Ad-Dawaa' Journal of Pharmaceutical Sciences
ISSN: 2654-7392, E-ISSN: 2654-6973
Vol. 6, No. 1, June 2023, p. 33 – 45
DOI: https://doi.org/10.24252/djps.v6i1.37568

# Antibacterial Activity Test of Roll on Deodorant Tamarind Seed Coat Ethanol Extract (*Tamarindus indica* L)

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**Article history:**
Submited: 15-5-2023
Revised: 25-6-2023
Accepted: 9-7-2023

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**Cite this article**: Salmiah., Ihsan, E.A., Rahim, A.. (2023). Antibacterial Activity Test of Roll on Deodorant Extract Ethanol Tamarind Seed Coat (*Tamarindus indica* L). Ad-Dawaa' J. Pharm. Sci. 6(1): 33-45.



**ABSTRACT**

**Introduction**: Armpit odor is one of the problems caused by bacteria, one of which is Staphylococcus aureus. The rind of the tamarind seed contains tannins and flavonoids that function as antibacterial. **Aims**: The purpose of this study was to formulate the ethanolic extract of tamarind seed coat into roll-on deodorant preparations and to determine the zone of inhibition from variations in the concentration of the extract. **Methods**: The method used is the well diffusion method and the data obtained are then analyzed using Statistical Product and Service solution (SPSS). The level of confidence used is 95% to see the significance of each evaluation of the preparation. **Result**: The results showed that the roll on deodorant preparation of ethanol extract of tamarind seed coat did not meet the requirements for good dispersibility, adhesion and viscosity for topical preparations in general and emulsion preparations. The pH of the preparation met the axillary skin pH he standard for topical preparations. The roll-on deodorant preparation of ethanol extract of tamarind seed cultivars was effective in inhibiting the growth of *Staphylococcus aureus* bacteria. **Conclusion**: The results of inhibition zone 3 formulations containing extracts were in the strong category and the value increased with increasing concentration of tamarind seed coat extract in the deodorant preparation.

**KEYWORDS**: Antibacterial, roll on deodorant, tamarind seed soat, *Staphyococcus aureus*, well diffusion.

## INTRODUCTION

The armpit skin area is slightly different from other skin areas, due to the presence, identity and number of sweat glands in the armpit area (Ojih et al., 2014). The armpit is an area where apocrine glands are larger and more numerous than in other parts of the body (Inaba & Inaba, 1992). The high humidity level of the armpit area compared to other skin areas causes the number of microorganisms in the armpit area to exceed 10 million microorganisms, the number is more than other skin areas such as on the back where there are only about 1000 skin bacterial microorganisms per square centimeter (Ojih et al., 2014).

Rosenberg (2018) states that the factors that cause bad body odor are bacteria that stick to and ride sweat, causing an unpleasant odor to come out (Rosenberg, 2018). According to research scientists, the cause of human body odor is the apocrine glands. This is because the

apocrine glands secrete most of the chemical compounds such as proteins and fats needed by the skin flora (microorganisms) to produce odors (Lundstrom & Olsson, 2010). So it can be said that body odor is a combination of apocrine glands with microorganisms. One of the microorganisms found on normal healthy skin is Staphylococcus aureus bacteria (Kuraitis & Williams, 2018).

Staphylococcus aureus is one of the gram-positive bacteria, which can be isolated on healthy skin, one of which is in the armpit area (Enright & Witte, 2004). These bacteria can produce isovaleric acid (3-methyl butanoic acid) which is one of the sources of underarm odor. Armpit odor can be a factor that can make a person feel irritated and stressed because it causes discomfort during activities. The problem of underarm odor affects one's self-confidence and causes a person to be shunned by his friends and closest people. Based on a survey conducted by the job search site Nationalevacaturebank.nl, body odor, one of which comes from the armpits, is in the first place as a nuisance to the work atmosphere (Hasan, 2015).

