

Introduction and Trials of Eco-enzyme as a Household Waste Management Solution at Dukuhdempok Village, Wuluhan District, Jember Regency, Indonesia

Muhammad Abyan Syafi ^a, Janatul Firdausi Nuzula ^b, Dennis Tito Manaek ^c, Alya Fakhirah ^d, Diah Riski Hedianti^e

^a *Medical programme Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia*

^b *Midwifery programme, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia*

^c *Communications Programme, Faculty of Social and Political Sciences, Universitas Airlangga, Surabaya, Indonesia*

^d *Pharmaceutical sciences programme, Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia*

^e *Nutrition Sciences programme, Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia*

Abstract

The problem of household waste is currently one of the issues that is a serious problem for the government that requires handling. Jember Regency is an area that produces household waste (organic waste) which is quite high, especially in the Dukuhdempok Village area, Wuluhan District. To overcome this problem, it is necessary to have proper organic waste management, that way is to create an eco-enzyme innovation as the main solution. This study uses a community service method by taking action in the field and conducting introductions related to these innovations and the main targets are Dukuhdempok Village residents and women in high organizational positions in Dukuhdempok Village. Then the results obtained that eco-enzyme is a major solution in managing organic waste and eco-enzyme also brings many benefits as organic plant fertilizers and natural pesticides, disinfectants and cleaning fluids, and can be used as a substitute for bath soap, floor cleaners, and mouthwash.

Keywords: *eco-enzyme, organic waste, household waste*

1. Background

The current household waste problem is one of the issues that is becoming a serious problem for the government that requires handling. Public awareness of waste management is still relatively low. The community's waste management still refers to the end-of-pipe approach, namely by collecting, transporting, and disposing of it in landfills where the waste is left piled up or burned. The accumulation of large volumes of organic waste has the potential to cause new problems such as emissions of greenhouse gases, methane gas (CH₄), CO₂, and N₂O which come from the decomposition process which causes an unpleasant odor (Lolita Endang Susilowati et al., 2021; Ministry of Environment Life and Forestry, 2018).

Jember Regency is one of the districts with the largest number of waste problems in East Java by producing 255,947.5 m³ of waste per year (Ministry of Environment and Forestry, 2018). Dukuhdempok Village, which is located in Wuluhan District, Jember Regency, East Java Province, is one of the sub-districts that has a high organic waste problem. The amount of organic waste generated from the household environment is quite large, reaching 60-70% of the total waste produced, including food scraps, fruit peels, vegetable scraps, and animal waste (Wahyudin and Nurhidayatullah, 2018).

According to Law No. 18 of 2008 defines waste management as a systematic, comprehensive and continuous activity which includes handling and reducing waste. Efforts that can be taken for waste management are turning waste into products that are harmless and have a sale value (Putri and Putri, 2018). In general, people are still reluctant to manage their waste because most people do not understand the dangers of waste for the environment or the potential benefits that can be obtained by the community if they manage waste properly and correctly. Correct waste management can have quite high economic value, so community empowerment-based waste management efforts are needed to reduce the negative impacts of waste (Ojewale, 2014; Defriatno and Krisdhianto, 2022).

Waste that is managed properly can be utilized to become something valuable and useful and can reduce environmental pollution. One good organic waste management is by making eco-enzymes. The product innovation eco-enzyme is a fermented liquid from organic waste such as vegetable scraps, fruit peels and organic fruit scraps with a minimum fermentation time of 3 months. This eco-enzyme product innovation, even though it only uses three basic ingredients, but the benefits are very environmentally friendly which can be used as a cleaning solution (mopping, washing dishes, carbolic acid bathroom cleaners), plant growth factors, detergent mixtures, pesticide residue cleaners, eco liquid -enzyme can purify contaminated river water, as an antiseptic and reduce the temperature of car radiators (Yulistia and Chimayati, 2021; Dewi, 2021).

The socialization activity "Eco-Enzyme Innovation as a Solution for Household Waste Management" made PKK mothers the targets of this activity. The purpose of this community service activity is to increase the knowledge and insight of housewives so they know and recognize eco-enzyme innovations as a solution to household waste management, especially kitchen waste.

