TRANSPUBLIKA INTERNATIONAL RESEARCH IN EXACT SCIENCES (TIRES)

EFFECTIVENESS OF ECO ENZYME HAND SANITIZER ON DECREASING THE NUMBER OF GERMS ON HANDS WITH DOSAGE SCALE OF 1 : 600

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Abstract

The environmental problem we see today is waste. Around 70% of the total waste generation is dominated by organic waste which is considered only as residual waste that has no economic value. With the high problem of organic waste, one solution to reduce household waste such as fruit and vegetable waste into eco-enzyme is made hand sanitizer. The purpose of this study was to see the effectiveness of eco-enzyme hand sanitizer on reducing the number of germs on hands with a dose scale of 1:600. The type of research used is experimental. The analysis used is univariate and bivariate analysis. The samples in this study were 15 students of the undergraduate of Environmental Health study program, Muhammadiyah University, East Kalimantan. The sampling technique in this research is random sampling. Based on the results of this study, there were 13 students who experienced a decrease in the number of germs on their hands while 2 students experienced an increase in the number of germs on their hands by being treated and after being treated (Hand sanitizer). The results of the Wilcoxon bivariate test between before being treated and after being treated with the use of eco-enzyme hand sanitizers got P 0.001 (smaller than 0.05), then the eco-enzyme hand sanitizer that has been made is effective in killing germs on hands.

Keywords: *Eco Enzyme, Hand Sanitizer, Organic Garbage, Germs*

1. INTRODUCTION

The current condition is still a pandemic and one of the alternative solutions to reduce the number of germs with hand sanitisers. Hand sanitizer from eco enzyme is natural, environmentally friendly and has no impact on health. There are also many synthetic chemical hand sanitisers that have an impact such as dry hands easily. The active ingredient of synthetic chemical hand sanitiser is alcohol which has the highest efficacy against viruses, bacteria and fungi and does not cause bacterial resistance. Alcohol itself has a drying effect on hands, so hand sanitisers must be formulated with moisturisers and emollients to keep hands soft and not dry, unlike pure alcohol solutions that can dehydrate the skin. But these synthetic chemical hand sanitisers when used in the long term also have an effect on the hands so that the hands can get skin irritation due to the presence of very harmful synthetic chemicals (Sahabuddin, Sinardi et al., 2017)

Eco enzyme, derived from organic waste, serves as a natural hand sanitizer to combat germs effectively. This fermented liquid, produced from various organic materials, offers numerous advantages. It can be utilised in agriculture for fertilisation and pest control, in health care for disinfection and cleaning, and in households for various cleaning purposes. Eco-enzyme is known to be effective in eliminating harmful

viruses in the atmosphere. Moreover, it stands out for its eco-friendly nature and non-toxicity towards the human body (Hasanah Yaya et al., 2020).

Dr Rosukon Poompanvong, the founder of the Thai Organic Farming Association, introduced eco-enzymes. This solution is created through fermenting organic kitchen leftovers like fruit and vegetable peels, sugar, and water. It has a dark brown appearance and emits a strong sweet and sour smell from the fermentation process. While it is eco-friendly, eco-enzyme is not suitable for consumption. Its uses range from domestic cleaning to agricultural and animal care. Essentially, eco-enzymes speed up natural biochemical reactions to create beneficial enzymes from unused fruit or vegetable scraps. These enzymes offer a sustainable waste management solution by turning food scraps into something valuable. The liquid can serve as a household cleaner and also act as a potent organic fertiliser and pesticide (Yanti & Awalina, 2021).

Eco-enzyme kills germs, bacteria and viruses because it contains acetic acid and alcohol. Eco-enzymes can also be used as fertilisers and fertilise the soil, as they contain nitrites and organic residues produced during fermentation. Eco-enzymes include lipase, amylase and trypsin. These enzymes have biocatalyst properties and can be used to reduce the concentration of pollutants in wastewater (Pratamadina & Wikaningrum, 2022). The purpose of this study is to see the effectiveness of eco enzyme hand sanitiser on reducing the number of germs on hands with a dose scale of 1:600.

2. RESEARCH METHODS

This particular study involves quantitative research that utilises experimental methods. The research design follows a pre-test and post-test comparison group model, focusing on the reduction of germs on the hand. The study looks at the difference in germ count on hands before and after treatment with eco enzyme hand sanitizer. The target population for this research includes all undergraduate students studying Environmental Health at Muahmmadiyah University in East Kalimantan. Data from the Environmental Health programme show that there were 39 undergraduate students in 2018. The sampling method employed in this study is random sampling, where items are selected randomly from a large pool. Each item or individual in the population has an equal chance of being chosen as a sample.

