

THE UTILIZATION OF HOUSEHOLD WASTE THROUGH ECOENZYMES

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Keywords	Abstract
Waste, Ecoenzyme, Literature Review	The existence of household waste has a huge impact on the environment and health if left unchecked. One way to process household waste into useful products is by making Ecoenzyme. This study aims to determine the utilization of household waste through ecoenzyme by analyzing the literature review. There are 14 scientific articles used in this research which come from 12 accredited national journals and 2 journal proceedings articles. The technique of presenting the data is using a table listing scientific publication articles that will be analyzed into research data. Data analysis techniques were carried out descriptively by analyzing and identifying scientific articles so as to produce a more formative summary. The results of the literature review research show that this Ecoenzyme is an alternative to organic waste processing, especially in household waste, this Ecoenzyme has several product results and their uses. In agriculture, Ecoenzyme is

used as liquid organic fertilizer (POC). The results of Ecoenzyme are also used as cleaners, soaps, hand sanitizers, disinfectants, and are made in the form of essential oils to be added to water purifiers.

INTRODUCTION

Indonesia is one of the largest waste-contributing countries, ranked 5th out of several developed countries on the Asian continent, reaching 56,333 tonnes/year (source: Lourens JJ Meijer et al., 2022). The accumulation of material waste from community activities causes harm to the environment or the community itself, especially to health, namely the spread of disease. The mountains of garbage at the Cipayung TPA reach 20 meters. UPD TPA Cipayung Ardan said, "So far, his party has even encouraged residents to see the condition of the TPA which he admits is indeed over capacity".

Garbage waste is waste generated by production processes both industrial and domestic (household). One of them is household waste, mostly organic material, for example, organic waste, kitchen waste, leftover flour, vegetables, fruit peels, and leaves (Marliani, 2015). Organic waste consists of ingredients for plants and animals taken from nature or produced by agriculture, fisheries, or other activities. This waste is easily decomposed in natural processes.

One way to use household waste is in the form of a product, namely Ecoenzyme. A liquid extract produced by fermenting vegetable and fruit residues made from brown sugar (Widodo et al., 2022). The principle of the Ecoenzyme production process itself is actually similar to the composting process but water is added as a planting medium so that the final product is a liquid which has advantages (Dwiyanti & Jati, 2019).

Another feature of Ecoenzyme is that it doesn't take up or require a large area of land, it's enough to use used bottles or containers with sufficient space capacity for the fermentation process (Nurhamidah et al., 2021). There is a Makmur Jaya Outcome Garbage Bank which the people of Karangtempel use as a place to collect household waste which will be recorded regularly by officers. Household waste collected will be managed to become Ecoenzyme and magot cultivation (Widodo et al., 2022).

In the school environment, it turns out that there are still many students who are unfamiliar with Ecoenzyme products. Students' understanding of the benefits of Ecoenzyme in general in everyday life is still very low, namely only 3.8% of students in the category of less understanding. Some students understand Ecoenzyme only as plant fertilizer. This is because students have not been given much information about the benefits of eco-friendly (Dwiyanti & Jati, 2019) Ecoenzyme.

There are also Ecoenzyme- Based Essential Oil products that contain fruit peel raw materials. Ecoenzyme-Based Essential Oil Products conducted a literature search on the Ecoenzyme topic and offered several aromatherapy innovations with the addition of essential oils (Dwiyanti & Jati, 2019). Another product is a hand sanitizer made from Ecoenzyme which has been made by housewives in Sungai Pinang Luar

Samarinda Village (Alam, 2022). Eviati & Sulaeman (2009) stated that one of the components of Ecoenzyme is acetic acid (CH₃COOH), which can kill viruses and bacteria. As an alternative Ecoenzyme also offers long time chemical treatment of effluents, compared to other chemical agents (Cahyawati et al., 2023). Based on this background, this study intends to determine the processing of Ecoenzyme from household waste.

METHODS

The method used in this study uses a literature study by loading analysis of several articles and then reviewing documents and evaluating previous similar research on Ecoenzyme. Several stages of the literature review method contain; First, the selection of the script. The analyzed articles can be obtained by searching for relevant literature using several well-known online research platforms related to Ecoenzyme, waste, and review literature (Google Scholar). The articles used were from 2013 to 2023. The articles studied were from journals in English and Indonesian. Related articles should focus on household waste ecoenzymes. 15 articles provide a clear picture of ecoenzymes from household waste. By monitoring titles and abstracts, journal articles are selected and examined by researchers to determine whether or not the article is suitable for the purpose of the research being carried out. Second, the analysis uses qualitative content with a correlation between content and context. The research articles were analyzed based on the discussion sub-categories according to the researcher's questions (Nurwahyunani, 2021; Rusdiyana et al., 2021).

