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ORGANOLEPTIC TEST OF ECO-ENZYME: FERMENTATION OF BANANA PEEL WASTE

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ABSTRACT

Prevention of environmental damage can be done by recycling household waste both organic and inorganic. One of them is by making eco-enzymes made from banana peel waste which is found in the environment. This study aims to determine the level of respondents' preferences based on organoleptic test variables. This research method is an experiment that includes making eco-enzymes, and organoleptic tests consisting of aroma, color, and texture variables. Data analysis was carried out in a qualitative descriptive way by looking at the level of respondents' liking. The results showed that the average respondent chose a brown color with a percentage of 90%, yellow with 7%, and colorless with 3%. For the aroma, variable respondents chose sour odor 70% and other aromas 30%. While the texture of all respondents chose the composition of liquid eco-enzyme. This study concludes that the use of banana peel as the basic ingredient for making eco-enzyme affects the respondents' level of liking. Eco-enzyme can be used as a natural fertilizer for plant growth and can reduce household waste.

INTRODUCTION

Household waste also known as domestic waste that generated from daily human activities (Exposto & Januraga, 2021; Prabulingga *et al.*, 2020). Household waste consists of various components such as solid waste, paper, glass, metals, plastics, textiles, and others (Fadhullah *et al.*, 2022). Most household waste consists of plant residues such as vegetables, fruit peels, bones and meat scraps, chicken and fish feces, which are

considered wet waste (Dehghani *et al.*, 2021). While dry waste consists of papers, cardboards, plastics, books, irons, metals and glass (Victoire *et al.*, 2020).

EPA (United States Environmental Protection Agency) data reported that in 2018 the total household waste generated in America was 292.4 tons or about 4.9 pounds per person per day, with 17.7 million tons of wet residual waste (EPA, 2020). In Indonesia, the amount of household waste accounts for 42.23% of the total national waste or as much as 21.88 million tons in 2021 or one day Indonesia produces 175 thousand tons of waste (Mahdi, 2022; Pradityo *et al.*, 2019). The absence of public awareness worsens this to recycle waste. Most people choose to burn 35%, bury 7.5%, and compost 1.6% or other ways 15.9% (Qodriyatun, 2014). This makes household waste significantly one of the causes of environmental damage (P. Wang & Wang, 2014).

Environmental maintenance can be done by recycling household waste both organic and inorganic (Pujiati & Retariandalas, 2019). One of the efforts to recycle household waste using biological treatment into eco-enzymes to overcome environmental damage. Eco-enzyme is produced from the fermentation process of organic waste such as vegetables, and fruit peels with sugar as nutrients, and molasses with water *(*Prasetio *et al.*, 2021). In the production of eco-enzymes, it is necessary to use plastic containers because if use glass containers, they will break as a result of microbial activity in the fermentation process. The fermentation process involves several microorganisms that obtained nutrients from sugar so that chemical reactions occur (Novianti & Nengah Muliarta, 2021).

One of the wastes that can be processed into eco-enzymes is banana peel. This is because bananas are a horticultural crop that thrives in Indonesia. Banana plants are a business opportunity for the community, resulting in a lot of banana peel waste being produced (Gurning *et al.*, 2021; Ozabor *et al.*, 2020). In addition, banana peel waste can be used as a substrate for forming xylanase and pectinase enzymes, which fungi can use to break down organic matter into simple forms and use as nutrients for growth (Jadhav & Fernandes, 2019; Zehra *et al.*, 2020). Therefore, a solution is needed to overcome banana peel waste that contributes to environmental pollution. Based on this, the production of eco-enzymes based on banana peel waste is an important thing to do to reduce banana peels waste. The objective of this study was to determine the level of

respondents' preferences based on organoleptic test variables such us aroma, color, and texture.

MATERIALS AND METHODS

Materials

The tools used in this study were a bucket, scissors, stirrers, 100 ml measuring cup (Pyrex), 100 ml beaker glass (Pyrex), digital scales (Matrix), and scale ruler (Mercy). The materials used in this study were banana peel waste obtained from the Mardika Market, Sirimau District, Ambon City. In addition, sugar, EM4 (Effective Microorganism 4), and water are required.

Production of Eco-enzyms

The eco-enzymes was produces from banana peal waste as the main material. Banana peel was washed under running tap water then cut into small pieces, weighed to 1.5 kg, and put into bucket. As much as 500 g of sugar, 5 L of water, and 50 mL of EM4 (*Effective Microorganism 4*) with a ratio of banana peels: sugar: water: EM4 (3:1:10:5). The eco-enzyme was stirred and incubated at room temperature 24-25^{o}C with under facultative anaerobic conditions. The fermentation process was carried out for two months, and filtering was carried out to obtain the eco-enzymes (Maryanti & Wulandari, 2023).

