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THE EFFECT OF VARIATIONS IN AFRICAN LEAF EXTRACT (VERNONIA AMYGDALINA DEL.) CONCENTRATION IN LOOSE POWDER FORMULATION ON THE INHIBITORY ACTIVITY AGAINST STAPHYLOCOCCUS AUREUS

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ABSTRACT

Herbal plants that have antibacterial properties are African leaf plants (Vernonia amygdalina del). African leaf extract contains active compounds such as flavonoids, tannins and saponins which have the potential to inhibit bacterial growth. This study aims to determine the antibacterial inhibitory power of African leaf extract loose powder preparations on Staphylococcus aureus bacteria which were tested using 3 African leaf extract loose powder formulas, namely F1 (20%), F2 (30%) and F3 (40%) where clindamycin HCl as a positive control comparison and aquadest as a negative control. The subjects in this study were Staphylococcus aureus bacteria which were divided into 3 petri dishes. The method used in this study was the agar diffusion method using Nutrient Agar (NA) medium in testing bacterial inhibition. The results of the study showed that the average diameter of the inhibition zone obtained was F1 (20%) of 13.86 mm, F2 (30%) of 15,7 mm, F3 (40%) of 18.35 mm, clindamycin HCl (K +) of 23.86 mm and aquadest (K-) had no inhibition zone. Based on the results obtained, it can be concluded that loose powder with a concentration of 20% , 30% and 40% can inhibit the growth of staphylococcus aureus bacteria with a strong category.

INTRODUCTION

Acne (Acne vulgaris) is a skin condition that often occurs when the skin's oil glands are overactive, causing pores to appear. This is caused by excess sebum, bacterial activity, and inflammation (Syahrana et al., 2022). This condition generally affects adolescents and adults and is characterized by the appearance of various skin abnormalities such as blackheads (both open and closed), papules (red bumps without pus), and pustules (bumps filled with pus). Acne can also cause discomfort in the form of itching or pain. The most commonly affected areas are areas of the body with a high concentration of sebaceous glands, such as the face, upper back, chest, and shoulders (Hariani, 2022).

Acne vulgaris is caused by a combination of factors, with one of the primary causes being the growth of pathogenic microorganisms such as Staphylococcus epidermidis, Propionibacterium granulosum, Propionibacterium acnes, and the fungus Malassezia fufur in clogged hair follicles. The highest incidence of acne occurs in adolescents, with a prevalence reaching approximately 90%. This condition is closely related to hormonal activation that occurs during puberty. Based on various studies, acne tends to be more common in women than in men. Acne vulgaris is generally treated with topical medications such as benzoyl peroxide, retinoids, and antibiotics. However, in more severe cases, oral antibiotic therapy is often necessary. Various internal and external factors contribute to acne, including heredity/genetics, hormonal imbalances, consumption of certain foods, use of cosmetic products, skin infections, mechanical trauma to the face, and psychological conditions such as stress (Nasution et al., 2022).

One microorganism that can cause acne vulgaris is Staphylococcus aureus, a gram-positive bacterium commonly found on the surface of the skin and in the human respiratory tract. Although many individuals carry this bacterium as normal flora without showing symptoms, S. aureus can be an opportunistic pathogen, causing infections, both mild and severe. Morphologically, this bacterium is spherical (coccus) and forms colonies resembling grapes under a microscope. Its presence is most often found on the skin, nasal cavity, and throat (Pato et al., 2024).

A herbal plant with antibacterial properties is the African leaf plant (Vernonia amygdalina del). According to Sari et al. (2024), African leaf extract contains active compounds, namely flavonoids, tannins, and saponins, which have the

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potential to inhibit bacterial growth. This is in line with research conducted by Sarijowan et al. (2022), which found that ethanol extract of African leaves can inhibit the growth of Pseudomonas aeruginosa and Staphylococcus aureus bacteria at a concentration of 80%. This is in line with research conducted by Husna & Lingga (2024), which found that the higher the concentration of ethanol extract of African leaves, the greater its inhibitory effect on bacterial growth.

Based on previous research, a loose powder preparation was created from African leaf extract as an anti-acne agent. One of the advantages of powder formulated with anti-acne ingredients is its ability to prevent acne breakouts. Generally, acne occurs due to pores being clogged by various particles, dust, and bacteria. Using powder with anti-acne ingredients offers a solution, especially for teenage girls who frequently experience acne problems. In addition to covering acne scars such as pockmarks, this product also helps protect facial skin from the appearance of new acne (Futri et al., 2023).

