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Utilization of Organic Waste into Eco Enzymes that are Beneficial for Plants

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A B S T R A C T

Household waste in the form of organic materials, including vegetable waste and fruit peels that are considered garbage, can be converted into the eco enzyme, a multipurpose liquid. The PKM activity aims to train and provide examples to Pastors and Gospel Teachers in District 5 Region I to make eco enzymes from vegetable waste and fruit peels as liquid organic fertilizer for vegetable plants. The problems faced include the community not knowing how to make and the benefits of the eco enzyme (EE) from fruit peel waste and vegetable waste. The solution to this problem is through counseling and training in EE-making technology. The results of the PKM activities that have been carried out show that the Pastors and Gospel Teachers in District 5 Region I are very enthusiastic about participating in all PKM activities provided. Pastors and Gospel Teachers in District 5 Region I can make the eco enzyme.

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INTRODUCTION

Family is an important part of supporting food security. Food security can be done by all families, namely by utilizing the yard. The yard is utilized for planting various plants such as vegetables, fruits, medicinal plants, and ornamental plants. Utilizing the yard will reduce family shopping expenses (Kementerian RI, 2018). Plants planted in the yard need nutritional intake, such as fertilizer. Chemical fertilizer is used for plants. The community is less aware of the dangers of continuously using chemical fertilizers given to plants. This chemical fertilizer is applied continuously and done excessively, so using chemical fertilizers can have an impact that damages the fertility of the soil itself and does not make it fertile. Chemical fertilizers can speed up the planting period because the soil can absorb their nutrient content directly. However, they will have a negative impact in the long term. Plants cannot absorb 100% of chemical fertilizers, and there are always leftovers. When exposed to water, the remains of chemical fertilizers left in the soil will bind the soil like glue/cement, and after drying, the soil will stick to each other (not loose) and hard (Titiaryanti *et al*., 2022). The use of organic fertilizers can replace the provision of chemical fertilizers. Organic fertilizers that can be utilized are eco enzymes.

Eco enzymes are produced from processed organic waste such as vegetable and fruit peels and are a solution to reducing household waste (Rosnina *et al*., 2022). Of the total waste produced by organic waste, 80% of which is only considered residual waste that has no economic value (Budiyanto *et al*., 2022). If appropriately managed, processing organic waste from vegetable and fruit peel waste will have economic value, namely producing eco enzymes and being used in the agricultural sector as liquid organic fertilizer and plant pesticides (Hasanah, 2021). The fermentation process of natural ingredients, such as plant proteins, minerals, and hormones, are enzymes produced by eco enzymes (Sari *et al*., 2020). The result of the fermentation of organic waste is vegetable and fruit peels, Sugar (palm sugar, brown sugar, or cane sugar), and water (Imron, 2020). The color is dark brown and has a strong sweet and sour smell (a typical fermentation smell). The sour smell is obtained from vegetable scraps and fruit skins (Win, 2011).

Eco enzyme is waste management that provides many benefits in a sustainable agricultural development system (Muliarta & Darmawan, 2021). The eco enzyme the functions as a floor-cleaningfloor-cleaning fluid, vegetable and fruit cleaner, insect repellent,, and plant fertilizer. The eco enzyme also functions as a disinfectant because it contains alcohol and acetic acid (Saprayogi *et al*., 2022). Eco enzymes are fertilizers and environmental preservers; they neutralize various pollutants that pollute the environment and act as water purifiers (Rochyani *et al*., 2020). Eco enzyme is also a hand sanitizer because of its antibacterial properties (Alkadri & Asmara, 2020). Different raw materials will certainly have different effects on the conversion results. The greater the bioactive compound concentration, the more it will inhibit bacterial growth (Surtina *et al*., 2020). One of the fruit skins that produce eco enzymes is pineapple skin. Pineapple skin is an agricultural waste that is rich in bioactive compounds such as flavonoids, alkaloids, tannins, saponins (Ramadani *et al*., 2022), phenolic,

and terpenoid (Namrata, Sharma & Sharma, 2017). Pineapple skin can even be made into nata de pina (Sutanto, 2012), Luka (Chalchisa & Dereje, 2021), bioethanol (Tropea *et al*., 2014), and eco enzyme (Ramadani *et al*., 2019). Eco enzymes can be made with a ratio of 1:3:10, namely 1 part sugar, three parts fruit or vegetable waste, 10 parts water, and fermented for 3 months (Arifin *et al*., 2009). The eco enzyme requires media the size of a refillable water bottle so that it can save processing space and can be applied at home. Used mineral water bottles that are no longer used can be used as eco-enzyme fermentation tanks (Nasihin *et al*., 2022). Organic acids are an important key in determining acidity. The higher the organic acid content, the lower the pH value. Eco enzyme, with a low pH value, results from high organic acid content such as acetic or citric acid (Etienne *et al*., 2013).

Activity Objectives

Referring to the problem, the aim of the activity is:

1. The form of implementation of the Dharma of Community Service as part of the Tridharma of Higher Education.
2. Concern and empathy for the community's problems regarding the large amount of organic waste (vegetable waste and fruit peels) that is not utilized. It is hoped that the community can process kitchen waste through product diversification, namely eco enzymes.