Washing the armpits with soap and water can help but does not eradicate all bacteria, because many are hidden in the deep layers of the skin (Rosenberg, 2018). To reduce body odor, especially from the armpits, there are several strategies that can be done such as maintaining good hygiene combined with the use of deodorants containing active antiperspirants or deodorants containing active antibacterials. Deodorant is one of the topical cosmetic preparations to eliminate armpit odor, its mechanism of action is to suppress the growth of microorganisms (Ojih et al., 2014). There are many forms of deodorant preparations, one of which is roll-on deodorant where this form is very popular because it provides convenience when applying the product to the armpit area because of the roll-on ball assistance, does not provide an oily sensation and spreads well on the underarm skin (Paye & Maibach, 2009).

The active ingredients that are generally used in deodorant preparations on the market are aluminum chlorohydrate and triclosan, which are materials that act as antibacterial and are able to reduce the amount of sweating on the skin. However, both of these ingredients can cause irritation if used on injured skin and bacterial resistance often occurs. Therefore, there is a need for natural antibacterials that are safer to use for the skin, as an alternative to aluminum chlorohydrate and triclosan in deodorant preparations.

Tamarind seed coat is a residue from the core of tamarind seeds which is one part that is rarely used, just thrown away as organic waste. Tamarind seed rind can be used as an antibacterial, because based on the results of research conducted by Prabhu & Teli (2014) showed that tamarind seed husk extract contains thick tannins that can inhibit the growth of Staphylococcus aureus and Escherecia coli bacteria, with a minimum inhibitory concentration of 1%. The results of

the phytochemical study of tamarind seed coat extract showed the presence of tannins, saponins, sesquiterpenes, alkaloids, tri terpinoidal saponins and reducing sugars and were active against gram-positive and gram-negative bacteria (Adeniyi et al., 2017; Sravanthi et al., 2017). And the results of research by Kengaiah et al., (2020) showed the main phytochemical content in the ethanolic extract of the tamarind seed coat (TSCEE) were alkaloids, flavonoids, and polyphenols.

Based on the above background, this study aimed to formulate tamarind seed coat extract as an alternative natural antibacterial (active substance) in deodorant preparations and to test its antibacterial activity against Staphylococcus aureus bacteria. This research provides a new area for the use of large quantities of tamarind seed coat which is available as a residual material from the tamarind seed core to be used as a natural antibacterial (active substance) in roll-on deodorant preparations.

## MATERIAL AND METHODS

### Tools and Materials

The tools used include: digital scales, blender, sieve, electric stove, mortar, stamper, beaker, erlenmeyer, porcelain dish, watch glass, dropper, stir bar, test tube, tube rack, LAF, incubator, ose needle , spreader, yellow tip, blue tip, micropipette, petri dish, autoclave, pH meter, oven, and refrigerator.

The ingredients used include: Ethanol extract of tamarind seed coat, Cetyl alcohol, Antibacterial activity test of roll on deodorant Mineral oil, Polysorbate-80, Glycerin, Magnesium aluminum-silicate, Aquadest, FeCl3 1%, Ethanol 70%, Ethanol 95%, Magnesium (Mg), Concentrated HCl, 10% NaCl, 2 N HCl, Gram-positive Staphylococcus aureus, Mueller Hinton Agar (MHA)

### Sample Preparation and Extract Preparation.

The tamarind seed coat taken is the old seed coat which is brown to black in color. Seeds are separated from the fruit, washed to remove adhering pulp (pulp), then dried in an oven at 60℃ for 2 x 24 hours (Nakchat et al., 2014). The seed coat and kernel are separated manually. Furthermore, the seed coat was mashed with a blender and sieved using a sieve number 100 mesh to obtain a fine powder of tamarind seed coat. Extraction is done by maceration. The solvent used is 70% ethanol. with a sample:solvent ratio (1:7.5). The extract was filtered through filter paper and the filtrate was stored. Then the residue is macerated. Remaceration was carried out 2 times. Subsequently, the extract was concentrated using a rotary evaporator at a temperature of 50° C to remove the solvent.

### Extract Phytochemical Test

*Flavonoid test*

A total of 2 ml of tamarind seed coat ethanol extract was mixed with 3 ml of 70% ethanol and then shaken, heated, shaken again and then filtered. The filtrate obtained was then added with 0.1 g Mg powder and added 5 drops of concentrated HCl. The formation of a yellow,

orange or red color in the solution indicates a positive result for the presence of flavonoids (Lailiyah et al., 2019).

