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## Formulation of Antibacterial Floor Cleaning Soap Using Banana Weevils



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### ABSTRACT

Humans are in contact with the floor every day. Plantain leaf extract contains flavonoids and saponins which have antibacterial activity against *S. aureus* bacteria. The existence of high antibacterial activity in banana weevils can be applied in daily life. The purpose of this study was to determine the concentration of ethanolic extract of plantain weevil which can inhibit *Staphylococcus aureus* bacteria, and determine the inhibitory power of plantain weevil ethanol extract in inhibiting *Staphylococcus aureus* bacteria. The tests carried out from this study were antibacterial activity tests on banana weevil extract and floor cleaning preparations, specific gravity tests, pH tests, viscosity tests on floor cleaning soap preparations. Next, a swab is carried out on the floor that has been wiped with floor cleaning soap. Dry *Simplicia* was obtained weighing 1200 grams or having a LOD value of 90.4 % of the overall sample weight. In this study, the extract from the maceration method was obtained in the form of a thick extract of 67.3.8 grams which was dark brown from 1200 grams of dried *Simplicia* and the yield of the extract was 5.61 % with a drying shrinkage value of 7.5 %. The phytochemical test of the banana weevil extract showed that the banana weevil extract was positive for flavonoids, tannins, and saponins. The antibacterial activity test on banana weevil extract with a concentration of 25 % had a strong inhibitory power of 15.5 mm. The floor cleaning soap produced is light brown and homogeneous, has a pH value of 4.6 with a swab test on the floor there is no bacterial growth on the media, and the viscosity value falls into the criteria for liquid soap in the range of 500 – 2000 cPs.

## **INTRODUCTION:**

Humans are in contact with the floor every day. Sometimes people don't care about cleanliness, even though the floor can be a medium for the spread of disease. The risk of spreading disease through the floor does exist, especially in places where cleanliness is still not getting enough attention. The floor cleaning fluid has a variety of compositions; including water, dyes, fragrances and disinfectants, antiseptics. Antiseptics are products or biocides that can destroy or inhibit the growth of microorganisms in or on the surface of a living tissue<sup>[4]</sup>. *Staphylococcus aureus* (*S. aureus*) is one of the bacteria that is often found in various places, including surfaces of objects, clothes, floors, soil, hospitals, even on human skin, and is pathogenic for humans<sup>[4]</sup>.

Antibacterial alternatives that can be used are materials derived from plants. Many plants are used as medicine to heal and prevent disease. One of the plants that can be used is plantain. Plantain is one type of banana that is easily found in Indonesia. In addition to the fruit, the hump to the leaves of the plantain can be used. However, most people only use the fruit.

Rasmika Dewi Dap et al. (2008) stated that *Staphylococcus aureus* (*S. aureus*) is one of the bacteria that is often found in various places, including the surface of objects, clothes, floors, soil, hospitals, even on human skin, and is pathogenic for humans<sup>[16]</sup>. Based on this description, *S. aureus* is the choice to be used as a test bacterium in this study.

Ambon banana hump sap contains tannins, flavonoids, and saponins as antibiotics and stimulants for the growth of new cells in wounds<sup>[13]</sup>. The thick extract of the yellow kepok banana weevil had the greatest effect on the growth of *S. aureus* and *Escherichia coli* bacteria, compared to other parts of the thick extract<sup>[10]</sup>. The plantain leaf extract contains flavonoids and saponins which have antibacterial activity against *S. aureus* bacteria<sup>[22]</sup>. The author intends to make an antibacterial floor cleaning soap derived from banana weevil and to test the antibacterial activity of the ethanolic extract of plantain weft on the growth of *Staphylococcus aureus* bacteria at various concentrations.

## **MATERIALS AND METHODS:**

### **Banana Weevil Extract**

Extraction from banana weevil was carried out by the maceration method using 70 % ethanol to obtain a thick extract from banana weevil.

## Floor Cleaning Soap Making

**Table No. 1: Floor Cleaning Soap Formula**

Ingredients	F I	F II	F III
Banana weevil extract	5 %	7 %	10 %
Citric acid	2 %	2 %	2 %
Glycerin	20 %	20 %	20 %
Cocamid DEA	30 %	30 %	30 %
Perfume	0.3 %	0.3 %	0.3 %
Methyl Paraben	0.02 %	0.02 %	0.02 %
Aquadest	AD 100 %	AD 100 %	AD 100 %

### Preparation of Floor Cleaning Soap

Cocamide DEA and glycerin were put into a glass beaker container, homogenized with the help of a homogenizer at 200 rpm (Mixture 1). Nipagin, banana weevil extract, and citric acid were mixed by adding 10 ml of water into a glass beaker (Mixture 2). Mixture 2 is put into mixture 1. Add perfume to the mixture, dissolve it with a homogenizer. Added aquadest into the admixture 100% dissolved with a homogenizer.

