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Comparative Analysis of the Effectiveness of Eco Enzyme from Waste Orange Fruit Peel (Citrus Sp.) and Pineapple (Pineapple Comossus) as an Effort to Sterilize Chicken Coop

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ABSTRACT

Chicken coops are one of the places where pathogenic microorganisms develop that can cause problems for the health of chickens and the surrounding community, so sterilization efforts are necessary. This study aims to compare the effectiveness of eco enzyme liquid from orange and pineapple peel waste in reducing the number of bacteria in chicken coops. A type of pre-experimental research with a one-shot case study design. The samples in this study are two chicken coop samples that were treated each using orange and pineapple eco enzyme liquid . Data collection was carried out before and after treatment with the pour plate method. The data was analyzed using Paired Sample T-Test and Independent Sample T-Test with an error rate of 5%. The results of this study showed that there was a significant decrease in the number of bacterial colonies in cage A (orange) and cage B (pineapple), with significance values of p=0.002 and p=0.001, respectively. However, the results of the comparison test between cages showed no significant difference in the results after treatment (p=0.967). This shows that both eco enzyme liquids are equally effective in reducing the number of bacteria. It is recommended to test the number of bacteria also on other disinfectants to see how much advantages and disadvantages of eco enzymes are compared to commonly used disinfectants.

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INTRODUCTION

Environmental sanitation is an effort to prevent disease by controlling environmental risk factors, both physical, chemical, biological, and social which are the chain of sources of transmission, and contamination of diseases and health disorders. Cleaning chicken coops is an effort to prevent diseases by killing or controlling factors related to the disease transfer chain (Caesar et al., 2023).

Cage sanitation aims to maintain the cleanliness of the building where livestock lives or cages and their environment in order to maintain the health of livestock and prevent the spread of disease seeds that can attack livestock. Therefore, poor cage hygiene can have an impact on livestock and the surrounding environment. The impact on the environment is causing environmental pollution (Irwan, 2021).

According to research conducted by Widyaningrum and Resi in 2023 on broiler chicken coops in Kupang Regency, it is known that 100% of cages contain microorganisms Eschericia coli. Meanwhile, at a distance of 5 meters from the cage, there are 94.4% of the cages that contain bacteria Eschericia coli, and at a distance of 10 meters from the cage there are 77.78% bacteria Eschericia coli. This means that the closer the cage is to the number of bacteria Eschericia coli

The chicken coop in the Donggala Village area after being surveyed found that the condition of the chicken coop is very close to the residents' settlements and the settlements are quite densely populated and the sanitation of the cages is not good enough and after a brief interview with the people living around the

coop, there were eight heads of families who complained about the unpleasant smell produced from the chicken coop. Unpleasant odors are one of the environmental pollution and can interfere with the activities of people living around the cage. Not only people who live but often people who just pass by also feel disturbed by the smell produced.

The use of cleaners in sterilizing chicken coops from chemicals such as formalin is feared to have toxic effects (toxins) on livestock. The use of natural ingredients instead of detergent chemicals can be an alternative in the manufacture of cage cleaning fluids. One of the natural sterilization efforts is Eco Enzyme (Mahdia et al., 2022).

Eco enzyme is one of the alternative natural cleaning agents that comes from fresh vegetable and fruit waste through the fermentation process. Produces a variety of organic acids. While mold acts as a decomposer of carbohydrates, cellulose, and hemicellulose found in the skin of the fruit (Galintin & Rasit, 2021).

The advantage of using cleaning liquid from orange and pineapple peel waste is that this fruit contains natural antimicrobials and antioxidants. Citrus fruits themselves contain vitamin C, citric acid, essential oils, bioflavonoids, polyphenols, coumarin, flavonoids, and volatile oils on the skin such as limonene (±70%), α-terpinene, α-pinen, β-pinen, and coumarin, and polyphenols (Krisnawan et al., 2017).

The purpose of this study is to analyze which fruit waste is more effective as a chicken coop cleaner and test the comparison of effectiveness of orange and pineapple peel waste as an effort to sterilize chicken coops.