According to (Gay & Diehl, 1992) the study conducted for business and management courses offers recommendations on the smallest sample size needed for experimental research, which is determined to be 15 subjects per group. The researcher has chosen a sample size of 15 for this study, resulting in a total of 15 samples for examination. This total sample size of 15 allows for 30 examinations to be conducted, focusing on the number of germs present before and after treatment (in this case, hand sanitiser being sprayed on the palm of the hand).

3. RESULTS AND DISCUSSION

3.1. Research Results

3.1.1. Univariate Analysis

Univariate analysis is focused on elucidating the individual attributes of each research variable. Mean analysis and the count of germs from each variable were utilised in this investigation. A total of 15 participants were included in the study, with age, gender, and educational background serving as the distinguishing features, and the findings were displayed in a tabular format. The data derived from a study involving Environmental Health students from Muhammadiyah University of East Kalimantan, class of 2018, shed light on the characteristics of the respondents as seen in the table below.

Table 1. Frequency Distribution of Respondent Characteristics of Undergraduate Students of Environmental Health

No.	Respondent Characteristics	n	%
Gender			
1.	Male	5	33.3
2.	Female	10	66.7
Latest Education			
1.	Completed high school	15	100
Age			
1.	21	2	13.3
2.	22	10	66.7
3.	23	3	20
Total		**15**	**100**

Source: Primary Data, 2022

Based on table 1, characteristics of respondents of undergraduate Environmental Health students in 2018, it can be seen that from the female gender category there are more with 10 respondents (66.7%), the last education category graduated from high school with 15 respondents (100%). The age category of respondents was more at the age of 22 years with a total of 10 respondents (66.7%), while respondents with age 23 were 3 respondents (20%), and the fewest were respondents aged 21 with a total of 2 respondents (13.3%). The results of the examination of the number of germs as follows

Table 2. The results of the examination of the number of germs before and after being treated on the palm of the hand using eco-enzyme hand sanitizer at a dose of 1:600

No. of samples	The number of germs before and after treatment of palms using eco-enzyme hand sanitiser at a dose of 1:600		
	Before	After	Difference
1	12250	2560	9690
2	14400	3315	11085
3	4550	1550	3000
4	5825	6650	-825

5	7000	1250	5750
6	9600	1550	8050
7	3860	2000	1860
8	10450	450	10000
9	4550	190	4360
10	8700	8950	-250
11	3825	2250	1575
12	9650	3450	6200
13	7600	1050	6550
14	8450	1200	7250
15	6900	1120	5780
Total	117610	37535	80075
Average	7840,67	2502,33	5338,33

Source: Primary Data, 2022

Based on table 2, the average number of germ numbers obtained before being treated on hands using eco enzyme hand sanitizer dose 1: 600 is 7,840.67 colonies per mL, and after being treated on hands using eco enzyme hand sanitizer dose 1: 600 is 2502.33 colonies per mL.

3.1.2. Bivariate Analysis

The purpose of the bivariate analysis is to examine the correlation between two variables, through the use of statistical testing based on the collected data.

Table 3. Results of Normality Test Analysis

No.	Variable	Shapiro-Wilk		
		statistic	df	Sig.
1	Before treatment	0,952	15	0,556
2	After treatment	0,780	15	0,002

Source: Primary Data, 2022

Based on the table above, it shows that the data before being treated, the significance value is normally distributed, obtained p = 0.556> 0.05 (the p-value is greater than the standard value of the normality test), while after being treated, the significance value is not normally distributed because the p-value after being treated is obtained p = 0.002 < 0.05 (the p-value is smaller than the standard value of the normality test). Paired T-Test test requirements, the significance value of all variables must be normally distributed. If one of the data above is not normally distributed, the Wilcoxon test will be performed. The Wilcoxon test analysis table is as follows:

Table 1. Wilcoxon Test Analysis Results

No.		Before treatment-after treatment
1	Z	-3,273[b]
2	Asymp. Sig. (2-tailed)	0,001

Source: Primary Data, 2022

Based on the table above shows that the value of Asymp. Sig. (2-tailed) value of 0.001, then the sig.= 0.001 < 0.05 (p-value is smaller than the standard value of the Wilcoxon test or alpa value). So, it can be concluded that the hypothesis is accepted, the eco enzyme hand sanitizer is effective in killing germs because there is a decrease in the number of germs between before and after being treated on the hands using the eco enzyme hand sanitizer.

3.2. Discussion

Research on the effectiveness of eco enzyme hand sanitiser on reducing the number of germs on hands with a dose scale of 1:600 includes several work procedures, namely making eco enzyme, making hand sanitiser, and laboratory tests. The first process of making eco enzyme is to prepare the tools and materials to be used then cut into small pieces of orange peel that has been washed and or cleaned using scissors or a knife. Put the ingredients into a plastic jar with a ratio of 1:3:10 (100 grams of brown sugar: 300 grams of orange peel: 1 liter of water) and add 1 piece of yeast tape (the function of yeast tape is to accelerate the fermentation process) and homogenised then tightly closed the jar and glued using adhesive to all sides of the jar cover so that air does not enter the jar.