### Physical Quality Test of Floor Cleaning Soap Preparations

The tests carried out are organoleptic, homogeneity test, antibacterial activity test, pH measurement, and viscosity test.

## RESULTS AND DISCUSSION:

### Simplicia Collection and Extract

In this study, the sample used was a banana weevil that was still fresh and not rotten weighing 12.5 kg. The banana weevil sample that had been obtained was then washed with running water until it was clean to clean. Plantain humps were cut into small pieces, dried in an oven at 60°C to reduce the moisture content. Water is a good medium for the growth of fungi and other microorganisms, this causes plants to rot easily and cannot be stored for a long time. Obtained dry Simplicia weighing 1200 grams or having a LOD value of 90.4 % of the overall sample weight. The extraction process using the maceration method is due to the operational process that is easy to do, less solvent is used, the extract obtained is not easily

overgrown with mold or yeast so that it can produce extracts optimally and economically, maceration is the cheapest extraction method than other extraction methods. Thus, the extraction process carried out will be more standardized because the maceration process can be controlled easily. *Simplicia* was macerated with 70 % ethanol solvent with a ratio of powder and solvent 1: 3, with this ratio the *Simplicia*, was submerged with the solvent. Ethanol 70 % is used because it has the same polarity as most of the chemical compounds found in plantain plants such as flavonoids, saponins, and tannins. Ethanol can be said to be polar because it has a hydroxyl group (-OH). The filtrate obtained was concentrated with a rotary evaporator at a temperature of 70°C which is the boiling point of ethanol and then evaporated with a water bath at a temperature of 70°C to obtain a thick extract. In this study, the extract from the maceration method was obtained in the form of a thick extract of 67.3.8 grams which was dark brown from 1200 grams of dried *Simplicia* and the yield of the extract was 5.61%.

#### **Phytochemical Test of Banana Weevil Extract**

From the results of the phytochemical test of plantain hump extract, it was positive to contain flavonoids, saponins, and tannins, but negative to contain alkaloids. The plantain hump extract was negative for alkaloids because the plantain hump extract did not occur after the addition of Mayer's reagent. A positive result is indicated by the formation of a precipitate. In this study, the extract did not contain any alkaloids.

Plantain hump extract was positive for flavonoids which were indicated by the appearance of a brownish-red color after the filtrate was added with concentrated HCl and Magnesium (Mg) powder. In this study, the ethanol extract of the plantain hump belongs to the type of flavone because the color changes to orange<sup>[23]</sup>.

The saponin test of the plantain hump extract showed positive results with the appearance of foam that did not disappear for 10 minutes after shaking. In this study, the foam height was  $\pm$  1 cm, which means that the extract was positive for saponins. The tannin test showed positive results in the presence of a blackish green color after the filtrate was added with 1% FeCl<sub>3</sub>. Tannins in the ethanol extract of plantain hump are included in condensed tannins because they change color to blackish green. These data show the same results as the results of research by Rosanto (2012) that plantain contains flavonoid compounds, saponins, and tannins. Meanwhile, another study conducted by Saifudin (2017) showed that the banana leaf extract was positive for flavonoids and saponins that have antibacterial activity on *S. aureus*

bacteria.

### Antibacterial Activity Test

Plantain is an alternative plant that can be used as an antibacterial treatment. The results of the measurement of the diameter of the inhibition zone from the antibacterial activity test against *Staphylococcus aureus* can be seen in Table No. 2. A pure extract of plantain weevil was prepared with various concentrations (25%, 50%, 75%, and 100%) in a DMSO solution. In Ningsih's research (2013), pure viscous extract of yellow kepok banana weevil had antibacterial activity against *Staphylococcus aureus* bacteria with an average diameter of the inhibition area of 20.391 mm<sup>[8]</sup>.

Effective disintegration does not form swelling to enhance its disintegration, it is believed that the action of porosity and capillarity can promote disintegration. The porosity of the tablet allows the liquid to enter the tablet. When the tablet is inserted into a suitable medium, the medium will penetrate the tablet and fill the air voids in the particles so that the intramolecular bonds will break and break the tablet into small particles.

In the research that has been done, the results of the inhibition zone are greater than Ningsih (2013) with an extract concentration of 5 grams/5 mL. The decrease in extract concentration, namely 25%, 50%, 75%, and 100% was carried out to determine the effect of variations in extract concentration on the size of the inhibition zone. The solvent used was DMSO because in a previous study conducted by Hartoyo (2018) the antibacterial test results on 100% DMSO solvent control had positive results indicating that DMSO did not have antibacterial activity<sup>[9]</sup>. The pure extract was weighed according to the weight of the extract for each concentration then dissolved using DMSO and put in a 5 mL volumetric flask. DMSO or dimethyl sulfoxide is a compound with the chemical formula C<sub>2</sub>H<sub>6</sub>OS with a molecular weight of 78.13 g/mol, this liquid is a polar solvent that can dissolve both polar and nonpolar compounds, and dissolves in organic and inorganic solvents<sup>[19]</sup>.