*Alkaloid test*

A total of 50 mg of sample extract was put in a beaker, added 0.1 ml of 2 N HCl and 0.9 ml of distilled water. The next step is to heat the mixture of 3 ingredients on a water bath for 2 minutes, then cooled and filtered. The filtrate obtained was put into 2 test tubes (3 drops in each tube). Then added 1 drop of Dragendorf's reagent and Mayer's reagent into each tube. If an orange yellow precipitate is formed in a tube with Dragendorff's reagent added, and a yellow or white clotted precipitate is formed in the tube to which Dragendor's reagent is added, the sample is said to be positive for alkaloids (Idroes et al., 2019).

*Tannin test*

As much as 0.5% solution of ethanolic extract of tamarind seed coat was reacted with various reagents such as ferric chloride (FeCl3) solution and gelatin. P]a color change was observed after the addition of the reagent (Russell, 1935). As much as 2 ml of tamarind seed coat aqueous extract was added to 2 ml of distilled water. Next, the extract solution is dripped with one or two drops of 1% FeCl3 solution. The presence of tannins is indicated by the appearance of a dark green or bluish green color. Meanwhile, after being given a 1% gelatin solution containing 10% NaCl, if a white precipitate forms, the extract contains tannins (Endarini, 2016).

*Saponin test*

A total of 0.5 mL of ethanolic extract of tamarind seed coat was added to 10 mL of hot water, then cooled and shaken vigorously, then added 1 drop of 2 N HCl (Yati et al., 2018)

**Roll-on deodorant formulation**

Roll on deodorant formulations are made in 4 formulas (table 1), where the difference in the four formulas lies in the concentration of ethanol extract of tamarind seed coat. the formulation did not contain extract only as a base (negative control). The steps for making roll-on deodorant emulsion are as follows:

Weigh all ingredients according to the amount stated in the formula. Separate the oil phase (mixture 1) from the water phase (mixture 2). Oil phase (cetyl alcohol and mineral oil), water phase (glycerin, tween-80, aquadest and magnesium aluminum silicate). Magnesium aluminum silicate is first dissolved with water, before being mixed or combined with other materials including the water phase. Mixtures 1 & 2 are heated and stirred at a temperature of 70-75ºC separately until homogeneous. After mixture 1 & 2 is homogeneous, then enter mixture 2 into mixture 1 and stir continuously until homogeneous. The active ingredient, namely ethanol extract of tamarind seed coat, was added at a temperature of 50ºC. Then stir until homogeneous (The stirring process is carried out until the mixture is homogeneous and reach a temperature of 40ºC.

Table 1. Roll-on deodorant formulation (Paye & Maibach, 2009; Rowe *et al*., 2006)

| Ingredients | Formula | | | | Function |
|---|---|---|---|---|---|
| | I | II | III | IV | |
| Tamarind Seed Coat Ethanol Extract | - | 10 % | 15% | 20% | Active substance |
| Cetyl Alkohol (g) | 3 | 3 | 3 | 3 | Stiffening agent (Rowe *et al*., 2006) |
| Mineral oil (g) | 2 | 2 | 2 | 2 | Oil phase (Rowe *et al*., 2006) |
| Polysorbate-80 (g) | 1.0 | 1.0 | 1.0 | 1.0 | Emulsifying agent (Rowe *et al*., 2006) |
| Glycerin (g) | 1.5 | 1.5 | 1.5 | 1.5 | Humectants (Rowe *et al*., 2006) |
| Magnesium-aluminium silicate (g) | 0.8 | 0.8 | 0.8 | 0.8 | Emulsifying agent (Rowe *et al*., 2006) |
| Aquadest (g) | add 75 | add 75 | add 75 | add 75 | Solvent (Rowe *et al*., 2006) |

**The Characteristics of Roll On Deodoran Preparations**

*Organoleptic test*

Organoleptic test is done by looking directly at and describing the preparation in terms of shape, color and aroma (Ansel, 1989).

