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BIMA ETHNIC MEDICINAL PLANTS AS A NATURAL HAND SANITIZER

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Abstract: This study aims to identify potential ethnic plants with medicinal properties in Bima Regency, Indonesia, as hand sanitizers. The type of research is experimental research, with a completely randomized design with two factorials: concentration of medicinal plant extracts and the ratio of alcohol and triclosan. The medicinal plants used are cherry, meniran (Phyllanthus Urinaria), the burden of straw, ketepeng (Senna alata), white turmeric, and guava, taken from the leaves. The results showed that the test plant extracts (cherry, meniran, pandanus, ketepeng, white turmeric, and guava) all had inhibitory power based on the test concentration. The ability of the inhibition of bacteria in the test plant extracts had different diameters of inhibition, where the average concentration of each concentration that had the lowest diameter of inhibition could be seen in the plant extract. In contrast, in the plant extract treatment, the inhibition zone began to appear at a concentration of 20%. In other treatments with other test plant extracts, a zone of the inhibition began to form at a concentration of 10%. Meanwhile, the plant extract which has the largest relative inhibition zone is the white turmeric plant extract. Tests on each test, namely cherry, meniran, ketepeng, white turmeric, and guava, used a concentration of 10%, and the burden of straw used an extract concentration of 20%. The overall hand sanitizer shows characteristics in the treatment concentration A1 = 4% and the concentration of alcohol and triclosan B2 = 1 ml: 1.5 g.pH of the hand sanitizer for various plants was obtained in a relatively similar pH range, namely in the range of 6.06 - 6.82.

Keywords: *Utilization, Medicinal Plants, Bima Ethnic, Hand Sanitizer.*

INTRODUCTION

The spread of the Covid-19 was declared a global pandemic by WHO [1]. Indonesia is one of the countries affected by the Covid-19 pandemic [2]. The rapid transmission of Covid-19 and the massive media coverage have made the public more alert and take protective measures: using hand sanitizer. Hand sanitizer is one of the antiseptic ingredients in the form of a gel which is generally used as a handwashing medium whose formulation is in the form of alcohol, phenolic compounds, carbopol 940, and glycerin. The use of hand sanitizers can kill microorganisms in a relatively short time. Hand sanitizer contains alcohol (ethanol, propanol, isopropanol) with concentrations of ± 60% to 80% and phenol groups (chlorhexidine, triclosan) [3]. The alcohol and phenolic compounds contained in hand sanitizers have a working mechanism by denaturing and coagulating microorganism cell proteins to inhibit bacterial growth and be antifungal and antiviral [5].

However, with the increasing use of hand sanitizers by the public during the Covid-19 pandemic, the availability of hand sanitizers in the community is increasingly scarce [2]. The use of hand sanitizers is excessive and continuous. One of the efforts to meet the need for hand sanitizers with minimal side effects is to innovate hand sanitizers by using various compounds found in the indigenous plants of the Bima community, NTB. The use of compounds in various plants as hand sanitizers is possible because natural hand sanitizers are relatively cheaper, easy to obtain and accepted by the community, and are local wisdom. Bima Regency has high biological wealth, and some of them have potential as medicinal plants [5]. Traditional medicinal plants generally utilize various parts of plant organs such as roots, stems, leaves, flowers, fruits, and seeds. It contains various metabolites that have the potential to cure various diseases [6], and some of them can be antimicrobial, antifungal, and antivirus [4]. The phytochemical and ethnobotany tests of traditional medicinal plants in the Bima Regency show 19 types of plants with medicinal potential. Six types could potentially be used as wound medicine or antiseptics: cherry, meniran, the burden of straw, ketepeng, white turmeric, and guava [7]. These plants contain various secondary metabolites, including flavonoids, alkaloids, terpenoids/steroids, saponins, and tannins. The combination of metabolite compounds such as alkaloids, flavonoids, tannins, and steroids can be used as antibacterial, antifungal, and antiviral. Compounds such as flavonoids, alkaloids, steroids,

tannins, saponins, anthraquinones, and terpenoids in plants are antibacterial, denature proteins, prevent bacterial digestion, and antimicrobial antiviral [8].