Organoleptic Test

Organoleptic assay was conducted 2 (two) months after fermentation. The variables tested were color, aroma, and texture. Organoleptic assay were involved 30 respondents work as students and teachers of Junior High School Laboratory of Pattimura University by filled out a questionnaire.

Data Analysis

Data were analyzed by descriptive qualitative by determining respondents' preference level for color, aroma, and texture variables.

RESULTS AND DISCUSSION

Figure 1. showed the eco-enzyme product from banana peel. **Figure 2** showed the organoleptic test result of eco-enzyme.

Figure 1. Eco-enzymes from Banana Peels

Aroma

Based on **Figure 2**, it can be seen that 21 respondents chose sour odor, or about 70% of the total respondents, while 9 other respondents chose other aroma around 30%. In the choice of odorless and banana odor, no respondents chose.

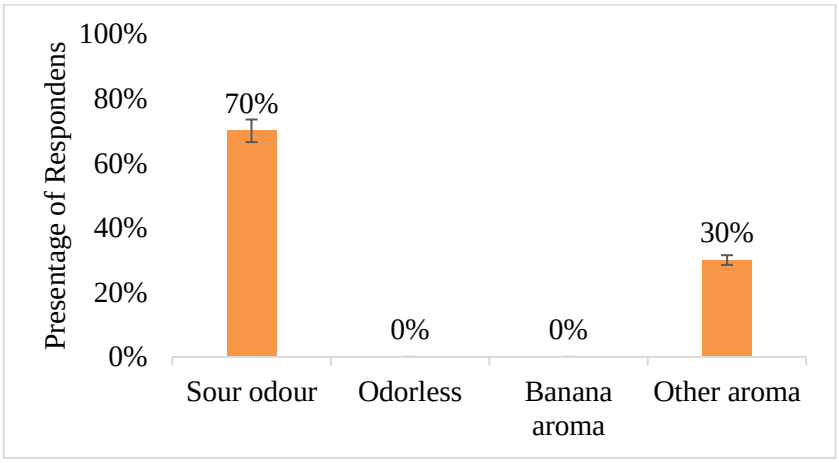

Figure 2. Aroma test results of eco-enzyme products made from banana peel waste

Color

Based on **Figure 3**, it can be seen that the number of respondents who chose the brown color was 27 people with a percentage of 90%. In the yellow color, two respondents chose or with a percentage of 7% and only one respondent chose clear with a percentage of 3%.

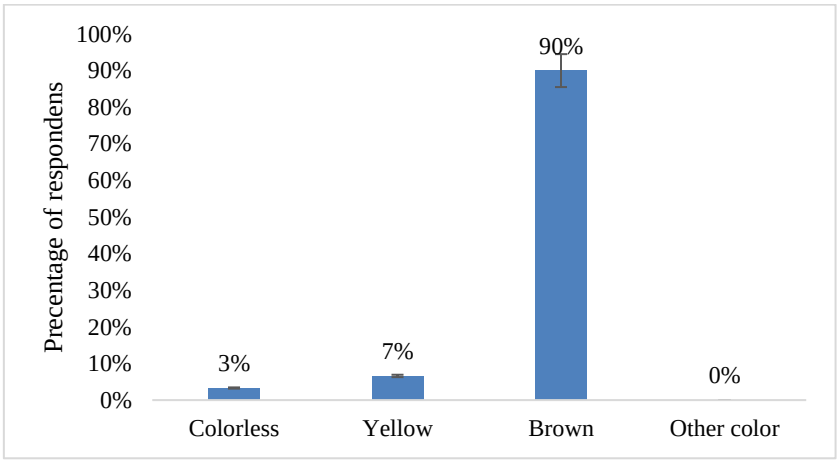

Figure 3. Color test results of eco-enzyme products made from banana peel waste

Texture

Figure 4 showed that 30 respondents chose the liquid texture of eco-enzyme made from banana peel waste. No respondents chose thick and gel textures. The results obtained in this study provide information in the form of respondents' acceptance of the color, aroma, and texture of banana peel-based eco-enzyme. Eco-enzyme is a liquid produced from the fermentation process of organic waste with the addition of sugar and water (Panataria *et al.*, 2022; Rusdianasari *et al.*, 2021). In the process of making eco-enzyme, sugar serves as a source of nutrients used by bacteria to produce ethanol to increase lactic acid compounds (Timmermans *et al.*, 2022; Warella *et al.*, 2016). This is related to microbial metabolism which uses glucose to synthesize acetic acid and lactic acid (Gomes *et al.*, 2018; Hanifah *et al.*, 2022). The eco-enzyme fermentation process involved microorganisms obtained from the addition of EM4 (*Effective Microorganism 4*) which is a mixture of several microorganisms such as phosphate solubilizing bacteria, *Lactobacillus*, yeast, *Actinomycetes*, and photosynthetic bacteria (Husaini *et al.*, 2022). In addition, EM4 contains micronutrients such as Ca, Mg, Fe, Al, Zn, Cu, Mn, and Na which function to improve soil fertility and quality (Astutik *et al.*, 2020; Joshi *et al.*, 2019; Olle & Williams, 2013).

