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ANTIBACTERIAL TEST OF GROUNDCHERRY LEAF EXTRACT LIQUID SOAP AGAINST STAPHYLOCOCCUS AUREUS

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ABSTRACT

Groundcherry is a medicinal plant with many benefits and properties. Groundcherry leaves contain flavonoid and alkaloid compounds, which can be used as antibacterials. Antibacterial is a substance that can kill or inhibit the growth of bacteria on the skin, such as Staphylococcus aureus, which can cause skin infections. Antibacterial preparations are generally very varied. One type of antibacterial preparation is liquid soap. This research aims to determine whether Groundcherry leaf extract liquid soap preparations can inhibit the growth of Staphylococcus aureus bacteria and to determine the effect of different formulations of Groundcherry leaf extract liquid soap preparations on the ability to inhibit the growth of Staphylococcus aureus bacteria. Liquid soap formulations use extracts with concentrations of 10%, 15% and 20%. The method used in this research was disc diffusion using positive control, negative control and test samples (formulations I, II, III). The research results showed that the liquid soap preparation was able to inhibit bacterial growth. A clear zone in the area around the disc indicated this. Differences in the concentration of extracts in liquid soap preparations can affect bacterial growth. The diameter of the inhibition zone of the formula in the sequence is 10% concentration, the diameter of the inhibition zone is 7.97 mm, and the 15% concentration the diameter of the inhibition zone is 14.82 mm. The 20% concentration, the diameter of the inhibition zone is 17.6 mm, so it can be concluded that the leaf extract liquid soap preparation Groundcherry can inhibit the growth of Staphylococcus aureus bacteria.

Keywords: Groundcherry leaves, liquid soap, Staphylococcus aureus

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INTRODUCTION

Indonesia is a country that has many herbal plants that can be used in traditional medicine. The demand for medicinal plants is increasing rapidly in developing and developed countries. Many Indonesian people also understand the benefits of using herbal plants as modern health products. One of the medicinal plants that is widely used as a health product is Groundcherry (Setianah et al., 2021).

Groundcherry is a medicinal plant with many benefits and properties that still need to be discovered by the public (Setianah et al., 2021). In general, the benefits of the Groundcherry plant are used as traditional medicine by the community. Groundcherry leaves contain compounds that can be used in medicine. Some of the compounds contained in Groundcherry leaves are flavonoids, alkaloids, steroids, tannins, saponins, anthraquinones and terpenoids (Wang et al., 2023). The Groundcherry plant contains flavonoids and alkaloids, which are used as antibacterials (Daud et al., 2021) (Rostikawati & Supratman, 2021).

Antibacterials are substances that can kill or inhibit the growth of bacteria that cause infection, including Staphylococcus aureus bacteria. Staphylococcus aureus bacteria is a common cause of skin infections such as boils, acne, impetigo and wound infections. Treatment for diseases caused by

bacteria is generally in the form of gel, lotion or ointment, cream and soap because they can treat the infection directly (Hoang et al., 2021).

The various types of antibacterial preparation products generally used by the public vary greatly. One type of preparation that is currently in great demand is liquid soap. Liquid soap is a skin cleansing preparation that can remove dirt stuck to the skin's surface. Liquid soap preparations are also useful for treating skin diseases caused by bacteria and fungi. Natural ingredients can be added to liquid soap preparations, such as Groundcherry leaves, which contain flavonoid and alkaloid compounds which can be used as antibacterials. The advantage of using liquid soap based on the natural ingredients of Groundcherry leaves is that it can kill or inhibit the growth of bacteria on the skin that cause infection, namely Staphylococcus aureus (Kusumaningtyas et al., 2015). In general, testing of antibacterial preparations uses the agar diffusion method using discs (Handayani et al., 2019).

Antibacterial activity can be studied using several methods, namely the dilution method, dilution diffusion method, and agar diffusion method (Chen et al., 2023). The diffusion method is the most frequently used method for analyzing antibacterial activity. The working principle of the diffusion method is the diffusion of antibacterial compounds into the medium where the test bacteria have been inoculated. The results observed in this test were that the diameter of the area was proportional to the number of test bacteria added to the disc paper and the growth of bacteria around the area of the disc paper (Nurhayati et al., 2020).

This study aims to carry out antibacterial tests of ground cherry leaf extract liquid soap formulations using Staphylococcus aureus, which can cause skin infections using the agar diffusion method using paper discs with formulation ratios.