**Table No. 2: Test Results of Antibacterial Activity of Banana Weevil Extract**

Replication	Inhibition Zone Diameter				
	Chloramphenicol	E.25 % (mm)	E.50 % (mm)	E.75 % (mm)	E.100 % (mm)
1	21.5	15.5	18.5	21	23
2	-	16	19	21	19.5
3	-	15.5	20	20.5	21.5
4	-	14.5	17.5	20.5	21.5
5	-	15.5	18.5	19.5	22
6	-	16	17	20.5	20.5

This study uses the disc diffusion test method aims to facilitate the identification of antibacterial activity because the media and extracts used have almost the same color. To find out that the extracting solvent used does not have antibacterial activity, a negative control is needed. The negative control in this test is DMSO. DMSO did not have antibacterial activity as evidenced by the absence of a clear zone around the paper disc containing DMSO. Meanwhile, to compare the antibacterial activity of plantain weevil extract with antibacterial which is sensitive to *S. aureus* bacteria, it is necessary to have a positive control. The positive control used was chloramphenicol, because based on literature studies, *S. aureus* bacteria were sensitive to chloramphenicol antibiotics<sup>[6]</sup>.

Davis and Stout (1971) stated that if the inhibition zone formed in the agar diffusion test was less than 5 mm, the inhibitory activity was categorized as weak. If the inhibition zone measuring 5 - 10 mm is categorized as moderate, 10 - 19 mm is categorized as strong and 20 mm or more is categorized as very strong. Based on the results of observations and measurements of the diameter of the inhibition zone of plantain weevil extract, concentrations of 25% and 50% had strong antibacterial activity against *Staphylococcus aureus* bacteria, while concentrations of 75% and 100% had very strong antibacterial activity against *Staphylococcus aureus*<sup>[21]</sup>. The antibacterial activity of the plantain hump extract is probably due to the presence of flavonoid compounds, saponins, and tannins in the plantain hump. According to Nuria, et al. (2009) in Munawar's research (2016), the mechanism of action of flavonoids as an antibacterial is to form complex compounds with extracellular and dissolved proteins so that they can damage bacterial cell membranes and are followed by the release of intracellular compounds. Bacterial cells cannot form. Meanwhile, according to

Wagler in Munawar's (2016) study, saponin compounds as antibacterial agents reduce surface tension, resulting in increased permeability of cell leakage and bacterial intracellular compounds will come out<sup>[23]</sup>.

**Table No. 3: Results of Physical Properties of Floor Cleaning Soap**

Physical Test	F1	F2	F3
Color	Light brown	Light brown	Light brown
Smell	Typical Rose Perfume	Typical Rose Perfume	Typical Rose Perfume
Homogeneity Test	Homogeneous	Homogeneous	Homogeneous
Antibacterial Activity Test	Clear	Clear	Clear
pH measurement	4.63	4.64	4.68
Viscosity Test (cP)	1061.7	1064.4	1064.5

The antibacterial activity test on the floor cleaning soap preparation using banana weevil extract was carried out using a swab or scrub with soap poured on the floor then the floor cleaning process was carried out on the area that had been poured with soap, then the other areas were not dripped with floor cleaning soap, then carried out floor cleaning in areas where soap is not poured. In the area that was poured with soap and the area that was not poured with soap, scratching was carried out on the agar media that had been previously made on a petri dish, then the Petri plate was incubated at 37° C in an incubator for 24 hours and seen whether there was bacterial growth as indicated by the presence of turbidity in the media. The results showed that on the floor that had been poured with antibacterial floor cleaning soap using banana weevil extract, there was no bacterial growth on the media, and on the floor that had not been poured with soap, there was bacterial growth which was indicated by the presence of turbidity on the media.

The preparation of antibacterial floor cleaning soap using banana weevil extract has a pH of 4.63, 4.64, and 4.68 while the banana weevil extract had a pH of 4.7. For this floor cleaning

soap preparation, it does not meet the requirements for the pH of the preparation, that the pH generally ranges from 9.5 to 10.8<sup>[24]</sup>. The amount of alkali in soap affects the pH value, this is because banana weevil extract is acidic so it is necessary to add ingredients that can be used to increase the pH of the preparation.

The viscosity of this antibacterial floor cleaning soap is 1061.71 cP, 1064.4 cP, and 1064.5 cP. The expected viscosity for cleaning fluid products is in the range of 500 – 2000 cP<sup>[22]</sup>. For formulas 1, 2, and 3, the antibacterial floor cleaning soap using banana weevil has met the viscosity criteria.

## CONCLUSION:

The preparation of antibacterial floor cleaning soap using banana humps is acceptable to the community. The concentration of 25% plantain hump extract can strongly inhibit the growth of *S. aureus* bacteria. The inhibition against *S. aureus* bacteria by using banana weevil extract 25% concentration of 15.5 mm.

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## Abbreviations

ODT: Orally Disintegrating Tablet; DC: Direct Compression.

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