Hand sanitizer is one of the antiseptic ingredients in a gel, which is generally used as a practical handwashing medium—the alcohol contained in the hand sanitizer functions as a disinfectant that has bactericidal and antifungi activity. The alcohol content in hand sanitizer can also be used as a solvent for triclosan. The triclosan contained in hand sanitizers can slow down the growth of bacteria, is also antifungal and antiviral, and is less corrosive. The combination of alcohol and phenol compounds in hand sanitizer has a working mechanism by denaturing and coagulating microorganism cell proteins, inhibiting bacterial growth, and being antifungal and antiviral [4]. Hand sanitizers on the market can be divided into liquid and gel.

People generally use hand sanitizer gel products because they cause a cold feeling on the skin and dry easily. The gel material as a hand sanitizer was obtained from the addition of carbopol 940. The carbopol has high stability and low toxicity, so that it can increase its effectiveness as an antibacterial. Meanwhile, glycerin can cause the preparation to be clear and transparent. Glycerin is an emollient gel that helps hand sanitizer preparations when used on hands that are not too dry and acts as an antimicrobial [3]. Use of hand sanitizer excessive and continuous will damage skin tissue [3]. Alternative hand sanitizers derived from plant metabolite compounds are considered more effective because natural ingredients have a relatively low tendency of side effects, are easy to obtain, inexpensive, and can be accepted by the community. Hand Sanitizer can be made from various plants with secondary metabolite compounds that can be antimicrobial, antifungal, and antiviral. Generally, secondary metabolites found in plants have antimicrobial properties, such as groups of flavonoids, alkaloids, steroids, terpenoids, saponins, and tannins [7]. The manufacture of hand sanitizers is carried out by combining alcohol, phenolic, carbopol 940, and glycerin compounds so that Hand Sanitizer products resemble products on the market. Hand Sanitizer requires testing to determine the viscosity and ability to inhibit microorganisms.

Stated that the mechanism of action of secondary metabolites found in plants works with different mechanisms in inhibiting the growth of microorganisms [9]. Where the alkaloid compounds themselves can interfere with the constituent components of peptidoglycan in microorganism cells so that the cell wall layer is not fully formed and causes cell death. The mechanism of action of flavonoids is to form complex compounds with extracellular and dissolved proteins so that they can damage the cell membranes of microorganisms, followed by the release of intracellular compounds. The mechanism of action of tannins is by shrinking the cell wall so that it interferes with the permeability of the cell itself and causes cell wall damage [10]. The mechanism of terpenoids as an antibacterial involves membrane damage by lipophilic compounds. Terpenoids can react with porins (transmembrane proteins) on the outer membrane of the cell wall of microorganisms, forming strong polymer bonds and damaging the porin, and reducing the permeability of the cell walls of microorganisms. As a result, microorganism cells lack nutrients, and their growth will be stunted or die. The mechanism of action of steroids as an antibacterial is by damaging the bacterial cell membrane [11]. The current study focus on identifying the potential of various ethnic plants with medicinal properties in Bima Regency as hand sanitizer natural.

RESEARCH METHODOLOGY

The type of study used in this study is a fully randomized experimental type using two factors: the concentration of medicinal plant extracts and the ratio of alcohol to triclosan. The medicinal plants used were cherry, menilan, rambutan point, ketepeng, white turmeric, guava, and the leaves were used as a hand sanitizer in Bima folk medicine.

RESULTS AND DISCUSSION

The bacteria used in the test of the test plant extracts was Staphylococcus aureus, a bacterium commonly found on the surface of the human body. Identification of these bacteria was carried out to ensure that the test bacteria were S. aureus, carried out by Gram staining. The observations under a microscope (100x) showed that the bacteria were purple in color, round in shape, and clustered like grapes. The bacteria that have been correctly identified are Gram-positive bacteria (S. aureus). These bacteria have thicker peptidoglycan than Gram-negative bacteria so that the Gram stain retains a violet color. The difference in response to the Gram staining mechanism was based on the structure and composition of the bacterial cell wall [12]. Gram-positive bacteria contain protein in lower prevalence and have thick cell walls. Administration of crystal violet and iodine and administration of alcohol (ethanol) in Gram staining causes lipids not to be extracted, thereby reducing the permeability of Gram-positive cell walls. The cell walls were dehydrated by alcohol treatment. The pores were shriveled, and the permeability of the cell walls and membranes

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decreased so that the safranin staining could not enter, and the cells turned purple.