METHOD

The study was a laboratory experiment, examining the ability of loose powder containing African leaf extract (Vernonia amygdalina del.) to inhibit Staphylococcus aureus growth. The inhibition zone was measured using a 10-gram sample of loose powder containing African leaf extract (Vernonia amygdalina del.). The population used in this study was African leaves (Vernonia amygdalina del.) from Perintis Kemerdekaan IV, Tamalanrea District, Makassar.

RESULT

Based on the research that has been conducted, the following results were obtained:

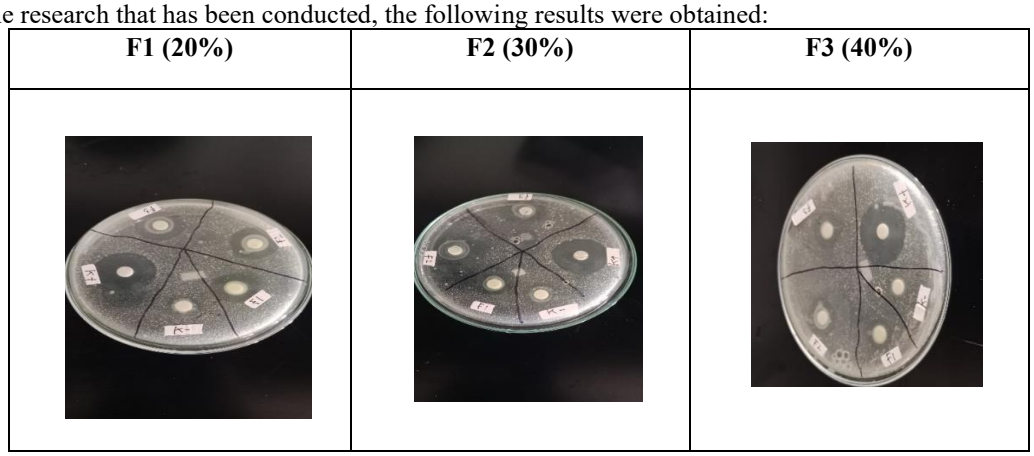

Figure 1. Inhibitory Test of Loose Powder with African Leaf Extract (Vernonia amygdalina del.)

The research conducted yielded results from the inhibition test of loose powder with African leaf extract (Vernonia amygdalina del.) against Staphylococcus aureus bacteria. The test results are shown in the table below.

Table 1 Results of Inhibitory Power of African Leaf Extract Powder Preparations (Vernonia amygdalina del.)

Replica	Control (-)	Inhibition Zone Category F1 (mm)	F2 (mm)	F3 (mm)	Control (+) (mm)
1	-	15.2	17.3	17.8	23.8
2	-	13.8	15.5	18.2	23.2
3	-	12.6	14.3	19,07	24.6
Total	-	41.6	47.1	55.07	17.6
Average	-	13.86	15.7	18.35	23.86
±SD	-	±2.029	±1.509	±0.649	±0.702

The antibacterial assay evaluated five distinct treatment groups. The experimental groups consisted of three loose powder formulations integrated with varying concentrations of active African leaf extract: Formula 1 (F1) at 20%, Formula 2 (F2) at 30%, and Formula 3 (F3) at 40%. For the control groups, distilled water (*Aquadest*) was utilized as the negative control (Control -) to provide a chemically inert baseline, ensuring that the base material itself had no inhibitory

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effects. Meanwhile, Clindamycin HCl was employed as the positive control (Control +) to serve as a high-efficacy comparative antibiotic benchmark against *Staphylococcus aureus*

Table 2 Inhibition zone categories

Formula	Inhibition zone diameter (mm)	Inhibition zone diameter (mm)	Antibacterial Inhibitory Power Category
K-	-	≤ 5	Weak
F1	13,86	10-20 mm	Strong
F2	15,7	10-20 mm	Strong
F3	18,35	10-20 mm	Strong
K+	23,86	≥ 20	Very strong

The antibacterial assay evaluated five distinct treatment groups. The experimental groups consisted of three loose powder formulations integrated with varying concentrations of active African leaf extract: Formula 1 (F1) at 20%, Formula 2 (F2) at 30%, and Formula 3 (F3) at 40%. For the control groups, distilled water (*Aquadest*) was utilized as the negative control (Control -) to provide a chemically inert baseline, ensuring that the base material itself had no inhibitory effects. Meanwhile, Clindamycin HCl was employed as the positive control (Control +) to serve as a high-efficacy comparative antibiotic benchmark against *Staphylococcus aureus*.

