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Innovation Of Deodorant Sticks And Lotions Based On Betel Nut Extract As An Antibacterial Problem Of Body Odor Against Staphylococus Aureus Bacteria

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Abstrak

Bau badan merupakan masalah umum yang disebabkan oleh interaksi antara keringat dan bakteri Staphylococcus aureus. Pinang memiliki potensi sebagai sediaan farmasi karena mengandung senyawa metabolit sekunder seperti alkaloid, flavonoid, tanin, saponin dan polifenol yang memiliki sifat antibakteri. Penelitian ini bertujuan untuk mengekstrak biji pinang menggunakan metode maserasi dengan etanol 96% dan memformulasikannya menjadi deodoran stik dan lotion dengan konsentrasi 5%. Uji sifat fisik dilakukan untuk mengevaluasi pH, homogenitas, daya sebar, titik leleh dan aktivitas antibakteri. Hasil penelitian menunjukkan bahwa deodoran stik memiliki pH 4,5, sedangkan deodoran lotion memiliki pH 5,5. Kedua sediaan menunjukkan homogenitas yang baik tanpa adanya partikel kasar. Daya sebar lotion tercatat sebesar 5,3 cm, meningkat menjadi 5,5 cm dengan penambahan beban 50 gram. Titik leleh deodoran batangan sekitar 80°C, dan deodoran batangan meleleh sempurna dalam waktu 60 menit pada suhu 100°C. Kedua jenis deodoran tersebut menunjukkan diameter zona hambat yang signifikan terhadap bakteri, yaitu 18,16 mm untuk losion dan 16,77 mm untuk stik. Ekstrak pinang menunjukkan aktivitas antibakteri yang sangat kuat dengan diameter zona hambat sebesar 20,14 mm.

Kata kunci : antibakteri, bau badan, deodoran

Abstract

Body odor is a common problem caused by the interaction between sweat and Staphylococcus aureus bacteria. Areca nut has potential as a pharmaceutical preparation because it contains secondary metabolite compounds such as alkaloids, flavonoids, tannins, saponins and polyphenols which have antibacterial properties. This research aims to extract areca nut seeds using the maceration method with 96% ethanol and formulate them into stick deodorant and lotion with a concentration of 5%. Physical properties tests were carried out to evaluate pH, homogeneity, spreadability, melting point and antibacterial activity. The research results showed that stick deodorant had a pH of 4.5, while lotion deodorant had a pH of 5.5. Both preparations showed good homogeneity without the presence of coarse particles. The spreadability of the lotion was recorded at 5.3 cm, increasing to 5.5 cm with the addition of a 50 gram load. The melting point of bar deodoran is around 80°C, and bar deodorant melts completely within 60 minutes at 100°C. Both types of deodorant showed a significant inhibition zone diameter against bacteria, namely 18.16 mm for lotion and 16.77 mm for stiks. Areca nut extract showed very strong antibacterial activity with an inhibition zone diameter of 20.14 mm.

Keyword : antibacterial, body odor, deodorant

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I. INTRODUCTION

Body odor is a skin problem caused by the production of sweat mixed with bacteria. Bacteria that cause body odor include *Staphylococcus aureus, Staphylococcus epidermidis, Corynebacterium acne* and *Pseudomonas aeruginosa*. Body odor is disturbing to oneself and causes discomfort to those around it so that body odor needs to be eliminated. To overcome body odor, you can use powder and deodorant. The form of deodorant on the market can be in the form of lotion, stick and spray (Hidayah *et al*., 2019).

Staphylococcus aureus is a type of bacteria commonly found on human skin. This bacteria belongs to the *Staphylococcus* group which is a gram-positive bacteria, round in shape, and usually in the form of colonies that are collected in groups (*staphylococci*). *Staphylococcus aureus* is often considered a harmless bacteria and generally does not cause infection in healthy people. This bacteria can contribute to the decomposition process of sweat which can cause the formation of body odor. There are two types of sweat-producing glands, namely apocrine glands and eccrine glands. Apocrine glands in the armpits contain a number of proteins and sugars which are later broken down by bacteria to produce an ammonia-like odor. In addition, sweat glands in the armpits are quite large water producers and there are also armpit hairs that further facilitate and expand the activity of bacteria that produce unpleasant odors (Lestari dan Asri, 2021).