*pH test*

Measurement of pH using a pH meter was carried out by calibrating a pH meter using a buffer solution of pH 6.86 and pH 9.18.

*Viscosity test*

Viscosity test using the Viscotest Rion VT-06 rotor no 1.

*Spreadability test*

A total of 1 gram of the sample is placed in the middle of a scaled round glass, another round glass that has been weighed is placed on top of it then added a load of 125 grams, then allowed to stand for 1 minute then the diameter of the spread formed is measured (Hendriana, 2016).

*Adhesion test*

A total of 0.5 grams of the sample is placed on an object glass, then another glass object is placed again on the sample, on top of the glass object a load of 1 kg is added for 5 minutes, the object glass is mounted on the test equipment, remove the 80 gram load and record the time until both glasses object is detached (Shovyana and Zulkarnain, 2013).

**Antibacterial Activity Test of Roll On Deodorant Preparations**.

*Source of Microorganisms*

Pure isolates of Staphylococcus aureus bacteria were obtained from the stock of the Microbiology laboratory of the Faculty of Health, Hamzanwadi University.

*Production of Growth Media and Test Media*

The bacterial growth medium used was Mueller hinton agar (MHA) media. The method of making MHA media is as much as 0.95 grams of MHA media powder dissolved with 25 mL of distilled water. The medium is heated until it boils and is homogeneous. Furthermore, the media was sterilized by autoclaving at a pressure of 1.5 atm at a temperature of 121ºC for 15 minutes (Hudaya et al., 2014).

Then for testing antibacterial activity also using MHA media. How to make MHA media as much as 5.7 grams of MHA powder (for 6 petri dishes) dissolved with 150 mL of distilled water. The media is poured into Erlenmayer and then homogenized by heating until it boils. Furthermore, the media was sterilized by autoclaving at a pressure of 1.5 atm with a temperature of 121ºC for 15 minutes, so that a sterile medium was obtained (Hudaya et al., 2014).

*Preparation of Test Bacteria and Standardization/Equivalent*

The bacteria used were gram-positive Staphylococcus aureus. The bacteria were rejuvenated by taking a pure culture of bacteria as much as 1 ose and then inoculated by the scratch method (zigzag) on an inclined Sodium Agar (NA) medium. Then the media was incubated for 18-24 hours at 37ºC (Radji, 2019).

So that the bacteria to be grown do not die, the thing that must be done is to balance the osmotic pressure of the bacterial cell and the medium. The trick is that the rejuvenated bacteria are suspended in 5 mL of physiological NaCl (0.9% NaCl) aseptically (Hudaya et al., 2014). 24-hour-old cultures were standardized to the 0.5 McFarland standard (106 CFU/ml).

*Testing Of Antibacterial Activity*

Mueller-Hinton Agar was prepared, sterilized, allowed to cool to room temperature and then poured into plates to a depth of about 4 mm under aseptic conditions. Pure cultures were taken using a sterile cotton swab and scratched on MHA media until the entire surface of the petri dish was covered (Normaliska et al., 2019).

The diameter of the wells made is 5 mm in each petri dish using a yellow tip or cook boorer. As many as 3 holes were made for the roll-on deodorant preparation of ethanol extract of tamarind seed coat and 2 holes in different cups for positive and negative controls. Roll-on deodorant preparations containing ethanolic extract of tamarind seed coat with concentrations of 10%, 15%, and 20% were added to each well using a micropipette and the other 2 holes were dripped with a formulation without ethanolic extract of tamarind seed coat and roll-on deodorant preparations on the market. as a positive control. The petri dish was then


A B C D E

Figure 1. The results of phytochemical screening, A (saponin test), B (tannin test), C (Dragendroff reagent Alkaloid test), D (Meyer reagent test Alkaloids), E (flavonoid test).

incubated for 24 hours at 37℃ and the zone of inhibition was measured (Prabhu & Teli, 2014).

