

EXPLORATION OF POTENTIAL ANTIBACTERIAL PLANTS IN HERBAL CONDITIONS AGAINST (*STAPHYLOCOCCUS EPIDERMIDIS*) THE CAUSE OF BODY ODOR

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ABSTRACT

Introduction: herbal concoctions from beluntas leaves, betel leaves, ginger and kandis acid are known to have activity against the bacteria that causes body odor, *Staphylococcus epidermidis*, so it is possible that it can be used to eliminate body odor. Method: Quasi Experimental research type with Pretest-Posttest Nonequivalent Control Group Design. Held at the STIKES Panca Bhakti Pontianak Dormitory on 14-28 November 2023. The sample was 26 female students at the Stikes Panca Bhakti dormitory and had body odor problems, the respondents were randomly divided into 2 groups, teenagers in the intervention group were given herbal body odor test materials with a dose of 1x1 suchet (25 grams) and teenagers in the control group were given the comparison agent Detol, the research was carried out for 14 days. Results: organoleptic test regarding the taste of body odor herbal medicine, almost all panelists liked the taste of body odor herbal medicine, namely 20 people (77%), regarding the aroma of body odor herbal medicine, most of the panelists liked the aroma of body odor herbal medicine, namely 16 people (61.6 %), regarding the form of body odor herbal medicine, some of the panelists really liked the form of body odor herbal medicine, namely 11 people (42.3%) and the P-value was $0.000 < 0.005$ which shows that there is a difference in the effectiveness of providing body odor herbal medicine in the intervention and fluid administration groups. detol in the control group. Conclusion: Body odor herbal medicine (exploration of beluntas leaves, ginger, green betel and kandis acid) is effective in reducing body odor in adolescents.

Keywords: *beluntas leaves, betel leaves, body odor, kandis acid, ginger*

INTRODUCTION

Body odor, also known as *bromhidrosis*, is a problem that is often found in the puberty adolescent population, which is characterized by excessive odor that disturbs the sense of smell of people around them. Humans regulate body temperature by sweating. Sweat contains water, salt and waste substances from the body (Lam et al., 2018) . Usually an unpleasant odor occurs with body odor which is caused by the activity of the *Staphylococcus epidermidis* bacteria (Ramdani et al., 2018) . There are two types of sweat-producing glands, namely apocrine and exocrine. Usually an unpleasant odor comes from the skin and is more often the result of secretions from the apocrine glands

than the eccrine glands. The apocrine glands in the armpit area contain a number of proteins and sugars which can be broken down by bacteria which produce an odor such as ammonia (Tuslinah & Sandy, 2021) . Excessive activity causes an enlargement of the area of the sweat glands in the armpits so that the water supply and armpit hairs are more susceptible to bacteria that cause body odor. Apocrine glands are one of the sweat glands in humans which are found on the head, axillary, anogenital, eyelids, external auditory meatus and mammary glands, face and stomach. *Staphylococcus epidermidis* bacteria, as one of the bacteria that causes body odor, is generally resistant to the antibiotics penicillin and methicillin (Basopangka, 2013) .

Bathing and cleaning activities are still relatively ineffective in reducing body odor. Therefore natural ingredients are needed that have the potential to act as antibacterials that can inhibit and kill the growth of *Staphylococcus epidermidis* bacteria as bacteria that cause body odor more effectively, efficiently and safely, such as herbal drinks or herbal concoctions. Herbal drink is a mixture of ingredients derived from plants, minerals and serian (galenic) preparations, or a mixture of these ingredients which have been used for generations for treatment based on experience and can be applied in accordance with the norms applicable in society. Herbal medicine can be used for treatment and health maintenance because it is considered to contain ingredients that are beneficial for the body if consumed in appropriate doses (Lincah Cerdik Hulu, Amaano Fau, 2022) . In Indonesia, many plants grow which can be used as basic ingredients for making herbal medicine, especially for eliminating body odor. Some of these plants include beluntas leaves, ginger, betel leaves and kandis acid. This plant is known to have activity against the bacteria that causes body odor, *Staphylococcus epidermidis*, so it is possible that it can be used to eliminate body odor . This is due to its ability to produce secondary metabolites that are antibacterial (Ahmad & Hikmah, 2023) .

This medicinal plant has been used as traditional medicine for generations because it is easy to obtain, affordable, can be mixed yourself, and has milder side effects than chemical medicines (Hasrianti, Sukarti & Suhaeni, nd) . Therefore, the public's tendency to use traditional medicines originating from nature or herbs in maintaining health, fitness and treatment is increasing. The effectiveness of herbal plants as an effort to prevent and reduce body odor has generally been studied. However, no one has conducted research on the proximate content of beluntas leaf plants, ginger, green betel leaves and kandis acid. Differences from previous research is the development of preparations from beluntas leaf plants, ginger, green betel leaves and kandis acid in herbal medicine.