RESEARCH METHODS

Research Location and Time

The location of this research was carried out in one of the chicken coops in Donggala Village, Hulonthalangi District for 1 month from January to February 2025.

Research Design

This type of research uses the Pre-Experimental Design, with a plan One-shot Case Study (One shot case study) i.e. there is only one group of bound variables considered.

Population and Sample

The population in this study is all chicken coops in Gorontalo City. The sample taken in this study is one of the chicken coops in Donggala Village, Hulonthalangi District. This sample was taken using purposive sampling That is, choosing a subject based on certain characteristics that are considered to have a relationship with the thing to be researched.

The characteristics are seen from the distance between the chicken coop and the settlement is very close, which is 3-9 meters, where the standard regulation of the Minister of Agriculture of the Republic of Indonesia is 25 meters, the sanitation of the cage is still quite poor based on initial observations, and the number of chickens that are bred quite a lot can reach 500-1,000 chickens and the chickens are also sold.

RESULTS

The effectiveness of eco enzymes from orange peel waste Testing with a multi-level dilution method.

Table 1 Eco enzyme effectiveness from orange peel waste

Sample	Number of bacteria before spraying			Number of bacteria after spraying		
	10-1	10-2	10-3	10-1	10-2	10-3
Stable A (orange)	> 300 colonies	· 300 colonies	· 300 colonies	51 colony	16 colony	13 colony

Source : Primary Data 2025

Based on table 1, the number of bacteria found in cages reached >300 colonies at each dilution which exceeded the microbial quantity requirement. After spraying using liquid Eco Enzyme Oranges are known to decrease the number of bacterial colonies with each dilution.

At dilution 10-1 found as many as 51 colonies, since 51 is included in the ALT calculation range then the value at dilution 10-1 is 51 x101 CFU/mL. While dilution 10-2 there are only 16 colonies and at dilution 10-3 There are 13 colonies where both do not include the ALT calculation requirement.

Paired Test Sample T-Test

To find out if there are any effects before and after spraying Eco Enzyme Orange against a decrease in the number of bacteria. It was found that the results of statistical analysis sb :

Table 2 Paired Test Sample T-Test of eco enzyme effectiveness of orange fruit peel before and after treatment

Sample	*p-value*
Eco enzyme orange	0,002

Based on table 1 above, it is known that the test results Paired Sample T-Test from the sample Eco Enzyme to the decrease in the number of bacteria obtained results p-value = 0.002 < 0.05 then it can be said that there is a significant difference between the results before and after the spraying Eco Enzyme oranges against a decrease in the number of bacteria

Effectiveness of eco enzyme from pineapple peel waste
Testing with the multi-level dilution method

Table 3 Effectiveness of eco enzymes from nana peel waste

Sample	Number of bacteria before spraying			Number of bacteria after spraying		
	10-1	10-2	10-3	10-1	10-2	10-3
Stable B (pineapple)	> 300 colonies	300 colonies	300 colonies	43 colony	28 colony	11 colony

Source : Primary data 2025

Based on table 3, the number of bacteria found in cages reached >300 colonies at each dilution which exceeded the microbial quantity requirement. After spraying using liquid Eco Enzyme Pineapple is known to decrease the number of bacterial colonies with each dilution. At dilution 10-1 43 colonies or 43 x101 CFU/mL. were found. While in dilution 10-2 there are only 28 colonies and at dilution 10-3 There are 11 colonies.

Paired Test Sample T-Test

To find out if there are any effects before and after spraying Eco Enzyme pineapple against a decrease in the number of bacteria. The results of statistical analysis were found as follows:

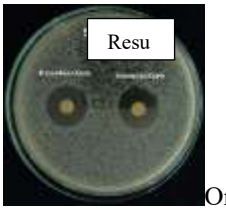
Table 4. Paired Test Sample T-Test of eco enzyme effectiveness of pineapple fruit peel before and after treatment

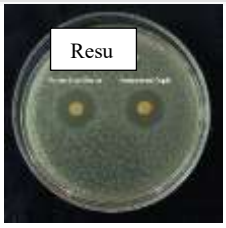
Sample	*p-value*
Eco enzyme pineapple	0,001

Based on table 4 above, it is known that the test results Paired Sample T-Test from the sample Eco Enzyme to the decrease in the number of bacteria obtained results p-value = 0.001 < 0.05 then it can be said that there is a significant difference between the results before and after spraying Eco Enzyme pineapple against a decrease in the number of bacteria.