RESULTS AND DISCUSSIONS

This research is based on an article that examines research activities on ecoenzyme processing. from household waste published in the period 2021 - 2023. According to experts, Ecoenzyme . has several meanings, so in this article, the author synthesizes the definition of Ecoenzyme . based on this opinion. Scientific article data used in research that has been validated is then grouped based on the search for coding definitions that match the research idea. The grouping of scientific articles is presented in tabular form as follows:

Table 1. Classification of scientific article data obtained				
Utilization	Environment	Agriculture	Household Products	Total
Number of Journals	5	4	4	14

In detail, 11 scientific articles were obtained which were used as research data, namely there were 4 ecoenzyme scientific articles for the environment, 3 ecoenzyme scientific articles in agriculture, and 4 ecoenzyme scientific articles for the environment .

Table 2. Details of the articles used

Author	Title	Jurnal
Theme 1. Utilization of Ecoenzyme from Household Waste for the Environment		
Nurussalma, S., Tikasari, J., Warisman, A. N. P., Kismayanti, C. N., & Ulfah, M	Pemberdayaan Masyarakat Grobogan Melalui Pemanfaatan Ecoenzyme Limbah Buah dan Sayur Sebagai POC Hidroponik	<i>Jurnal Ilmiah Pertanian</i>
Parwata, I. P., Ayuni, N. P. S., Widana, G. A. B., & Suryaputra, I. G. N. A.	Pelatihan Pengolahan Sampah Organik Menjadi Eco Enzyme Bagi Pedagang Buah Dan Sayur Di Pasar Desa Panji.	<i>Prosiding Senadimas Undiksha, 631–639.</i>
Ayu, P., Dewi, V. H., Sutama, W., Akuntansi, P., Ekonomi, F., & Bisnis, D	Pengolahan Sampah Organik Melalui Konsep Eco Enzyme Bagi Rumah Tangga Di Desa Dalung Masa Pandemi.	<i>Jurnal Pengabdian Masyarakat</i>
Nurhamidah, N., Amida, N., Rohiat, S., & Elvinawati, E.	Pengolahan Sampah Organik Menjadi Eco-Enzyme pada Level Rumah Tangga menuju Konsep Eco-Community.	<i>Jurnal Pengabdian Masyarakat Rafflesia</i>
Supriyanto, S., Maflahan, I., Rahman, A., Hidayati, D., Mojiono, M., Faridz, R., & Lestari, H.	Pendampingan Pemanfaatan Sampah Organik Menjadi Eco-Enzyme Sebagai Upaya Pengurangan Sampah di Lingkungan Sekolah	<i>Jurnal Ilmiah Pangabdhi</i>
Theme 2. Utilization of Eco Enzyme from Household Waste for Agriculture		Theme 2. Utilization of Eco Enzyme from Household Waste for Agriculture

