Proceeding of ICMR 6(1), 101-108 DOI: https://doi.org/10.32672/picmr.v6i1.753

The Utilization of Eco-Enzyme as an Alternative to Emphasize the Household Wastes

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Abstract. *The enhancement of human activity has significantly influenced the increase in waste production. The Ministry of Environment and Forestry 2022 reports that Indonesia produced 68.7 tons of waste per year, and the largest waste contribution came from household activities. Garbage is an agent of disease transmission, so it must be managed well. Make an eco-enzyme to discard household waste materials, especially kitchen waste. Therefore, eco-enzymes can be used as an alternative to reduce household waste production. This study is a quasi-experiment research with a one-group pre and post-test design. This research aims to explore the community knowledge before and after being given education about eco-enzymes. The population in this study was all mothers who had toddlers in Lam Teungoh village, Peukan Bada District Aceh Besar Regency. Some mothers with toddlers were used as research samples of 55 people using purposive sampling techniques—data was collected using a questionnaire that the researcher had designed. The data analysis used a paired T-test with a confidence interval of 95%. The result showed that there was an increase in the average knowledge score of mothers of toddlers before (57,09) and after being given eco-enzyme counseling (79,3182), with a significant value (p-value) of 0.000. This shows that eco-enzyme promotion can increase the knowledge of mothers of toddlers significantly at the 95% confidence interval ($p<0.05$).*

Keywords: *eco-enzyme, environmental health, waste, health promotion*

1. Introduction

An increase in population automatically increases human activity, leading to waste production (Syaiful et al., 2023). Waste is leftover material that comes from household and industrial activities. The results of these activities must be managed well; if the excess waste in the environment is not processed correctly, natural disasters and contagious disease transmission. Therefore, good waste management is a shared responsibility to reduce the impact of improper waste disposal to prevent the spread of disease (Vidalia et al., 2023).

Waste can be differentiated theoretically based on the chemical substances contained in it, namely organic waste and inorganic waste. Organic waste is further divided into wet waste and dry waste. Organic waste comes from the remains of living creatures such as plants, animals, and humans. Organic waste generally comes from various activities such as households, markets, industry, and agencies/institutions. At the most minor level, namely the family. 68% of household waste consists of organic waste. Meanwhile, inorganic waste is waste that cannot be renewed, such as plastic waste, hazardous and toxic materials (Aulia et al., 2021). However, organic waste is a type of waste that is easily decomposed in the environment with the help of certain microorganisms. One type of organic waste produced is food waste (Cheng et al., 2020). One of the food scraps that can be reused is the skin of kitchen herbs, vegetables, and fruit.

Aceh Besar District is one of the regions in Aceh province selected as a regional

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waste management area, with the final waste disposal site in Blang Bintang Village. The waste received is 70 tons per day from Aceh Besar district. However, the Aceh Besar district government can still not manage its waste optimally. This can be seen in several sub-districts of Aceh Besar district. Peukan Bada sub-district is one of the areas in Aceh Besar district that has not been able to manage household waste properly. There is still a lot of rubbish piled up on the streets. In addition, most Peukan Bada residents manage their waste by piling it up and burning it around their yards. This can cause various health and environmental problems (Putra, 2016). The accumulation of rubbish around the yard will increase the incidence of transmission of several diseases such as ISPA, diarrhea, worms, and so on. Not only that, burning waste increases the effect of greenhouse gases which impact depleting the ozone layer. Therefore, real action is needed to deal with it (Syahputra et al., 2021).

Lamteungoh village is one of the areas of Aceh Besar District. Initial surveys conducted by researchers show that most people accumulate household waste and then burn it in their yards. Some food waste is also piled on the ground and not processed. If this is appropriately processed, household waste can be used as compost. In addition, there is no separation of types of household waste between organic and inorganic waste, so the increase in waste continues to occur. This can be an agent for transmitting contagious diseases, as inhalation infection and diarrhea often occur in the Lamteungoh Village area.

Managing food waste from the skin is necessary to minimize health and environmental problems. Food waste from kitchen waste in the form of onion skins, fruit, and vegetables can be used as raw material for making eco enzymes. Eco enzyme is a multi-purpose natural-based liquid that can be used as a disinfectant or natural fertilizer (Mar'ah & Farma, 2021). Eco enzymes comprise several components, including food waste (which comes from fruit peels, vegetables, and kitchen spices), sugar, and water. Eco enzymes occur due to the fermentation process of fresh waste residue, which contains several protease, lipase, and amylase enzymes (Hidayat et al., 2023).