Comparison f eco effectiveness enzyme from fruit peel waste Orange and pineapple use disk diffusion method (Kirby-Bauer)
Testing with the disk diffusion method (Kirby-Bauer)

Table 5 Testing of the effectiveness of the liver using the disk diffusion method

No.	Picture	Inhibition Zone Results
	 Orange	in Concentration = 14.1 mm *(strong)* plo Concentration = 13.35 mm *(strong)* +) = 24.26 mm *(very strong)* -) = 0

	 Pineapple	in Concentration = 11.8 mm *(strong)* plo Concentration = 12.2 mm *(strong)* +) = 26.5 mm *(very strong)* -) = 0

Source : Primary data 2025

Based on table 5, the liquid sample shows Eco Enzyme oranges have a primary concentration of 14.1 mm and a duplex concentration of 13.35 mm, with a K (+) of 24.26 (very strong). While in liquid samples eco-enzyme Pineapple has a primary concentration of 11.8 mm and a duplo concentration of 12.2 mm. With a K (+) of 26.5 mm (very strong). Then the two liquids Eco Enzyme It has an equally strong buffer zone. However, for Eco Enzyme oranges have a greater range of clear zones. So that the liquid eco-enzyme oranges are more effective in lowering the number of bacteria compared to eco-enzyme pineapple.

Independent Test Sample T-Test

To find out the comparison of effectiveness from after spraying Eco Enzyme from the waste of orange and pineapple peels to a decrease in the number of bacteria. The results of the statistical analysis were found as follows:

Table 6 Independent Sample T-Test to test the comparison of eco enzyme effectiveness of orange and pineapple fruit peels

Result	*p-value*
Effectiveness of *orange and pineapple* eco enzyme after	0.967

Based on table 6 above, it is known that the test results Independent Sample T-Test from the test results after sample testing Eco Enzyme oranges and pineapples to reduce the number of bacteria obtained results p-value 0.967 > 0.05, it can be said that there is no significant difference in the results after testing between cages 1 (oranges) and 2 (pineapples) that were sprayed Eco Enzyme against a decrease in the number of bacteria

Discussion

The effectiveness of eco enzymes from orange peel waste

This research process uses a sample of cage wood powder before being sprayed with liquid Eco Enzyme to see the number of bacteria before and the measurement of the number of bacteria by the dilution method and for flat. The purpose of dilution is to reduce the density of bacteria grown (Fajri, 2020).

The results of the test with the dilution method found the number of bacteria present in the chicken coop before being sprayed with liquid Eco Enzyme Oranges reach >300 bacterial colonies. So that is not included in the range, where the standard or regulation that has been determined by Fardiaz (1992) is 30-300 colonies. If the result of the colony that appears exceeds 300, it cannot be calculated using the calculation of the total plate number (ALT).

Based on the test with the repeated dilution method, it is found at dilution 10-1 found as 51 colonies or 51 x101 CFU/mL. While in dilution 10-2 there are only 16 colonies and at dilution 10-3 There are 13 colonies.

In statistical testing using the Paired Sample T-Test results were obtained p-value = 0.002 where < 0.05 so it can be said that there is also a significant difference between the results before and after the spraying Eco Enzyme Oranges in the first cage against a decrease in the number of bacteria.

This significant decrease in the number of bacteria can occur due to the content in orange peels that are the basic ingredients Eco Enzyme that is, natural oils called D-Limonene which is often used in cleaning products due to its strong solvent properties is also effective in removing grease and impurities.

In addition, orange peel also has antibacterial properties that can help kill germs on household appliances. So that orange peel can also be used as a cleaning liquid, namely eco-enzyme floor cleaning liquid, insecticide insecticide as well, as well as disinfectants as antibacterial that can be used in cleaning bathtubs and so on (Sidauruk et al., 2022).