2. Community Service Methodology

Introduction activities regarding "Eco-Enzyme Innovation as a Solution for Household Waste Management" in Dukuhdempok Village, Wuluhan District, Jember Regency were carried out by involving all community service members. These university students came from several faculties including FSP, FST, FM, FPharm, FPH, FPsy, and FEB. The method of introduction activities regarding eco-enzyme innovations as a solution to household waste management is carried out in the village houses at different locations, then from these activities the following formulation is produced:

a. Preparatory Stage

- 1) The activities carried out in the preparatory stage are:
- 2) Formation of the structure in charge of introduction.
- 3) Determination of specific targets of extension programs.
- 4) Observation stage of household waste problems in Dukuhdempok Village.
- 5) Making eco-enzyme samples as examples during demonstrations.
- 6) The finalization stage includes preparing materials, preparing tools and materials for demonstrations, and preparing the packaging of the eco-enzyme in order to increase the sale value.

b. Implementation Stage

The implementation of Eco-enzyme innovation introduction activities as a solution to household waste management was carried out by presenting material through PPT (power point) media carried out by several students. This introduction activity was carried out offline and carried out in different locations. Conditions when the activity took place fairly smooth and conducive. The participants in this activity also participated in paying attention to the material that had been presented.

3. Discussion

Waste is defined as the remains of human activities in solid form, which can be in the form of organic or inorganic substances that cannot be used anymore. An example of organic waste is the remains of fruits and

vegetables, while an example of inorganic waste is plastic. Waste management is a complex matter and not easy. Improper waste management can be a big threat to the health of flora and fauna where the waste is disposed of. (Sujarwo et al., 2014) So efforts are needed to minimize the presence of waste that pollutes the environment, one effort that can achieve this goal is the use of organic waste for eco-enzymes.

Eco-enzyme is a liquid produced from the fermentation of leftover fruits and vegetables mixed with brown sugar or molasses as a substrate. The principle of the process for making eco enzyme itself is actually similar to the process of making compost, but water is added as a growth medium so that the final product is liquid which is preferred because it is easier to use and has many benefits (Luthfiyyah et al., 2010).

The benefits of eco-enzymes are divided into 3 categories, the first for agriculture (as organic plant fertilizer and natural pesticides), the second for health (as a disinfectant and cleaning fluid) and for household use (as a substitute for soap, floor cleaners and mouth cleaners). (Hasanah, 2021). Eco-enzyme outreach activities at the routine Dasa Wisma event for residents of Dukuhdempok Village will be held on 19-22 July 2022 in different locations. The main targets of this introduction are women in organizational positions with influence from Purwojati Hamlet and Gawok Hamlet, Dukuh Hamlet, and Hamlet Wulun.

The main purpose of this introduction is to provide insight and direction regarding how to make eco-enzyme liquid, the ingredients that must be prepared, as well as the benefits and purposes of making eco-enzyme. In introduction and outreach activities it is hoped that the community can manage household waste by building awareness so that they pay more attention and care as a way to minimize waste.

Regarding the process of making eco-enzymes which is very easy and also does not require a large place, organic household waste treatment can be applied directly at home. Before conducting the introductions, we have made samples of ready-made eco-enzymes. The process for making eco-enzymes is very simple and the tools and materials needed are also easy to find, namely plastic fermentation process storage containers, knives for cutting household organic waste, molasses or molasses, and organic waste.

The steps for making eco-enzyme have a ratio of 10 parts of water, 3 parts of organic waste and 1 part of molasses. For the manufacturing process as follows. First, cut the organic home kitchen waste according to the size of the fermenter container. Second, prepare clean water and pour it into a container as a fermentation medium. Third, pour the molasses or molasses into the fermenter container. Fourth, put organic kitchen waste into a plastic container and mix it thoroughly. Fifth, close the fermentation container with a plastic bag then tie it tightly with a rope or rubber, then make a hole in the top of the plastic bag. Therefore, in the first 7 days there will be a fermentation reaction that will cause gas. And the final step, label the date of manufacture to make it easier to remember the harvest date and store it in a cool place for 90 days for the fermentation process. After 90 days, the eco-enzyme is ready to be harvested. We received information from Mr. Nur Kholiq, a resident of

Dukuhdempok village and who has also studied eco-enzyme that leftover rice and egg shells can be used as an eco-enzyme mixture. Egg shells contain good calcium as a mineral for the soil.

In terms of the process, the manufacture of eco-enzymes has advantages for the atmospheric environment, where during the fermentation process it produces O₃ gas (ozone) which is released into the atmosphere which is useful for absorbing ultraviolet light radiation which is harmful to human health, animals and the environment. The reaction of ozone formation during the fermentation process is as follows: $\text{CO}_2 + \text{N}_2\text{O} + \text{O}_2 \rightarrow \text{O}_3 + \text{NO}_3 + \text{CO}_3$. During the harvesting process, there is a possibility that there may be fine white mold on the surface, but this process is normal. The part of the eco-enzyme that is harvested is the liquid eco-enzyme. The method of harvesting is very easy, namely separating the liquid and eco-enzyme dregs by straining the liquid. Eco-enzyme liquid has a good standard for maximum results. That is, it has acidic properties and has a pH below 4.0.