The eco enzyme has high cleaning power due to its organic acid content, so it can be used as a multi-purpose cleaning solution, eco enzyme is even able to release fat deposits in drainage channels and purify water that is discharged into the environment (Chin et al., 2019). Eco enzymes contain alcohol with various acetic acid contents, which come from the metabolic processes of bacteria originating from kitchen waste, such as fruit and vegetable peels. Thus, eco enzymes contain some secondary metabolic components, such as alkaloids, flavonoids, saponins, and tannins, which come from organic materials. Therefore, eco enzymes can be used as a multi-purpose disinfectant and, in specific concentrations, can be used as a natural fertilizer (Dessie et al., 2018).

2. Method

This research is quasi-experimental with a one-group pre and post-test design. This research was conducted in Lam Teungoh Village, Peukan Bada District, Aceh Besar Regency. Based on the consideration that waste management in this area has not been managed well. Most people in Lam Teungoh Village tend to their waste by burning and piling up rubbish in front of their houses. The object of this research is all mothers who have toddlers because toddlers are a group with vulnerable immunity. The number of families with toddlers in Lam Teungoh Village in 2022 will be 122 families. Therefore, objects were drawn by using the Slovin formula as follows.

$$= \frac{N}{1+Nd^2} = \frac{122}{1+(122)(0{,}01)} = 55 \text{ families}$$

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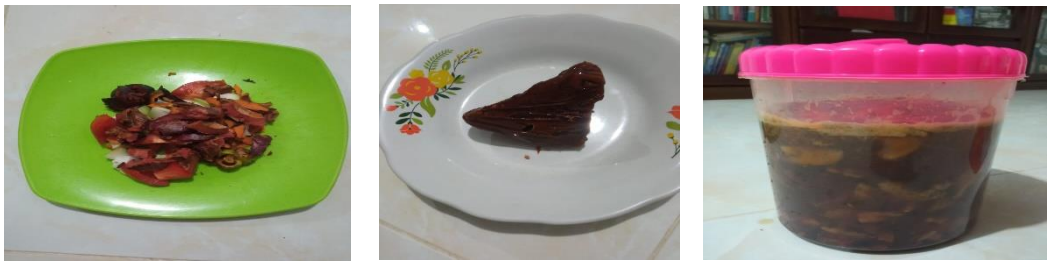
Sampling was done using a purposive sampling technique with a sample size of 55 people. The sample selection was based on several criteria, namely that the mother was a resident of Lam Teungoh Village, was not undergoing treatment, was healthy, had at least one toddler, and was willing to be a respondent.

The research was carried out in two stages: promotion and monitoring by measuring the respondent's level of knowledge about eco enzymes. Eco enzyme promotion activities are carried out by promoting how to make eco enzymes. The ingredients needed to make eco enzymes include water, brown sugar, and organic materials from household waste, such as vegetable and fruit peels. Making eco enzymes begins by adding water as much as 60% of the container's size and pouring the brown sugar and kitchen waste containing vegetable or fruit peels.



(a) **(b)** **(c)**

Figure 1. The Main Materials of Eco Enzyme (a. The fruit and vegetable peels; b. the brown sugar; c. the materials stored in a closed container)

The material used is in a ratio of 10:1:3. The choice of container used is essential to consider. The initial container must use a closed plastic basin. After that, the eco enzyme can be stored at room temperature. In the first week, this container must be opened every day for the first week, then once every 2-3 days every week, stirred on the 7th and 30th day. Next, soak the results and store them for three months, then filter the eco enzyme solution and store it in a tightly closed bottle.

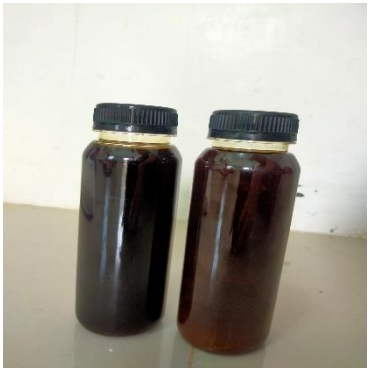


Figure 2. The Eco Enzyme Solution

The second step measured the respondents' level of knowledge about eco enzymes. Data was collected by providing a questionnaire on mothers' knowledge of making eco enzymes. Researchers have designed the questionnaire. Data was collected before (pretest) and 48 hours after the intervention was given (posttest). Data analysis was carried out univariately and bivariately. After that, the level of knowledge was grouped

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according to three criteria, namely: good knowledge (if the value obtained 76-100%), sufficient knowledge (if the value received 56-75%), and poor knowledge (if the value obtained ≤ 56%). Before the data was analyzed, data distribution was measured using the Kolmogorov-Smirnov test, assuming that more than 50 data were used. The results showed that the data was distributed unnormally, so bivariate data testing was done using the Wilcoxon test at a 95% confidence interval.