Deodorants contain active ingredients as active substances in antiperspirants that are antibacterial and can reduce the amount of sweat in the armpits. However, these antiperspirants can cause damage to the surface epithelium of the skin and blockage of sweat glands which continues to the inability of the skin to produce sweat. One alternative to overcome these side effects is to formulate deodorants or antiperspirants with natural active ingredients that have been proven effective in preventing the growth of bacteria that cause body odor that live on the skin (Timur dan Latifah, 2019).

Jambi is one of the largest betel nut producing provinces in Indonesia for export and domestic needs. Jambi betel nut is known as Pinang Betara which has superior quality and has the potential to be developed as a superior regional product. In the last 2 years, the price of betel nut in Jambi has decreased due to falling export demand, so that the amount of betel nut harvested is abundant and piled up due to falling export demand and falling prices to a third of the usual.

Betel nut has the potential to be developed into pharmaceutical preparations because it contains pharmacologically active secondary metabolite compounds. Betel nut seeds have been shown to contain alkaloids, flavonoids, tannins, saponins, and polyphenols which are known to be effective as antibacterials (Tuslinah *et al*., 2021). Based on research Rawe (2016), It is known that betel nut extract has antibacterial properties against *Staphylococcus aureus* which causes body odor. The properties of betel nut can be developed into superior regional innovation products based on local wisdom, one of which is by making deodorants to overcome body odor. Deodorants with the active ingredient of betel nut have the advantage of inhibiting the growth of bacteria that cause body odor. In addition, the utilization of local potential and the natural

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properties of betara betel nut into stick and lotion deodorant products can provide economic benefits and effective solutions for local communities to increase their income. The development of superior betara betel nut commodity products can also support regional economic growth and expand export markets.

This study formulated betel nut in the form of stick deodorant and lotion deodorant because it has several advantages that meet quality standards. The advantages of stick deodorant are that it is in the form of a solid bar that is easy to apply and spread evenly on the skin, has a distinctive odor and does not cause a sticky sensation when used. Lotion deodorant has the advantage of being quickly absorbed when used, has a practical shape so that it is easy to carry anywhere so that it is more applicable and effective (Lidia et al., 2022)..

II. RESEARCH METHODS

Tools

The tools used are beaker glass, Erlenmeyer flask, ose, dropper pipette, water bath, hot plate, stirring rod, rotary evaporator, petri dish, analytical balance, deodorant stick and lotion containers, and oven.

Ingredients

The ingredients used are betara betel nut, 96% ethanol, stearic acid, 10% NaOH, glycerin, propylene glycol, PEG 400, cetyl alcohol, triethanolamine, olive oil, methyl paraben, propyl paraben, oleum rosae, distilled water, and Staphylococcus aureus bacteria.

Making areca nut simples

Areca nuts are taken from Muntialo Village, Betara District, West Tanjung Jabung Regency. The areca nuts taken are sorted with the criteria of orange-colored areca nuts, good quality as indicated by the absence of rotting on the areca nuts. The sorted areca nuts are washed with clean water to remove dirt that sticks to them. The fruit skin is separated from the areca nuts through a peeling process, so that only the seeds are used. The peeled areca nuts are then cut into small pieces to speed up the drying process. Areca nuts are dried using an oven. Drying areca nuts at a temperature of 550C takes about 24 hours to achieve perfect dry results. The dried areca nuts are blended little by little until they become a fine powder (Nazila et al., 2019).

Extract making

The preparation of betel nut extract was carried out using the maceration method using 96% ethanol solvent. Betel nut powder simplicia was soaked in 96% ethanol solvent in a dark bottle with a ratio of 1:2 (3 kg of betel nut powder and 4000 mL of 96% ethanol) for 3x24 hours at room temperature, occasionally shaken, followed by filtration so that the filtrate and residue were separated. The filtrate was evaporated using a rotary evaporator until a thick extract was obtained, then the % extract yield was calculated (Erwiyani et al ., 2021).

$$\text{Formula \% Extract Yield} = \frac{weight\ of\ extract}{weight\ of\ simplex} \times 100\%$$

Deodorant Stick and Lotion

Preparation Formulation Stick deodorant formula

Table I. Formula Design of Stick Deodorant and

Stick Deodorant		
Ingredients	**Formula**	**Description**
Betara Betel Nut Seed Extract	5	Active substances
Stearic acid	5	Hardener
NaOH 10%	7,2	Thickener