**Data Analysis**

The research data were analyzed using the Statistical Product and Service solution (SPSS) program. The data was tested using the Kolmogorov-Smirnov test first to determine whether the data was normally distributed or not (Wibowo & Larasati, 2015). If the data is normally distributed and homogeneous then it is continued with the one way ANOVA parametric statistical test, and if the data is not normally distributed and not homogeneous then a non-parametric test is carried out using the Kruskal-Wallis test and the Mann-Withney test with a 95% confidence level (Wibowo & Larasati, 2015 ).

## RESULTS AND DISCUSSION

**Extraction**

The results of the organoleptic test of the extract showed the consistency of the extract was thick, the extract was reddish brown in color and had a characteristic smell of tamarind seed coat. The yield of the extract obtained from the sample was 59.68 grams of finely ground tamarind seed coat, which was 77.63%.

**Phytochemical**

In table 2 it can be seen that the secondary metabolites contained in the ethanolic extract

Table 2. Phytochemical test results

| Compound | Parameter | Result | Conclusion |
|---|---|---|---|
| Alkaloids | Formation of an orange yellow precipitate (with meyer's reagent) | No yellow-orange precipitate is formed | - |
| | A yellow or white lumpy precipitate is formed (with Dragendroff's reagent) | No yellow or white lumpy precipitate is formed | - |
| Flavonoids | Formation of red orange to red purple | Formation of red orange color | + |
| Tannins | Greenish black color | Greenish black color | + |
| Saponins | Foam is formed and stable in less than 10 minutes | Unstable foam (lost) | - |

of the tamarind seed shell are flavonoids and tannins, the changes that occur can be seen in Figure 1. The results are in accordance with previously reported data conducted by Prabhu & Teli (2014), where the results Qualitative analysis of the extract showed that the tamarind seed coat extract contained thick tannins. Research conducted by (Adeniyi et al., 2017) the results of phytochemical screening showed the presence of flavonoid compounds in the ethanol extract of tamarind seed coat.

**Organoleptic**

Roll-on deodorant preparations without extract are white, semi-solid consistency and odorless. While the results of the roll-on deodorant formulation containing tamarind seed coat extract at a concentration of 10% (F2) showed a thick consistency, brown in color and characteristically smelled of tamarind seed coat. The results of the formulation on a roll-on deodorant containing ethanol extract of tamarind seed coat at a concentration of 15% (F3) showed a slightly thick consistency, brown in color and characteristically smelled of tamarind seed coat. While the results of the formulation on roll-on deodorant preparations containing ethanol extract of tamarind seed coat at a concentration of 20% (F4) showed a thicker consistency, brown in color and had a distinctive smell of tamarind seed coat. From these results it can be concluded that the addition of ethanol extract into the base affects the color of the preparation from white to brown. Meanwhile, variations in the concentration of ethanol extract of tamarind seed coat added in roll-on deodorant preparations affect the shape or consistency of deodorant preparations.

**pH**

Based on table 3 shows that the pH of the deodorant formulated meets the requirements of skin pH and deodorant pH where the pH range of deodorant preparations in this study ranges from 6.53-6.92. Therefore, the deodorant that is formulated has good cosmetic properties, which is in accordance with or close to the physiological pH of the skin (Tranggono & Latifah, 2007).

**Homogeneity**

The homogeneity test aims to see whether the active substance has been evenly distributed into the base (Masadi et al., 2018) or all ingredients are mixed homogeneously. According to the Directorate General of POM (1979) a preparation is said to be homogeneous

Table 3. Characterization of roll on deodorant preparations ethanol extract of tamarind seed coat**.**

| | Formula | | | | |
|---|---|---|---|---|---|
| | I | II | III | IV | (+) |
| pH | 6,92 | 6,53 | 6,78 | 6,86 | 4,59 |
| Viscosity (dPa.s) | 10 | 110 | 120 | 140 | 16 |

FI, Negative control; FII, 10% ethanol extract of tamarind seed coat; FIII, 15% ethanol extract of tamarind seed coat, FIV, 20% ethanol extract of tamarind seed coat; (+) deodorant on the market (positive control)

if there are no coarse grains when the preparation is applied to a piece of glass or other transparent material. Examination of the homogeneity of each formula showed that the preparation was homogeneous, characterized by the absence of coarse granules when applied to the glass surface during the test and the preparation did not undergo separation into two phases, indicating that the emulsion base and active ingredients were evenly mixed.