METHOD

The antibacterial test method was carried out using the disc diffusion method. Staphylococcus aureus bacteria have been cultured on slanted NA media using the streak plate technique. Sample on study This uses liquid soap. In this study, various tools and materials were used such as Erlenmeyer, test tubes, measuring cups, beaker glass, petri dishes, ose needles, incubators, spirits, autoclaves, laminar air flow, pH meters, drip pipettes, spatels, test tubes, rotary evaporators, waterbaths, ciplukan leaves (Physalis angulata L.), pure cultures of Staphylococcus aureus, ethanol 70%, KOH 40%, HCl 0.1N, stearate acid, NaCl 0.9%, aquadest, erythromycin, and indicator PP. The research process involves several steps, including making ciplukan leaf ethanol extract, making ciplukan leaf extract liquid soap with different formulations (F1, F2, F3), and examining the liquid soap preparation through organoleptic tests, pH, foam tests, and free alkali tests. Antibacterial tests were also carried out using the disc diffusion method with Staphylococcus aureus bacteria as pathogens.

RESULTS AND DISCUSSION

Making Groundcherry Leaf Extract

The results of making Groundcherry leaf extract are thick, dark brown, and have a distinctive odour from Groundcherry leaves. The extract weight obtained was 109.2879 grams, with a yield value of 10.92%.

Results of Evaluation of Physico-chemical Characteristics of Liquid Soap Preparations

The results of the physicochemical characteristic evaluation test showed that the organoleptic test results on FI were liquid, brown in color, with a characteristic odour of Groundcherry leaves; FII is liquid, brown in color, has a characteristic odour from Groundcherry leaves; FIII is liquid, brown in color, and has a distinctive smell of Groundcherry leaves. The pH value in each formula ranges from 11.56 to 11.80. The foam height in each formula is between 24 mm and 36 mm. The foam stability

value for each formulation is 59% -78%. The free alkali content in each preparation is between 0.4% - 0.9%. This can be seen in Table 1, page 10.

Antibacterial Test Results

The results of the antibacterial test obtained an average result of replication; the positive control (erythromycin) was 25.22 mm; the positive control (soap only) was 16.27mm; the positive control (extract) 11.05mm; the negative control was 0mm; 10% concentration of 7.97mm; 15% concentration of 14.82mm; 20% concentration is 17.6mm. This can be seen in Table 2, page 10.

Extract preparation in this study used the maceration method. The results obtained were calculated by calculating the yield value of the extract. Calculation of yield results aims to determine the amount of extract obtained. This is by research conducted by (Sayuti et al., 2017) that the yield value is related to the active compound content of a sample, so if the yield value is higher, the active compound content will also be greater. The high value of bioactive compounds contained in a sample is indicated by the high yield value produced.

Making liquid soap is carried out by adding the active ingredient Groundcherry leaf extract as an additional excipient. After the process of making the liquid soap preparation is carried out, physico-chemical testing is carried out, which aims to determine the quality of the liquid soap preparation by standards. The physicochemical testing of liquid soap was carried out by previous research by (Widyasanti et al., 2018). Testing the characteristics of liquid soap was carried out to determine the quality of the liquid soap produced. This characteristic aims to determine the physical and chemical properties of liquid soap and the suitability of the liquid soap product produced.

Physico-chemical testing of liquid soap preparations includes organoleptic tests, pH tests, foam tests and alkali tests. In this test, it can be seen that if the pH value is too alkaline, this is influenced by the addition of high concentrations of KOH as an excipient to liquid soap preparations which have a strong alkaline pH, which can cause the pH of the liquid soap to become more alkaline. This is by research conducted by (Aras, 2023). The higher the KOH concentration, the higher the pH value obtained in liquid soap preparations (Deng et al., 2023).

In testing for free alkali in this study, the results still needed to be lowered. This was caused by the high alkali value results, which could be caused by the KOH concentration being too high and concentrated, which could cause the alkali content in the liquid soap formulation to be greater. This is by research conducted by (Aras, 2023) that the high alkali value is caused by the greater the KOH concentration, the greater the free alkali in the soap. This is because not all KOH binds with fatty acids to form soap. In addition, the KOH concentration is too concentrated or excessive during the saponification process. Based on SNI, the standard for free alkali in liquid soap is a maximum of 0.1%.