Health scientists say that the existence of medicinal plants cannot be equated with modern medicine if they have not been tested and only empirical data is passed down from generation to generation (Kristian, 2013). The implication of this research for health practice is to develop and prove the safety of traditional medicine in responding to the needs of teenagers who experience body odor based on science through research.

Therefore, the formulation of the problem in this phenomenon is how to explore plants (beluntas leaves, ginger, betel leaves and kandis acid) as potential antibacterials against (*Staphylococcus epidermidis*) which causes body odor. The aim of this research is to analyze the potential of plants in Indonesia that have antibacterial activity against *Staphylococcus epidermidis* which causes body odor.

METHOD

This type of research is *Quasi Experimental with a Pretest-Posttest Nonequivalent Control Group Design* . Carried out at the Stikes Panca Bhakti Pontianak Kubu Raya dormitory on 14 - 28 November 2023. The population and sample used were young women who had body odor problems at the Stikes Panca Bhakti dormitory and randomly divided into 2 intervention groups, then the sample size was determined Using Federer's formula , there were 13 respondents/group. Random sampling technique, namely dividing respondents randomly into 2 groups, teenagers in the intervention group were given the healthy herbal medicine nifabau body test material at a dose of 1x1 suchet (25 grams) and teenagers in the control group were given the comparison substance detol which was mixed in the bathtub, the research was carried out for 14 days. Data collection was carried out by direct observation in organoleptic and body odor tests. The data was tested using variance analysis for homogeneity between groups as a requirement for parametric analysis of pattern variations unidirectional or analysis of variance (one way ANOVA) is presented in the form of diagrams and tables.

RESULTS AND DISCUSSION

1. Preparation Test Results

The test carried out is an organoleptic test which includes the taste, aroma, shape and color of the preparation with the following results:

Table. 1 Organoleptic Taste Test Results Body Odor Herbal Medicine

| Variable | Frequency (n) | Percent (%) | Cumulative Percent | Mean/Median |
|---------------|---------------|--------------|--------------------|-------------|
| Do not like | 0 | 0 | 0 | |
| Kinda like it | 4 | 15.3 | 15.3 | |
| Like | 20 | 77.0 | 92.3 | 3.60 / |
| Really like | 2 | 7.7.0 | 100.0 | 4.00 |
| Total | 26 | 100.0 | | |

Source: Processed Data, 2023

Based on organoleptic tests from 26 panelists regarding the taste of body odor herbal medicine, almost all of the panelists liked the taste of body odor herbal medicine, namely 20 people (77%) and very few of the panelists really liked the taste of body odor herbal medicine, namely 2 people (7.7%) with an average score of 3.60 which states that the panelists liked the taste of herbal body odor.

Table. 2 Organoleptic Test Results for Body Odor Herbal Aroma

| Variable | Frequency (n) | Percent (%) | Cumulative Percent | Mean/Median |
|---------------|---------------|--------------|--------------------|-------------|
| Do not like | 5 | 19.2 | 19.2 | |
| Kinda like it | 5 | 19.2 | 38.4 | |
| Like | 16 | 61.6 | 100.0 | 3.20 / |
| Really like | 0 | 0 | 100.0 | 4.00 |
| Total | 26 | 100.0 | | |

Source: Processed Data, 2023

Based on organoleptic tests from 26 panelists regarding the aroma of body odor herbal medicine, the majority of panelists like the aroma of body odor herbal medicine, namely 16 people (61.6%) and a small percentage of panelists who do not like and somewhat like the aroma of body odor herbal medicine, namely 5 people (19.2%) with an average score of 3.20 which states that the panelists liked the aroma of herbal body odor.

Table. 3 Organoleptic Test Results for Body Odor Herbal Forms

| Variable | Frequency (n) | Percent (%) | Cumulative Percent | Mean/Median |
|---------------|---------------|--------------|--------------------|-------------|
| Do not like | 1 | 3.8 | 3.8 | |
| Kinda like it | 5 | 19.2 | 23.0 | |
| Like | 9 | 34.6 | 57.6 | 3.85 / |
| Really like | 11 | 42.3 | 100.0 | 4.00 |
| Total | 26 | 100.0 | | |

Source: Processed Data, 2023

Based on organoleptic tests from 26 panelists regarding the form of body odor herbal medicine, some of the panelists really liked the form of body odor herbal medicine, namely 11 people (42.3%) and very few of the panelists did not like the form of body odor herbal medicine, namely 1 person (3.8%) with an average score of 3.85 which states that the panelists liked the form of body odor herbal medicine.