3. Results and Discussions

Family Characteristics

The research sample is divided based on several characteristics. Family characteristics are essential in shaping parenting patterns, which impact family health. The mother's role cannot be separated from managing all household activities, so that the mother's characteristics greatly determine the level of health of her family. The research results in Table 1 show that most mothers of toddlers are late adulthood aged (52.6%). Age is the length of a life process from birth to current life and can be determined by individual work productivity (Purba et al., 2023). The age characteristics in this study were mostly early adulthood (38.6%); research results stated that the older a person gets, the greater the level of maturity in thought patterns obtained from experience, which will become a learning process for adults (Hidayat et al., 2023).

Another characteristic of the respondents in this study was the level of education, where the majority had secondary education (high school graduate) (47.4%). Many factors influence pursuing education, such as cost and interest factors (Indrayanti et al., 2023). As we know, a person's level of education affects his thinking and reasoning abilities (Rhofita, 2017); the higher the education he takes, the broader and more developed his thinking patterns will be regarding the knowledge he has obtained.

The degree of family health is indirectly determined by income level. Income level determines the availability of basic family needs. In Table 1, it can be seen that most families are classified as low income with an amount less than the Aceh Besar regional minimum wage or less than Rp 3.413.666 (84.2%). In addition, most family mothers work as housewives (80.7%), so fulfilling family needs is only expected from the father's income as head of the family. This can be seen in Table 1.

Table 1. The Family Characteristics Distribution

Characteristics	n	%
Age		
Late teens	3	5,3
Early adulthood	22	38,6
Late adulthood	30	52,6
Educational Level		
Not Finished Elementary School	3	5,3
Elementary School	12	21,1
Junior High School	27	47,4
Senior High School	13	22,8
Income Level		
Less	48	84,2
Sufficient	7	12,3
Profession		
Farmer	1	1,8
Government Employees	8	14,0
Housewife	46	80,7

Proceeding of ICMR 6(1), 1-6 DOI: https://doi.org/10.32672/picmr.v6i1.753

The Knowledge Level Before the Promotion (Pretest)

The knowledge level about eco enzymes is essential to measure before the respondent is promoted. So that the information obtained can be easily understood. The result of measuring respondents' knowledge level about eco enzymes can be seen in Table 2.

Table 2. The Respondent's Knowledge Level About Eco Enzyme Before Treatment

Knowledge Level	n	%
Sufficient	24	42.9
Less	31	55.4
Amount	**55**	**100,0**

Table 2 shows that most respondents' knowledge belonged to the lower knowledge level before getting the promotion (55,4%). Most respondents do not know how to manage household waste, whether organic or non-organic. Respondents only knew about waste management by burning it and piling it in their yards. None of the respondents knew about the term eco enzyme. Most people only know the term eco enzyme when counseling is carried out. It can be assumed that the outreach activities in Lamteugoh village are more focused on health education in general, such as the problems of stunting, immunization, disease, and non-communicable diseases, even if there is education about waste, it is only on knowledge about the dangers posed by the waste, not on skills in processing it. Rubbish.

The Promotion of Eco-Enzyme

Most respondents had never heard about eco enzymes. This is the background for researchers to measure the response to promotions delivered regarding making eco enzymes. The results of research on promotional responses can be seen in Table 3.

Table 3. Respondents' Interest in Promoting Eco-enzymes

Interest Level	n	%
Interested	22	40
Very Interested	33	60
Amount	**55**	**100,0**

Table 3 shows us that most respondents were very interested in the promotion. This is because the term eco enzyme is something new for the respondents. Besides, the materials used in making eco enzymes are simple. The rise of the eco enzyme was apparent and easy to understand. Promoting eco-enzyme production is carried out by using poster media and demonstration methods. The poster is in the form of a calendar, which contains information on the importance of recycling organic waste materials and how to make eco-enzymes. Meanwhile, the demonstration method is a direct learning method that guides participants directly through direct demonstrations to prevent participants from making mistakes because participants get a clear depiction of information (Milwati et al., 2015).