The effectiveness of eco enzymes from pineapple peel waste

Liquid eco-enzyme pineapple is also tested for the number of bacteria in chicken coop B with the same method as in chicken coop A to see the amount of bacteria present before spraying cleaning liquid eco-

enzyme pineapple.

It was found that the number of bacteria in the three media was good for 10 media-1, 10-2 and 10-3 is as many as >300 colonies, the same as the first cage where the requirement for the number of colonies that can be calculated is based on the standards or regulations that have been determined by Fardiaz (1992), namely 30-300 colonies.

Chicken coops that had previously been sampled were then sprayed with liquid eco-enzyme pineapple and again took a sample of 1 gram of wood powder and then took it to the laboratory to see the level of effectiveness of the liquid eco-enzyme pineapple in reducing the number of bacteria with the same dilution method as previously done. It was found that the number of bacteria decreased at dilution of 10-1 = 43 x 101 CFU/mL, dilution 10-2 = 28 colonies, and dilution 10-3 = 11 colonies.

The results of the test showed that the liquid eco-enzyme Pineapple is also effective in reducing the number of bacteria in the chicken coop either at dilution 10-1, 10-2 and10-3. In statistical testing using the Paired Sample T-Test It was also found that the result of P-value = 0.001 where < 0.05 so it can be said that there is also a significant difference between the results before and after the spraying Eco Enzyme pineapple in the second cage against a decrease in the number of bacteria.

This significant decrease in the number of bacteria can also occur due to the content of pineapple peel which is the basic ingredient Eco Enzyme namely vitamin C, carotenoids and flavonoids. In addition, pineapple peel contains tannins, saponins, steroids, phenols, carbohydrates, terpenoids, alcoids, phenols, anthraquinone and amino acids that can be used as a cleansing liquid Eco Enzyme (Agustin & Wahyuningrum, 2019).

Comparison of eco effectiveness enzyme from fruit peel waste Orange and pineapple use disk diffusion method (KirbyBauer)

This test was done to see a comparison of the effectiveness of the two liquids eco-enzyme oranges and pineapples that have previously been tested from each eco-enzyme Is it effective in lowering the number of bacteria.

Based on table 5, the liquid sample shows eco-enzyme Oranges have a main concentration of 14.1 mm (strong) with a duplex concentration of 13.35 mm (strong). With a K (+) of 24.26 mm (very strong). While on liquid samples eco-enzyme pineapple has a primary concentration of 11.8 mm (strong) and a duplex concentration of 12.2 mm (strong), with a K (+) of 26.5 (very strong).

It is said to have a strong category of resistance if the diameter of the resulting resistance ranges from 10 mm - 20 mm. The diameter of the drag is medium when the drag is between 5 mm - 10 mm and the diameter of the drag is said to be weak when the resulting force is less than 5 mm (Sudarmi et al., 2017).

Based on these results, the two liquids eco-enzyme From the waste of orange and pineapple peels, both are classified as strong inhibition zones. However, if you look at the amount of resistance range produced from the two paperdisks, the paperdisk with liquid eco-enzyme oranges are more effective than eco-enzyme pineapple with the main concentration reaches 14.1 mm and the duplex concentration reaches 13.35 mm.

It can therefore be concluded that the liquid eco-enzyme From orange peel waste is more effective in inhibiting growth and reducing the number of bacteria compared to liquids eco-enzyme from pineapple fruit waste waste.

The antimicrobial activity test is carried out using disk diffusion because the resulting filtrate is in the form of a liquid so the right and easy-to-use way is the diffusion method (Rismawati & Ismiyati, 2017).

Based on statistical tests using the Independent Sample T-Test taken from the bacterial test value was also found to be the result p-value 0.967 > 0.05 so that it can be concluded that there is no significant difference in the test results between cages 1 (oranges) and 2 (pineapples) that have been sprayed Eco Enzyme against a decrease in the number of bacteria.

It can therefore be concluded that statistically, there is no significant difference in effectiveness testing between Eco Enzyme Oranges and pineapples are effective at reducing the number of bacteria from the results after treatment, meaning they both have equally good effectiveness. This is because Eco Enzyme From the peel of citrus fruits and pineapples are both effective in reducing the number of bacteria, it can be seen from tables 4.1 and 4.3 which show that both are able to reduce the number of bacteria and in table 4.5 also both have equally strong inhibition zones.