Benefits Of Activities

Empowering communities by using kitchen waste as organic materials through product processing diversification is expected to provide understanding and also skills to the community, which will have an impact on increasing knowledge in terms of the function and exemplary role of increasing the value of functions and benefits through product processing diversification, namely:

1. Environmental sustainability at the community service location because kitchen waste, namely vegetables and fruit peels, is processed into organic materials.
2. The community receives complete information about diversifying processed kitchen waste products, namely vegetables and fruit peels, into organic materials.
3. Academics are expected to conduct research after this community service by utilizing kitchen waste, namely vegetables and fruit peels, which are often found in residential areas.

IMPLEMENTATION AND METHODS

Community service activities are conducted through counseling, training, and mentoring to make eco enzymes. The target of this activity is pastors and gospel teachers in District 5, Region I.

RESULTS AND DISCUSSION

Counseling on the use of household waste to make eco enzymes. Counseling on using household waste to make eco enzymes has been carried out to pastors and gospel teachers in District 5 Region I.

Figure 1. Presentation of material on the use of organic waste to make ecoenzymes

Counseling on the use of household waste to make eco enzymes. Counseling on using household waste to make eco enzymes has been carried out to pastors and gospel teachers in District 5 Region I. The implementing personnel present were the head of the PKM committee, all PKM members, and 10 students. The activity began with an opening and continued with counseling by the PKM Team. And continued with a joint discussion. All participants were enthusiastic about the counseling activity, as evidenced by the many questions submitted. Results (activity output): Participants know the PKM activity in making eco enzymes. The tools and materials used in the eco enzyme-making training are: 2 10 liter fermentation containers, buckets, filters, stirrers, digital scales, knives, duct tape, brown sugar/molasses, waste in the form of vegetable and fruit peel waste, and water. The beginning of the activity was counseling on the utilization of household waste from fruit and vegetable peels, followed by training on making eco enzymes. Eco enzymes are multipurpose natural liquids resulting from fermentation from fruit/vegetable waste (fruit peels, fresh vegetable pieces), Sugar (brown sugar or molasses,) and water. The training activities were carried out in District 5 Region I. How to make eco enzyme: (1) The container is cleaned from soap residue or chemicals. (2). A maximum of 60% of the container volume is added (10 parts). (3). Sugar is added according to the measurements, which is 10% of the weight of the water (1 part). (4). The remaining pieces of fruit and vegetables are added, which is 30% of the weight of the water (3 parts), then stir until well mixed. (5). The container is tightly closed and fermented until

harvest for 3 months. Label the date of manufacture and the date of harvest. The location is not exposed to direct sunlight.

Figure 2. Participant practice in utilizing organic waste into ecoenzymes.

The harvesting of eco enzymes is done by filtering. The harvested eco enzymes are packed in glass or plastic bottles with tight lids and given stickers. The eco enzyme should be packed in small bottles for practicality and quality control. A suitable eco enzyme meets the requirements of pH below 4.0 and has a fresh sour aroma typical of fermentation. The dregs from the remaining eco enzyme that is harvested can be used for organic plant fertilizer (not for potted plants). Cleaning the toilet drain: The pulp is blended finely and poured into the toilet at night. Car freshener: The pulp is dried and put into a small cloth bag. If fermentation goes well, it will smell like alcohol after 1 month and like fresh vinegar after 2 months. A layer of fungus and a jelly-like layer (mama enzyme) will appear in the fermentation solution, which is normal. This delicate white fungus can be used as a high-quality face mask. Mama enzyme can be used as a face mask, wound dressing, and fever reducer.

Figure 3. Photo of community service activities

With gratitude, the community service activity Utilization of Organic Waste into Eco Enzymes that are Beneficial for Plants has been completed for pastors and gospel teachers in District 5 Region I. Hopefully all the efforts and contributions that we have given can bring real benefits to the community. Thank you for the participation and spirit of togetherness of all parties involved.

CONCLUSIONS AND RECOMMENDATIONS

The training participants, consisting of pastors and gospel teachers of District 5 Region I, were very enthusiastic about following all the PKM activities provided. The training participants were able to make eco enzymes.

REFERENCES

Alkadri, S. P. A., & Asmara, K. D. (2020). Training on Making Eco-Enzyme as Hand Sanitizer and Disinfectant for the Margo Sari Hamlet Community, Rasau Jaya Tiga Village in an Effort to Create an Independent Village Resilient to Covid-19 Based on Eco-Community. *Jurnal Buletin Al-Ribaath,* 17(2), 98. https://doi.org/10.29406/br.v17i2.2387

Arifin, L. W., Syambarkah, A., Purbasari H. S., Ria R., & Puspita V. A. (2009). Introduction of Eco-Enzyme to Support Organic Farming in Indonesia. A. *J. Food Ag-Ind*. 1(1): 356–59. ISSN 1906-3040.