The next test is the antibacterial test. In this test, the results obtained were that the higher the concentration contained in the liquid soap preparation, the larger the diameter of the inhibition zone produced. This proves that the liquid soap formula containing ethanol extract from Groundcherry leaves provides antibacterial activity against Staphylococcus aureus because it contains secondary compounds that have antibacterial properties. In replications 1 and 2, there was a decrease in antibacterial activity in the results. This antibacterial activity is influenced by a secondary compound contained in Groundcherry leaf extract. This is by research by (Daud et al., 2021) that one of the factors that influences antibacterial activity is the content contained in an extract. The active compounds contained in Groundcherry leaf extract include flavonoids and alkaloids, which can influence the inhibition of bacterial growth.

Secondary compounds contained in liquid soap formulations that can influence bacterial growth are flavonoids and alkaloids (Wu et al., 2021). The mechanism of action of flavonoids in inhibiting bacterial growth is that the ethanol extract of Groundcherry leaves can form extracellular and soluble

protein complexes with cell walls and has lipophilic properties. This process causes damage to the cytoplasmic membrane so that bacterial cells and cell membranes will be damaged and die. The mechanism of action of alkaloids in inhibiting bacterial growth disrupts the stability of the peptidoglycan components in the bacterial cell wall so that the cell wall layer does not form intact and causes death. This is by research conducted by (Kolo et al., 2022) that secondary metabolites such as flavonoids and alkaloids can inhibit bacterial growth. Flavonoids work by forming complex compounds with extracellular and dissolved proteins, which result in phospholipids being unable to maintain the shape of the bacterial cell membrane and becoming leaky so that the bacteria experience growth inhibition and even death. Apart from flavonoids, alkaloid compounds can inhibit bacterial growth by inhibiting the peptidoglycan components in bacterial cells so that the cell walls do not form completely and cause death.

Data analysis in the antibacterial test research used a one-sample t-test using SPSS, which aims to determine whether there are differences in averages in the research sample data. Before carrying out this test, a normality test was carried out to ensure that the data was normally distributed. The normality test was carried out in 2 tests, namely Kolmogorov-Smirnov and Shapiro-Wilk. In the results of the Kolmogorov -Smirnov test, a significant value of 0.200 was obtained, and in the results of the Shapiro - Wilk test, a significant value of 0.302 was obtained. From the results of the normality test, the significant value obtained was more than >0.05. It can be concluded that the data is normally distributed. It can be seen in the One sample T-test that the results obtained with significant values at each concentration were 10% concentration = 0.086, 15% concentration = 0.193, and 20% concentration = 0.168. From these data, it is stated that the One Sample T Test results obtained were more than >0.05, so it can be concluded that there is no significant difference between the different concentrations of Groundcherry leaves in the formulation in influencing the inhibitory power of bacterial growth.

CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that The liquid soap formulation of Groundcherry leaf extract can inhibit the growth of Staphylococcus aureus bacteria. This can be seen from the antibacterial test, characterized by a clear zone area around the disc. The results of the antibacterial activity test of Groundcherry leaf extract liquid soap at a concentration of 10% were included in the medium category. It produced an average diameter of the inhibition zone of 7.9 mm; 15% concentration is included in the strong category because it produces an average zone diameter of 19.45mm. A concentration of 20% is included in the very strong category because it produces an obstacle zone diameter of 22.35 mm.

The difference in concentration of liquid soap formulation with Groundcherry leaf extract, if seen from the results of the average diameter of the inhibition zone, can influence the growth inhibition of Staphylococcus aureus bacteria. The higher the concentration, the wider the diameter of the inhibition zone. However, look at it statistically using the One Sample T Test. The result is a P value> 0.05, namely a concentration of 10% = 0.086, 15% concentration = 0.193, and 20% concentration = 0.168. So, there is no significant difference between the different concentrations of Groundcherry leaves in the formulation influencing the growth inhibition of Staphylococcus aureus bacteria.

REFERENCES

Aras, N. M. (2023). Antiseptic Liquid Soap from Corn Oil (Zea Mays L) and Aloe Vera Extract with The Variation of SLS (Sodium Lauryl Sulfate). Jurnal Akta Kimia Indonesia (Indonesia Chimica Acta).