In this study, researchers used citrus fruit peel as a natural ingredient, which was fermented into eco-enzyme and then made into hand sanitizer. Based on research by Dewi, S. P., (2021) stated that citrus fruit peels can be used as an antiseptic material, by utilising the content of chemical compounds in citrus peels in the form of essential oils. The content of essential oils in orange peel is believed to have antiseptic, antiviral, astringent, haemostatic, restorative, and tonic properties. It also has antimicrobial and anti-inflammatory properties, which can inhibit the growth or even kill germs on the skin.

This study is in line with research by Bardono (2020) which states that orange peel has 53.2 mg of vitamin C in every 100g. It also contains antioxidants, flavonoids, beta carotene, and hesperidin that act as antibody producers and can boost the body's defences. This research is also in accordance with the opinion of Giano Excelsis Pangemanan, Meity N. Tanor, Verawati I. Y. Roring, Nova LIM Ogi (2022) which states that antimicrobial activation of the citrus fruit peel fermentation process can inhibit bacteria (Escherichia coli, Staphylococcus, Streptococcus, Pseudomonas, Salmonella, Aspergillus niger, Fusarium sp, and Cladosporium sp). Then waited for the fermentation process for ± 15 days, after fermentation for ± 15 days opened then measured using a pH meter. pH meter calibrated first using pH 4 and pH 7, then measured the eco enzyme that has been made and obtained measurement results of pH 3.6. The requirement for a good eco enzyme is below pH 4 and the researcher's eco enzyme has fulfilled the above

requirements with a pH of 3.6. Then filtered the eco enzyme liquid from the dregs using a filter and the eco enzyme was ready for use.

In this study, it is said that the optimum time to produce eco enzyme according to standard requirements for 8-10 days, where fermentation produces eco enzyme pH below 4.0. The experimental results showed that the longer the fermentation time, the lower the pH value of eco enzyme (Rahayu et al., 2021).

The second stage of making hand sanitizer from eco enzyme is to prepare tools and materials then put water in a measuring cup as much as 600 ml and put 1 ml of eco enzyme using a measuring pipette into 600 ml water. then homogenised using a stirring spoon and put the eco enzyme hand sanitizer into a 250 ml spray bottle, then the hand sanitizer is ready to use.

The last stage of laboratory testing is germ sampling using the swab method. At this stage, two collections were made, namely before and after the application of hand sanitizer. The equipment used is sterile cotton, buffer solution and test tubes. This stage is carried out taking germ samples using sterile cotton swabs. Then the sterile cotton swab that has contained the germ is inserted into a test tube containing a buffer solution and after that it is implanted into plate count agar (PCA) media using the pour method and then incubated for 24 hours at 37oC. The next day, the number of colonies that grew was counted using a colony counter.

In testing the hypothesis using the Wilcoxon method, the probability result was 0.001 ($p<0.05$), which means rejecting H0 so that the alternative hypothesis (Ha) is accepted, namely hand sanitizer from eco enzyme with a dose scale of 1: 600 effective in reducing the number of germs.

This research is in line with that conducted by Rusdianasari et al., (2021) stated that Eco-enzyme was employed as a hand sanitiser spray after mixing it with distilled water. Different dilution ratios were used for each sample: 1:40, 2:40, 3:40, 4:40, 5:40. Tests carried out on the hand sanitizer spray consisted of pH test, sensory test, and antibacterial activity test. According to the findings, not all hand sanitizer samples met the SNI standards, with the top sample being from the hand sanitizer made with eco-enzyme fermented for 3 months and diluted at a ratio of 5:40.

This research is supported by Nur Anisa et al., (2022) stated that Eco-enzyme can be used as a hand sanitizer, an alcohol-based hand sanitizer that kills microorganisms without rinsing with water. It is a practical and portable hand sanitizer that contains antiseptic properties. There is no need to add alcohol to eco-enzyme hand sanitizer, because eco-enzyme contains alcohol and acetic acid, which has the effect of killing bacteria. Alcohol and acetic acid are produced through the fermentation process of eco-enzyme, so this eco-enzyme hand sanitizer will not irritate hands.

Eco-enzyme kills germs, bacteria and viruses because it contains acetic acid and alcohol. Eco-enzyme can also be used as a fertiliser and fertilise the soil, as it contains nitrites and organic residues produced during fermentation. Eco-enzymes include lipase, amylase and trypsin. These enzymes have biocatalyst properties and can be used to reduce the concentration of pollutants in wastewater (Pratamadina & Wikaningrum, 2022).

