Objective: Know “Herbal Medicine Formulation Emulgel Preparation Combination of Red Betel Leaf Extract and Green Betel Leaf Extract Rawa South Kalimantan and Central Kalimantan Indonesia as an inhibitor of Escherichia coli and Staphylococcus aureus bacteria.

Theoretical framework: Postpartum infections are the second leading cause of maternal death in Indonesia after bleeding. This research was within the theoretical framework of perineal wound care to assess the effectiveness of betel leaves in treating wounds (Damarini et al, 2012). Betel leaves have a distinctive aroma because they contain 1−4.2% essential oil, water, protein, fat, carbohydrates, calcium, phosphorus, vitamins A, B, C, iodine, sugar and starch. Of these various contents, in there essential oils are natural phenols which have antiseptic power 5 times stronger than ordinary phenols (bactericides and fungicides) but not sporacids. Essential oil from betel leaves contains 30% phenol and several derivatives. (Chakraborty, 2011). Essential oils act as anti-bacterials by interfering with the process of forming membranes or cell walls so that they do not form or form imperfectly (Ajizah, 2008).

Method: Type of true experimental research. The ingredients used are red and green betel leaves originating from South Kalimantan and Central Kalimantan. The leaves are dried, then extracted using the maceration method, then the extract is dried. The extract was made in emulgel dosage form, then the physical properties of the emulgel were tested. Data was analyzed statistically.

Results and conclusion: The formulation was able to produce an emulgel preparation from a combination of green and red swamp betel leaf extracts from South Kalimantan and Central Kalimantan Indonesia. This combination was effective in inhibiting Escherichia coli and Staphylococcus aureus.
Green Betel Leaves Extract and Red Betel Leaves Extract South Kalimantan and Central Kalimantan Indonesia are the Best Combination to Inhibit Escherichia Coli and Staphylococcus Aureus

Test results of the physical properties of the emulgel product, a combination of green and red swamp betel leaf extracts in South Kalimantan and Central Kalimantan, with formula 1 results, namely homogeneous, viscosity 3173 Centipoise (cps), adhesive power 7.70 seconds, spread ability 8.62 cm², and pH 6.23. While formula 2 is homogeneous, viscosity 3259 cps, adhesion power 7.80 seconds, spread ability 8.30 cm², and pH 6.33. The results of statistical tests on the physical properties of the emulgel product, a combination of green and red swamp betel leaf extracts in South Kalimantan and Central Kalimantan as inhibitors of Escherichia coli and Staphylococcus aureus bacteria, show that formula 2 has the best ability when compared to placebo and formula 1. Emulgel formulation of Green Betel leaves extract and Red Betel leaves South Kalimantan and Central Kalimantan as inhibitors to Escherichia coli and Staphylococcus aureus which fulfill the physical requirements emulgel and formula 2 have the best ability.

Implications of the research: this research has implications for continuing (Damarini et al, 2012) to focus on preventing perineal wound in postpartum mother against bacteria.

Keywords: emulgel, green betel, red betel, escherichia coli, staphylococcus aureus.

RESUMO

Objetivo: Saber “Formulação de medicina à base de plantas Preparação de Emulgel Combinação de extrato de folha de betel vermelho e extrato de folha de betel verde Rawa South Kalimantan e Kalimantan indonésia central como um inibidor de bactérias Escherichia coli e Staphylococcus aureus.

Estrutura teórica: As infecções pós-parto são a segunda principal causa de morte materna na Indonésia após sangramento. Esta pesquisa foi realizada dentro do quadro teórico do cuidado de feridas perineais para avaliar a eficácia das folhas de bétel no tratamento de feridas (Damarini et al, 2012). As folhas de bêtele têm um aroma distinto porque contêm 1-4,2% de óleo essencial, água, proteína, gordura, carboidratos, cálcio, fósforo, vitaminas A, B, C, iodo, açúcar e amido. Destes vários conteúdos, em lá óleos essenciais são fenóis naturais que têm poder antisséptico 5 vezes mais forte do que fenóis comuns (bactericidas e fungicidas), mas não esporádicos. O óleo essencial de folhas de bétel contém 30% de fenol e vários derivados. (Chakraborty, 2011). Os óleos essenciais atuam como antibacterianos, interferindo no processo de formação de membranas ou paredes celulares para que não se formem ou se formem imperfeitamente (Ajizah, 2008).