**Viscosity**

Based on table 3 above, it shows that the concentration of ethanol extract of tamarind seed coat affects the viscosity of roll-on deodorant preparations. Where the higher the concentration of tamarind seed coat extract in roll-on deodorant preparations, the higher the viscosity value. The roll-on deodorant preparation of ethanol extract of tamarind seed coat when compared with the marketed preparations and base (F1) which have a viscosity value of 10 dPa.s and 16 dPa.s respectively have a wide range or difference in viscosity value, so that the deodorant emulsion Roll on tamarind seed peel extract is difficult to flow and this condition can cause discomfort when applied to the underarm skin.

In addition, the viscosity of emulsion preparations can also be influenced by their constituent materials, namely by thickening agents and emulsifying agents. In this study, the thickening agent used was cetyl alcohol, based on the results of research conducted by Rahmatika (2017) that the higher the Antibacterial activity test of roll on deodorant concentration of cetyl alcohol added to the cream preparation, the higher the viscosity of the cream preparation. Other ingredients that can affect the viscosity of the preparation in this study are magnesium aluminum silicate which functions as an emulsifying agent and also as a thickener then polysorbate-80 which also functions as an emulsifying agent (Rowe et al., 2006). The results of research conducted by Arizal et al., (2013) showed that the optimal concentration of magnesium aluminum silicate as a thickener in deodorant preparations was 0.5%. Therefore, the viscosity can be improved by modifying the amount of the three ingredients in order to get the viscosity according to the quality standard of deodorant preparations.

**Spreadability**

Based on the graph above, the dispersion results show that the higher the concentration of tamarind seed coat extract in the deodorant preparation, the lower the dispersion value. The spread value of roll-on deodorant preparations containing ethanolic extract of tamarind seed coat is not within the range of dispersive power of topical preparations in general, which is 5-7 cm (Rakhmawati et al., 2019) and preparations marketed for deodorants have a spreadability of more than 7 cm. that is, the average spreading power is 8.46 cm.

The dispersion value is inversely proportional to the viscosity, where if the viscosity is large, the dispersion value will

decrease. In this study, it can be seen that the higher the viscosity value of the preparation, the dispersion value tends to decrease. Viscosity is not suitable, too high, causing the spreadability is also not suitable.

In the one way ANOVA test, a significance value of 0.000<0.05 was obtained, which means that variations in the concentration of ethanol extract of tamarind seed coat in roll-on deodorant preparations resulted in roll-on deodorant preparations with significantly different dispersion values between formulas.

**Stickiness**

The results of testing the stickiness of roll on deodorant preparations ethanol extract of tamarind seed coat showed an average value of less than 2 seconds. From the results obtained, it can be said that the concentration of ethanol extract of tamarind seed coat affects the adhesion value of roll on deodorant preparations. The higher the concentration of tamarind seed coat extract in deodorant preparations, the longer the sticking time.

The value of the stickiness of roll on deodorant preparations ethanol extract of tamarind seed coat does not meet the requirements for the adhesion of topical preparations that have an adhesion time of not less than 4 seconds (Nurisna Utami et al., 2021). The length of time for adhesion is directly proportional to the viscosity value, where the higher the viscosity of the preparation, the longer the adhesion time of the preparation.

In the OneWay ANOVA test, a significance value of 0.298>0.05 was obtained, which means that variations in the concentration of ethanol extract of tamarind seed coat in roll-on deodorant preparations resulted in roll-on deodorant preparations with adhesion values that were not significantly different between formulas.

**Antibacterial Activity**

The results of the antibacterial activity test of roll-on deodorant preparations can be seen in figure 2 where the results show that the higher the concentration of ethanol extract of tamarind seed coat added to roll-on deodorant preparations, the more the zone of inhibition against the growth of Staphylococcus aureus bacteria increases. The increase in the inhibition zone formed was caused by the higher the concentration of tamarind seed coat extract, the higher the content of active compounds contained therein. The active substances contained in the ethanol extract of the tamarind seed coat which function as antibacterial are tannins and flavonoids.