CONCLUSION

Eco-enzyme from orange peel waste was effective in reducing the number of bacteria in chicken coops which previously > 300 bacterial colonies decreased to 51 colonies or 51x101 CFU/mL, 16 colonies, and 13 colonies in multi-stage dilution with a p-value of 0.002 < 0.05.

Eco-enzyme from pineapple peel waste was effective in reducing the number of bacteria in chicken coops which previously >300 bacterial colonies decreased to 43 colonies or 43 x 101 CFU/mL, 28 colonies, and 11 colonies in multi-stage dilution with a p-value of 0.001 < 0.05.

Eco-enzyme from orange peel waste is more effective in inhibiting or decreasing the number of bacteria than eco-enzyme from pineapple peel waste with a main concentration of 14.1 mm compared to pineapple eco-enzyme which has a main concentration of only 11.8 mm with a p-value after testing of 0.967 > 0.05.

SUGGESTION

For chicken farmers: The hope is to provide knowledge and switch to the use of disinfectants or chemical-based sterilization fluids that can have a bad impact on the surrounding environment and even on livestock.

For the study program: It is hoped that it can add research to the study program and reference to be used as further research on the comparative analysis of the effectiveness of eco-enzymes from orange and pineapple peel waste as an effort to sterilize chicken coops.

For the University: As an input material and can be a simple alternative in utilizing organic waste as an eco-enzyme, thereby reducing the use of chemical-based cleaning liquids.

REFERENCES

Agustin, S., & Wahyuningrum, M. A. (2019). Effect of POC Concentration of Squeezed Orange Peel Waste on the Growth and Production of Mustard Plants (Brassica Juncia L .). Respati Scientific Journal, 10(2), 136–145.

Caesar, D. L., Hidayah, U., Dewi, E. R., & Budiati, R. E. (2023). Analysis of sanitary hygiene and fly density in a chicken farm environment. J-KESMAS: Journal of Public Health, 9(1), 73.

Fajri, H. N. (2020). Microbial Dilution and Growth Techniques.

Galintin, O., & Rasit, N. (2021). Production and Characterization of Eco Enzyme Produced from Fruit and Vegetable Wastes and its Influence on the Aquaculture Sludge. 11(3), 10205–10214.

Irwan. (2021). Public Health Sciences. Zahir Publishing.

Krisnawan, A. H., Budiono, R., Sari, D. R., & Salim, W. (2017). The antioxidant potential of local and imported lemon peel extracts and squeezes. Proceedings of the 2017 National Seminar of the Faculty of Agriculture UMJ, 30–34.

Mahdia, A., Safitri, P. A., Setiarini, R. F., Maherani, V. F. A., Ahsani, M. N., Soenarno, M. S., Studi, P., Hasil, T., & Ranching, F. (2022). Analysis of the Effectiveness of Ecoenzymes as Chicken Cage Cleaners from Citrus Fruit Waste (Citrus sp.). 10(30), 42–46.

Rismawati, S. N., & Ismiyati, I. (2017). The effect of pH variation on flavonoid levels on propolis extraction and its characteristics as an antimicrobial. Journal of Conversion, 6(2), 89.

Sidauruk, S. W., Safitri, Maulidia, N., Sianturi, M. S., Lusra, M., Gaol, G. S. S. T. L., Yanti, N., Prameswari, A. D., Hartati, Syah, Y. I., & Arif, M. (2022). Socialization of Processing Orange Peel Waste into Eco Enzyme Products at SMPN 3 Siak Kecil, Bengkalis Regency. Indonesian Journal of National Service (JPN), 3(2), 135–140.

Sudarmi, K., Darmayasa, I. B. G., & Muksin, I. K. (2017). Phytochemical test and inhibition of juwet leaf extract (Syzygium cumini) against the growth of Escherichia coli and Staphylococcus aureus atcc. SYMBIOSIS Journal of Biological Sciences, 5(2), 47.