Método: Tipo de pesquisa experimental verdadeira. Os ingredientes utilizados são folhas de bétel vermelhas e verdes provenientes de Kalimantan do Sul e Kalimantan Central. As folhas são secas, depois extraídas através do método de maceração, depois o extrato é seco. O extrato foi feito em forma de dosagem de emulgel, então as propriedades físicas do emulgel foram testadas. Os dados foram analisados estatisticamente.

Resultados e conclusão: A formulação foi capaz de produzir uma preparação de emulgel a partir de uma combinação de extratos de folhas de betel verde e vermelho de Kalimantan Sul e Kalimantan Central. Resultados de teste das propriedades físicas do produto emulgel, uma combinação de extratos de folhas de betel verde e vermelho em Kalimantan Sul e Kalimantan...
1 INTRODUCTION

Red betel leaves is scientifically known as Piper crocatum which is included in the Piperaceae family. Green betel leaves (Piper betle Linn) The betel plant or Piper betle Linn comes from the order Piperales, family Piperaceae, and genus Piper. This plant is a widely distributed plant in tropical and subtropical areas in various parts of the world (Chakraborty, 2011). Betel leaves have a distinctive aroma because they contain 1−4.2% essential oil, water, protein, fat, carbohydrates, calcium, phosphorus, vitamins A, B, C, iodine, sugar and starch. Of these various contents, in essential oils there are natural phenols which have antiseptic power 5 times stronger than ordinary phenols (bactericides and fungicides) but not sporacids.

Essential oils act as anti-bacterials by interfering with the process of forming membranes or cell walls so that they do not form or form imperfectly (Ajizah, 2008). The mechanism of phenol as an anti-bacterial agent acts as a toxin in the protoplasm, damaging and penetrating the walls and precipitating bacterial cell proteins. Large molecular phenolic compounds are able to inactivate essential enzymes in bacterial cells even in very low concentrations. Phenol can cause damage to bacterial cells, denature proteins, inactivate enzymes and cause cell leakage (Hyne, 1987).

Apart from that, betel leaves contain several chemical compounds such as flavonoids, alkaloids and tannins which are bactericidal. Flavonoids are phenolic compounds that can cause denaturation of proteins which are important substances in the structure of bacteria. If cell components such as proteins are denatured, the bacterial
metabolic process will be disrupted and cause lysis which will result in the death of the bacteria (Jawetz et al., 2007).

Alkaloids have antibacterial capabilities. The suspected mechanism is by disrupting the peptidoglycan components in bacterial cells, so that the cell wall layer does not form completely and causes cell death (Robinson, 1991). Tannins have antibacterial activity, because the toxic effects of tannins can damage bacterial cell membranes, tannin astringent compounds can induce the formation of binding compound complexes to enzymes or microbial substrates and the formation of tannin binding complexes to metal ions which can increase the toxicity of tannin itself. This research develops herbal medicines that are effective, cheap and standardized.