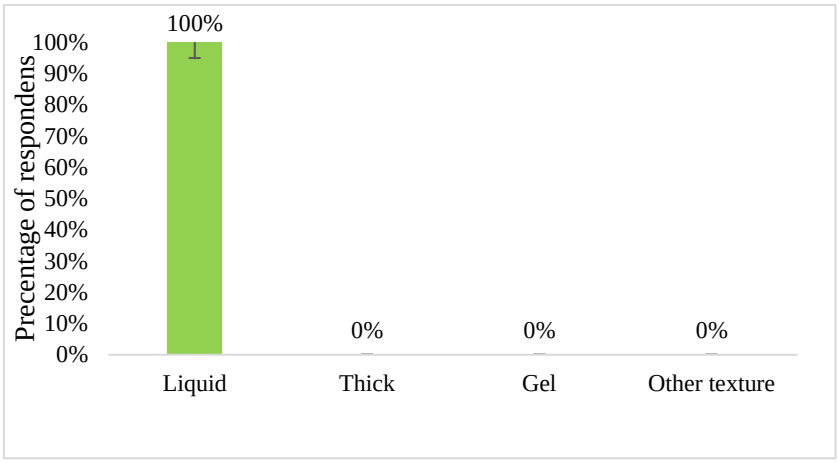

Figure 4. Texture test results of eco-enzyme products made from banana peel waste

In this study, banana peel was used as a substrate for the eco-enzyme fermentation process. The use of banana peel is considered effective because its main components are carbohydrates, carbonic acid, potassium, phosphate, sulfate, and other nutrients that can support the growth of microorganisms (Fatmawati *et al.,* 2018; Vivekanand *et al.,* 2011). In the fermentation process, carbohydrates break down into monosaccharides, and further lactic acid bacteria used the monosaccharides and converted them into lactic acid (Abedi & Hashemi, 2020; Sharma *et al.,* 2020; Ziarno & Cichonska, 2021). A research study by (Abdullah & Amalia, 2022) reported that the carbohydrate content in plantain peel of 70.52% was able to increase lactic acid production. In addition, (Vivekanand *et al.,* 2011) in their study explained that the ability of microorganisms to produce high lactic acid in banana peels was due to the content of banana peels which are rich in nutrients. The ability of microorganisms to synthesize lactic acid is also related to the length of fermentation time. The optimal time for eco-enzyme fermentation is 3 months because of the high lactic acid content produced. A study of (Rusdianasari *et al.,* 2021) reported that during the fermentation time of 2.5 months, the pH value of eco-enzyme was 3 while during the fermentation time of 3 months, the pH value of the semester was 1.5. This data showed that the length of fermentation time, the production of acetic acid in eco-enzyme will increase. In this study, fermentation was carried out for two months and showed that the microorganisms are in the exponential phase which continues to synthesize lactic acid. But the resulting pH is still high.

An organoleptic assay using color variables obtained that the general color of the eco-enzyme after fermentation was cloudy brown. The influencing factor is the overhaul of the substrate by bacteria resulting in changes in the color and texture of the banana

peel. In addition, there is sediment produced by banana peels that are not well filtered (Jannah *et al.,* 2021). In the aroma variable, the result obtained was a sour-odor eco-enzyme. This is due to the breakdown of the substrate into acetic acid in the metabolic process of microorganisms (Y. Wang *et al.,* 2021). While the texture produced is liquid because the process of making eco-enzyme uses additional water as a solvent. The addition of water depends on the condition of the substrate, in this case, bananas have little water content. In addition, the liquid texture is because the eco-enzyme has passed the filtering process.

Therefore, processing banana peel waste into eco-enzymes is a solution to control household waste. Another challenge in this research is that the time required is quite long, so the production of eco-enzymes can be upscale in large quantities to increase the effectiveness and efficiency of waste treatment.

CONCLUSION

Utilization of banana peel as a base material for making eco-enzyme affects the variables of color, aroma, and texture. The eco-enzyme made from banana peal was brown, with an acidic aroma, and in liquid form Eco-enzyme can be used as a natural fertilizer for plant growth and reduce household waste.

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