Lactic acid bacteria are also present in eco enzyme, which has an important role in reducing germs on hands. Lactic acid bacteria that have the potential as probiotic agents can also be utilised as starter cultures for fermentation processes so that the resulting fermentation products can serve as carriers of probiotic agents. Probiotics are

microorganisms that can have beneficial effects on human health. Several studies report the effects of probiotics to prevent and reduce acute diarrhoeal diseases, inflammation, hypertension, and diabetes (Manik et al., 2021).

4. CONCLUSION

Results from the Wilcoxon test showed a significance value of 0.001 < 0.05, indicating a reduction in germs on hands when using eco enzyme hand sanitizer at a ratio of 1:600. Therefore, it can be inferred that the eco enzyme hand sanitizer produced is efficient in eliminating germs on hands. It is hoped that future researchers can conduct research on eco enzyme hand sanitisers to reduce the number of germs on hands with varying doses of eco enzyme doses with the same dilution.

REFERENCES

Bardono, S. (2020). *Permintaan Jeruk Dalam Negeri Meningkat di Masa Pandemi Covid-19*.

Dewi, S. P., S. dan S. (2021). *Pembuatan dan Uji Organoleptik Eco-enzyme dari Kulit Buah Jeruk. Seminar Nasional dan Call for Paper Hubisintek*. 649–657.

Gay, L. R., & Diehl, P. L. (1992). *Research Mothods for Business and Management*. MacMillan Publishing Company.

Giano Excelsis Pangemanan, Meity N. Tanor, Verawati I. Y. Roring, Nova LIM Ogi, L. R. (2022). Perbandingan Daya Disinfeksi Ekoenzim Berdasarkan Beda Komposisi Bahan Organik Comparison of Disinfection Performance By Differences of. *Nukleus Biosains*, *3*(1), 34–42.

Hasanah Yaya, Mawarni Lisa, & Hamidah Hanum. (2020). Eco enzyme and its benefits for organic rice production and disinfectant. *Journal of Saintech Transfer*, *3*(2), 119–128.

Made Rai Rahayu, Nengah, M., & Yohanes Parlindungan Situmeang. (2021). Acceleration of Production Natural Disinfectants from the Combination of Eco-Enzyme Domestic Organic Waste and Frangipani Flowers (Plumeria alba). *SEAS (Sustainable Environment Agricultural Science)*, *5*(1), 15–21. https://doi.org/10.22225/seas.5.1.3165.15-21

Manik, M., Kaban, J., Silalahi, J., & Ginting, M. (2021). Lactic acid bacteria (LAB) with probiotic potential from Dengke Naniura. *Baghdad Science Journal*, *18*(1), 35–40. https://doi.org/10.21123/bsj.2021.18.1.0035

Nur Anisa, D., Utami, G. N., Nurvazly, D. E., & Chasanah, S. L. (2022). Pembuatan Eco Enzyme Sebagai Hand Sanitizer Dalam Upaya Pencegahan Covid-19 Bagi Warga SMPN 2 Sekampung. *Jurnal Pengabdian Kepada Masyarakat (JPKM) TABIKPUN*, *3*(1), 61–68. https://doi.org/10.23960/jpkmt.v3i1.62

Pratamadina, E., & Wikaningrum, T. (2022). Potensi Penggunaan Eco Enzyme pada Degradasi Deterjen dalam Air Limbah Domestik. *Jurnal Serambi Engineering*, *7*(1), 2722–2728. https://doi.org/10.32672/jse.v7i1.3881

Rusdianasari, Syakdani, A., Zaman, M., Sari, F. F., Nasyta, N. P., & Rizka Amalia. (2021). Pemanfaatan Eco-Enzymes dari Limbah Kulit Buah Sebagai Hand Sanitizer.

Asian Journal of Applied Research Untuk Pengembangan Dan Pemberdayaan Masyarakat, *5*(3), 1–5.

Sahabuddin, Sinardi, F., Iryani, A. S., & Iryani. (2017). *Pendahuluan Era modern seperti saat ini membuat masyarakat cenderung menyukai produk instan dan praktis . Seiring dengan mobilitas yang semakin meningkat , tidak telah banyak dilakukan seiring dengan meningkatnya dampak negatif yang timbul pada kesehatan*. *November*, 167–175.

Yanti, D., & Awalina, R. (2021). Sosialisasi dan Pelatihan Pengolahan Sampah Organik Menjadi Eco-Enzyme. *Jurnal Warta Pengabdian Andalas*, *28*(2), 84–90. https://doi.org/10.25077/jwa.28.2.84-90.2021

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