2 THEORETICAL FRAMEWORK

This research was within the theoretical framework of perineal wound care to assess the effectiveness of betel leaves in treating wounds (Damarini et al, 2012). Betel leaves have a distinctive aroma because they contain 1−4.2% essential oil, water, protein, fat, carbohydrates, calcium, phosphorus, vitamins A, B, C, iodine, sugar and starch. Of these various contents, in there essential oils are natural phenols which have antiseptic power 5 times stronger than ordinary phenols (bactericides and fungicides) but not sporacids. Essential oils are oils that evaporate easily and contain a distinctive aroma or fragrance. Essential oil from betel leaves contains 30% phenol and several derivatives. Essential oils consist of hydroxy kavicol, cavibetol, estragol, eugenol, methyleugenol, carbacrole, terpenes, sesquiterpenes, phenylpropanes, and tannins. Kavikol is the most abundant component in the essential oil which gives betel its characteristic odor. Kavikol is easily oxidized and can cause discoloration. (Chakraborty, 2011). Essential oils act as anti-bacterials by interfering with the process of forming membranes or cell walls so that they do not form or form imperfectly (Ajizah, 2008). At low levels, phenol protein complexes will form with weak bonds and immediately decompose, followed by penetration of phenol into cells and causing precipitation and protein denaturation. At high levels, phenol causes protein coagulation and cell membranes undergo lysis (Parwata, 2008). Meanwhile, the mechanism of phenol as an anti-bacterial agent acts as a toxin in the protoplasm, damaging and penetrating the walls and precipitating bacterial cell proteins. Large molecular phenolic compounds are able to inactivate essential
enzymes in bacterial cells even in very low concentrations. Phenol can cause damage to bacterial cells, denature proteins, inactivate enzymes and cause cell leakage (Hyne, 1987).

In addition, this theoretical framework Betel leaves are also rich in metabolites such as volatile oils (safrol, eugenol, eugenol methyl ester, isoeugenol), phenolic components (chavicol, hydroxyl chavicol), hydroxyl fatty acids (stearic, palmitic, myristic), and fatty acids. (stearate and 8 palmitate) which have antibacterial effects and can be used in microbial infections (Bangash, et al., 2012). The strong antimicrobial effect of betel leaves is also caused by the presence of esters, flavonoids, alkaloids and benzoic acid (Foo, et al., 2015). Flavonoids are able to shorten the inflammation time, thereby enabling the proliferation process (Indraswari, 2011).

This research is based on a conceptual framework that focuses on the importance of treating perineal wounds because when a mother experiences perineal trauma, the problem that immediately arises is complaints of pain. Perineal pain that occurs or recurs can be caused by infection. Infection can continue which is characterized by watery skin edges, swelling, possibly smelling, pus in the wound (Myles, 2009). According to Bick et.al 2002 in Myles (2009), giving compresses and complementary medicines is considered useful for healing perineal wounds. In research conducted by Damarini et al (2012) with the aim of assessing the effectiveness of betel leaves in treating wounds, the results showed that in the treatment group, the average number of days needed to treat perineal wounds was around 3 days shorter than the control group which took a minimum of 5 days. There are two types of vulva hygiene in treating birth canal injuries, namely non-antiseptic treatment, one of which is using traditional medicine which uses betel leaf decoction.

The main objective of this framework is to develop a Combination Product of Red Betel Leaf Extraction and Raw Green Betel Leaf in South Kalimantan and Central Kalimantan as a Herbal Medicine that can be used to treat perineal wounds in postpartum mothers at an affordable, effective, cheap and standardized price. In the end, these efforts aim to develop an effective herbal medicine formulation for the combination of red betel leaves and green betel leaves in swamps in South Kalimantan and Central Kalimantan with low costs from a variety of dosage formulas, especially in areas where there is a high incidence of postpartum infections due to perineal wounds caused by lack of knowledge about perineal wound care and vulva hygiene.
3 METHODOLOGY

This research proposal has been reviewed by The Research Ethics Commission of Muhammadiyah University Banjarmasin as stated in certificate number 191/UMB/KE/V/2022. This research consists of 3 stages, namely: 1) Stage I: Making simplicia, extract and/or green and red swamp betel from South Kalimantan and Central Kalimantan using the maceration method (Azizah, 2020) and the solvents used are ethanol and ethyl acetate (Hartutiningsih et al., 2009; Widyawati et al., 2010), 2) Stage II: Making chitosan gelling agent, Formulation of chitosan emulgel preparations-extract of green and red swamp betel leaves from South Kaimantan and Kalimantan Middle (Placebo, Formula 1: 10%, Formula 2: 20%), Preparation of chitosan emulgel from betel leaf extract, 3) Stage III: Physical properties test of chitosan emulgel-chitosan extract-green and red swamp betel leaf extract in South Kalimantan and Central Kalimantan (Organoleptic Test, Homogeneity Test, pH Test, Adhesion Test, Spreadability Test, Viscosity Test (Tunjungsari D., 2012).