DISCUSSION

This study aims to determine the extent to which antibacterial agents can suppress the growth of microorganisms in loose powder containing African leaf extract. According to Sari et al. (2024), the herbal plant with antibacterial properties is the African leaf plant (Vernonia amygdalina del.). African leaf extract contains active compounds such as tannins, saponins, and flavonoids, which have the potential to inhibit the growth of microorganisms.

According to Fendri et al. (2024), loose powder is a cosmetic preparation in the form of a homogeneous, soft, and smooth powder that is easy to spread or spread evenly on the skin's surface. Its light, oil-absorbing texture makes it safe for various skin types, including oily and acne-prone skin. This study used Staphylococcus aureus bacteria, according to Pato et al. (2024). Staphylococcus aureus bacteria are a group of gram-positive, spherical (coccal) microorganisms most commonly found on the skin.

The first stage in carrying out the test starts from sterilizing the tools to be used, making a slanted NA medium by weighing 0.56 grams of NA diluted with 20 ml of distilled water and taking 5 ml for each test tube after that it is heated on the stove until dissolved after that store the solution in the test tube by tilting it, preparation of test bacteria in this stage there are 2 stages, namely first inoculated in the slanted NA medium by taking the bacteria using 2 loops then growing it on agar media using the zigzag method then incubated at 37°C for 24 hours. The second stage after the colony grows on the slant media, 2 colony loops are taken and put into a test tube containing 2 ml of 0.9% NaCl, then homogenized, making a test solution by weighing all ingredients according to the calculation and dissolving with 5 ml of distilled water, making a test medium by weighing 1.26 grams of nutrient agar (NA) and dissolving with 45 ml of distilled water and taking 15 ml for each petri dish after that heated on the stove until dissolved after that store the solution in a brown bottle wait until the solution is warm and added with bacterial suspension after that pour into a petri dish wait until solidified, the last is the bacterial inhibition zone test by soaking disc paper in the test solution each dish is given 5 disc papers and placed on the solidified nutrient agar (NA) media and labeled to mark the location of each disc paper namely F1, F2, F3, K- and K + then incubate for 1x24 hours and measure the inhibition zone obtained. Three formulations with varying concentrations are available: F1 (20%), F2 (30%), F3 (40%), distilled water K (-), and clindamycin HCl K (+).

According to Astriani and Feladita (2022), Nutrient Agar (NA) is one of the most widely used culture media because it supports the growth of various types of bacteria. One example of a microorganism that thrives in this medium is Staphylococcus aureus. Meanwhile, according to Rinihapsari et al. (2023), NA media is a yellowish-white powder that solidifies after preparation because it contains a solidifying agent, agar. The main components of this medium are carbohydrates and proteins derived from meat extract and peptone, which are the nutritional requirements of microorganisms.

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Clindamycin K (+) is effective against Staphylococcus aureus. This drug works by inhibiting bacterial protein synthesis by binding to ribosomal subunits, preventing peptide formation. (Herdiansyah et al., 2023). Meanwhile, according to Gerung et al., (2021), distilled water with K (-) is considered neutral, meaning it has no effect on the growth of microorganisms.

This study used the agar diffusion method, using three petri dishes, each containing five paper discs in various formulations and with different comparators. Clear areas were obtained around the discs, except for the K (-) discs. This indicates that African leaf extract loose powder inhibits the growth of Staphylococcus aureus microorganisms. This is in line with research conducted by Sarijowan et al. (2022) that ethanol extract of African leaf extract inhibits the growth of Pseudomonas aeruginosa and Staphylococcus aureus microorganisms at a concentration of 80%. However, the loose powder preparation at a concentration of 20% can inhibit the growth of strong macro-category microorganisms, possibly due to the presence of zinc oxide in the preparation, which has antibacterial properties, thus increasing the inhibitory power of the African leaf extract loose powder. This is in line with research by Styaningrum et al. (2022) which states that zinc oxide has antibacterial properties against Staphylococcus aureus microorganisms. The results of the clear zone measurements that were successfully observed were in accordance with the observation results at F1 (20%) of 13.86 mm, F2 (30%) of 15.7 mm, F3 (40%) of 18.35 mm and in the comparison, namely clindamycin HCl K (+) of 23.86 mm. The results obtained showed

CONCLUSION

Based on the results obtained, it shows that loose powder from African leaf extract (Vernonia amygdalina del.) is effective in preventing the growth of staphylococcus aureus bacteria starting from concentrations of 20%, 30% and 40% which are classified as strong.

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