The Knowledge Level After the Promotion

After the eco-enzyme promotion, the respondents' knowledge level was measured 48 hours after the upgrade. It aims to evaluate the advertisements that have been carried

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out. The research results about the knowledge level after the promotion are listed in Table 4.

Table 4. The Respondent's Knowledge Level About Eco Enzyme After Treatment

Knowledge Level	n	%
Good	29	51,8
Sufficient	23	41,8
Less	3	5,5
Amount	**55**	**100,0**

The result listed in Table 4 showed us that there was an increase in the level of knowledge by 29 people (51.8%) with a relatively good level of expertise. It is hoped that increasing public knowledge will increase respondents' awareness of managing household waste, especially from the kitchen, by processing it as eco-enzymes. It motivates the authors to measure the effect of eco-enzyme promotion on respondents' knowledge level, as listed in Table 5.

Table 5. The Impact Between the Promotion and The Respondents' Knowledge Level

The Knowledge Level	Mean	SD	Mean Difference	T	p-value
Pretest	57,09	8,784	22,2282	10,991	0,000
Posttest	79,3182	17,54923			

The statistical test result showed that the promotion could increase knowledge (p-value 0,000). Another research showed that advertising has a significant relationship with knowledge level, especially before and after health education (Wijayanti et al., 2021). In this regard, researchers assume that interest influences the increase in knowledge of the material presented, so interest arises in obtaining the information presented. In this regard, respondents' interest in information on making eco-enzymes is around 60%. A person's interest in information that they have never heard of and obtained will give rise to high motivation to receive health education (Hastuti et al., 2020), so that the new information obtained can provide a cognitive basis for increasing knowledge (Azwar, 2015).

Health promotion cannot be separated from activities or efforts to convey health messages to the community, groups, or individuals. With this message, you can gain better knowledge about health. This knowledge will later influence the formation of the target behavior (Rahayuwati et al., 2018). In this case, eco-enzyme promotion was carried out to increase the respondents' knowledge and skills in processing organic waste in the family environment. It is hoped that the knowledge can grow and the family's ability to emphasize waste production on a household scale. Reducing the accumulation of organic waste in households can reduce waste collection in final disposal sites.

4. Conclusions

There was an increase in the average knowledge score of mothers of toddlers before (57,09) and after being given eco-enzyme counseling (79,3182), with a significant value (p-value) of 0.000. This shows that providing eco-enzyme education can increase the knowledge of mothers of toddlers significantly at the 95% confidence interval ($p<0.05$).

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5. Acknowledgments

The author would like to thank RISTEKDIKTI for providing financial support for this study.

6. References

Aulia, D. C., Situmorang, H. K., Prasetya, A. F. H., Fadilla, A., Nisa, A. S., Khoirunnisa, A., Farhan, D., Nindya, D. N., Purwantari, H., Jasmin, I. O. D., Akbar, J. A., Ginting, N. M. C. B., Lubis, R. F., & G, Z. P. (2021). Peningkatan pengetahuan dan kesadaran masyarakat tentang pengelolaan sampah dengan pesan jepapah. *Jurnal Pengabdian Kesehatan Masyarakat (Pengmaskesmas)*, 1(1), 62–70.

Azwar, S. (2015). Sikap Manusia : Teori dan Pengukurannya (Edisi 2). Pustaka Belajar.

Cheng, D., Liu, Y., Ngo, H. H., Guo, W., Chang, S. W., Nguyen, D. D., Zhang, S., Luo, G., & Liu, Y. (2020). A review on application of enzymatic bioprocesses in animal wastewater and manure treatment. *Bioresource Technology*, 313(June), 123683. https://doi.org/10.1016/j.biortech.2020.123683

Chin, Y. Y., Goeting, R., Alas, Y. bin, & Shivanand, P. (2019). From fruit waste to enzymes. *Scientia Bruneiana*, 17(2). https://doi.org/10.46537/scibru.v17i2.75

Dessie, W., Zhang, W., Xin, F., Dong, W., Zhang, M., Ma, J., & Jiang, M. (2018). Succinic acid production from fruit and vegetable wastes hydrolyzed by on-site enzyme mixtures through solid state fermentation. *Bioresource Technology*, 247, 1177–1180. https://doi.org/10.1016/j.biortech.2017.08.171

Hastuti, L., M. Noer, R., & Agusthia, M. (2020). Metode Demonstrasi Sadari Terhadap Kemampuan Melakukan Sadari Pada Wanita Usia Subur. *PREPOTIF : Jurnal Kesehatan Masyarakat*, 4(2), 141–148. https://doi.org/10.31004/prepotif.v4i2.953