4 RESULTS AND DISCUSSION

The percent yield results of the two samples of simplicia leaves are shown in table 1:

<table>
<thead>
<tr>
<th>No.</th>
<th>Area</th>
<th>Leaf Type</th>
<th>Percent Leaf Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>South Kalimantan</td>
<td>Green Betel</td>
<td>52.64 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red Betel</td>
<td>51.56 %</td>
</tr>
<tr>
<td>2.</td>
<td>Central Kalimantan</td>
<td>Green Betel</td>
<td>52.43 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red Betel</td>
<td>51.32 %</td>
</tr>
</tbody>
</table>

Source: Prepared By the Author (2022)

Percent yield is obtained from calculating the weight of fresh leaves or wet samples and the weight of dry simplicia. Percent yield of the four leaves, namely South Kalimantan green betel 52.64%, South Kalimantan red betel 51.56%, Central Kalimantan green betel 52.43%, Central Kalimantan red betel 51.43%.

The purpose of drying simplicia is to reduce the water content in the simplicia so that it can prevent a decrease in quality and spoilage of the sample due to mold and so that the storage time of the simplicia lasts longer. Dry simplicia powder is stored in a tightly closed container and protected from light (Syafrieda et al., 2018).
The betel leaves used consist of green betel leaves and red betel leaves. This can cause differences in the results for each parameter because the place of growth is one of the main factors that influences the compound content in the sample. The difference in sampling locations aims to see the influence of different locations on the test parameters. Differences in the results of these parameters can usually be influenced by several general factors such as the environment where the plants grow, altitude, air humidity, temperature, pH, light intensity, nutrients and soil quality which are closely related to the process of forming active compounds in plants (Bata et al., 2018).

The results of the percent yield of leaf extract from both samples are shown in table 2:

<table>
<thead>
<tr>
<th>No.</th>
<th>Area</th>
<th>Leaf Type</th>
<th>Percent Leaf Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>South Kalimantan</td>
<td>Green Betel</td>
<td>8.45 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red Betel</td>
<td>7.25 %</td>
</tr>
<tr>
<td>2.</td>
<td>Central Kalimantan</td>
<td>Green Betel</td>
<td>8.28 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red Betel</td>
<td>7.21 %</td>
</tr>
</tbody>
</table>

Source: Prepared By the Author (2022)

The extraction results showed results that were not much different between the four samples. Extract yield results namely South Kalimantan green betel 8.45%, South Kalimantan red betel 7.25%, Central Kalimantan green betel 8.28%, Central Kalimantan red betel 7.21%. The percent yield results can be used to calculate the need for fresh leaves if the desired amount of extract is needed.

The average yield results obtained for the two samples showed different results. This could be caused by differences in growing places which influence the amount of secondary metabolite compounds contained in each sample. Factors that influence results include the growing environment, temperature, pH, light intensity, altitude, air humidity, nutrients and differences in soil quality depending on where the plants grow. (Bata et al., 2018). The Indonesian Herbal Pharmacopoeia states that the requirements for extract yield are a yield of not less than 7.2%, so it can be concluded that the leaf extract yield has met the requirements (Djoko et al., 2020).

Extraction using the maceration method is carried out by stirring with the aim of ensuring and increasing the surface contact of the powder sample with the polluting liquid or solvent, making it easier for the active compound to dissolve completely in the solvent (Apriliana et al., 2019). The aim of changing the solvent (remaceration) every 24 hours
with a new solvent is so that the chemical compounds contained in the sample can be extracted optimally (Posmaningsih et al., 2018; Ernyasih et al., 2023; Astuti et al., 2023).

Extract yield is an important parameter in determining the success of extraction or as a standard parameter for extract quality. Factors that can influence the yield value obtained are the solvent used, the extraction method and the length of the extraction process (Apriliana et al., 2019). Other influencing factors are the particle size of simplicia powder, type of solvent polarity and solvent concentration (Handoyo, 2020). The aim of calculating the extract yield value is to determine the number of chemical compounds that are extracted during extraction. The higher the percent yield obtained, the higher the chemical compound content contained in the sample (Dewatisari et al., 2017).