Based on the research results on the inhibitory power of several test plant extracts, the data obtained are described in Table 1.

Table. 1. Results of Inhibitory Test of Plant Extract Test

Treatment Concentration	Average Inhibitory Power of Test Material (cm)					
	Cherry	Meniran	Loads	Ketepeng	White Turmeric	Guava
K-	0.000	0.000	0.000	0.000	0.000	0.000
10%	0.091	0.070	0.000	0.090	0.179	0.117
20%	0.149	0.095	0.044	0.139	0.353	0.214
30%	0.197	0.154	0.095	0.194	0.398	0.321
40%	0.266	0.203	0.130	0.309	0.502	0.410
50%	0.352	0.417	0.213	0.428	0.696	0.514
K+	1.563	1.786	1.748	1.656	1.842	1.900

The increase in the concentration of the test plant extract has an impact on increasing the inhibitory power of the test bacteria. The increase in concentration in the extract of the test plant was directly proportional to the increase in secondary metabolite compounds of plants so that it would increase the inhibitory power of the antimicrobial [13].

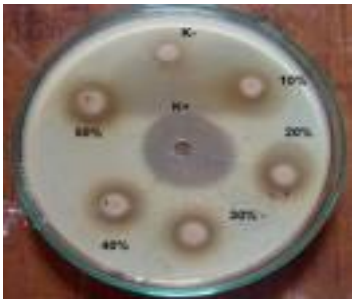

Figure 1. Inhibitory Power of Kersen Extract on the Growth of Test Bacteria.

Table 1 shows the ability of the inhibitory of bacteria in the test plant extracts has different diameters of inhibition. The average concentration of each concentration with the lowest diameter of inhibition can be seen in the plant burden of straw. In the treatment of the plant extract, the inhibition zone began to appear at a concentration of 20%. In comparison, the other treatment with other test plant extracts began to form a zone of inhibition at a concentration of 10%. Meanwhile, the plant extract which has the largest relative inhibition zone is the white turmeric plant extract. The difference in the ability to inhibit the test bacteria could be due to the types and concentrations of secondary metabolites found in the test plant extracts. The content of metabolite compounds such as saponins, flavonoids, tannins, and alkaloids contained in plants can be used as antimicrobials and antifungals [14-18]. The results of the ANOVA analysis from the treatment of the test bacteria can be seen in Table 2.

Table 2. Results of Plant ANOVA Test Against Bacterial Inhibition Test

No.	Test Plants	Interpretation
1	Kersen	Berda significant (influential)
2	Meniran	Berda significant (influential)
3	Arimatic	Berda significant (influenced)
4	Ketepeng	Berda significant (influenced)
5	White	Turmeric significant (influenced)
6	Guava	Berda significant (influenced)

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The ANOVA test showed that all the test materials affected (significantly different) the growth of the test bacteria. The manufacturer of hand sanitizers used the lowest extract concentration of the test plants in each test, namely cherry, meniran, ketepeng, white turmeric, and guava using a concentration of 10% and burden of straw using an extract concentration of 20%. The organoleptic hand sanitizer testing results of various plants can be seen in Table 3.