Table. 4 Organoleptic Test Results for Body Odor Herbal Color

| Variable | Frequency (n) | Percent (%) | Cumulative Percent | Mean/Median |
|---------------|---------------|--------------|--------------------|-------------|
| Do not like | 0 | 0 | 0 | |
| Kinda like it | 0 | 0 | 0 | |
| Like | 14 | 53.8 | 52.0 | 3.90 / |
| Really like | 12 | 46.2 | 100.0 | 4.00 |
| Total | 26 | 100.0 | | |

Source: Processed Data, 2023

Based on organoleptic tests from 26 panelists regarding the color of body odor herbal medicine, some of the panelists liked and really liked the color of body odor herbal medicine, namely 14 people (53.8%) and 12 people (46.2%) with an average score of 3.90. stated that the panelists liked the color of the body odor herbal medicine.

2. Respondent Test Results

Table. 5 Body Odor Measurement Results Before and After Intervention

| Group | Variable Body odor | Day 1 n (%) | Day 7 n (%) | Day 14 n (%) | P-Value |
|-------|--------------------|-------------|-------------|--------------|---------|
| I | Very Smelly | 13 (100%) | 0 (0%) | 0 (0%) | 0.005 |
| | Smell | 0 (0%) | 3 (23%) | 0 (0%) | |
| | A bit smelly | 0 (0%) | 10 (77%) | 1 (7.7%) | |
| | No Smell | 0 (0%) | 0 (0%) | 12 (92.3%) | |
| II | Very Smelly | 13 (100%) | 7 (53.8%) | 0 (0%) | 0.005 |
| | Smell | 0 (0%) | 6 (46.2) | 5 (38.4%) | |
| | A bit smelly | 0 (0%) | 0 (0%) | 7 (53.8%) | |
| | No Smell | 0 (0%) | 0 (0%) | 1 (7.7%) | |

Source: Processed Data, 2023

I = intervention group

II = control group

Based on table. 5. Results were obtained on day 1 of all respondents with very smelly bodies, namely 13 people (100%) in both the intervention group and the control group. On the 7th day, most of the intervention group respondents had slightly smelly bodies, namely 10 respondents (77%) and some of the control group respondents had very smelly bodies, namely 7 people (53.8%). On the 14th day,

almost all respondents in the intervention group had no body odor, namely 12 respondents (92.3%) and some of the respondents in the control group had a slight body odor, namely 7 people (53.8%). The P-value is $0.000 < 0.005$, which indicates that there is a difference in the effectiveness of giving body odor herbal medicine to the intervention group and giving detol fluid to the control group.

Table. 6 Statistical Test Results for Body Odor Measurement

| Test Statistics | Post Test 7 Days | Post Test 14 Days |
|------------------------|---------------------|---------------------|
| Z | -4,796 ^a | -4,512 ^b |
| Asymp. sig. (2-tailed) | 0,000 | 0,000 |

a. Wilcoxon signed ranks test

b. based on negative ranks

Based on table 6 above, it shows that the Asymp.Sig between day 1 and day 7 and between day 1 and day 14 has a value of 0.000 or a value < 0.05 , so it can be concluded that there is a difference between body odor before and after the intervention is given. consume body odor herbal medicine for either 7 days or 14 days. So there is an effect of consuming body odor herbs on reducing body odor. The effect of giving herbal medicine for body odor appeared to be more effective in reducing body odor on the 14th day.

DISCUSSION

Based on the results of research on the effect of body odor herbal medicine (exploration of beluntas leaves, betel leaves, ginger and kandis acid) on the growth of Staphylococcus epidermidis bacteria, it can be stated that body odor herbal medicine can inhibit and kill Staphylococcus epidermidis bacteria. Based on the results of phytochemical tests, body odor herbal medicine contains concentrations of substances it is highly antibacterial so that the working mechanism for eliminating Staphylococcus epidermidis bacteria is more effective than just good personal hygiene. So body odor herbal medicine provides benefits in reducing body odor. According to Ariyanti et al (2015) in (Cahya et al., 2019) that the higher the concentration of anti-microbial substances, the

greater their ability to control and kill microorganisms. Because it is suspected that there are secondary metabolite compounds that can inhibit the growth of Staphylococcus epidermidis according to the results of the identification of antibacterial compounds carried out by (Sinaga et al., 2020) . Antibacterial compounds provide different effects in inhibiting bacterial growth. Determinant factors such as temperature, pH, humidity, and nutrition influence bacterial growth. The ability of a material to inhibit bacterial growth can also be influenced by the nature of the bacterial cell wall itself (Maftuhah, 2016) . The main activity of body odor herbal medicine in inhibiting bacterial growth is by inhibiting the synthesis of bacterial cell membranes. Damage to the cell membrane allows nucleotides and amino acids to exit the cell. Apart from that, this damage can prevent the entry of important materials into cells (Sadijah et al., 2022) . This results in inhibition of bacterial growth.