Sari, T. P., & Basmantra, I. N	Pemanfaatan Sampah Organik Rumah Tangga Menjadi Eco Enzyme Dalam Upaya Pemberdayaan Ekonomi Masyarakat Desa Rejasa	<i>Jurnal Pengabdian Multidisiplin</i>
Pakki, T., Adawiyah, R., Yuswana, A., Namriah, Dirgantoro, M. A., & Slamet, A.	Pemanfaatan Eco-Enzyme Berbahan Dasar Sisa Bahan Organik Rumah Tangga dalam Budidaya Tanaman Sayuran di Pekarangan	<i>Prosiding PEPADU 2021: Seminar Nasional Pengabdian Kepada Masyarakat</i>
Septiani, U., Najmi, & Oktavia, R.	Pengolahan Sampah Rumah Tangga Menjadi Produk Serbaguna di Yayasan Khazanah Kebajikan.	<i>Jurnal Universitas Muhamadiyah Jakarta</i>
Illahi, Ayu Kurnia Kurniasih, Dedeh Sari, & Deliana Andam	Analisis Kualitas Eco Enzym dari Berbagai Bahan Dasar Kulit Buah Untuk Pertanian Berkelanjutan	<i>Jurnal Ilmu-Ilmu Pertanian</i>
Theme 3. Utilization of Eco Enzyme from Household Waste as a Product		
Indah Sari, V., Susi, N., & Rizal, M.	Pelatihan Pemanfaatan Sampah Organik Sebagai Bahan Eco-Enzym Untuk Pembuatan Pupuk Cair, Desinfektan Dan Hand Sanitizer.	<i>Jurnal Pengabdian Masyarakat</i>
Jaya, K. K., Lampung, B., Agustrina, R., Ernawati, E., Pratami, G. D., & Mumtazah, D. F. (n.d.)	Pengolahan Sampah Organik Melalui Konsep Eco Enzyme Bagi Rumah Tangga Di Desa Dalung Masa Pandemi.	<i>Jurnal Pengabdian Kepada Masyarakat</i>
Nurafina, E., Hasna, A., Fillah, A., Pawestri, S. D., &	Potensi Kewirausahaan Mahasiswa Berbasis Pemanfaatan Ecoenzyme	<i>Prosiding Seminar Nasional Sains Dan Entrepreneurship</i>

Ulfah, M.	Limbah Kulit Buah	63–66.
	Sebagai Air Purifier.	
Utami, S., Kusumaningrum, E. N., & Hewindati, Y. T	Pembuatan Eco-Enzyme di Kelurahan Pondok Cabe Ilir , Pamulang , Tangerang Selatan : Solusi Penanganan Sampah Organik pada Level Rumah Tangga	<i>Jurnal Pengabdian Masyarakat</i>

Theme 1 . Utilization of Ecoenzyme from Household Waste for the Environment

Community-Based Integrated Waste Management is an approach to waste management that is based on community needs and requests, planned, implemented, controlled and evaluated with the community. At present, especially in big cities, the increase in urban waste generation (2–4%/year) which is not followed by the availability of adequate waste infrastructure and facilities, has an impact on environmental pollution which is always increasing from year to year. (Purwata et al., 2021).

Cutting the distribution channel of waste to landfill is an effective way and speeds up the processing of waste into more useful products. This effective method can be realized through the manufacture of *Ecoenzyme* . applicable at the household level. Making *Ecoenzyme* is very simple and has been widely carried out in the community, especially in community assistance activities. These activities are very useful for increasing community knowledge and public awareness to utilize the existing waste generated in households (Maflahah et al., 2023). *Ecoenzyme* is a liquid extract produced from the fermentation of vegetable and fruit residues with brown sugar as a substrate. The principle of the process for making *Ecoenzyme* itself is actually similar to the process for making compost, but water is added as a growth medium so that the final product obtained is in the form of a liquid which is preferred because it is easier to use (Purwata et al., 2021)



Figure 1. Fruit waste processing into *ecoenzymes*(Nurwahyunani et al., 2023)

Ecoenzyme technology seems to be the best solution for organic waste management in the future. For this reason, training on the use of household waste that is processed into *Ecoenzyme* is carried out to increase public awareness, interest and skills in processing organic waste into *Ecoenzyme products* , making *Ecoenzyme* and practicing it by the community. *Ecoenzyme* products produced by the community are expected to be able to provide changes in people's behavior towards the management of organic waste produced so that it has an impact on improving environmental quality. (Nurussalma et al., 2021)

Theme 2. Utilization of Eco Enzyme from Household Waste for Agriculture

Organic waste that is not managed properly greatly worsens the environment with the occurrence of global warming (global warning). One of the efforts that can be made to reduce the negative impact of leftover household organic matter is the manufacture of *Ecoenzyme* . The method for making *Ecoenzyme* can be carried out by fermentation of the remaining organic materials in an-aerobic conditions with the help of living organisms derived from these organic materials (Sari & Basmantra, 2023). *Ecoenzyme* is a liquid extract made after leftover vegetables and fruits are fermented with molasses, brown sugar, or granulated sugar as a substrate. This program aims to provide *Ecoenzyme* as a solution for handling widespread organic waste. It is hoped that this program will help more people(Nurwahyunani et al., 2023; Septiani et al., 2021)

Utilization of *Ecoenzyme* made from household organic waste in the form of vegetable and fruit waste can be used for environmental preservation, one of which is the manufacture of fertilizers. *Ecoenzyme* can convert ammonia into nitrate or NO_3 , nutrients for plants, and natural hormones, so it can be used as liquid organic fertilizer or POC because it contains macro and micro nutrients (Pakki et al., 2021a). *Ecoenzyme* was created by Mrs. Dr. Rosukan Poompanvong with the aim of healthy and saving the Earth. In addition, it is very useful in many ways, such as agriculture. As a soil fertilizer because it contains

microbes that can improve the physical, chemical and biological properties of the soil, as well as vegetable fertilizers and pesticides (Pakki et al., 2021b).