Table 3. Organoleptic test results

No.	Plants Test	Formulation	Organoleptic Test		
			Color	Odor	Taste
1	Kersen	A1B1	light Pale	Aromatic weak extract	Cool on the surface of the hands and sticky
		A2B1	Pale dark	chocolate Aromatic strong extract	the surface of the hands and sticky
		A1B2	light brown	Aromatic weak extract	Cool on the hands and sticky
		A2B2	Dark chocolate Pale	Aromatic Strong extract Cooler	on the surface of the hands and sticky
2	Meniran	A1B1	Pale yellow	Aromatic medium extract	Cool on the surface of the hands and sticky
		A2B1 Dark	pale yellow	Aromatic strong extract	the surface of the hands and sticky
		A1B2	Pale yellow	Aromatic medium extract	Cool on the surface of the hands and sticky
		A2B2	Pale yellow Aromatic	strong extract Cooler	on the surface of the hands and sticky
3	Aromatic	of straw	light Pale	medium extract	Cool on the surface of the hands and sticky
		A2B1	Pale dark	chocolate Aromatic extract Stronger	and sticky
		Aromatic	light Pale	medium extract	Cool on the surface of the hands and sticky
		A2B2	Pale dark	chocolate Aromatic strong extract Cooler	on the surface of the hands and sticky
4	Ketepeng	A1B1	light Pale	Aromatic medium extract	Cool on the hands and sticky
		A2B1	Pale dark	chocolate Aromatic strong extract	hands and sticky

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		Aromatic	light Pale	medium extract	Cool on the surface Hand and stickiness
		A2B2	Pale dark	chocolate Aromatic strong extract Cooler	on the surface of the hands and sticky
5	White turmeric	A1B1 Attractive	yellow light	Aromatic strong extract	Cool on and sticky
		A2B1	Strong yellow	Aromatic	hands
		Light	yellow Attractive	aromatic	Cool on the surface of the hands and sticky
		A2B2	Strong yellow	Aromatic strong extract	the surface of the hands and sticky
6	Guava	A1B1 Light	brown	Aromatic extract Medium	Cool on the surface of the hands and sticky
		A2B1	Dark brown	Aromatic extract Stronger	hands and sticky
		A1B2 Light	brown	Aromatic extract	Cool on the surface

The organoleptic test shows that the characteristics of the hand sanitizer based on the treatment of different concentrations of extract, as well as alcohol and triclosan are different from the color, aromatic characteristics of the extract, and taste when used. Based on the characteristics shown by the overall hand sanitizer in the treatment, concentration A1 = 4% and the concentration of alcohol and triclosan B2 = 1 ml: 1.5 g. Meanwhile, the pH measurement on various hand sanitizers is described in Table 4.

Table 4. Results of Measurement of pH Hand Sanitizer

No.	Test Plants	Formulation	The pH level of the hand sanitizer
1	Kersen	A1B1	6.14
		A2B1	6.34
		A1B2	6.21
		A2B2	6.57
2	Meniran	A1B1	6.56
		A2B1	6.34
		A1B2	6.28
		A2B2	6.06
3	Aromatic	A1B1	6.41
		A2B1	6.52
		A1B2	6.21
		A2B2	6.82
4	Ketepeng	A1B1	6.08
		A2B1	6.63
		A1B2	6.27
		A2B2	6.13
5	White turmeric	A1B1	6.46
		A2B1	6.78
		A1B2	6.21

No.	Test Plants	Formulation	The pH level of the hand sanitizer
		A2B2	6.53
6	Guava	A1B1	6.14
		A2B1	6.32
		A1B2	6.28
		A2B2	6.54

Based on the measurement of the pH of the hand sanitizers of various plants, the pH range is relatively the same, namely in the range of 6.06 - 6.82. The pH value that meets the pH requirements of topical preparations that are safe for use on the skin is 4.5 - 6.5 [19]. The pH of topical preparations such as hand sanitizers must be adjusted to the skin's pH. It will accept hand sanitizer preparations, and the possibility of irritation to the skin will be lower. The ideal topical preparation is non-irritating to the skin. The possibility of skin irritation will be very large if the preparation is too acidic or too alkaline [20].

CONCLUSION

The use of the Bima ethnic medicinal plant as hand sanitizer showed that all the test plant extracts (cherry, meniran, rambutan fruit, ketepeng, white turmeric, and guava) had inhibitory based on the test concentration. An increase in the concentration of the test plant extract had an impact on increasing the plant's inhibitory performance against bacteria. In conclusion, the test plant can be used as an effective hand sanitizer with a low possibility of irritation to the skin.

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