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Glycerin	5	Solvent
Propylene Glycol	41,3	Humectant
PEG 400	10	Emulsifier
Ethanol 96%	ad 100	Solvent

Lotion Deodorant

Ingredients	Formula	Function
Betara Betel Nut Seed Extract	5	Active substances
Cetyl Alcohol	2	Thickener
Stearic Acid	5,5	Emulsifier
Triethanolamine	1,5	Surfactant
Glycerin	1,8	Humectant
Olive Oil	2,2	Emollients
Methyl Paraben	0,18	Preservative
Propyl Paraben	0,02	Preservative
Oleum rosae	0,1	Fragrance
Aquadest	ad 100	Solvent

Making Deodorant Stick and Lotion

Preparations Stick Deodorant

Mix stearic acid, 96% ethanol and glycerin (Mass I) into a glass beaker and heat at 70℃. Add 10% NaOH into Mass I, then stir for 15 minutes. Mix propylene glycol and PEG 400 (Mass II) into a glass beaker of Mass I, then heat at 70℃. Add 5% betara betel nut extract with continuous stirring. Cool to 50℃, then pour into a stick deodorant container.

Deodorant Lotion

Prepare the oil phase of deodorant lotion into glass beaker I, namely cetyl alcohol, stearic acid, olive oil and propyl paraben. Prepare the water phase of deodorant lotion into glass beaker II, namely triethanolamine, glycerin, and methyl paraben. Dissolve the oil phase and water phase on a hot plate at a temperature of 70ºC. Add distilled water little by little until a cream base is formed. Add betara betel nut extract and fragrance and stir until homogeneous.

Physical Quality Test Evaluation of Deodorant

Organoleptic Test

Organoleptic testing was carried out using 0.5 grams of stick deodorant and areca nut extract deodorant lotion. The sample is applied to a petri dish, then tested with visual observations including changes in color, smell (tanninness) and the shape of the deodorant made (Afni *et al.*, 2015).

pH Test

This test is to see the pH value of the preparation using a pH meter. Weighing as much as 1 gram of deodorant lotion and sticks is then added aquadest as much as 10 ml. Used pH meter to measure the pH of deodorant lotion preparations. The pH requirement is 4.5 - 6.5 according to the normal pH of the skin (Fauzia *et al.*, 2023).

Homogeneity Test

The homogeneity test of deodorant lotion and stick deodorant preparations is conducted by applying 0.5 grams to a glass slide to observe its homogeneity. If there are no coarse particles on the glass slide, the tested deodorant is declared homogeneous, while the presence of coarse particles indicates that the deodorant is not homogeneous (Afni *et al.*, 2015).

Melting time test

The melting time test was carried out with 5 grams of stick deodorant, placed in water at a temperature of 37°C and turned on the stopwatch then recorded the melting time (Cahyanta et al., 2019).

Melting point test

The melting point test is performed by placing the preparation in a heating device by slowly

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raising the temperature, using a thermometer to measure the temperature and observe the change, then recording when the material begins to melt completely (Aslin *et al.,* 2024).

Antibacterial Activity Test

The antibacterial power test in this study used the diffusion method by means of a conveyor. Staphylococcus aureus bacterial suspension that has been inoculated in 0.9% NaCl, then dipped a sterile cotton swab into the bacterial suspension and then applied to the NA medium. Make a wells (holes) in the nutrient medium to use a 7 mm diameter ose tool, then prepare a sample of deodorant lotion and sticks of 0.1 g at concentration variations of 5%, 7.5%, 10%, negative control and positive control. The test was carried out by putting areca nut extract with various concentrations of 0.1 g each into the mixture, then the petri dish was incubated for 24 hours at a temperature of 370C. The diameter of the barrier zone is measured in millimeters (mm) using calipers by measuring the distance from the edge of the test well to the circumference boundary of the barrier zone. Then the diameter of the barrier zone is categorized as its antibacterial power strength based on classification (Afni *et al.,* 2015).

