

WASTE PROCESSING THROUGH FLY LARVA CULTIVATION BLACK SOLDIER FLY (BSF) AND ECOBRICK IN MERTOYUDAN, MAGELANG DISTRICT, CENTRAL JAVA

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Abstract - Most Indonesian people have problems related to waste, both organic waste and inorganic waste. Indonesian people also have not yet accustomed themselves to processing waste properly. This can be proven by the emergence of problems due to too much waste in landfills. Waste can become something valuable or useful if used properly and correctly. One action that can be used as an effort to overcome the waste problem is to cultivate Black Soldier Fly (BSF) fly larvae or what are often referred to as maggots. As is known, maggots contain protein which is very good for livestock and can be a profitable business by relying on the use of organic waste. Apart from that, inorganic waste can also be used to make ecobricks or substitutes for bricks. Implementation of this Kuliah Kerja Nyata (KKN) begins with conducting an analysis of waste problems, cultivation analysis, and analysis of profitable business prospects. Delivery and cultivation practices were carried out at Muhammadiyah 1 Pujotomo Middle School and Hamid Hamzah Islamic Boarding School, Mertoyudan, Magelang, Central Java. This program can run smoothly and the socialization of cultivation, cultivation practices and cage construction can be conveyed well to students and teachers as a form of realizing the vision in forming students' entrepreneurial spirit.

Keywords: Ecobricks, Cultivation, Garbage, Maggots

1. INTRODUCTION

Most Indonesian people have problems related to waste. This waste can be divided into two categories, namely organic waste and inorganic waste. Organic waste is waste or waste material from plants, animals and humans that can be biodegraded. Meanwhile, inorganic waste is waste that cannot be decomposed, such as plastic, glass, iron and so on. Indonesian people are not used to processing waste properly. This is due to the large amount of waste remaining, both organic (which can be recycled), inorganic (which cannot be recycled), and residue (which is burned at high temperatures). Without the public realizing, household waste will take much longer to accumulate and will continue to increase if effective countermeasures are not taken. The impact will cause serious environmental and health problems.

The organic waste that is abundant and accumulates every day can actually be processed and utilized in various ways. One way is by using it as a medium for cultivating caterpillars/maggot Black Soldier Flies (BSF). Growth maggot influenced by organic media (Masir et al., 2020). Restaurant waste has the greatest influence on the growth of BSF maggots (Fajri & Hamid, 2021). Apart from that, adult maggots can be used as animal feed, and the pupae can also be used as fish food.

To deal with the unpleasant odor from maggot cultivation, you can anticipate it by making a liquid ecoenzym. This liquid is also made from organic waste from fresh fruit and vegetables. The way to make it is just by mixing organic waste with water and molasses/jaggery liquid. Then fermented for 2-3 months, the resulting liquid will turn brownish and can be used immediately by watering it in the area around the cultivation. Ecoenzym Can also be used as plant fertilizer.

Meanwhile, handling inorganic waste can be done using methodsecobrick namely handling waste using plastic bottles filled with plastic waste (Widiyasari et al., 2021). With ecobrick, plastic waste that was previously thrown away, landfilled and even burned can be turned into useful items by putting it in plastic bottles. One plastic bottle can hold one plastic trash bag. So, with making ecobrick very useful for dealing with the accumulation of plastic waste around.

The main reason for maggot cultivation, production ecoenzym, and making ecobrick namely the problem of waste and at the same time changing something that has no value into goods that have marketable value so that they can be used by the community to support the economy. From maggot cultivation, maggot larvae can be obtained which can be used as animal feed, apart from that there is also leachate from filtered waste juice which can be used as liquid fertilizer which is useful for plants. Ecoenzym itself also has many benefits for plants and even health. Meanwhile making ecobrick can overcome the accumulation of waste and can be turned into useful items, even those with selling value. Through this Community Service Activity (CSA) or Kuliah Kerja Nyata (KKN), it is hoped that this will be the first step in handling waste, namely by carrying out socialization and activities regarding handling waste that has economic value to students at Muhamadiyah Pujotomo Middle School and the Tahfidz Hamid Hamzah Islamic Boarding School,

which also has a vision to form students with soul of entrepreneur and in line with our program.