Budiyanto, Cucuk Wawan, Amisa Yasmin, Annona Nura Firdaushi, Asa Qubaila Sitta Zidni Rizqia Rizqia, Avona Rara Safitri, Devita Nurul Anggraeni, Kharimah Heba Farhana, Maryam Quatly Alkatiri, Yoga Yhuda Perwira, and Yoshan Ardhi Pratama. 2022. "Transforming Organic Waste into Multifunctional Eco Enzymes: Innovation in Urban Areas" 4(1):31–38.

Chalchisa, T., & Dereje, B. (2021). From waste to food : utilization of pineapple peels for vinegar production. *MOJ Food Processing & Technology*, 9(1), 1–5. https://doi.org/10.15406/mojfpt.2021. 09.00254

Etienne, A., Genard, M., & Lobit, P. (2013). What Controls Fleshy Fruit Acidity ? A Review of Malate and Citrate Accumulation in Fruit Cells. Journal of Experiment Botany, 64(6), 1451-1469.

Hasanah, Y. (2021). *Eco Enzyme and Its Benefits for Organic Rice Production and Disinfectant*. Journal of Saintech Transfer (JST) *III*(2), 119-128.

Imron, M. (2020). Waste Management. https://zerowaste.id/zero-waste-lifestyle/ecoenzyme/.

Kementan RI, B. (2018). Technical Instructions for Optimizing the Utilization of Yard Land Through Sustainable Food Home Areas (KRPL).

Muliarta, I. N & Darmawan I. K. 2021. Processing Household Organic Waste into Eco-Enzyme as an Effort to Realize Zero Waste. *Agriwar Journal.1*(1): 6-11.

Namrata, Sharma, Y., & Sharma, T. (2017). AntiMicrobial, Anti-Oxidant Activity and Phytochemical Screening of Polyphenolic Flavonoids Isolated from Peels of Ananas Comosus. *International Journal of Engineering Research & Technology*, 6(09), 285–298.

Ramadani, A. H., Karima, R., & Ningrum, R. S. (2019). Antibacterial Activity of Pineapple Peel (*Ananas comosus*) Eco-enzyme Against Acne Bacteria (*Staphylococcus aureus* and *Prapionibacterium acnes*). *Indonesian Journal of Chemical Research,* 9(3), 201-2017. https://ojs3.unpatti.ac.id/index.php/icjr.

Ramadani, A. H., Rosalina, R., & Ningrum, R. S. (2019). Empowerment of Puhrejo Hamlet Farmer Group in Processing Pineapple Peel Organic Waste as Eco-enzyme Liquid Fertilizer. *Hayati Seminar Proceedings* VII, 1–6.

Rochyani, N., Utpalasari, R. L., & Dahliana, I. (2020). Analysis of Eco Enzyme Conversion Results Using Pineapple (*Ananas Comosus*) dan Papaya (*Carica papaya* L.). *Jurnal Redoks*, 5(2), 135-140. https://dpi.org/10.31851/redoks.v5i2.5060.

Rosnina, Wirda, Z., Nilahayati, Dewi S. A., & Zuriani. (2022). Application of Eco-Enzyme Fertilizer on Marginal Land in Reuleut Barat Village, Muara Batu, North Aceh. 4(1), 78–83.

Saprayogi, D., Asra, R., Mahdalia, R. 2022. Eco Enzyme Product Analysis From Pineapple Peel (*Ananas comosus* L.) And Berastagi Oranges (Citrus X Sinensis L.). *Jurnal Redoks*, 7(1), 19-27.

Sari, R. P., Astuti, A. P., & Maharani, E. T. W. (2020). The Effect of Ecoenzyme on the Preservation Level of Red and Black Grapes. Hygiene: Journal of Environmental Health, 6(2), 70-75.

Surtina, S., Sari, R. P., Zulita, Z., Rani, R., Roanisca, O., & Mahardika, R. G. (2020). Antibacterial Potential of Kelubi Fruit Flesh Extract (*Eleiodoxa conferta*) Bangka Belitung Using Microwave-Assisted Extraction (MAE). *Indonesian Journal of Chemical Research*, 7(2), 177–82. https://doi.org/10.30598//ijcr.2020.7-sur.

Sutanto, A. (2012). Pineapple Liquid Waste as Nata De Pina Raw Material. *Makara, Teknologi*, 16(1),63–67. https://doi.org/10.7454/mst.v16i1.1286

Titiaryanti, N. M., Hastuti, P. B., & Mardhatilah, D. (2022). Utilization of Eco

Enzyme as Liquid Fertilizer in KWT Sekar Melati. Dharma Bakti Journal - LPPM IST AKPRIND, 5(1), 46–55.

Tropea, A., Wilson, D., Torre, L. G. La, Curto, R. B.Lo, Saugman, P., Troy-Davies, P.,Waldron, K.W. (2014). Bioethanol Production From Pineapple Wastes. Journal of Food Research,3(4), 60–70. https://doi.org/10.5539/jfr.v3n4p60

Win, C. Y. 2011. Ecoenzime Activating the Earth's Self-Healing Power. (http://www.enzymesos.com/wpconten/uploads/2014/12/enzyme-english-2011-small.pdf&ved).