III. RESULTS AND DISCUSSION

Sample preparation and extraction

Simplisia areca nuts have a total of 6,000 grams that have been macerated into macerated powder with 96% ethanol. The maserat obtained is then concentrated with a rotary evaporator to produce a thick extract of areca nut betara of 720 grams. The yield of betel nut extract obtained in this study was 12%. The results of the yield calculation from a sample are very necessary to find out the amount of extracts obtained during the extraction process. The calculation of extract yield is said to be good if the yield value of the extract obtained is more than 10%. The use of 96% ethanol as a solvent in the maceration process is due to the nature of 96% polar ethanol and can extract polar and non-polar compounds. In addition, ethanol is able to inhibit the growth of molds and germs, has good absorbance, does not cause swelling of the cell membrane and can improve the stability of dissolved drug materials. Its properties are able to inhibit the work of enzymes and are very effective in producing optimal extracts (Saerang *et al.,* 2023).

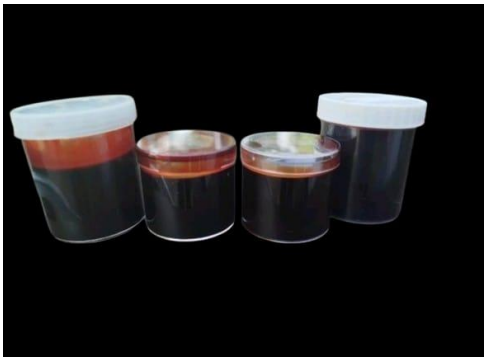

Figure 1. .Batara areca nut extract

Rendemen= (720/ 6000 gram) ×100% = 12 %

The extraction method by maceration was chosen because this method does not require heating so that it does not interfere with the content contained in the sample so that the sample will not be damaged. The maceration process is carried out by immersion of simplicia powder in the solvent used. In the soaking process, there is a breakdown of the cell wall and cell membrane due to the difference in pressure between the inside and outside of the cell so that secondary metabolites contained in the cytoplasm will break down and can be dissolved in the solvent used (Saerang *et al.,* 2023).

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Extraction is a chemical separation technique to separate or withdraw one or more components or compounds of compounds from a sample using certain appropriate solvents. The extraction separation method uses the principle of like dissolve like solubility where a polar solvent will dissolve polar compounds and non-polar solvents will dissolve non-polar compounds. The purpose of extraction is to attract or separate the compound from its mixture or simplicia. The extraction method used depends on the type, physical properties and chemical properties of the compound to be extracted. The solvent used depends on the polarity of the compounds contained in areca nuts, ranging from nonpolar to polar. In general, extraction will be better if the surface of the simplicia powder in contact with the solvent is wider. Thus, the finer the simplicia powder, the better the simplicia will be (Noor *et al.,* 2019).

In this study, 96% ethanol solvent was used to attract compounds in areca nuts. The resulting extract is a dark brown and thick extract with a randemen of 12%. According to Shadmani., et al (2004), 96% ethanol can be used as a solvent because it is a solvent that can dissolve almost all organic compounds, both polar and non-polar. In addition, 96% ethanol has non-toxic properties, good absorption and high purification ability so that it can absorb compounds that are non-polar, semi-polar and polar. Ethanol solvents are 96% easier to penetrate into the sample cell wall than ethanol solvents with lower concentrations, resulting in concentrated extracts.

The result of the calculation of the yield from a sampleIt is very necessary to know the number ofextracts obtained during the extraction process. The calculation of extract yield is said to be goodwhen the yield value of the extracts obtained more than 10% (Wardaningrum et al., 2019).

In the process of extracting plants, it is very important to pay attention to which parts to extract, since each part of the plant has a different chemical composition and benefits. Each part, such as roots, stems, leaves, or flowers, has different physical and chemical characteristics, so it requires a specific extraction approach to obtain the active compound optimally. The method chosen will affect the efficiency of extraction and the quality of the compounds produced. Therefore, the selection of extraction methods must be adjusted to the part of the plant used to ensure th at bioactive compounds can be extracted optimally (BPOM RI, 2023).

Cold extraction methods such as maceration were chosen because they have a number of advantages over other extraction methods. The main advantage is that the procedures and equipment used are relatively simple, and are able to maintain the stability of natural materials that are not resistant to heat (Puspitasari & Lean, 2017).