2. METHOD

A. Tools and materials

Materials needed for cultivation maggot, making ecobrick and ecoenzym covers baby maggot, organic waste, used plastic bottles, used plastic packaging, still vegetable and fruit waste fresh, air, molasses/brown sugar. Meanwhile, for tools for making stacked buckets, BSF cages, ecobrick, and ecoenzym used include used paint buckets, nails, faucets, wooden plywood, nets, tin roofs, scales, glue guns, used cloth, scissors and used gallons.

B. Work procedures

(1) Discussion and Socialization

The discussion and socialization involved all community service members with supervisors and partners at the KKN venue, namely Muhammadiyah Pujotomo Middle School and Tahfidz Hamid Hamzah Islamic Boarding School. The material provided is to increase the knowledge and understanding of teachers and students, namely related to waste and its problems, as well as cultivation maggot or fly larvae Black Soldier Flies (BSF) for processing organic waste.

(2) Training on Making Stacked Buckets, Cages and Maggot Cultivation

The training in making stacked buckets, cages and cultivating maggots involved all students of Muhammadiyah Pujotomo Middle School and Tahfidz Hamid Hamzah Islamic Boarding School who were also accompanied by the teachers there. The training carried out included preparing tools and materials, collecting organic waste around campus and partner sites, making stacking buckets and cages as maggot cultivation media, egg hatching maggot, and the process of breeding maggots until they are ready to harvest.

(3) Manufacturing Training Ecobrick

Manufacturing training ecobrick carried out involving all students of Muhammadiyah Pujotomo Middle School and Tahfidz Hamid Hamzah Islamic Boarding School. The training includes collecting bottle and plastic waste, putting the plastic waste into bottles until they are full and solid, then arranging them into chairs that can be used in schools.

3. RESULTS AND DISCUSSION

General description of the KKN location

Kuliah Kerja Nyata (KKN) regarding waste processing which focuses on maggot cultivation, making ecobrick, ecoenzym and leachate was carried out at SMP 1 Muhammadiyah Pujotomo and Tahfidz Hamid Hamzah Islamic Boarding School in Magelang Regency. Where one of the visions of the school is to form students with soul of entrepreneur. Therefore, one of the efforts to realize this vision is to foster a

business spirit by training in maggot cultivation which utilizes organic waste in the area. As well as building student creativity in creating ecobrick. Implementation at this location is carried out at the request and approval of the head of the Middle School and Islamic Boarding School. By processing this waste, it is hoped that it can provide added value from waste that is simply thrown away.

Organic Waste Processing Using Maggot Cultivation

Maggots are larvae of Black Soldier Fly (BSF). In contrast to green flies, BSF flies have a shorter fly phase compared to their maggot phase. The life cycle of BSF flies from egg to adult fly takes between 40 and 43 days. One parent BSF fly can produce eggs ranging from 185 to 1235 eggs. Maggot cultivation process starting with hatching BSF eggs for approximately 2-4 days with chicken fodder media, dry rice bran which functions to maintain baby maggot in order to remain in a dry place, the tissue as a base for the eggs, as well as dry leaves as a barrier between the chicken fodder and the tissue. After the egg hatches, baby maggot will go down and eat the chicken fodder. Baby maggot can be transferred to a stacked bucket about 1 week after the eggs hatch and routinely fed in the form of organic waste.