The mechanism of action of flavonoids as antibacterial is by being an inhibitor that inhibits bacterial DNA replication and transcription and flavonoids can also bind to extracellular bacterial proteins and can dissolve bacterial cell walls (Egra et al., 2019), as well as by binding to bacterial adhesin molecules. While the mechanism of action of tannins in inhibiting microbial growth is by inactivating bacterial cell adhesion, through

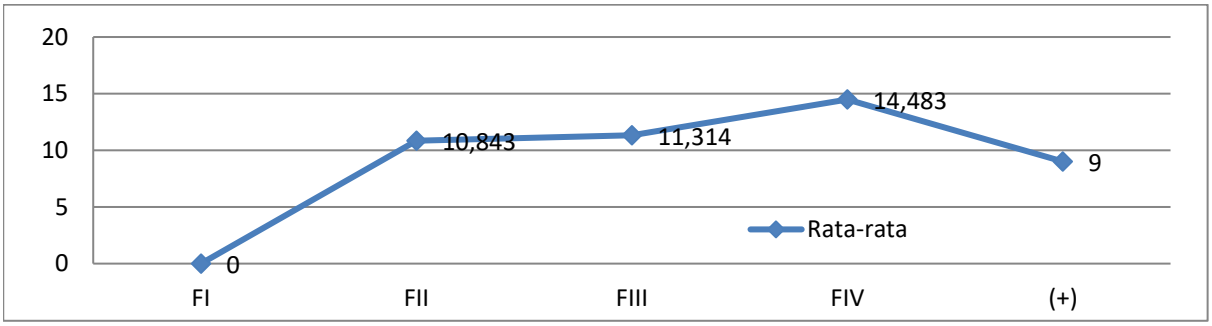


Figure 2. Average inhibition zone of roll on deodorant preparations. FI, negative control; FII, 10% ethanol extract of tamarind seed coat; FIII, 15% ethanol extract of tamarind seed coat; FIV, 20% ethanol extract of tamarind seed coat.

enzymes and disrupting protein transport in the inner layer of bacterial cells (Egra et al., 2019). Tannins and flavonoids are polar compounds. This polar nature causes the two compounds to easily penetrate peptidoglycan which is also polar in bacteria, so that these two compounds are very effective in inhibiting the growth of gram-positive bacteria such as *Staphylococcus aureus*.

Based on the inhibition zone formed, the inhibition zone was categorized into 4, namely 20 mm was categorized as very strong, 10-20 mm was strong, 5-10 mm was moderate and 5 mm was categorized as weak (Davis and Stout, 1971). The inhibitory power of roll on deodorant preparations ethanol extract of tamarind seed coat is in the strong category. The market deodorant used as a positive control had a smaller inhibition zone than the three formulations containing ethanol extract of tamarind seed coat. While the negative control, Formula I, did not show antimicrobial activity against Staphylococcus aureus bacteria.

In the one way ANOVA test, a significance value of 0.000<0.05 was obtained, which means that there was a significant difference in the variation in the concentration of ethanol extract of tamarind seed coat in roll-on deodorant preparations on the growth of Staphyococcus aureus bacteria.

## CONCLUSION

Based on the results and discussion in this study, it can be concluded that the ethanolic extract of tamarind seed coat extract concentrations of 10%, 15% and 20% made or formulated into roll-on deodorant preparations met the requirements for pH, organoleptic and homogeneity tests, but did not meet the standards. spreadability, adhesion and viscosity. There are differences in antibacterial activity on the growth of Staphylococcus aureus bacteria from roll on deodorant preparations of ethanol extract of tamarind seed husk with variations in the concentration of the extract, namely formula I without extract has no clear zone, formula II concentration of 10% clear zone diameter is 10,843 mm, formula III concentration 15% is 11.314 mm and formula IV is 20% concentration is 14,483 mm. Variations in the concentration of ethanolic extract of tamarind seed coat in roll-on deodorant preparation aff-

ect the inhibition formed, the clear zone increases with the increase in the concentration of the active substance (ethanol extract of tamarind seed coat) in the deodorant preparation.

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