Hidayat, M. R., Acoustia, C., Zaitun, V. I., Dirhan, C. A., Nurhasanah, S. F., Audina, O. R., Rusdi, R., & Suhelmi, R. (2023). Pemanfaatan Eco-Enzyme Dalam Kegiatan Praktik Belajar Lapangan Kepada Masyarakat. *JMM (Jurnal Masyarakat Mandiri*), 7(2), 1435. https://doi.org/10.31764/jmm.v7i2.13665

Indrayanti, L., Juliana, C., Yani, E. D., Safmila, Y., & Hamzah, D. F. (2023). Studi Kasus Desa Salur Lasengalu Kecamatan Teupah Barat Kabupaten Simeulue. *Pro Health Jurnal Ilmiah Kesehatan*, 5(2), 344–351.

Mar'ah, S., & Farma, S. A. (2021). *Making and Utilizing Organic Waste into Bio Eco-Enzyme as an Indicator of Organic Plant Fertilizer*. Prosiding SEMNAS BIO, 1, 689–699.

Milwati, S., Hadi, S., & Utami, N. W. (2015). Penerapan Promosi Kesehatan Metode Demonstrasi Dan Keterampilan Pemeriksaan Payudara Sendiri (Sadari) Bagi Ibu-Ibu PKK Di Kota Malang. *Jurnal Informasi Kesehatan Indonesia*, 1(2), 142–147.

Purba, E. R. V., Apay, F., Manangsang, F., Rumaseb, E., Suweni, K., Gentidatu, S., Suryani, S., Swastika, I. K., & Purba, L. I. N. (2023). Pemanfaatan Sampah Plastik Dalam Upaya Merawat Lingkungan Dalam Pencegahan Malaria Di Kampung Yoboi Papua. *SELAPARANG: Jurnal Pengabdian Masyarakat Berkemajuan*, 7(2), 1222. https://doi.org/10.31764/jpmb.v7i2.15178

Proceeding of ICMR 6(1), 1-6 DOI: https://doi.org/10.32672/picmr.v6i1.753

Putra, R. C. (2016). *Pembuatan Game Edukasi Pintar Memilih Sampah Berbasis Android*. Universitas Muhammadiyah Surakarta Digital Library, 1–21.

Rahayuwati, L., Nurhidayah, I., Ibrahim, K., & Setyorini, D. (2018). Pendidikan dan Promosi Kesehatan tentang Pencegahan Penyakit Kanker melalui Pilihan Jajan pada Siswa - Siswi Sekolah Dasar serta mengenali Potensi Masyarakat dalam Peningkatan Kesehatan. *Media Karya Kesehatan*, 1(2), 196–203. https://doi.org/10.24198/mkk.v1i2.18632

Rhofita, E. I. (2017). Peran Masyarakat dalam Sistem Pengelolaan Sampah Rumah Tangga (Studi Kasus di Desa Pasinan Lemahputih Kecamatan Wringinanom Kabupaten Gresik). *Management Journal*, April.

Syahputra, F., Razi, T. K., & Fachrurrozi, K. (2021). *Manajemen Pengelolaan Limbah Rumah Tangga Era Pandemi Covid-19 di Desa Lamsiteh Kecamatan Darul Imarah Kabupaten Aceh Besar*. 1, 200–206.

Syaiful, A. Z., Fikruddin, M., & Ridwan, R. (2023). Pembuatan dan Pemanfaatan Larutan Multiguna Eco Enzyme sebagai Upaya Reduksi Limbah Organik di Kampoeng Kuliner Makassar. *PengabdianMu: Jurnal Ilmiah Pengabdian Kepada Masyarakat*, 8(2), 130–139. https://doi.org/10.33084/pengabdianmu.v8i2.4373

Vidalia, C., Angelina, E., Hans, J., Field, L. H., Santo, N. C., & Rukmini, E. (2023). Eco-enzyme as disinfectant: a systematic literature review. *International Journal of Public Health Science (IJPHS)*, 12(3), 1171. https://doi.org/10.11591/ijphs.v12i3.22131

Wijayanti, T. S., Fayasari, A., & Khasanah, T. A. (2021). Permainan Edukasi Ular Tangga Meningkatkan Pengetahuan dan Konsumsi Sayur Buah Pada Remaja di Jakarta Selatan. *Journal of Nutrition College*, 10(1), 18–25. https://doi.org/10.14710/jnc.v10i1.29153