The physical properties test results are presented in table 3 below:

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>Placebo</th>
<th>Formula 1</th>
<th>Formula 2</th>
<th>Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Homogeneity</td>
<td>Homogeneous</td>
<td>Homogeneous</td>
<td>Homogeneous</td>
<td>Homogeneous (Suryani et al., 2019)</td>
</tr>
<tr>
<td>3</td>
<td>Viscosity</td>
<td>2136.67 cps</td>
<td>3173 cps</td>
<td>3259 cps</td>
<td>2000-4000 cps (Garg et al., 2002).</td>
</tr>
<tr>
<td>4</td>
<td>Stickiness</td>
<td>6.34 seconds</td>
<td>7.70 seconds</td>
<td>7.80 seconds</td>
<td>&gt; 4 seconds (Nevi, 2006)</td>
</tr>
<tr>
<td>5</td>
<td>Spread Power</td>
<td>9.43 cm2</td>
<td>8.62 cm2</td>
<td>8.30 cm2</td>
<td>7.605 – 19.625 cm2 (Garg et al., 2002).</td>
</tr>
<tr>
<td>6</td>
<td>pH</td>
<td>5.37</td>
<td>6.23</td>
<td>6.33</td>
<td>4.5-6.5 (Tranggono and Latifah, 2007)</td>
</tr>
</tbody>
</table>

Source: Prepared By the Author (2022)

The first test result is organoleptic. Organoleptic testing or sensory testing is a method of testing using human senses as the main tool for measuring the acceptability of products. In the placebo formula, it is known that the emulgel formed is semi-solid, odorless, tasteless and white in color. Formulas 1 and 2 are known to have a distinctive odor, slightly bitter taste, light brown color, and are semisolid. The homogeneity test
results showed that the three formulas were homogeneous which was characterized by the absence of coarse particles or solid particles in the emulgel preparation. The viscosity test results showed that placebo was 2136.67 cps, formula 1 was 3173 cps, and formula 2 was 3259 cps. The relatively low viscosity of placebo indicates low viscosity. This is because the placebo does not contain active ingredients in the form of extracts. The test results showed that the placebo had a sticking force of 6.34 seconds, while formula 1 was 7.70 seconds and formula 2 was 7.80 seconds. The spread ability test results showed that placebo had a spread ability of 9.43 cm², formula 1 was 8.62 cm², and formula 2 was 8.30 cm². The results of pH testing on the three formulas showed that placebo had a pH of 5.37, formula 1 was 6.23, and formula 2 was 6.33. The test results show that the higher the extract level, the more alkaline the pH will be. Formula 1 is 8.62 cm², and formula 2 is 8.30 cm². The results of pH testing on the three formulas showed that placebo had a pH of 5.37, formula 1 was 6.23, and formula 2 was 6.33. The test results show that the higher the extract level, the more alkaline the pH will be. Formula 1 is 8.62 cm², and formula 2 is 8.30 cm². The results of the physical properties test of the emulgel product, a combination of green and red swamp betel leaf extracts in South Kalimantan and Central Kalimantan as an inhibitor of Escherichia coli and Staphylococcus aureus bacteria, meet the requirements for the physical properties of emulgel with the results of

5 CONCLUSION

The results of the research that has been carried out show that the formulation is able to produce an emulgel from a combination of green and red swamp betel leaf extracts in South Kalimantan and Central Kalimantan as an inhibitor of Escherichia coli and Staphylococcus aureus bacteria. The results of the physical properties test of the emulgel product, a combination of green and red swamp betel leaf extracts in South Kalimantan and Central Kalimantan as an inhibitor of Escherichia coli and Staphylococcus aureus bacteria, meet the requirements for the physical properties of emulgel with the results of
formula 1, namely homogeneous, viscosity 3173 cps, adhesion 7.70 seconds, spread ability 8.62 cm², and pH 6.23, while formula 2 is homogeneous, viscosity 3259 cps, adhesion power 7.80 seconds, spread ability 8.30 cm², and pH 6.33.
REFERENCES