This activity is empowering our goal to be able to process organic kitchen waste into eco enzyme. This is done as an effort to provide a complete solution to the organic waste handling program circulating in the community which is converted into a more useful product. This effort can be realized through the manufacture of eco enzymes which are applied at the household level.

4. Conclusions and Closing

As explained Eco-enzyme is a liquid produced from the fermentation of leftover fruits and vegetables mixed with brown sugar or molasses as a substrate. The fermentation process is carried out for 3 months and avoid direct sunlight. Eco-enzyme liquid is very useful for everyday life. The benefits of eco-enzymes include organic plant fertilizers and natural pesticides, disinfectants and cleaning fluids, and can be used as a substitute for soap, floor cleaners and mouth cleaners. Apart from being beneficial for everyday life, making eco-enzymes is also beneficial for the environment because there is no buildup of organic waste. Organic waste that has accumulated is usually burned by the community and creates new problems for the environment.

With this eco-enzyme introduction, it is suggested that the women in organizational positions at Dukuhdempok village will turn this eco-enzyme opportunity into new business opportunities for the villagers of Dukuhdempok and can apply eco-enzyme as a cleaning agent and organic fertilizer for agricultural purposes.

References

- Defriatno, M.E. and Krisdhianto, A., 2022. ANALISIS POTENSI NILAI EKONOMI SAMPAH PERUMAHAN KAWASAN KOTA KABUPATEN JEMBER. *BIOSENSE*, 05(01), pp.91–99. Available at: <https://ejournal.unibabwi.ac.id/index.php/BIOSENSE/article/view/1961/1288> [Accessed: 31 July 2022].
- Dewi, D.M., 2021. Pelatihan Pembuatan Eco Enzyme Bersama Komunitas Eco Enzyme Lambung Mangkurat Kalimantan Selatan. *Jurnal Pengabdian ILUNG (Inovasi Lahan Basah Unggul)*, 1(1), p.67.
- Hasanah, Y, 2021. Eco enzyme and its benefits for organic rice production and disinfectant. *Journal of Saintech Transfer*, 3(2), pp.119-128
- Kementerian Lingkungan Hidup dan Kehutanan, 2018, Indeks Kualitas Lingkungan Hidup Tahun 2017 [Online]. Available at: https://www.menlhk.go.id/site/single_post/1551 [Accessed: 31 July 2022].
- Lolita Endang Susilowati, Mansur Ma'Shum and Zaenal Arifin, 2021. Pembelajaran Tentang Pemanfaatan Sampah Organik Rumah Tangga Sebagai Bahan Baku Eko- Enzim. *Jurnal Pengabdian Magister Pendidikan IPA*, 4(4), pp.356–362.
- Ojewale, O.S., 2014. Intraurban Analysis of Domestic Solid Waste Disposal Methods in a Sub-Sahara African City. *Journal of Waste Management*, pp.1–7. Available at: <http://dx.doi.org/10.1155/2014/193469> [Accessed: 31 July 2022].
- Putri, Rizqy Fadhline and Putri, Rini Fadhline, 2018. PELATIHAN PEMANFAATAN BARANG BEKAS MENJADI BARANG YANG BERNILAI EKONOMI. *Jurnal Pengabdian Kepada Masyarakat*, 2(1), pp.150–155. Available at: <https://jurnal-lp2m.um naw.ac.id/index.php/AJPKM/article/view/107/109> [Accessed: 31 July 2022].
- Sujarwo, T, & Widyaningsih, 2014. Pengelolaan Sampah Organik & Anorganik. *Pengelolaan Sampah Organik & Anorganik*, pp. 7–8.
- Wahyudin and Nurhidayatullah, 2018. PENGOMPOSAN SAMPAH ORGANIK RUMAH TANGGA MENGGUNAKAN MIKROORGANISME LOKAL BONGGOL PISANG SEBAGAI BIOAKTIVATOR. *AGRIOVET*, 1(1), pp.20–36.
- Yulistia, E. and Chimayati, R.L., 2021. Pemanfaatan Limbah Organik menjadi Ekoenzim. *Unbara Environment Engineering Journal*, 2(1), pp.1–6. Available at: <http://journal.unbara.ac.id/index.php/UEEJ/article/view/1184/730> [Accessed: 27 July 2022].