Chen, S., Li, Z., Gu, Z., Ban, X., Hong, Y., Cheng, L., & Li, C. (2023). A new micro-agar dilution method to determine the minimum inhibitory concentration of essential oils against microorganisms. Journal of Microbiological Methods, 211, 106791. https://doi.org/https://doi.org/10.1016/j.mimet.2023.106791

Daud, M., Yaman, M. A., Usman, Y., & Aqmarina, Y. (2021). Potential of ciplukan extract (Physalis angulata L.) and patchouli waste (pogostemon patchouli pellet) as alternative sources of phytogenic feed additive. IOP Conference Series: Earth and Environmental Science, 644(1), 12072.

Deng, C., He, J., Wang, G., Hong, X., & Liang, B. (2023). Electrochemical activation of NiCo-hydroxysulfides in high concentration KOH for constructing ultra-high capacitance electrodes. Electrochimica Acta, 463, 142815. https://doi.org/https://doi.org/10.1016/j.electacta.2023.142815

Handayani, D. S., Saputra, D. A., & Marliyana, S. D. (2019). Antibacterial activity of polyeugenol against staphylococcus aureus and escherichia coli. IOP Conference Series: Materials Science and Engineering, 578(1), 12061.

Hoang, T. P. N., Ghori, M. U., & Conway, B. R. (2021). Topical antiseptic formulations for skin and soft tissue infections. Pharmaceutics, 13(4), 558.

Kolo, Y., Rezaldi, F., Fadillah, M. F., Ma'ruf, A., Pertiwi, F. D., & Hidayanto, F. (2022). Antibacterial Activity of Staphylococcus capitis, Bacillus cereus, Pantoea dispersa From Telang Flower (Clitoria ternatea L) Kombucha Bath Soap as a Pharmaceutical Biotechnology Product. PCJN: Pharmaceutical and Clinical Journal of Nusantara, 1(01), 1–11.

Kusumaningtyas, R., Laily, N., & Limandha, P. (2015). Potential of Ciplukan (Physalis Angulata L.) as Source of Functional Ingredient. Procedia Chemistry, 14, 367–372. https://doi.org/https://doi.org/10.1016/j.proche.2015.03.050

Nurhayati, L. S., Yahdiyani, N., & Hidayatulloh, A. (2020). Perbandingan pengujian aktivitas antibakteri starter yogurt dengan metode difusi sumuran dan metode difusi cakram. Jurnal Teknologi Hasil Peternakan, 1(2), 41–46.

Rostikawati, R. T., & Supratman, L. (2021). Uji antibakteri obat kumur ekstrak etanol tanaman ciplukan (Physalis angulata L.) Terhadap bakteri gram positif. Quagga: Jurnal Pendidikan Dan Biologi, 13(1), 103–107.

Sayuti, M., Putri, W. D. R., & Yunianta, Y. (2017). Antioxidant Activity and Identification of Compounds in the Extract of Sea Bamboo's (Isis hippuris) Outer Layer.

Setianah, H., Nugraheni, I. A., & Wibowo, D. S. (2021). Aktivitas Antibakteri Isolat Bakteri Endofit Asal Daun Ciplukan (Physalis angulata L.) Terhadap Bakteri Escherichia coli dan Staphylococcus aureus Antibacterial Activity of Endophyte Bacteria Isolates From Ciplukan Leafs (Physalis angulata L.) Against to . Jurnal Health of Studies ISSN, 2549, 3353.

Wang, X., Ma, Y., Xu, Q., Shikov, A. N., Pozharitskaya, O. N., Flisyuk, E. V, Liu, M., Li, H., Vargas-Murga, L., & Duez, P. (2023). Flavonoids and saponins: What have we got or missed? Phytomedicine, 109, 154580. https://doi.org/https://doi.org/10.1016/j.phymed.2022.154580

Widyasanti, A., Ginting, A. M. L., Asyifani, E., & Nurjanah, S. (2018). The production of paper soaps from coconut oil and Virgin Coconut Oil (VCO) with the addition of glycerine as plasticizer. IOP Conference Series: Earth and Environmental Science, 141(1), 12037.

Wu, S., Pang, Y., He, Y., Zhang, X., Peng, L., Guo, J., & Zeng, J. (2021). A comprehensive review of natural products against atopic dermatitis: Flavonoids, alkaloids, terpenes, glycosides and other compounds. Biomedicine & Pharmacotherapy, 140, 111741. https://doi.org/https://doi.org/10.1016/j.biopha.2021.111741