Figure 2. Application of POC from *Ecoenzyme* in hydroponics(Nurussalma et al., 2021)

The nutrient content in the *Ecoenzyme solution* can help the growth of microorganisms and organisms in the soil so that it can accelerate the decomposition process in the soil. The highest N content was obtained from an *Ecoenzyme solution* made from papaya peel, which was 0.15%, while an *Ecoenzyme solution* from dragon fruit and pineapple peels obtained a yield of 0.06% (Illahi et al., n.d.). Low nitrogen content can be caused by a lack of oxygen so that the nitrification process does not work properly.

Theme 3. Utilization of Eco Enzyme from Household Waste as a Product

The simplest method of waste processing that can be done by the community is the 3R method, namely Reduce, Reuse and Recycle. If the 3R method has been implemented, at least the community has assisted in the waste sorting and processing stages. One of the organic waste processing techniques that has recently been widely applied by the community because it is easy, does not require large areas of land, and containers with certain specifications, namely the *Ecoenzyme manufacturing technique*. (Jaya et al., n.d.). Another advantage of this *Ecoenzyme* manufacturing technology is that it produces products for household needs which can be used as a source of business activities that are highly prospective, environmentally friendly, and fulfill the principles of socio-entrepreneurship. The principle of the process for making *Ecoenzyme* is similar to the process for 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.

Ecoenzyme is a liquid extract/solution resulting from the fermentation of vegetable and fruit residues using brown sugar as a substrate (Utami et al., 2023). This fermented liquid has many benefits, including in agriculture (as liquid organic fertilizer, vegetable pesticides), health (as a disinfectant, cleaning fluid), and household (as a substitute for soap, floor cleaner, mouth rinse). The *Ecoenzyme* solution produced from PKM activities is used in the household sphere, such as for cleaners, soap, handsanitizers, disinfectants, toilet cleaners, reducing sewage odors around the house, and as plant fertilizer in the environment around the house.



. Figure 1. ECOS AIR product from *Ecoenzyme*(Nurafina et al., 2021a)

One of the products that can be produced from processing household waste into *Ecoenzyme* is essential oil. Pre-production, production, and post-production are the steps in the process of making enzyme-based essential oil products (Nurafina et al., 2021b). The results of lab tests at the Semarang Health Laboratory showed that the ECOS AIR product was effective against bacteria in the room. The bacteria decreased by an average of 61.38%.

During the COVID-19 pandemic, many people are trying to boost their immune system to protect the body from various viruses, bacteria and germs. So this essential oil product (ECOS AIR) is suitable for use as a room air purifier at home to maintain health. On the other hand, this product can also help keep fruit and vegetable waste.



Figure 2. Handsanitizer from *Ecoenzyme*(Basri et al., 2022)

In addition, products that can be produced from *Ecoenzyme* are household products such as making hand sanitizers, disinfectants, and other useful products. *Ecoenzyme* can be used to make disinfectants, hand soap, organic fertilizers and other household needs, motivating participants to try (Indah Sari et al., 2021). *Ecoenzyme* can be used to clean hands, wash bathroom floors, clean rooms and household furniture, repel pests, and liquid plant fertilizer. However, if liquid fertilizer is used on the plants, water will still need to be added. The content of alcohol and acetic acid in the liquid allows *Ecoenzyme* to function as a disinfectant. This fermentation process occurs because the enzymes in the bacteria or fungi work.

CONCLUSION

The literature review research , it can be concluded that one of the uses of household waste is Ecoenzyme . Besides being used as an alternative to organic waste processing, this Ecoenzyme has several products and their uses. In agriculture, Ecoenzyme is used as liquid organic fertilizer (POC). The results of ecoenzyme are also used as cleaners, soaps, hand sanitizers, disinfectants, and are made in the form of essential oil to be added to air purifiers.

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