Additionally, cold extraction allows more active compounds to be extracted, although some compounds may have limited solubility at room temperature. In this process, ethanol solvents are used because ethanol is polar, universal, and easy to obtain. Maceration is carried out 3 times for 24 hours (3 × 24 hours), where every 3 times 24 hours the extract is filtered, then the maceration process is repeated with a new solvent. This process is called remaceration, which aims to attract active compounds that are still left behind from previous maceration (Selfiana, 2019).

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After the maceration process is complete, the obtained filtrate is evaporated using a rotary evaporator at a temperature of 40°C, because at that temperature the active compounds in the sample will not be damaged. This evaporation process aims to separate the solvent from the extract so that a thick extract is obtained (Woran et al., 2021)

Evaluation of Deodorant Lotion and Deodorant Sticks

Organoleptic Test

Organoleptic tests are intended to look at the physical appearance of a preparation which includes shape, color and smell. Based on the results obtained in Table I are as follows :

Table II. Organoleptic Results of Deodorant Sticks and Deodorant Lotion

Parameter	Deodorant Stick	Deodorant Lotion	Standard Conformity
Color	Light chocolate	Light chocolate	The color does not deviate from the active material and is stable during storage
Smell	Not rancid (neutral)	Not rancid (neutral)	There is no rancid smell, indicating the stability of the material
Shape/Texture	Compact, easy to apply, non-sticky	Thick liquid, quickly absorbs, gives a moist sensation	Easy to apply, comfortable on the skin, non-irritating or sticky
Appearance	Homogeneous, no coarse particles	Homogeneous, no coarse particles	Indicates a good and stable mixing of active ingredients and additives

The standard of a good organoleptic lotion based on Afni et al. (2015) is to have a color that matches the active ingredient, a scent that is not pungent or rancid, and a texture that is not sticky and easily absorbs into the skin.

The results of observations of stick deodorant and lotion deodorant show that both products have the same color, namely light brown. This similarity shows that the composition of active and additional ingredients in both preparations is similar and does not undergo changes during the manufacturing process. In terms of smell, both products do not show any rancid odor which indicates that the ingredients, especially oils or fats are in good condition and have not undergone oxidation. This is important because the firmness is usually caused by the oxidation of fats, and the absence of this odor indicates that the product formulation remains stable and of high quality. The most striking difference between the two preparations lies in their shape. Stick deodorant is solid-formed, providing ease of application without a sticky taste and is suitable for daily use with long-lasting results. On the other hand, deodorant lotion is in the form of a thick liquid that absorbs more easily into the skin, provides a moist sensation, and is suitable for users who want additional moisturizing on the area being applied. In relation to lotion requirements, deodorant lotion must have a

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texture that is easy to apply, non-stick, and absorbs quickly, and the criteria are met by this product. Thus, both products meet good quality criteria and provide options that suit user preferences (Hidayati et al., 2019).

Based on the test results between dedodorant stick and deodorant lotion, deodorant lotion is considered superior to deodorant stick because deodorant lotion has a stronger antibacterial inhibition zone than deodorant stick, which is 17.44 mm with a strong category while deodorant stick is only 13.94 mm, this shows that deodorant lotion is more effective in inhibiting the growth of staphylococcus aureus bacteria that cause body odor. For the pH range both meet the pH of the skin (4.5-6.5), however the lotion has a pH that is close to neutral, making it safer for sensitive skin.

pH Test

Table III. pH Results of Deodorant Sticks and Deodorant Lotion

Parameters	Deodorant Stick	Deodorant Lotion
pH	4,5	5,5
pH Compatibility	Meet	Meet

The pH test results showed that there was a difference in pH in the stick deodorant and lotion deodorant. Stick deodorant has a pH of 4.5, while lotion deodorant has a pH of 5.5. A pH that is too acidic can cause irritation to the skin, while a pH that is too alkaline can make the skin scaly. The ideal pH range for skin preparations is between 4.5 to 6.5, which is safe and convenient to use without causing skin problems. Based on the tests, the pH of deodorant sticks and deodorant lotions are within the range that meets the pH requirements of a good preparation for the skin (Hidayati et al., 2019).

Homogeneity Test

The homogeneity test of deodorant lotion preparations and stick deodorants is carried out by applying a certain amount of preparation on a piece of transparent glass then covering it with a glass cover and observing.