Organic waste that is suitable for maggot feed is kitchen waste, vegetables and fruit that are not spicy or sour. Feeding maggot must be monitored every day to maintain the availability of feed in stacked buckets. For 8 kg-10 kg maggot can consume around 7 kg of organic waste. Harvesting process maggot can be done after 14 days from egg hatching, after that maggot will enter the pre-pupa period until becoming a pupa. When maggots enter pupation, maggot can be moved into a cage to be bred into BSF. The time required from the pre-pupa to pupa process is 7 days. The advantage of maggot cultivation using stacked bucket media is that it can separate the resulting leachate from the organic waste used for feed maggot. This leachate can be used as Organic Liquid Fertilizer or Pupuk Organik Cair (POC).



Figure 1. Eggs of Black Soldier Fly (BSF)



Figure 2. Maggot or Larvae of Black Soldier Fly (BSF)



Figure 3. Simple Maggot Cultivation



Figure 4. Making Stacked Buckets as a Medium Maggot Cultivation



Figure 5. Making and repairing BSF cages

Inorganic Waste Processing with Ecobrick

Ecobrick is a visionary innovation developed as a solution for processing plastic waste. Taken from the two words that form it, eco and brick, simply defined as environmentally friendly brick. Ecobrick program is one of the results of observations regarding the problem of plastic waste around the community, especially at Muhammadiyah Pujotomo Middle School and Tahfidz Hamid Hamzah Islamic Boarding School. Ecobrick requires plastic bottles, inorganic waste, sticks to compact the waste. Where making ecobricks is done by putting inorganic waste into a bottle which is then compacted using a stick or tool until there is no cavity left in the bottle.

Implementation of the program began with notification to students and students to collect plastic waste and used plastic bottles around them. The plastic waste and used bottles are collected in one place at the school. Implementation of making ecobrick simultaneously carried out in the Muhammadiyah Pujotomo Middle School and Tahfidz Hamid Hamzah Islamic Boarding School on the 17th of August. Then it continued on the 19th of August to make seats from ecobrick. Where Ecobrick those that have been collected previously are then arranged into seats that can be used in schools.



Figure 6. Making Ecobrick with Students

Maggot Cultivation Socialization and Ecoenzym

Maggot cultivation socialization was done to provide understanding to junior high school and Islamic boarding school residents regarding how to cultivate maggot from egg to ready to harvest. Socialization begins with the introduction of various wastes around the community, especially in junior high school and Islamic boarding school areas. This introduction of waste is related to organic waste which

will be processed using maggot and ecoenzym, as well as inorganic waste that will be used to make ecobrick. Next is an introduction to maggots, starting from eggs to pupae which will hatch into BSF flies. In the maggot introductory session are given directions regarding the things that will be done in cultivating maggots. Apart from that, there is also direct training in cultivating maggots. Maggot cultivation carried out in junior high schools and Islamic boarding schools is small-scale cultivation so that cultivation tools are used that are adapted to the scale of cultivation. Therefore, in the socialization and practice of cultivating maggots, a stacked bucket and a BSF cage are used which are not very large in size. Apart from that, there is also outreach regarding the use of maggots that are ready to be harvested and the leachate produced during maggot cultivation along with the processing and utilization of liquid waste.



Figure 7. Cultivation Socialization Maggot



Figure 8. Feeding and Cultivation Practices Using Stacked Buckets

4. CONCLUSION

Indonesia is a country that cares about both organic and inorganic waste. Organic waste is waste that can be easily thrown away, while inorganic waste is waste that cannot be thrown away such as plastic, clay or wood. The Indonesian population is not well informed about organic waste, and it can be managed and used in various ways. Use maggot as a waste management agent it can help reduce organic waste and protect the environment from dangerous gas leaks. Making ecobricks using plastic waste as a medium can overcome the problem of inorganic waste. Activities carried out at Pujotomo Muhammadiyah Middle School and Islamic Boarding School are to deal with organic and inorganic waste so that it can be used into something of value. Apart from that, maggot cultivation is used to provide

information to junior high schools and Islamic boarding schools about managing organic waste into something that has economic value. We realize that there are still shortcomings in preparing this journal. We really hope that this journal can be of benefit to all readers and the wider community. So that the waste problem can be resolved, so that the environment becomes clean again.

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