake. Thus it could reduce biomass quantity in environment [1].

Reduction of waste product might be different on different waste. Another finding it can reduce bad odor because digestion process last faster so decomposition process runs faster too. Larva BSF can drying organic waste quicklt, in line with that it can be suppres growth of bacteria [9]; [3].

In addition BSF can control house fly (*Musca domestica*) population about 94-100 % in avian farm and pig feces by prevention from ovipositor [6] and Sheppard [7]. Deduction of house fly population decreasing is achive by modify feces modification [9]. This research aim to investigate the BSF function to conversion vegetables and fish waste to biomass in North Bandung West Java Indonesia.



**2. Method**

*2.1. Time and Place of Research*

This research type is a descriptive to know bsf biomass change on various organic materials. This research was carried out in the UPI botanical garden 2 from April May 2018.

*2.2. Research procedure*

A 100 mg of BSF larvae were put into different treatment doses, ie 200 g, 250 g, and 300 g with 2 combinations of milk + bran, vegetables + bran and fish carcas + bran. Followed by 3 combinations, namely milk + vegetables + bran and fish carcas + vegetables + bran. Milk, bran, vegetables and bran are cut and mixed according to the needs of the body and weighed. Then after reaching the pre pupae stage, it is harvested using a filter which is separated from the growth medium and then weighed by the addition of the biomass.

**3. Result and Discussion**

The result showed that Black Soldie Fly (bsf) is a promising substance as agen to turn matrial organic to biomass. Vegetable and fish waste for this research on the environment in this study were used organic waste from household waste. The result showed that combination of household waste product with proportion 250 g: 250 g was the best combination (Table 1).

**Table 1.** Effect of BSF (100 animals) on changes in organic waste biomass with two combinations

| No | Media                  | dose (g)  | biomassa (g) |
|----|------------------------|-----------|--------------|
| 1  | milk + bran            | 300+200   | 16,5         |
|    |                        | 250 + 250 | 16           |
|    |                        | 200 + 300 | 14           |
| 2  | vegetable waste + bran | 300+200   | 14,3         |
|    |                        | 250 + 250 | 15           |
|    |                        | 200 + 300 | 14           |
| 3  | fish waste + bran      | 300+200   | 19,3         |
|    |                        | 250 + 250 | 20           |
|    |                        | 200 + 300 | 17           |

BSF 100 mg in fish waste + bran mixed revealed the most efficient treatment a total number of 20 g. while other treatments, bsf in milk + bran was 16 mg and vegetable + fish in revealed 15 mg, is the lighter result compared to vegetables + fish. Another proportion also show a potential source as environment solver. Gary (2009) stated that bsf can change nutrient in organic wasterial around 50-70%.

**Table 2.** Effect of BSF (100 animals) on changes in organic waste biomass with three combinations

| No | Media                         | Dose (g)        | biomass (g) |
|----|-------------------------------|-----------------|-------------|
| 1  | milk+ vegetable waste + bran  | 200 : 200 : 100 | 26,3        |
|    |                               | 150 :150 :200   | 26          |
|    |                               | 100 : 100 : 300 | 20          |
| 2  | fish waste + vegetable + bran | 200 : 200 : 100 | 23          |
|    |                               | 150 :150:200    | 24          |
|    |                               | 100 :100 : 300  | 21          |

On the Table 2 showed that milk + vegetable waste + bran as three combination treatment with 150:150:200 revealing the highest result than other proportion between two treatment. Thus fish

waste + vegetable waste + bran showed lower result in producing bsf biomass. It showed that the balance compotion also determined the raise of biomass change [4].

In one case the digestion of pig manure in the US, such as [9] reported that nitrogen was reduced by 71%, phosphorus and potassium by 52%, aluminum, boron, cadmium, calcium, chromium, copper, iron, lead, magnesium, manganese, molybdenum, nickel, sodium, sulfur and reduced by 38-93% In another study, Phosphorus can be reduced by 61-70% and nitrogen reduction by 30-50% in limited bovine facilities has been documented [9]. BSFL can also be used to process and treat organic waste that should be expensive for in the hands of and pollute the marine and terrestrial environment.



**Figure 1.** BSF treatment for organic waste

Various studies have been shown by imago (5-8 days), cocoon (1-2 weeks) eggs (4 days) m larvae (2 weeks), pre pupae (1-2 weeks) with the potential to reduce different biomass quantities. [6] and [2] report 50%, [3] reported 65-75%, and more recently [5] reported that 78% of waste can be reduced. With such a combination of characteristics, odors are not given the opportunity to develop. BSF can control the population of house flies (*Musca domestica*) including preventing fly flies, reducing the number of house flies. This has been documented by [7] in the BSF study, the colonization of poultry and pig manure has the potential to reduce the population of flies in a population of 94-100%. Not only flies, their BSF also has low pathogenicity in organic waste.

It seems that BSf has been designed to be a natural means of managing organic waste, and is equipped with an effective mechanism. [6] showed that BSFL contains natural antibiotics which can actually prevent the spread of disease. Other researchers also reported that the BSFL suppressed *Escherichia coli* O157: H7 and *Salmonella enteric* serovar Enteritidis in chicken contaminated with manure [10], and this was achieved by modifying the dirt micro flora [9]. This BSF has more benefits while its pathogenicity has not been found. The Pollution Reduction Potential BSFL has the ability to reduce the potential for manure pollution by 50-60% or more

#### 4. Conclusion

Black soldie fly prove can solve environment problem. In this experiment, the two combinations: fish waste and bran also the three combinations: milk + vegetaable waste + bran were the highest in change waste organic materials int biomass.

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