Tabel IV. Homogeneity Results of Deodorant Stick and Deodorant Lotion

Types of Deodorants	Observation Results	Conclusion
Deodorant Lotion	No clumps	Homogeneous
Deodorant Stick	No clumps	Homogeneous

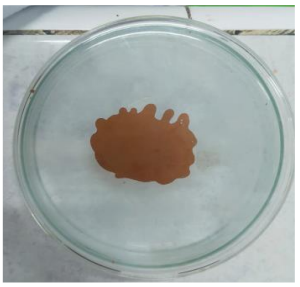

Figure 2. Homogeneity tets of stick deodorant

Figure 3. Homogeneity test of lotion deodorant

The results of the homogeneity test showed that both deodorant lotion and stick deodorant had homogeneous properties without coarse particles or clumps. This homogeneity is important because it ensures that the ingredients used in the preparation are well mixed, so that the active ingredients can be evenly dispersed throughout the product. This is

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directly related to the effectiveness of the product, where a homogeneous preparation will give optimal results because each part of the product contains the same amount of active ingredients. In lotion deodorants, test results show that the preparation does not have clots and is homogeneous, as well as in stick deodorants, where no clumps are also found and the product is homogeneous. This shows that both preparations have met the requirements of good formulation, so that they can provide optimal performance when used (Dominica and Handayani, 2019).

Dispersion Test of Deodorant Lotion

Table V. Dispersion Results of Deodorant Lotion

Load (grams)	Time (minutes)	Dispersion Diameter (cm)	Information
0	1	5,3	No load
50	1	5,5	Load addition

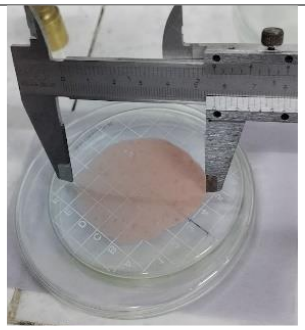

Figure 4. Deodorant lotion spreadability test

The purpose of the dispersion evaluation is to determine the absorption ability of the lotion on the skin to meet the requirements for the dispersion of the lotion if the dispersion is 5 - 7 cm. Good spreadability will make it easier when applied to the skin. The factor that affects the spreadability diameter of a preparation is the amount of extracts used in each of the formulas. This is based on the fact that the lower the consistency of the lotion preparation with the lower the adhesion time, it can make the lotion more easily spread. Based on the table above, the spreadability of the lotion is qualified because it is in the range of 5-7 cm, both when measured without a load (5.3 cm) and with an additional load of 50 grams (5.5 cm). This good spreadability makes it easier to apply lotion to the skin and shows that the lotion formulation is optimal, where the consistency of the lotion allows for an even and easy spread on the skin (Dominica and Handayani, 2019).

Melting Time Test

A melting time test is carried out to find out how many minutes the deodorant sticks melt. The results of the melting time test can be seen in the Table:

Table VII. Results of melting time of deodorant sticks

Temperature (°C)	Time (minutes)	Information
37	70	Not melted yet
45	120	Not melted yet
55	90	Not melted yet
80	60	Starting to melt
100	60	Melt

Melting point testing of the stick deodorant is performed to determine the temperature at which the stick deodorant begins to melt. The test data showed that the deodorant sticks began to melt at 80°C and melted completely within 60 minutes at 100°C. At 125°C, the deodorant sticks melt faster, i.e. within 40 minutes. Stick deodorant does not melt at low temperatures (37°C, 45°C, 55°C), although left for a considerable time, indicating that stick deodorant has a relatively high melting point, which is a desirable property for cosmetic products used at room temperature. The deodorant sticks begin to melt at 80°C, indicating that the melting point of the

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deodorant sticks is around 80°C. Stick deodorant melts completely within 60 minutes at 100°C and within 40 minutes at 125°C, indicating that stick deodorant melts faster at higher temperatures.