Based on biopharmaceutical tests, body odor herbal medicine (exploration of beluntas leaves, betel leaves, ginger and kandis acid) is effective in reducing body odor. This is due to the antibacterial activity of these plants which contain secondary metabolite compounds which have antibacterial activity such as flavonoids, alkaloids, saponins, tannins, phenols, and steroids/triterpenoids (Indarto, 2019) . Fflavonoids have the ability to inhibit bacterial biofilms, where this ability occurs due to the presence of phenolic groups in the extract which are able to strongly bind proteins and enzymes from bacteria so that the bacteria cannot produce biofilm (Oktaviana et al., 2019).

Saponin as an antibacterial has a mechanism of action by reducing tension surface so that it will result in increased permeability or leakage in cells which can cause intracellular compounds to escape. Alkaloids have the ability to disrupt the components that make up the peptidoglycan in bacterial cells, which causes the cell wall layer to not form completely and causes death of the cell (Chumairoh et al., 2021) . The alkaloid compounds contained in body odor herbal medicine are thought to have antibacterial activity. The mechanism that

occurs is that peptidoglycan activity in bacterial cells becomes inhibited due to disruption of the constituent components so that the cell wall layer cannot form and causes cell death. Apart from that, according to (Riyanta & Febriyanti, 2018) that in alkaloid compounds there are base groups containing nitrogen which will react and affect bacterial DNA. This reaction results in changes in the structure and composition of amino acids, which will cause damage and encourage bacterial cell lysis which will cause cell death {Formatting Citation} Tannin can disrupt the permeability of bacterial cell walls and has a target action on cell wall polypeptides, thereby influencing the formation of cell walls to be less than perfect, resulting in bacterial cells becoming lysed due to osmotic and physical pressure so that bacterial cells will die (Putu & Wahyuni, 2021) . The mechanism of tannin as an antibacterial can damage bacterial cell walls and cause cell death as a result of providing proline bonds which are rich in complex proteins (Oktaviana et al., 2019) . Phenols or polyphenols can inhibit bacterial growth by disrupting the peptidoglycan components of bacterial cells, so that the bacterial cell layer cannot form completely (Lailiyah, 2022) . Phenolic compounds can change surface tension, thereby damaging the selective permeability of microbial cell membranes which causes the release of important metabolism and inactivates enzymes in bacteria (Putu & Wahyuni, 2021) . Phenolic compounds have a mechanism of action in bacterial growth by inhibiting bacterial cell wall synthesis, forming complex bonds with proteins resulting in cell wall leakage, inhibiting bacterial protein synthesis and allegedly interfering with the function of bacterial cell DNA (Hidayat et al., 2018) . The steroid/triterpenoid group of compounds can inhibit bacterial growth and protein synthesis which can result in changes to several components that make up the bacterial cell itself (Chumairoh et al., 2021) . So based on the above ingredients, body odor herbal medicine (exploration of beluntas leaves, betel leaves, ginger and kandis acid) has the power to kill Staphylococcus epidermidis bacteria thereby reducing body odor.

CONCLUSION

Organoleptic tests regarding the taste of body odor herbal medicine, almost all panelists liked the taste of body odor herbal medicine, namely 20 people (77%), regarding the aroma of body odor herbal medicine, most of the panelists liked the aroma of body odor herbal medicine, namely 16 people (61.6%) , regarding the form of body odor herbal medicine, some of the panelists really liked the form of body odor herbal medicine, namely 11 people (42.3%) and the P-value was $0.000 < 0.005$ which shows that there is a difference in the effectiveness of providing body odor herbal medicine in the intervention group and giving detol liquid to control group. Body odor herbal medicine (exploration of beluntas leaves, ginger, green betel and kandis acid) is effective in reducing body odor in teenagers.

SUGGESTION

Further research is needed to find out what specific compounds can inhibit the growth of Staphylococcus epidermidis bacteria on each plant. It needs to be developed into a formula to prove it that the plants resulting from exploration can really be used as a body odor remover because from the results of the exploration the Staphylococcus epidermidis bacteria that cause body odor can be inhibited by these plants as proven by the presence of one parameter of antibacterial activity.

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