Melting Point Test

Table VIII. Melting Point Results of Stick Deodorant

Temperature (°C)	Time (minute)	Description
37	70	Not yet melted
45	120	Not yet melted
55	90	Not yet melted
80	60	Starting to melt
100	60	Melts in 1 hour
125	40	Melts in 40 minutes

Based on the table above, deodorant sticks have a melting point of about 80°C, which is indicated by the fact that deodorant sticks begin to melt at 80°C and melt completely within 60 minutes at 100°C. Stick deodorant does not melt at room temperature (37°C, 45°C, 55°C), although left for a considerable time, indicating that stick deodorant has a relatively high melting point, which is a desirable property for cosmetic products used at room temperature. However, stick deodorant melts faster at higher temperatures, by melting completely within 60 minutes at 100°C and within 40 minutes at 125°C. This indicates that the stick deodorant has good stability at room temperature, but it can melt if exposed to excessive heat. It's best to avoid exposing the stick deodorant to excessive heat and store the stick deodorant in a cool, dry place. It should be noted that the results of these tests only show the melting point of the stick deodorant, and other factors such as the composition of the stick deodorant, size, and test method may affect the test results.

Deodorant sticks have a solid shape that makes them not volatile or undergo changes in texture due to temperature or humidity, in contrast to liquid or semi-solid forms which are more susceptible to physical changes. This stability is supported by the presence of fat or wax components such as beeswax, stearic acid, and solid oils that function to maintain the shape and structure of the preparation at room temperature. Additionally, deodorant stick formulations tend to be simpler with fewer active components that can react with each other, making the product more resistant to chemical degradation. This product also has minimal water content, so the risk of microbial growth or hydrolysis is lower (Safira and Sari, 2014).

Deodorant preparations that have added additional ingredients to formulas with variations in the concentration of stearic acid as a base affect the physical properties of the preparation. The higher the concentration of stearic acid used, the better the form of the preparation produced (Ervianingsih and Razak, 2019).

Therefore, the use of stearic acid has an important role in the manufacture of preparations. Stearic acid can produce a stable preparation base and help bind and thicken preparations so that they produce a good preparation shape and have a longer shelf life (Safira and Sari, 2014).

Antibacterial Activity Test

Table IX. Results of Antibacterial Activity of Deodorant Sticks and Deodorant Lotion

Types of Deodorants	Deodorant Concentration	Jamming Zone	Category

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		Diameter (mm)	
Deodorant Stick (A)	5%	13,94	Strong
Deodorant Lotion (B)	5%	17,44	Strong

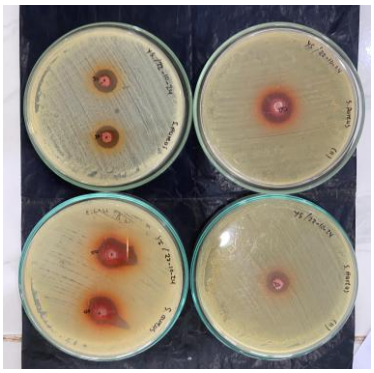

Figure 5. Antibacterial test of stick deodorant and lotion deodorant

In this study, the grazing method was used to measure the effectiveness of two types of deodorants, namely Deodorant Sticks and Deodorant Lotion, on bacterial growth. The use of the grazing method has the advantage of evaluating the area of the inhibition zone generated by the antimicrobial activity of the deodorant, both on the surface and at depth, providing a more comprehensive picture of the product's capabilities. From the tests carried out, both types of deodorants with a concentration of 5% showed identical inhibitory zone diameters, which were 20.14 mm with a very strong category. The buffer zone is the area around the well where bacterial growth is inhibited, indicating that the deodorant has the ability to prevent the growth of microorganisms in equal proportions. Results showing the same inhibition zone diameter between Deodorant Stick and Deodorant Lotion indicate that these two products have equal potential in inhibiting bacterial activity. This can mean that other factors, such as formulation and method of application, do not have a significant impact on the effectiveness of the two types of deodorants in terms of bacterial control. Although stick deodorant and lotion deodorant may have different physical characteristics and ways of use, the results of these tests show that both products are able to provide equal protection against bacterial growth (Nurhayati *et al.*, 2020).

IV. CONCLUSION

The extraction of betel nut seeds using the maceration method yielded a yield of 12%, which is above the value of the yield considered good (>10%). This shows that the extraction method used is efficient and appropriate to obtain quality extracts without damaging the active components. Areca nut extract with a concentration of 5% showed very strong antibacterial activity with an inhibition zone diameter of 20.14 mm, which was effective in inhibiting bacterial growth. In deodorant lotion, the barrier zone is 18.16 mm (strong category) and stick deodorant is 17.73 (strong category).

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